Current Developments in Nutrition 9 (2025) 107439

American Society for Nutrition
Excellence in Nutrition Research and Practice

Current Developments in Nutrition

journal homepage: https://cdn.nutrition.org/

Review

Narrative Review of the Validity and Cross-Context Equivalence of Healthy Diet Metrics and Their Data Collection Methods for Global Monitoring

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A B S T R A C T

Background: Valid, sensitive healthy diet metrics that are comparable across contexts are needed for global monitoring. The healthy diets monitoring initiative identified 4 field metrics as potentially fit for purpose: global diet quality score (GDQS), global dietary recommendations score, minimum dietary diversity for women (MDD-W), and Nova ultra-processed food score.

Objectives: To review whether these 4 healthy diet metrics *1*) accurately predict food and nutrient intakes; *2*) accurately differentiate the average or prevalence of food and nutrient intakes; *3*) respond to changes over time; *4*) are comparable across contexts; and *5*) can be collected using their proposed brief assessment methods while preserving predictive accuracy.

Methods: Peer-reviewed literature was searched and extracted from PubMed, Web of Science, and Google Scholar, including preprints and grey literature from the latter. Evidence on the accuracy of the field metrics and methods was qualitatively assessed against the aforementioned objectives, considering the underlying theory of change and study design, as well as the direction and magnitudes of the observed associations or effects.

Results: Increments in GDQS+ and MDD-W predicted higher composite metrics of nutrient adequacy. MDD-W was sensitive to changes in nutrient intakes over time. MDD-W cutoffs showed limited variability across contexts and population groups. Higher GDQS and global dietary recommendation scores and lower Nova ultra-processed food scores were associated with lower intakes of food and nutrients to moderate. The predictive accuracy of field methods for nutrient adequacy was maintained for GDQS and MDD-W. No study explicitly investigated how field metrics differentiate averages or prevalence of reference metrics across countries.

Conclusions: MDD-W demonstrated comparatively stronger predictive accuracy for nutrient adequacy, with a lower burden method, than GDQS+. Further research is required to determine the predictive accuracy of field-friendly metrics measuring moderation across contexts and time. Complementary metrics that can be collected simultaneously on a large scale are needed for global monitoring.

Keywords: accuracy, dietary assessment, GDQS, GDR score, MDD-W, moderation, NOVA, nutrient adequacy, sensitivity to change, UPF

Abbreviations: DQQ, diet quality questionnaire; FFQ, food frequency questionnaire; FGDS, food group diversity score; GDQS, global diet quality score; GDQS−, global diet quality score negative submetric; GDQS+, global diet quality score positive submetric; GDR, global dietary recommendations; HDMI, healthy diets monitoring initiative; MAR, mean adequacy ratio; MDD-W, minimum dietary diversity for women; MPA, mean probability of adequacy; NCD, noncommunicable disease; NL, nonlactating; NP, nonpregnant; pp, percentage point; UPF, ultra-processed food; 24-HR, 24-h recall.

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https://doi.org/10.1016/j.cdnut.2025.107439
Received 10 February 2025; Received in revised form 27 March 2025; Accepted 31 March 2025; Available online 6 April 2025

Introduction

A healthy diet promotes growth, development, and immune function and helps prevent malnutrition in all its forms [1]. To develop and implement effective, evidence-based strategies and assess progress toward a healthy diet for all, monitoring diets worldwide is essential. Nationally representative dietary surveys using (repeated) quantitative 24-h recall (24-HR) are a cornerstone of nutrition information systems, as these data are essential for assessments of the total diet or specific aspects of the diet [2]. Due to their cost and complexity, quantitative 24-HR is often unfeasible for countries to implement at the frequency required for timely monitoring of diets at the population level, particularly given the rapid pace of dietary transitions occurring worldwide. To scale up the monitoring of diets, countries require simpler, more affordable (i.e., field-friendly) dietary assessment methods for routine tracking that can complement quantitative 24-HR surveys. These brief, field-friendly methods should yield metrics of the healthiness of diets that are valid, sensitive to change, and perform equivalently across contexts [3].

The FAO of the United Nations, UNICEF, and WHO have joined forces to launch the healthy diets monitoring initiative (HDMI), with the mission of “enabling national and global decision-makers and stakeholders to monitor and achieve healthy diets for people and the planet” [3]. In 2023, HDMI published a technical assessment [4] of candidate healthy diet metrics against a suite of criteria based on a modified framework used to critically appraise health assessment tools [5], health literacy measures [6], and nutrition and food literacy measures [7]. The criteria included an assessment of metrics’ content, cross-context equivalence, validity for initial purpose, sensitivity to change, test-retest reliability, internal consistency, population groups covered, interpretation threshold, ease of computation, and ease of interpretation, whereas their field-friendly methods were assessed against criterion validity, interviewer burden, respondent burden and time required for data collection [4]. Subsequently, 4 priority healthy diet metrics, related submetrics, and brief dietary assessment methods were identified as potentially suitable for global monitoring [4]: *1*) the global diet quality score (GDQS) and GDQS positive (+) and negative (−) submetrics, *2*) the global dietary recommendations (GDRs) score, and its submetrics: noncommunicable disease (NCD)-protect and NCD-risk scores, *3*) the Minimum Dietary Diversity for Women (MDD-W) indicator and its underlying food group diversity score (FGDS), and *4*) the Nova ultra-processed foods (UPFs) score (Table 1). Metrics requiring quantitative dietary intake data for their computation, namely the Alternative Healthy Eating Index 2010, Dietary Approaches to Stop Hypertension, and Diet Quality Index-International, were principally excluded based on feasibility constraints for high-frequency monitoring.

HDMI also issued a call to action, which highlighted, among other priorities, the need to address evidence gaps regarding the development and validation of healthy diet metrics [3].

The objectives of this narrative review were to investigate the extent to which the 4 priority healthy diet metrics: *1*) accurately predict food and nutrient intakes from a reference or definitive measure (e.g., probability of nutrient adequacy from quantitative 24-HR) within populations or contexts; *2*) accurately differentiate the average or prevalence of food and nutrient intakes from a reference or definitive measure across countries; *3*) accurately respond to changes over time (e.g., seasonality, intervention) within populations or contexts, *4*) perform equivalently across contexts; and *5*) can be accurately and precisely collected using their proposed field-friendly methods while maintaining the healthy diet metric’s predictive accuracy for food and nutrient intakes from a reference or definitive measure.

This review is focused on a specific set of scalable non- or semi-quantitative healthy diet metrics to guide recommendations on their use for global monitoring, which includes an in-depth review of the validation literature, emphasizing validation against quantitative dietary reference metrics rather than nutritional status or health outcomes and considers studies across all population groups, including but not limited to children and adolescents.

Previous studies assessed evidence on the validity of healthy diet metrics either for children and adolescents only, focused on nutritional status or health outcomes, did not include newer metrics developed for use in multiple countries, were not comprehensive, or offered recommendations for epidemiological studies and not for global monitoring [8–15].

TABLE 1
Reference metrics of dietary intake to assess the accuracy of field metrics, by subconstruct of a healthy diet.

