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Tools developed in Brazil for the promotion and assessment of adequate and healthy eating habits: A scoping review

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Abstract *The objective of this study was to identify and discuss the tools for the promotion and evaluation of adequate and healthy eating based on the Food Guide for the Brazilian Population. The scoping review was conducted according to the JBI Manual for Evidence Synthesis via the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist and by searching PubMed/MEDLINE, EMBASE, SciELO and LILACS. Sixteen studies on relevant tools, based on the food guide for individuals of all age groups, were thus included: two descriptive studies, two randomized clinical trial protocols, eleven methodological analyses, and one psychometric paper, aimed at either a focal population (n=12) or health professionals (n=4). Six studies addressed tools for promoting adequate and healthy eating, and ten developed tools for evaluating dietary practices or the knowledge and activities of health professionals. This review can therefore assist health professionals in choosing instruments for the implementation and/or dissemination of food guide recommendations, contributing to the promotion of adequate and healthy eating habits.*

Key words *Food Guides, Nutrition Policy, Food and Nutrition Education, Food and Nutrition Health Promotion*

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Introduction

Adequate and healthy food is a basic human right[1] that involves the guarantee of permanent and regular access to an adequate dietary practice and must be in accordance with special dietary needs and the relevant culture, accessible, harmonious in quantity and quality, and based on sustainable production practices. The guideline for the Promotion of Adequate and Healthy Food (PAHF) is part of the National Food and Nutrition Policy and involves strategies such as food and nutrition education (FNE) and encouragement to create environments that promote adequate and healthy food to provide individuals and communities with appropriate dietary practices. This guideline is one of the priorities of the National Policy for Health Promotion, and for its implementation, the development of intersectoral actions in different spheres of government, together with society, must be articulated[2].

PAHF actions should support individuals in adopting healthy lifestyles, as well as identify and critically analyze unhealthy habits and practices. The set of these strategies contributes to the expansion of health actions, stimulating innovative alternatives that foster the development of individuals[2]. In this context, the Food Guide for the Brazilian Population (FGBP) constitutes one of the strategies for implementing PAHF guidelines[3].

The FGBP is an instrument for supporting and encouraging healthy eating practices and subsidizing the policies, programs, and actions for promoting the health and food and nutrition security (FNS) of the population. It is based on a broader concept of adequate and healthy eating, taking into account biological, sociocultural, and environmental aspects at the individual and collective levels. Its recommendations cover practices related to food choice, eating and commensality, in addition to highlighting possible obstacles to healthy eating practices, such as information, supply, cost, culinary skills, time or advertising[3,4]. These recommendations are presented qualitatively, guided by the golden rule "always prefer *natural* or minimally processed foods and culinary preparations to ultra-processed foods"[3].

In fact, food-based dietary guidelines with qualitative recommendations facilitate the dissemination and understanding of information on adequate and healthy eating because they are simple, realistic and flexible[4,5]. However, during the implementation of these recommendations, challenges may occur, due to, e.g., the use of language and visual resources that are not very understandable by the population or the absence of educational materials, an effective validation of the recommendations, or a multidisciplinary team qualified to disseminate these recommendations[6,7]. Such challenges hinder the adoption of adequate and healthy eating practices by the population[8]. Thus, the creation of tools that support and disseminate the recommendations in these dietary guidelines is essential for the adoption of these dietary practices in the daily life of the population[8].

Therefore, to track and gather all the requisite tools for the evaluation and promotion of adequate and healthy eating produced by the FGBP, this scoping review was conducted to identify and discuss the salient literature regarding these tools.

Methods

Protocol and registration

This scoping review was conducted according to the JBI Manual for Evidence Synthesis[9] via the *Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews* (PRISMA-ScR) 10 checklist[10,11] and registered with the OSF (Registration DOI 10.17605/OSF.IO/TC7GD: https://archive.org/details/osf-registrations-tc7gd-v1). This analysis was guided by a main question: "What are the tools, based on the Food Guide for the Brazilian Population published in 2014, for the promotion and evaluation of adequate and healthy eating habits?".