Subconstruct of a healthy diet	Definition	Field metrics	Field method	Definitive or reference methods	Reference metric
			Pairs of metrics-methods		Nutrients and dietary constituents
Nutrient adequacy	Dietary intake that meets micro- and macronutrient requirements (EAR) or cutoffs	GDQS GDR score MDD-W	GDQS-GDQS application GDR score-DQQ MDD-W-food list	Weighed food record 24-h recall Food diary	Adequate Carbohydrates Lipids Minerals Protein Vitamins
Moderation	Caloric intake that does not exceed total energy expenditure Dietary intake below cutoffs for specific foods and nutrients	GDQS GDR score Nova UPF score	GDQS-GDQS application GDR score-DQQ Nova UPF score-Nova UPF screener	Weighed food record 24-h recall Food diary	Excessive Added sugar Calories Saturated fat Sodium Trans-fat UPF (Nova group 4)

Abbreviations: DQQ, diet quality questionnaire; EAR, estimate average requirement; GDQS, global diet quality score; GDR, global dietary recommendations; MDD-W, minimum dietary diversity for women; UPF, ultra-processed food.

Methods

In the absence of a specific reporting guideline, this narrative review was cross-checked against the items on the scale for the assessment of narrative review articles [16].

Conceptual background

This study reviewed the validity of field-friendly metrics that sought to measure ≥1 of the 6 subconstructs of a healthy diet that are relevant for monitoring purposes: nutrient adequacy, macronutrient balance, diversity, moderation, food safety, and nutrient density [17]. Throughout this review, validation refers to the construction, reliability, and accuracy of a field-friendly metric or method compared to 1 that has been established as an acceptable measure closest to the "truth" [18].

Accuracy to predict food and nutrient intakes

The first objective of this review was to examine evidence of how accurately a field-friendly metric of healthy diets predicts food and nutrient intakes from a reference metric. Reference metrics (e.g., probability of micronutrient adequacy) are typically derived from a reference method, which includes weighed food records, food diaries, or quantitative 24-HR. We considered food frequency questionnaires (FFQ) to be secondary reference methods because FFQs provide a less accurate estimate of (absolute) dietary intake over a 24-h period and are conventionally used to rank individuals [19]. Field-friendly metrics (e.g., MDD-W) are typically derived from brief dietary assessment methods (e.g., sentinel-based food lists) that should be precise and feasible for frequent large-scale data collection while, ideally, also maintaining satisfactory accuracy to reflect the underlying subconstruct(s) of interest.

Accuracy to differentiate the average or prevalence of food and nutrient intakes

For global monitoring of populations or contexts (e.g., countries), field-friendly metrics must accurately differentiate the average (e.g., mean, median, or mode) or prevalence of food and nutrient intakes from a reference or definitive measure across countries. Evidence that field-friendly metrics (do not) accurately predict food and nutrient intakes *within* a population or context does not necessarily apply directly to differentiation *across* countries.

Response to change over time

Sensitivity to change (e.g., seasonality or intervention) is another critical attribute for any field metric that will be used to monitor trends. Establishing whether a field metric is (not) sensitive to change requires repeated cross-sectional or longitudinal studies in which a reference metric and the field metric are both assessed simultaneously over time or allow a retrospective computation of both.

Equivalence across contexts

For the evidence presented in this review, cross-context equivalence refers to whether an indicator cutoff performs consistently between the same population group (e.g., adolescent boys aged 10–19 y) across contexts [20]. This attribute is particularly important for global monitoring, as it allows for comparison across regions and countries.

Precision and accuracy of brief dietary assessment methods

Novel dietary assessment methods must be assessed for their precision and accuracy, as well as their predictive capacity. When a field method leads to an average or prevalence of a healthy diet metric within an acceptable range of an estimate obtained using a reference method, it is considered to be accurate at the population level. Only when the values of a healthy diet metric maintain the capacity to predict food and nutrient intakes obtained from a reference method is it considered to hold predictive capacity. To illustrate, an identical prevalence estimate could be obtained from a brief dietary assessment method and a reference method (e.g., 70%), but nonetheless, there are substantial numbers of false positive and false negative findings (e.g., 30% for both, indicating poor precision at the individual-level) which consequently hampers the predictive capacity of a field method for a reference metric.

Search strategy

Peer-reviewed literature published through 29 February 2024 was searched and extracted from PubMed, Web of Science, and Google Scholar, and preprints and grey literature (i.e., working papers and technical reports, but not abstracts) from the latter were also included in the narrative review. Extraction syntaxes were developed and searched separately for each healthy diet metric (Supplemental Text).

Exclusion criteria

Articles only examining determinants or predictors (e.g., age, socio-economic status, on-farm diversity) of healthy diet metrics and manuscripts without concurrent assessments of reference metrics of dietary intake were excluded. In addition, articles only assessing adapted versions of the priority healthy diet metrics were excluded (e.g., different numbers of food groups or scoring cutoffs). Lastly, articles that only assessed the validity of healthy diet metrics against nutritional status or health outcomes were also excluded. To clarify, HDMI deemed the accuracy of healthy diet metrics to predict nutritional status and health outcomes as secondary importance because such outcomes are not reference metrics for any of the subconstructs of a healthy diet. A key drawback of only using nutritional status and health outcomes is that many causes contribute to such outcomes (e.g., sanitation and healthcare), which transcend dietary intake. Therefore, statistical examinations of these relationships must adhere to a clear theory of change linking diet to the outcome of interest, be based on study designs that mitigate reverse causality, be well-controlled for confounders, and be complemented by evidence that the field metric accurately captures intakes of relevant dietary constituents as measured by a reference method. Moreover, disease markers and their outcomes are usually not appropriate for use among children and adolescents due to the extensive time lag between chronic exposure to unhealthy diets and disease onset.

Analysis of literature

The associations between a healthy diet metric and a reference metric were reported and assessed in this review when the evidence source used data from either a (quantitative) 24-HR or an FFQ. In studies where both were used for identical analyses, only the former findings were reported. The rationale behind this decision was that each field-friendly method [e.g., diet quality questionnaire (DQQ)] enumerates dietary intake over a 24-h period, and the comparison against 24-HR as the reference method better reflects the validity and operationalization of healthy diet metrics [21,22]. This review does not report on studies where a healthy diet metric was compared with another healthy diet metric, as such comparisons only offer evidence of agreement rather than validity [23].

Evidence-based theories of change linking the subconstruct being measured to the outcome of interest are essential for the interpretation of research findings. Healthy diet metrics designed to measure nutrient adequacy through food group diversity may be satisfactory predictors of micronutrient intakes and potentially micronutrient deficiencies (e.g., inadequate serum ferritin concentrations). Similarly, healthy diet metrics designed to measure the subconstruct of moderation of food and nutrients associated with NCD risk would be expected to be satisfactory predictors of critical food and nutrients associated with non-communicable diseases.

The extracted literature was analyzed according to the following criteria: *1*) evidence-based theory of change connecting a field-friendly metric to the subconstructs of a healthy diet (e.g., additional exclusion of articles only validating a field-friendly metric of nutrient adequacy against a reference metric of moderation); *2*) appropriateness of study design and analytical methods employed to assess the accuracy of field-friendly metrics and methods (e.g., risk of overfitting when developing and testing healthy diet metrics using the same dataset without cross-validation, outcome used for healthy diet metric development and validity assessment are tautological); *3*) direction and magnitude of associations and effects reported between field and reference metrics; and *4*) evidence of equivalence of findings across contexts.

Results

In total, 51 distinct articles or preprints were reviewed, of which 41 were related to the 10-point FGDS or MDD-W, 10 to GDQS and its submetrics, 3 to GDR score and its submetrics, and 5 to the Nova UPF score (Figure 1).

Prediction of food and nutrient intakes within populations or contexts

The 4 healthy diet metrics reviewed intended to measure ≥1 of 2 subconstructs: nutrient adequacy and moderation [24] (Table 1).

GDQS and its sub metrics

GDQS is intended to measure nutrient adequacy and moderation [24]. Specifically, higher GDQS+ is intended to signal better nutrient adequacy, whereas higher GDQS− is intended to reflect moderation of food and nutrients associated with increased NCD risks.

For the subconstruct of nutrient adequacy, 6 cross-sectional studies assessed the correlation between GDQS and a composite measure of nutrient adequacy [e.g., mean probability of adequacy (MPA)] from quantitative 24-HR or FFQ, and in different settings, among nonpregnant (NP), nonlactating (NL) or lactating females and males [21,22,25–27]. The choice and number of micronutrients (range: 6–11) were heterogeneous, and the composite measure occasionally included fiber and/or macronutrients. All studies reported a positive association between differences in GDQS+ and greater nutrient adequacy (no null findings, no inverse associations).

Higher GDQS was also positively correlated with a lower probability of nutrient inadequacy among adult females and males in Ethiopia [ρ = 0.07 (24-HR) among females and ρ = 0.32 (FFQ) among males] [21], Mexico [ρ = 0.27; 95% confidence interval (CI): 0.09, 0.38 among females] [22], 10 countries in sub-Saharan Africa [ρ = 0.37; 95% CI: 0.32, 0.41 among females and ρ = 0.34; 95% CI: 0.30, 0.38 among males] [28], China [odds ratio (95% CI) of MPA <0.50 between fifth and first GDQS quintile: 0.17 (0.14, 0.20)] [25], Thailand (ρ = 0.23) [27], and Viet Nam [ρ = 0.34; odds ratio (95% CI) per point increment: 0.87 (0.83, 0.91)] [26]. Furthermore, young females in Viet Nam with low (i.e., <15 points) and moderate GDQS (i.e., 15–22 points) were more likely to have an MPA <0.50, as compared to individuals with a high GDQS (i.e., ≥23 points) [odds ratios (95% CIs): 5.2 (2.7, 10.1) and 1.9 (1.2, 3.1), respectively] [26].

For the subconstruct of moderation, 4 studies assessed the correlation between GDQS and the intake of total fat, saturated fat, added sugars, and the proportion of energy from UPF. In Mexico, higher GDQS was negatively correlated to total fat (ρ = –0.06), saturated fat (ρ = –0.16), and added sugar intakes (ρ = –0.37) [22]. However, using an FFQ in India, GDQS and GDQS+ were positively correlated with SFA (ρ = 0.10 and ρ = 0.17, respectively) and total fat intakes (ρ = 0.26 and ρ = 0.34, respectively), whereas GDQS− was inversely associated with intakes of total fat (ρ = –0.31) and saturated fat (ρ = –0.23) [29]. Moreover, a cross-sectional study of NP females aged 15–49 y in Ethiopia reported that 1-point increments in GDQS, GDQS+, and GDQS− were negatively associated with the proportion of energy from UPF [regression coefficients (95% CIs): –2.9 percentage points (pps) (–3.9, 2.0) pp, –1.1 pp (–1.8, 0.5) pp, and –1.8 pp (–2.3, 1.3) pp, respectively] [30]. Lastly, GDQS was positively correlated with total fat intake among females aged 16–22 y in Viet Nam (ρ = 0.06) [26].

GDR score and its submetrics

The GDR score is intended to reflect adherence to GDRs. Specifically, higher NCD-protect is intended to reflect consumption of foods and nutrients protective against NCD and (micro)nutrient inadequacy, and lower NCD risk is intended to reflect moderation of food and nutrients associated with increased NCD risks. For this review, GDR was considered to reflect the subconstructs of nutrient adequacy and moderation [24].

For the subconstruct of nutrient adequacy, 2 studies have assessed the predictive accuracy of the GDR score and its submetrics for a composite measure of nutrient adequacy [27] or adherence to global food group and nutrient intake recommendations [31].

Among adult females and males in Thailand, a higher GDR score was positively correlated with an MPA of 6 micronutrients (ρ = 0.19) [27]. Furthermore, among individuals 15 y and older, the NCD-protect score showed stronger positive correlations