Eligibility criteria

Articles that have developed tools for the promotion and evaluation of adequate and healthy eating among individuals of all age groups, based on the FGBP, were included in thus review. Studies from any geographic setting were eligible for inclusion. Nonoriginal studies (comments, reviews, letters to the editor, case reports, theses, and abstracts) were excluded. Studies published before 2014 were also considered ineligible because the focal FGBP instrument was first published in 2014.

Search strategy

The search for original articles was performed using the following electronic bibliographic databases: PubMed/MEDLINE (www.pubmed.

com), EMBASE (www.embase.com/landing?status=gray), Scielo (www.scielo.br) and Lilacs (www.lilacs.bvsalud.org).

The keywords were chosen from the Medical Subject Headings (MeSH) and Descriptors in Health Sciences (DeHS) using the search terms described in Chart 1.

The search strategy was not restricted by language. The last search was performed on March 28, 2022. A reverse manual search was also performed to identify the relevant articles cited in all selected studies.

Selection of studies

The authors (APA and PVMR) independently performed the study selection in three phases: analysis of titles, reading of abstracts, and reading and comprehension of full texts.

Any divergent decisions were resolved by consensus or, if necessary, by a third author (DMUPR). Duplicate articles in different databases were identified and excluded using Mendley®, and the peer review process was performed via Rayyan QCRY® Software, which ensured independent (blind) evaluation by the authors.

Data extraction

Two reviewers (APA and PVMR) extracted relevant information from the eligible studies, following an extraction table prepared by the researchers: (i) name of the first author, year of publication; (ii) study design; (iii) tool; (iv) target audience; (v) tool components; and (vi) evaluation of the psychometric properties (whether the study performed an evaluation of the psychometric properties validity and reliability and regarding the methods adopted for the evaluation) of the relevant tool. This information was extracted as presented in these studies; however, those that did not clearly explain any of the above parameters according to the information presented were classified by the authors as such. Any disagreements were resolved by a third author (DMUPR).

Data analysis

The data extracted from the selected studies are summarized in Charts 2 and 3 and separated by tools, based on the FGBP, for the promotion and evaluation of adequate and healthy eating. These studies are organized chronologically by year of publication, starting from the first published study.

Results

Selected studies

A total of 1,207 studies were identified after searching the PubMed, EMBASE, SciELO and LILACS databases. Notably, no articles were found in the reverse manual search. A total of 293 duplicate studies were removed, resulting in 914 unique records. After a complete reading of the abstracts, 46 studies were identified. Finally, after reading the full texts, 16 studies were selected because they met all the criteria adopted for this scoping review. The reasons for excluding the other studies are indicated in Figure 1.

Description of included studies

The main characteristics of the sixteen studies included in this review are described in Charts 2 and 3. Regarding study design, two were descriptive[12,13], two adopted the protocol of a randomized clinical trial[14,15], eleven were methodological[6,16-25], and one was psychometric[26].

Six studies[12-16,18] addressed tools for promoting adequate and healthy eating, and ten[6,17,19-26] reported on tools for assessing diets or eating practices.

Among the six tools for promoting adequate and healthy eating, an iconographic instrument[12] can facilitate the understanding of the *NOVA* classification (categorizes foods into four distinct groups according to the extent and purpose of processing)[27] to provide the population greater autonomy in food selection: a digital card game, Rango Cards[14], for promoting healthy eating among adolescents; an educational workshop[13] for training health professionals to effectively promote educational activities for implementing FGBP recommendations; two messaging tools for promoting healthy eating in the population, one containing messages[16] supporting the adoption of healthy eating choices and behaviors and one[15] messages, via WhatsApp, for promoting adequate and healthy eating; and a clinical protocol[18] guiding Primary Health Care (PHC) professionals offering individual dietary advice.

The ten studies on feeding assessment tools included a Diet Quality Index adapted to pregnant women[19]; two[6,26] scales for assessing dietary practices; a data collection instrument[20] for auditing consumer food environment; an index[21] that assesses the degree of confidence in cooking skills[22]; a scale for evaluating FNE practices; a scoring system[23] for assessing the healthiness

Chart 1. Search strategy.

PubMed
("nutrition policy"[MeSH Terms] OR "nutrition policy" OR "nutrition policies" OR "nutrition guideline" OR "nutrition guidelines" OR "dietary guideline" OR "dietary guidelines" OR "nutritional policy" OR "nutritional policies" OR "nutritional guideline" OR "nutritional guidelines" OR "nutritional guide" OR "nutritional guides" OR "food policy" OR "food policies" OR "food guide" OR "food guides") AND (Brazil[Mesh] OR Brazil) AND (2014:3000/12/12[pdat])
EMBASE
('nutrition policy'/exp OR 'nutrition policy' OR 'nutrition policies' OR 'nutrition guideline' OR 'nutrition guidelines' OR 'dietary guideline'/exp OR 'dietary guideline' OR 'dietary guidelines' OR 'nutritional policy' OR 'nutritional policies' OR 'nutritional guideline' OR 'nutritional guidelines' OR 'nutritional guide' OR 'nutritional guides' OR 'food policy'/exp OR 'food policy' OR 'food policies' OR 'food guide' OR 'food guides') AND ('brazil'/exp OR 'brazil') AND (2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py)
SciELO
"nutrition policy" OR "nutrition policies" OR "nutrition guideline" OR "nutrition guidelines" OR "dietary guideline" OR "dietary guidelines" OR "nutritional policy" OR "nutritional policies" OR "nutritional guideline" OR "nutritional guidelines" OR "nutritional guide" OR "nutritional guides" OR "food policy" OR "food policies" OR "food guide" OR "food guides" OR "política nutricional" OR "políticas nutricionais" OR "guia nutricional" OR "guias nutricionais" OR "guia alimentar" OR "guias alimentares" OR "política de alimentos" OR "política de nutrição e alimentação" Filtros aplicados: (Ano de publicação: 2019) (Ano de publicação: 2018) (Ano de publicação: 2020) (Ano de publicação: 2017) (Ano de publicação: 2014) (Ano de publicação: 2016) (Ano de publicação: 2015) (Ano de publicação: 2021)
LILACS
2014 OR 2015 OR 2016 OR 2017 OR 2018 OR 2019 OR 2020 OR 2021 [País, ano de publicação] and "nutrition policy" OR "nutrition policies" OR "nutrition guideline" OR "nutrition guidelines" OR "dietary guideline" OR "dietary guidelines" OR "nutritional policy" OR "nutritional policies" OR "nutritional guideline" OR "nutritional guidelines" OR "nutritional guide" OR "nutritional guides" OR "food policy" OR "food policies" OR "food guide" OR "food guides" OR "política nutricional" OR "políticas nutricionais" OR "guia nutricional" OR "guias nutricionais" OR "guia alimentar" OR "guias alimentares" OR "política de alimentos" OR "política de nutrição e alimentação" [Palavras]

Source: Authors.

of consumer food environment; an online instrument for assessing[24] the knowledge of health professionals about the FGBP; an online scale[25] for measuring the effectiveness of professionals in applying FGBP recommendations; and a questionnaire[17] on the knowledge of and feeding practices for children.

Two tools for promoting adequate and healthy eating are intended for use by health professionals among the general population[12,18]; two others[14,15] are for use among teenagers, one[16] for adults, and one[13] for the continuing education of health professionals. Among the tools for assessing diet, three[17,19,22] are intended exclusively for professional nutritionists; two[17,19] for nutritionists to evaluate the population's dietary practices; one[22] for nutritionists to evaluate other professionals working in PHC; seven for health professionals in general and five[6,20,21,23,26] for particular evaluation of the population's eating practices or food environment; and two[24,25] for the evaluation of the knowledge of PHC professionals about FGBP recommendations and their application in professional practice.