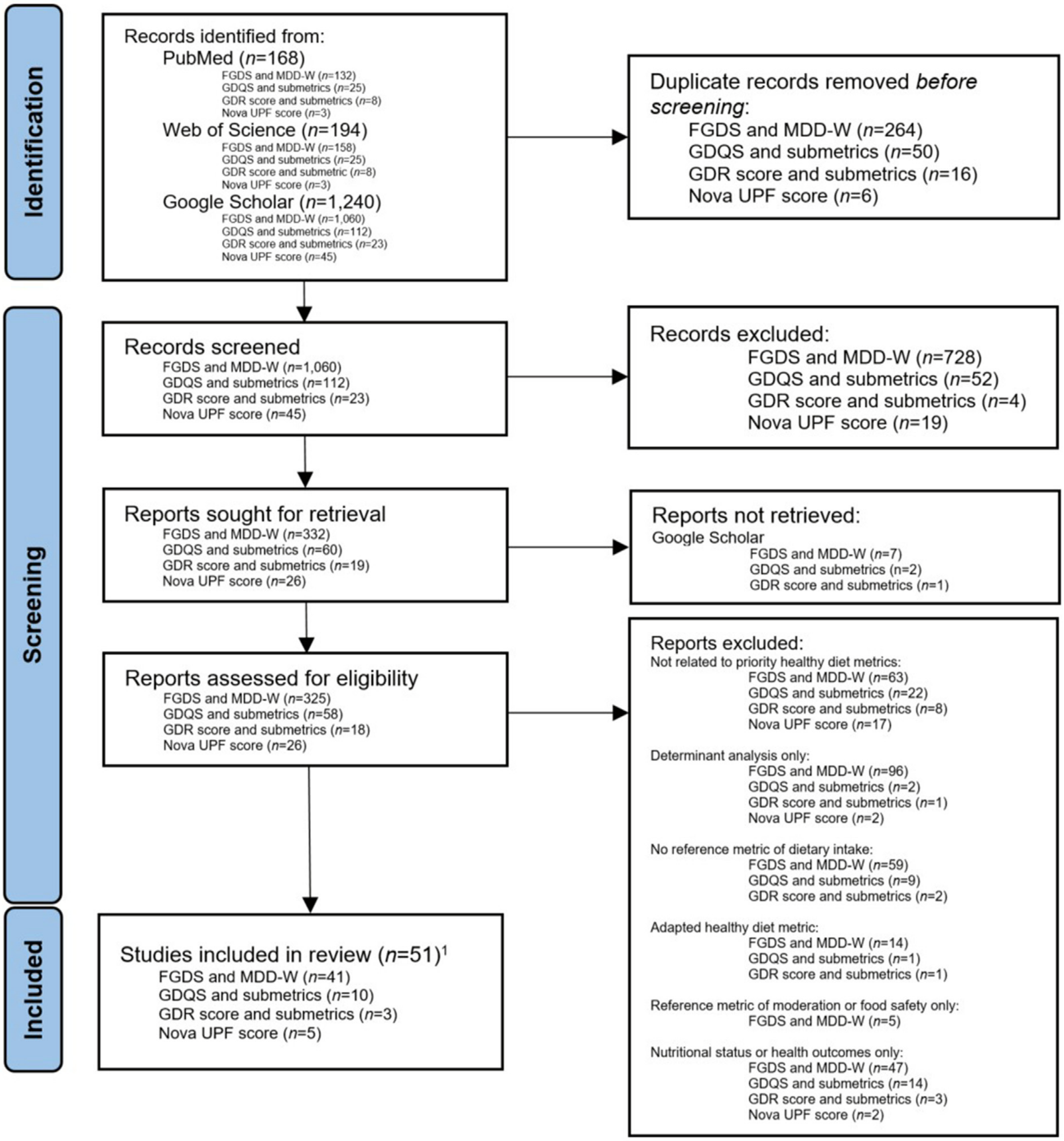

FIGURE 1. PRISMA flowchart. [1]One study included the 10-point food group diversity score (FGDS) and minimum dietary diversity for women (MDD-W) indicator, global diet quality score (GDQS) and submetrics, and global dietary recommendations (GDR) score and submetrics. Five studies were included for both FGDS and MDD-W and GDQS and submetrics. One study included both FGDS and MDD-W and GDR scores and submetrics. PRISMA, preferred reporting items for systematic reviews and meta-analyses; UPF, ultra-processed food score.

with the 5 global healthy food group and nutrient intake recommendations (ρ = 0.58 in Brazil and ρ = 0.66 in the United States) than the composite GDR score (ρ = 0.36 in Brazil and ρ = 0.47 in the United States) [31].

For the subconstruct of moderation, the GDR score was negatively associated with saturated fat intakes in Thailand (ρ = –0.14) [27]. In the United States and in Brazil, the GDR score was negatively correlated with the proportion of energy intake from UPF (ρ = –0.49 and ρ = –0.40, respectively), whereas the NCD-risk score was positively correlated with the proportion of energy from UPF in both countries (ρ = 0.42 and ρ = 0.50, respectively) [31]. In the United States, the NCD-protect score was also negatively correlated with the proportion of energy from UPFs (ρ = –0.33) [31]. In addition, higher NCD-risk scores were negatively correlated with adherence to unhealthy food groups and nutrient recommendations (ρ = –0.56 in Brazil and ρ = –0.61 in the United States) [31].

MDD-W

MDD-W and its underlying 10-point FGDS are intended to reflect (micro)nutrient adequacy [22,29,31,32].

Twenty-nine studies used a composite measure of nutrient adequacy as the outcome [e.g., mean adequacy ratio (MAR) or MPA] [21,22,27,28,29,31,33–55]. The choice and number of micronutrients were heterogeneous (range: 6–17), and the composite measure infrequently included fiber and/or macronutrients. All studies reported a positive association between differences in FGDS and greater nutrient adequacy (no null findings, no inverse associations).

In Bangladesh, Burkina Faso, Mali, Mozambique, the Philippines, and Uganda, higher FGDS was positively correlated with MPA of 11 micronutrients among NP females aged 15–49 y (range ρ: 0.25–0.56) [49]. Moreover, in Bangladesh, pregnant adolescent girls who consumed 5, 6, 7, and 8–10 food groups had 6, 15, 16, and 22 pp higher MPA, as compared to those who consumed ≤4 food groups [49]. Similar findings were observed for pregnant females, with coefficients ranging from 6 to 15 pp [50]. In both Mexico and China, FGDS was positively associated with MPA of 11 micronutrients among children aged 2–4 and 5–9 y, boys and girls aged 10–14 and 15–19 y, and males and females aged 20–49 y and 50 y and older (range ρ: 0.38–0.57 and 0.36–0.59, respectively) [51]. Furthermore, in Burkina Faso, greater FGDS was associated with a higher MPA of 11 micronutrients among children aged 24–59 mo (ρ = 0.59), NP NL females (ρ = 0.53), lactating females (ρ = 0.54), and pregnant females (ρ = 0.55) [52]. Likewise, among adolescents aged 13–18 y in Costa Rica, FGDS was positively correlated with MAR of 11 micronutrients (ρ = 0.43) [53]. In addition, among pregnant females in Bangladesh, Burkina Faso, India, and Nepal, a food group increase in FGDS was associated with a greater MPA of 11 micronutrients [regression coefficient (95% CI): 16.8 pp (15.7, 17.8) pp] [54]. Moreover, the 10-point FGDS was positively correlated with MPA (ρ = 0.53) [54]. Similarly, among boys and NP NL girls aged 10–19 y from 5 low-income, 7 lower-middle, 4 upper-middle, and 2 high-income countries, a food group increment in FGDS was associated with higher MAR of 7–11 micronutrients [regression coefficient (95% CI): 5.1 pp (5.0, 5.2) pp]. Furthermore, higher FGDS was positively correlated with MAR (ρ = 0.36 among boys and ρ = 0.34 among NP girls) [55].

In Malawi, a higher FGDS was correlated with a higher MAR of 11 micronutrients in the preharvest season (ρ = 0.23) but not during the postharvest season among pregnant females [34]. Likewise, among pregnant females in Ghana, FGDS was positively correlated with a MAR of 14 micronutrients (ρ = 0.24) [38]. Moreover, in Thailand, the FGDS was positively correlated with an MPA of 15 micronutrients among females aged 22–40 y (ρ = 0.46) [40]. Similarly, among males and NP NL females aged 40–60 y, the FGDS was positively correlated with an MPA of 6 micronutrients in Thailand (ρ = 0.25) [56]. Furthermore, among males and females in Ethiopia, the FGDS, calculated from FFQs, was positively correlated with the number of adequate intakes of 8 nutrients (ρ = 0.48 for both sexes) [21], whereas higher quintiles of the FGDS were associated with greater usual intakes of nutrients and an MPA of 11 micronutrients among females [44]. In addition, in Mexico, higher FGDS was positively correlated with greater MPA of 8 nutrients (ρ = 0.23) [22]. Moreover, greater FGDS was positively correlated with a composite measure of 8 nutrients among males and females in 10 countries in sub-Saharan Africa (ρ = 0.37 for both sexes) [28]. Likewise, among boys and girls aged 16–18 y, FGDS was positively correlated with a MAR of 6 nutrients (ρ = 0.66) [39]. In Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru, and Venezuela, higher FGDS was positively correlated with a MAR of 17 micronutrients among females aged 15–49 y (ρ = 0.39) [37]. Similarly, in Bangladesh, higher FGDS was correlated with greater MAR of 11 micronutrients among females aged 16–36 y (ρ = 0.37) [48]. Lastly, in Bangladesh, achieving MDD-W was associated with a higher MAR of 11 micronutrients among NP females [regression coefficient (95% CI): 5 pp (2, 8) pp] [45].