Finally, fifteen studies evaluated the psychometric properties of the developed tools (Chart 4). Eleven studies[6,13,15-18,20,22,24-26] validated content; all conducted focus groups, four[13,17,20] calculated the content validity index (CVI), two[18,26] performed content analysis, and three[22,24,25] calculated mean representativeness and clarity scores in addition to completing focus groups. Seven studies[6,17,18,21,22,24,25] validated their focal tool(s); one[18] conducted focus groups and content analysis, one[6] conducted a pretest with its focal audience, and five[17,21,22,24,25] showed a consensus only among a group of experts and/or the target audience of the tool(s). Five studies[6,22-25] validated their constructs; four[6,17,24,25] performed factor analysis and one[23] performed Kruskal-Wallis and Dunn tests.

Chart 2. Tools for promoting adequate and healthy eating based on the Food Guide for the Brazilian Population.

Author/ Year	Study design	Tool	Study sample	Tool components
Geraldi *et al.*, 2017[12]	Description	Iconographic instrument that aims to inform and facilitate the understanding of the NOVA classification, in order to provide greater autonomy in food choice.	Professionals who mediate FNE activities	Scheme of circles, colors and images that takes into account the most appropriate and healthy proportions of each food category. The larger circle contains the foods that should be consumed in greater amounts, and so on, until the smaller circle. - First category (green): larger circle contains in natura or minimally processed foods. - Second category (blue): the smaller circle contains the processed culinary ingredients. - Third category (yellow): the middle circle corresponds to processed foods. - Fourth category (orange): the smallest circle is ultra-processed foods. The front of each circle contains images that represent each category of food, and the back explains about the foods and how much should be consumed from each category.
Chagas *et al.*, 2018[14]	Randomized study protocol	Rango Cards, a digital card game used as an FNS strategy for promoting healthy eating practices.	Adolescents	The game has seven stages that address the classification of foods; healthy practices; importance of home cooking; food marketing focusing on misleading advertising; and reading food labels. The first phase consists of 23 cards. From the fifth phase onward, the game has 44 cards. The components of the game environment are energy markers; deck of cards; avatar, opponent and food (grouped as the classification described in the GAPB). Each character has a health score accompanied by meters for sodium, sugar and fat. The cards are divided as follows: Real food (green cards); Prepared meal (green cards); Processed foods (yellow letters); Mega-industrialized foods (red cards); Character cards (called "Buds"); and Letters of healthy eating practices.
Jaime *et al.*, 2018[13]	Description	Educational workshop based on the FGBP to include the recommendations of the guide in the work process of the PHC teams.	PHC professionals	Workshop protocol has 4 modules with 16 activities. The activities matrix comprises three axes: (a) organizational strategies, (b) understanding of the FGBP and (c) implementation of the FGBP.

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Reliability was also assessed in different ways. Four studies[17,19,20,22] assessed it through the degree of agreement, four[6,17,20,21] assessed reproducibility, four[6,17,21,23] assessed internal consistency, and one[26] assessed reliability through item dimensionality and item response theory. Finally, one study[14] evaluated viability, usability and attractiveness through a convenience sample of teenage gamers (all were interested in the topic, and the age group (14 to 16 years) was compatible with the target audience of the game).

Discussion

To the best of our knowledge, this is the first scoping review to identify, discuss and summarize the tools available for the promotion and evaluation of adequate and healthy eating habits based on the FGBP (2014) (Chart 5).

Chart 2. Tools for promoting adequate and healthy eating based on the Food Guide for the Brazilian Population.

Author/ Year	Study design	Tool	Study sample	Tool components
Khandpur *et al.*, 2021[16]	Methodological study	Messages to support the adoption of healthy eating choices and behaviors.	Brazilian adult population	28 messages to inform about activities and specific choices related to food that help them to better align their daily behaviors with FGBP recommendations. Content covered in the messages: food categorization based on the NOVA classification, choices and good practices related to planning and organizing meals, food purchases, culinary skills and ways of eating.
Melo *et al.*, 2020[15]	Protocol of a randomized clinical trial	Messages via WhatsApp for PAHF, improvement of knowledge, self-efficacy in adopting healthy habits and progression of stages of change in adolescents.	Adolescents	42 messages: 3 guidance messages and 39 thematic messages on food and nutrition based on the FGBP, considering the process of behavior change.
Louzada *et al.*, 2022[18]	Methodological study	Clinical protocol for individual dietary counseling to guide decision-making in PHC when providing nutritional counseling.	PHC professionals	The protocol is in a flowchart format, in which the professional's conduct is guided by the answer given to each question of the SISVAN instrument for assessing food consumption. If the individual presents an unhealthy eating practice, the professional is instructed to make recommendations for its modification and to identify obstacles that contribute to the adoption of these practices. If the individual has a healthy eating practice, the professional is instructed to value it.

PHC: primary health care. FNE: Food and Nutrition Education. FGBP: Food Guide for the Brazilian Population. PAHF: promotion of adequate and health food. SISVAN: Food and Nutrition Surveillance System.

Source: Authors.

The importance of the Food-Based Dietary Guidelines for the adoption of healthy eating practices

Food-based dietary guidelines are tools for promoting healthy eating habits and lifestyles among the population of a country[4,28,29]. According to the Food and Agriculture Organization of the United Nations (FAO), its Food Guidelines are intended to serve as a basis for the formulation of national policies on food and nutrition, health and agriculture, as well as for food and nutrition education programs for promoting healthy eating habits and lifestyles. They provide the general public with guidance on the foods, food groups and dietary patterns that provide essential nutrients for promoting general health and prevent chronic noncommunicable diseases (NCDs)[30].

Dietary guidelines should be determined by public health issues and the sociocultural context (relevant social, economic, agricultural and environmental factors that affect food availability and dietary patterns) of each country; they should reflect dietary patterns rather than numerical targets, i.e., should be positive and encourage the pleasure of an adequate and healthy diet and based on evidence[8].

In this context, in Brazil, the second version of the FGBP, published in 2014[3], plays a strategic role in encouraging public policies on food and nutrition and in guaranteeing the human right to adequate food and food sovereignty. With a qualitative approach guided by the degree of food processing and the sustainability of food systems, it consciously aims to ensure the health and nutrition of the Brazilian population and overcomes the idea of being a mere instrument for FNE actions[4,5,28].

Chart 3. Tools for assessing adequate and healthy eating based on the Food Guide for the Brazilian Population.

Author/ Year	Study design	Tool	Study sample	Tool components
Crivellenti *et al.*, 2018[19]	Methodological study	Quality Index of Diet Adapted for Pregnant Women (IQDAG).	For the nutritionist to apply in pregnant women	It has 9 components for evaluation: 3 food groups (vegetables, legumes and fresh fruits (in servings/1,000 kcal)); 5 nutrients (Fiber, Omega 3, Calcium, Folate and Iron); and 1 moderating component (percentage of the total energy value from UPP foods).
Santos *et al.*, 2021[26]	Psychometric study	The Diet Quality Scale (ESQUADA) is used to evaluate the diet.	For the health professional to apply to adolescents and adults	Consisting of 25 items, it includes questions about the consumption of natural or minimally processed foods, ultra-processed foods and dietary practices (such as having breakfast, cooking and replacing meals with snacks).
Borges and Jaime, 2019[20]	Methodological study	Instrument for auditing (data collection) of the consumer's food environment (AUDITNOVA) based on the NOVA classification.	For the health professional to audit the consumer's food environment	Indicators of the consumer's food environment, such as availability, price, promotional and advertising strategies and number of brands available were evaluated in 14 blocks: block 1 - general information; block 2 - type of trade and products traded; block 3 - entrance to the establishment; block 4 - produce sector; block 5 - meat, chicken and fish sector; block 6 - dairy sector; block 7 - grocery sector; block 8 - bodywork and preserves sector; block 9 - bakery and breakfast sector; block 10 - frozen foods sector; block 11 - beverage sector; block 12 - sector of chocolates, cookies and packaged snacks; and blocks 13 and 14, about advertisements inside and outside the establishment.
Gabe and Jaime, 2019[6]	Methodological study	Scale to measure healthy eating habits.	For the health professional to apply to the adult population	The scale consists of 24 items in a structure of four domains: Food choices and feeding modes - negative domains Household planning and organization - positive domains.
Martins *et al.*, 2019[21]	Methodological study	Culinary Skills Index that assesses confidence in the performance of culinary skills.	For the health professional to apply to the general population	Based on the golden rule of LPAI, encouraging the improvement of culinary skills and self-efficacy. It has ten short and closed items that assess the degree of confidence of people regarding the performance of culinary skills considered to facilitate the implementation of GAPB recommendations. The closer the score is to 100, the greater the confidence in performing the culinary skills.
Reis and Jaime, 2020[22]	Methodological study	Evaluation scale of FNE practices in PHC.	For the nutritionist to diagnose the adequacy of the FNS approach by the PHC team	Comprising 17 items: chapters of the GAPB, interprofessional collaborative practice and the family health strategy as models for organizing care in PHC.