Nova UPF score

Nova UPF score is intended to measure the subconstruct of moderation, specifically UPF intake. One cross-sectional study among females aged 14–20 y in Colombia found that a subgroup increase in the Nova UPF score was associated with higher intakes of sodium [regression coefficient (95% CI): 212 mg/d (163, 262) mg/d] and greater relative intakes of total and saturated fat (percentage kilocalories/day) [regression coefficients (95% CIs): 0.73 pp (0.3, 1.2) pp and 0.3 pp (0.1, 0.5) pp, respectively] [57].

Differentiation of average and/or prevalence of food and nutrient values across countries

This section includes studies that assessed whether differences in the average or prevalence of a healthy diet metric across distinct countries were reflected in differences in the average or prevalence of a reference metric of dietary intake.

GDQS and its submetrics

No study assessed the concurrent differences between average GDQS and average reference metrics across countries.

GDR score and its submetrics

No study assessed the concurrent differences between average GDR score and average reference metrics across countries.

MDD-W

In Mexico and China, the median FGDS was 4 and 5 for children 2–4 y, children 5–9 y, girls aged 10–14 y, boys 10–14 y, girls 15–19 y, boys 15–19 y, females 20–49 y, and males 20–49 y, respectively, whereas their corresponding mean MPA were 0.83 and 0.66, 0.76 and 0.59, 0.52 and 0.46, 0.61 and 0.52, 0.27 and 0.32, 0.43 and 0.40, 0.32 and 0.34, and 0.51 and 0.43, respectively [51]. Furthermore, the median FGDS was 4 among females 50 y and older and males 50 y and older in both countries, whereas the corresponding mean MPA was 0.33 and 0.33 and 0.40 and 0.35, respectively [51].

Furthermore, a cross-sectional study among adolescents aged 12–19 y indicated that mean (SD) FGDS was 4.2 (1.4) in Costa Rica and 4.7 (1.5) in Mexico, whereas the concurrent mean MPAs were 0.77 and 0.76, respectively [58].

Moreover, a multi-country study of pregnant females aged 15–49 y reported that the median (IQR) FGDS was 3 (2) in 3 studies from Burkina Faso, 4 (2) in India, 4 (1) in Nepal, and 5 (2) in Bangladesh, whereas the median (IQR) MPAs were 0.09 (0.21), 0.13 (0.21), and 0.16 (0.34) in Burkina Faso, 0.20 (0.32) in India, 0.43 (0.32) in Nepal, and 0.40 (0.19) in Bangladesh [54].

In addition, a multi-county study of NP girls aged 10–19 y indicated that median (P^{25}, P^{75}) FGDS was 3 (3, 4) in lower-middle income, 4 (3, 5) in low-income countries, 5 (4, 5) in upper-middle income, and 6 (5,6) in high-income countries, whereas the corresponding median MARs were 0.58 (0.44, 0.69), 0.60 (0.45, 0.75), 0.67 (0.52, 0.81), and 0.94 (0.85, 0.99), respectively. Likewise, among boys aged 10–19 y, median (P^{25}, P^{75}) FGDS was 3 (3, 4) in lower-middle-income, 5 (4, 6) in upper-middle-income, and 6 (5, 6) in high-income countries, whereas concurrently MPAs were 0.58 (0.46, 0.69), 0.72 (0.57, 0.83), and 0.95 (0.88, 0.99), respectively [55].

Lastly, in a multi-county study of NP females aged 15–49 y, mean (SD) FGDS was 4.4 (1.4) in Argentina, 4.4 (1.2) in Venezuela, 4.6 (1.3) in Brazil, 4.7 (1.4) in Colombia, 4.7 (1.2) in Chile, 4.9 (1.4) in Costa Rica, 5.2 (1.3) in Ecuador, and 5.3 (1.3) in Peru, whereas in parallel the mean (SD) MAR were 0.83 (0.04), 0.84 (0.04), 0.79 (0.08), 0.87 (0.05), 0.80 (0.07), 0.81 (0.07), 0.88 (0.03), and 0.85 (0.05) [37].

Nova UPF score

No study examined the concurrent differences between the average Nova UPF score and average reference metrics across countries.

Sensitivity to change over time in populations or contexts

GDQS

One study examined changes in GDQS and a reference metric simultaneously [59]. The 48 adolescent girls and young females (16–22 y) in the intervention arm of a quasi-experimental nutrition action-research study in Colombia had significantly higher GDQS and GDQS+ at the endline than baseline, whereas no changes in GDQS− or GDQS cutoffs were observed [59]. In parallel, simple carbohydrate, vitamin A, and vitamin B12 intakes were lower at the endline, and energy, protein, total fat, saturated fat, monounsaturated fat, polyunsaturated fat, cholesterol, riboflavin, niacin, folate, calcium, and zinc intake were higher at the endline [59]. Between the 48 females in the control group, no difference was observed in the GDQS or its submetrics and cutoffs between baseline and endline. In contrast, in the control group, intakes of protein, simple carbohydrates, vitamin A, vitamin B12, vitamin C, calcium, and zinc were lower at the endline, whereas thiamine, folate, and iron intakes were higher at the endline [59].

GDR and its sub metrics

No study assessed changes in the GDR score or its submetrics in conjunction with changes in a reference metric.

MDD-W

Four studies examined changes in the 10-point FGDS or MDD-W and a reference metric simultaneously. A longitudinal study among 118 females aged 18–49 y in India indicated that the FGDS was significantly higher in the winter, as compared to the monsoon season [41]. Usual nutrient intakes of these females for energy, protein, fat, carbohydrates, fiber, vitamin A, thiamine, riboflavin, niacin, vitamin B6, folate, vitamin C, iron, calcium, and zinc were also significantly higher in the winter than the monsoon season. Furthermore, a quasi-experimental participatory farm diversification study (i.e., agricultural extension and nutrition education) in Kenya indicated that, on average, FGDS among females aged 15–49 y in the intervention arm was no different from females in the control arm. Similarly, the MAR did not differ across trial arms [60]. In addition, a cluster randomized controlled trial of nutrition-intensified antenatal care in India did not lead to increases in the FGDS or the prevalence of pregnant females achieving MDD-W [61]. In parallel, MPA was not significantly different across groups. Lastly, an individual-level randomized controlled trial of a web-based nutrition application in Indonesia led to a higher FGDS among pregnant females (19–30 y) in the intervention arm, as compared to the control arm [i.e., intervention effect (95% CI): 0.7 food groups (0.3, 1.3)]. Likewise, the intervention group consumed significantly more energy, protein, iron, and vitamin C and less fat and carbohydrates, as compared to the control group [62].

Nova UPF score

No study assessed changes in Nova UPF score in conjunction with changes in a reference metric.

Cross-context equivalence of metrics

Studies that assessed whether differences in the average of a healthy diet measure across distinct population groups or settings were reflected in differences in the average of a reference metric of dietary intake were used to examine the differentiation of means and/or prevalence of food and nutrient values between populations or groups (Section 2), whereas studies comparing the test characteristics of an indicator cutoff against a reference indicator of dietary intake across distinct population groups or settings were included in the assessment of cross-context equivalence.

GDQS

An overview article reported that a GDQS ≥23 is associated with a low risk of both nutrient inadequacy and NCD, scores ≥15 and <23 indicate moderate risk, and scores <15 indicate high risk, whereas also stating there was a lack of evidence to support defining categories of GDQS+ or GDQS− for dietary risk [63]. However, neither the outcomes used to validate the aforementioned GDQS cutoffs nor the test characteristics of these cutoffs are described. Likewise, the potential heterogeneity of these cutoffs across the studies used was not reported or discussed (e.g., sub-Saharan Africa, China, Mexico, and the United States).

GDR score

In the United States and Brazil, the GDR cutoff of ≥10 out of 18 points was considered to adequately predict achieving ≥6 of 11 GDRs [31], based on AUC of 0.86 and 0.77, the sensitivity of 67.2% and 69.4%, specificity of 85.7% and 71.3%, and misclassification of 29.3% and 18.2%, respectively.

MDD-W

Ten studies assessed the test characteristics of 10-point FGDS cutoffs to predict a minimally acceptable level of micronutrient adequacy, such as an MPA >0.60 [50–55,58,64–66]. In Mali, Mozambique, the Philippines, and Uganda, the optimal food group cutoff was ≥5 [64], whereas in 2 datasets from Burkina Faso, FGDS cutoffs of ≥4 or ≥6 showed the best predictive accuracy among NP females aged 15–49 y [65]. Furthermore, among pregnant adolescents aged 13–19 y and pregnant females aged 20–43 y in Bangladesh, the best food group cutoff was ≥6 [50]. In addition, in Mexico, the optimal FGDS cutoff was ≥5 among school-aged children (5–11 y) and adolescents (12–19 y), whereas a ≥4 food group cutoff performed better among preschool children (1–4 y) and a ≥6 food groups cutoff showed the best test characteristics among adults (20–59 y) and the elderly (60 y older) [66]. Similarly, a technical report using the same survey data from Mexico identified a ≥5 food group cutoff among participants aged 10–14 y, 15–19 y, 20–49 y, and 50 y and older, and a ≥4 food group cutoff among children aged 2–4 y and 5–9 y [51]. Moreover, in China, a ≥5 food group cutoff had the optimal predictive capacity among study participants aged 2–4 y and 5–9 y, whereas a FGDS ≥6 showed better test characteristics among individuals aged 10–14 y, 15–19 y, 20–49 y, and 50 y and older [51]. Furthermore, among both NL females and children aged 2–5 y from Burkina Faso, a ≥4 food group cutoff best-predicted micronutrient adequacy [52]. Moreover, among adolescents (13–18 y) in Costa Rica, an optimal FGDS cutoff of ≥4 was reported [53]. In a similar study among adolescents (13–18 y), a ≥4 cutoff in Costa Rica, whereas a ≥5 food group cutoff showed the best test characteristics in Mexico [58]. In addition, among pregnant females (15–49 y) in Bangladesh, Burkina Faso, India, and Nepal, a ≥5 food group cutoff was identified, whereas a ≥4 and ≥6 threshold showed more optimal test characteristics in Burkina Faso and Bangladesh, respectively [54]. Lastly, among boys and NP NL adolescent girls (10–19 y) in 5 low-income, 7 lower-middle, 4 upper-middle, and 2 high-income countries indicated that a ≥5 out cutoff best predicted a MAR >0.60 in upper-middle and high-income countries, whereas a ≥4 food group cutoff showed superior test characteristics in low and lower-middle-income countries [55].

Nova UPF score

No study has aimed to define an indicator cutoff for the Nova UPF score.

Accuracy of field-friendly methods

Each field-friendly metric reviewed has a tailored brief dietary assessment method that aims to simplify large-scale data collection (Table 2).

GDQS-GDQS application

A cross-sectional study comparing the concordance of the GDQS application and 10 3D cubes [i.e., used as visual aids to assist the respondent with estimating the total quantity (volume) consumed at the food group level] with quantitative 24-HR among adults in Thailand indicated the application-derived GDQS was higher than GDQS from 24-HR (mean difference: 1.5 and 2.9 points for females and males, respectively) [27]. The rank correlations between GDQS derived from either the GDQS application or quantitative 24-HR and most-nutrients intake and clinical and biochemical measurements did not significantly differ[27].

GDR score-DQQ

A multi-country validation study comparing the agreement between the DQQ against quantitative 24-HR among females in Ethiopia, the Solomon Islands, and Viet Nam indicated that the medians and IQRs of the GDR, NCD-protect, and NCD-risk scores were comparable between the data collection methods [67]. Markedly, the NCD-risk score was 0 for each participant in Ethiopia, whereas the 75th percentile of the NCD-risk score was below 2 in the Solomon Islands and Viet Nam (i.e., inferring no or very low consumption of unhealthy food groups).

MDD-W-food list-based modules

A relative validity study comparing the agreement between nonquantitative list-based against quantitative 24-HRs among

TABLE 2
Characteristics of healthy diet field metrics.

Field metric	What does it measure?	Subconstructs of healthy diet measured	Field method description	Scoring
Global diet quality score (GDQS)	Intake of food groups as a reflection of better nutrient adequacy and NCD-risk reduction	Nutrient adequacy Moderation	The GDQS application is a semi-quantitative open 24-h recall that automatically classifies foods into GDQS food groups. The respondent uses 10 cubes to determine the quantity of a GDQS food group consumed (i.e., below, equal to, or above food group-specific cutoffs)	Range: 0–49 points High risk of nutrient inadequacy and NCDs (GDQS <15) and low risk of nutrient inadequacy and NCDs (GDQS ≥23)
Global Dietary Recommendations (GDR) score	Dietary alignment with the WHO/IARC global recommendations for a healthy diet	Nutrient adequacy Moderation	Nonquantitative DQQs collect data on the intake (yes/no) of 29 food groups, which are represented by sentinel foods (most frequently consumed within a population) over the previous 24 h	Range: 0–18 points Cutoff of 10 or more food groups: higher probability of meeting ≥6 out of 11 GDR
Minimum dietary diversity for women (MDD-W)	Intake of food groups as a reflection of better micronutrient adequacy	Nutrient adequacy	Nonquantitative MDD-W food lists collect data on the intake (yes/no) of (≥) 17 food groups over the previous 24 h	Range: 0–10 points[1] Cutoff of 5 or more food groups: higher probability of a minimally acceptable level of micronutrient adequacy
Nova UPF score	Intake of UPF subgroups as a reflection of dietary share of UPFs	Moderation	Nonquantitative Nova UPF screeners collect data on the consumption (yes/no) of 23 UPF subgroups over the previous 24 h	Range: 0–23 points

Abbreviations: DQQ, diet quality questionnaire; IARC, International Agency for Research on Cancer; NCD, noncommunicable disease; UPF, ultra-processed food; WHO, World Health Organization.
[1] The measure underlying MDD-W is widely referred to as the food group diversity score or individual dietary diversity score.

pregnant females in Bangladesh and India indicated that the accuracy of MDD-W to predict the micronutrient adequacy of the diet (i.e., MPA >0.60 of 11 micronutrients) was similar for both methods [68]. Underreporting of the 10-point FGDS, however, was observed when using the listed-based method in Bangladesh [difference (95% CI): 0.3 food groups (0.2, 0.4)] and India [difference (95% CI): 0.6 food groups (0.5, 0.7)] [68]. Similarly, the list-based method underestimated the prevalence of females achieving MDD-W; the percentage correctly classified as compared to quantitative 24-HRs was 81% and 72% in Bangladesh and India, respectively [68]. Furthermore, a multi-country validation study comparing field-friendly methods against weighed food records (i.e., definitive method) among NP females aged 15–49 y in Cambodia, Ethiopia, and Zambia indicated that nonquantitative list-based and open 24-HRs overreported females achieving MDD-W by 16 pp (95% CI: 10, 20 pp) and 10 pp (95% CI: 4, 14 pp), respectively [69]. The median (P^{25}, P^{75}) FGDS were, however, identical across data collection methods [69]. In addition, a multi-country validation study comparing the DQQ against quantitative 24-HRs among females aged 15–69 y in Ethiopia, the Solomon Islands, and Viet Nam reported that the DQQ overreported females achieving MDD-W by 6 pp, 6 pp, and 8 pp, respectively [67]. Furthermore, the median 10-point FGDS from the DQQ was only 1 food group higher in Ethiopia and the Solomon Islands, whereas it was identical in Viet Nam [67]. Moreover, a test-retest study comparing telephone-based to face-to-face interviews among females aged 15–49 y in Kenya showed that the data collection method had no effect on MDD-W prevalence [70]. Telephone-based interviews, however, slightly underestimated the 10-point FGDS (mean difference: 0.1 food groups) [70]. Lastly, a cross-sectional study of females in Bangladesh, Benin, Colombia, Kenya, Malawi, and Nepal indicated that national sentinel food lists of the most frequently consumed foods in each food group provide reliable data to estimate MDD-W, as compared to all food items reported during quantitative 24-HRs [mean pp difference (range): –6.5 (–0.2 to –11.5)] [71].

Nova UPF score-Nova screener

No study assessed the precision or accuracy of the Nova UPF score enumerated using the Nova UPF screener as compared to a reference or definitive method or reference metric, respectively. Nonetheless, a relative validity study among 300 individuals aged 18 y and older in Brazil indicated associations and agreement between quintiles of the Nova UPF score, enumerated using the nonquantitative list-based Nova UPF screener, and quintiles of the proportion of energy from UPF estimated using a quantitative 24-HR [difference between fifth and first quintile (95% CI): 24.9 pp (23.5, 25.7) pp] [72]. Likewise, a preprint of an analogous relative validity study among 812 adults in Brazil reported that higher (approximate) quintiles of the Nova UPF score were linearly associated with a higher proportion of energy from UPF [73]. Similarly, a relative validity study among females aged 14–20 y in Colombia reported that a subgroup increment in the Nova UPF score was associated with an increase in the proportion of energy from UPFs [regression coefficient (95% CI): 2.8 pp (2.1, 3.6) pp] and higher approximate quintiles of the Nova UPF score were linearly associated with higher proportions of energy from UPF (mean difference between fifth and first quintile: 22.2 pp)[57]. Lastly, a relative validity study among 301 adults in Senegal showed that higher (approximate) quintiles of the Nova UPF score enumerated using the Nova UPF screener were linearly associated with higher proportions of energy from UPF estimated using a quantitative 24-HR (mean difference between fifth and first quintile: 27.6 pp) [74].

Discussion

Numerous validation studies indicate that GDQS+, FGDS, and MDD-W have acceptable predictive accuracy for reference metrics of nutrient adequacy within populations and across contexts. In contrast, the relatively few studies that have assessed the predictive accuracy of GDQS−, NCD-protect, and Nova UPF scores against reference metrics of moderation indicate only weak to moderate predictive accuracy. Furthermore, for each field-friendly metric, no or limited evidence is available regarding their predictive accuracy to differentiate averages or prevalence of food and nutrient intakes across countries, their sensitivity to change over time, and cross-context equivalence, which are essential criteria for national and global monitoring of healthy diets. Lastly, the predictive accuracy of field methods for reference metrics of nutrient adequacy was maintained for GDQS and MDD-W.

GDQS+, FGDS, and MDD-W were purposively constructed to reflect nutrient adequacy and have been positively correlated with higher overall (micro)nutrient adequacy. The magnitude of these associations was similar or stronger for MDD-W, as compared to GDQS+, a finding that is supported by a more recent study in Brazil [75]. The more disaggregated and differentially weighted food groups and intake quantity cutoffs of the GDQS+ did not show greater accuracy than an equally weighted nonquantitative count of food groups used for MDD-W. One potential explanation is that the food group intake quantity cutoffs of GDQS+ may have reduced the metric's variability within and across contexts with relatively low food group diversity [23]. Nonetheless, a simple nonquantitative count of food groups (e.g., FGDS), as opposed to semi-quantitative metrics (e.g., GDQS+), is unlikely to differentiate nutrient adequacy in contexts with uniformly low or high food group diversity.

The comparatively poorer predictive accuracy of the GDR and NCD-protect scores for reference metrics of nutrient adequacy might be due to their negative scoring and exclusion of processed meat and unprocessed red meat, respectively. These animal-source food groups are known to be important sources of nutrients, such as vitamin B12, bioavailable iron, and protein, widely used in composite measures of nutrient adequacy. GDR score and its submetrics were developed predominantly through the lens of diet-related NCD reduction, however, justifying the exclusion of processed meat following its classification as a group 1 carcinogen by the International Agency for Research on Cancer [76]. Nevertheless, the reference metric used for their validation, a composite measure of adherence to GDRs, was not defined as a quantitative reference metric of nutrient adequacy in this review.

Validation studies for GDQS and its submetrics, GDR score and its submetrics, and Nova UPF score have focused on the differentiation of food and nutrient values within populations but have not addressed the differentiation of averages or prevalence from the reference or definitive measure across contexts, which is what is most important for global monitoring of healthy diets. Limited evidence for FGDS and MDD-W is available, but studies include only a few countries with low heterogeneity in dietary intakes, making conclusions about the accuracy of differentiating reference metrics across countries difficult.

To assess the sensitivity of the field metrics to changes within or between populations or contexts requires that the field-friendly metric and reference metric be both assessed concomitantly over time. No such studies were identified in the literature reviewed for the GDR score or Nova UPF score. For GDQS, the 1 study available did not demonstrate its sensitivity to change. For FGDS and MDD-W, there is evidence that these metrics reflect changes, or lack thereof, in reference metrics of nutrient adequacy due to seasonality, shocks, or intervention.

No evidence for the cross-context equivalence for GDQS, GDR, or Nova UPF score was available. The variability of optimal MDD-W cutoffs for different age groups and contexts suggests that for global monitoring, trade-offs exist between predictive accuracy and cross-context equivalence of indicators. More recent evidence among NP females and males aged 15–65 y from 8 Latin-American countries [77], adolescents aged 0–19 y from the United States [78], and children and adolescents aged 5–14 y in 7 low- and middle-income countries support a uniform cutoff of ≥5 food groups for global guidance [79]. Moreover, available multi-country studies indicated that higher FGDS reflected higher values of reference metrics of nutrient adequacy across countries; therefore, a uniform indicator cutoff might be sufficient to differentiate averages or prevalence of food and nutrient values from reference metrics. Nonetheless, as part of the HDMI, ongoing research is computing field-friendly metrics and reference metrics using comparable (nationally representative) quantitative 24-h dietary intake data collected across multiple countries and available open access to FAO/WHO global individual food consumption data tool to assess *1*) the direction and magnitude associations between (standardized) healthy diet measures and reference metrics of nutrient adequacy and moderation, and *2*) how well average healthy diet metrics differentiate average reference metrics of dietary intake.

For national and global monitoring of healthy diets, continuous measures (i.e., scores) that yield population averages and indicators that yield prevalence that perform equivalently across countries and population groupings are essential for comparability. For each of the 4 field metrics studied, construct equivalence is assumed to be reasonable for both nutrient adequacy and moderation. Furthermore, item equivalence is also reasonable, assuming foods or food groups are understood and interpreted the same across contexts, although responses to items could be affected differentially across contexts by recall or social desirability bias. Even if metrics are construct- and item-equivalent, to be useful, measurement and scalar equivalence are necessary. The evidence reviewed, except for FGDS and MDD-W, does not address these 2 types of equivalence. If metrics are measurement equivalent (i.e., differences in values of the metric mean the same across contexts), we would expect that, for example, regressing a reference measure on a field measure would result in similar regression coefficients for each context, but this information is not widely available [54]. Most studies reported correlation coefficients, which are not useful for understanding measurement equivalence because correlations are a function of the inherent variability in a sample, which can vary across contexts. Scalar equivalence requires further evidence, in a regression framework, that both intercepts and regression coefficients are about the same for continuous measures and, consequently, that prevalence values produced with the same indicator cutoff are comparable [54,55]. The results summarized for MDD-W suggest that the optimal cutoff for this indicator varies slightly across contexts. Research specifically investigating cross-context equivalence of both measures and indicators is much needed to determine whether measurement and scalar equivalence hold and, if not, whether and how to make adjustments to improve equivalence, such as what FAO has done with the food insecurity experience scale [80].

Regarding GDQS, at present, there is a lack of evidence that integrating a standalone dietary assessment application, in combination with a portion size estimation tool (i.e., 10 3D cubes), is feasible for large-scale multi-topic surveys such as the demographic and health surveys and Gallup world poll. Moreover, the requirement to visually estimate amounts (i.e., volume) of food groups consumed complicates telephone-based interviewing as a data collection method. Even if not scalable at the global level, the GDQS application is potentially useful for periodic national surveys. The DQQ and MDD-W food lists have been demonstrated to be sufficiently accurate as compared to reference methods within populations or contexts, and their simplicity might be important for the purpose of monitoring. The precision of the DQQ and predictive accuracy of field metrics for reference metrics of moderation, such as the NCD-risk score, should be assessed in settings with a higher prevalence of unhealthy food group consumption.

Although a single measure or indicator that summarizes multiple subconstructs of healthy diets may seem attractive for ease of interpretation and communication purposes, mounting evidence [12,23,81] has shown that composite metrics combining measures of different subconstructs are not clearly interpretable. They can also be inaccurate and unreliable because unhealthy characteristics of diets cannot be balanced out by healthy ones, or put simply, abstaining from unhealthy food consumption does not compensate for the lack of nutritious foods. Therefore, the multiple subconstructs of a healthy diet require metrics that distinguish between them. For instance, the GDQS and GDR score should be reported instead as submetrics that reflect nutrient adequacy and moderation (i.e., GDQS+ and GDQS− and NCD-protect and NCD-risk scores, respectively). The validation of GDQS−, NCD-risk score, and Nova UPF score against reference metrics of moderation (e.g., sodium intake <2000 mg/d, rather than sodium intake as a continuous outcome) must, however, receive more attention before uptake into national and global monitoring frameworks. The weak evidence on the moderation subconstruct may be partly due to the limited availability of dietary references for moderation as compared to nutrient adequacy, considering the nutrition science's historical focus on the latter and the more complex measurement of foods and nutrients to limit (e.g., urinary sodium, to also capture discretionary salt). Lastly, we acknowledge that FGDS and MDD-W are metrics developed and first validated in the mid-2010s, therefore allowing a larger body of evidence to be accumulated than GDQS, GDR, and Nova UPF scores, which were developed in the early 2020s.

In conclusion, among the 3 field-friendly metrics that intend to reflect nutrient adequacy, from the evidence available, MDD-W most accurately predicted composite measures of nutrient adequacy within populations or contexts. The subconstruct of moderation reflected by the GDQS−, NCD-risk, and Nova UPF score remains largely understudied. Future validation studies of these metrics should assess their accuracy to predict (excessive) intakes of critical nutrients such as sodium, free sugars, saturated fats, UPFs, and their potentially detrimental constituents, such as additives and processing and packaging contaminants. Assessing moderation is important for global monitoring because of the growing rates of overweight, obesity, and diet-related NCDs in most countries. We should not focus only on nutrient (in)adequacy when monitoring diets when the unhealthy share of diets continues to go unmonitored.

Often, highly confounded associations of healthy diet metrics with nutritional status and health outcomes cannot replace the validation of field-friendly metrics against reference metrics of food and nutrient intakes. Although accuracy is ascertainable in studies that compare the field-friendly metric to reference metrics, the limitations of the latter, including the lack of context-specific food composition data, should be acknowledged. Furthermore, the health effects of diets may not be restricted to nutrient values only (e.g., other bioactive compounds, food additives, and processing contaminants may play a role). Studies focused on comparing field-friendly metrics (e.g., GDR score) with composite metrics of dietary recommendations may provide insights into the agreement between metrics but not their predictive accuracy for the subconstruct of a healthy diet.

Lastly, GDQS and MDD-W estimates from field methods are accurate, as compared to metrics from reference or definitive methods (e.g., quantitative 24-HRs or weighed food records) for the purpose of differentiating individuals within populations or contexts and may represent an important reduction in data collection burden and costs compared with reference metrics. Nevertheless, the almost total absence of studies on the differentiation of averages and prevalence of metrics at the population level, their sensitivity to change, and their cross-context equivalence leaves a gap in knowledge essential to monitoring purposes.

Acknowledgments

We thank Shelly Sundberg (Bill & Melinda Gates Foundation) and Emma Kenney (University of South Carolina) for their comments on the earlier drafts. The members of the Healthy Diets Monitoring Initiative are Víctor Aguayo (UNICEF), Chika Hayashi (UNICEF), Vrinda Mehra (UNICEF), Pragya Mathema (UNICEF), Karoline Hassfurter (UNICEF), Francesco Branca (WHO), Elaine Borghi (WHO), Luc Ingenbleek (WHO), Kuntal Saha (WHO), Isabela Fleury Sattamini (WHO), Lynnette Neufeld (FAO), Giles Hanley-Cook (FAO), Bridget Holmes (FAO), Jennifer Coates (Tufts University), and Edward Frongillo (University of South Carolina).

Author contributions

The authors' responsibilities were as follows – EAF, JC: designed research; GTH-C, IFS: conducted research; GTH-C, IFS: analyzed data; IFS, GTH-C: wrote the paper; EAF, JC: wrote sections of the paper and had primary responsibility for final content; and all authors: read and approved the final manuscript.

Conflict of interest

The authors report no conflicts of interest.

Funding

This work was supported, in whole or in part, by the Rockefeller Foundation (grant: 2022 FOD 024) and the Bill & Melinda Gates Foundation (grant: INV-063321). Under the grant conditions of the Foundation, a Creative Commons Attribution 4.0 generic license has already been assigned to the author-accepted manuscript version that might arise from this submission.

Data availability

Results from individual studies are reported in and are available from their original journal articles, technical reports, or publication sites, as detailed in the manuscript's reference list.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cdnut.2025.107439.

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