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The fact that there are dietary guidelines does not, however, guarantee an effective nutritional policy or that the population will follow these guidelines. In addition to these guidelines having a solid scientific basis, they must present a set of factors for the effective communication of information to the public. These guidelines should be practical, understandable, culturally accepted, multimedia, multisectoral, address all groups and ages, and complement existing community programs[8,31].

Therefore, when the foods or food groups recommended in such guidelines are not accessible, widely available, and based on the food culture of the focal country, these dietary guidelines' language and visual resources are not understand-

Chart 3. Tools for assessing adequate and healthy eating based on the Food Guide for the Brazilian Population.

Author/ Year	Study design	Tool	Study sample	Tool components
Borges *et al.*, 2021[23]	Methodological study	Scoring system (Consumer Food Environment Healthiness Score) to evaluate the healthiness of the consumer's food environment, considering different types of food retailers and indicators, such as availability, price, advertising and placement strategies.	For the health professional to assess the healthiness of the consumer's food environment	Set of indicators classified into two dimensions: Food dimension - availability and promotional price. Foods from the first three NOVA groups may compose healthy eating patterns: positive score. UPP foods: negative score. Environmental dimension - advertising/information and placement. Advertising strategies and placement in the consumer's food environment related to the group of fresh or minimally processed foods - positive score. Food-related UPP - negative score. The scores are computed by the simple sum of the indicators of each dimension, standardized for the scale of 0 to 100 points. The higher the score, the healthier the food retailers are.
Reis and Jaime, 2021[24]	Methodological study	Online self-administered instrument to measure the knowledge of PHC workers about the GAPB content.	PHC workers	Composed of 16 items, which encompass the five chapters of the GAPB (principles, choice of food, from food to meals, ways of eating and understanding and overcoming obstacles).
Reis and Jaime, 2021[25]	Methodological study	Self-administered web -based scale to measure the self-efficacy and collective efficacy of PHC professionals in applying the GAPB for dietary guidance.	PHC professionals	Consisting of 24 items divided equally into Part A (self-efficacy) and B (collective efficacy). A set of items was constructed to capture the respondents' perception of self-confidence and the confidence of their teams to apply GAPB recommendations. The items were developed based on the concepts described in each chapter of the GAPB.
Silva *et al.*, 2021[17]	Methodological study	Questionnaire of Knowledge and Feeding Practices (QCPA) to assess nutritional knowledge and feeding practices.	For the nutritionist to apply in children (7 to 11 years)	Composed of 49 questions, 24 items on nutritional knowledge and 25 items on dietary practices. The questions were based on the GAPB's 10 steps for an adequate and healthy diet.

PHC: Primary Health Care. FNE: Food and Nutrition Education. GAPB: Food Guide for the Brazilian Population. UPP: ultra-processed products.

Source: Authors.

able; their design and implementation does not involve various sectors (nongovernmental organizations, the public sector or private companies) and professionals (educators, health professionals, social workers, extension workers, communication specialists, among others) in society; the professionals key to their dissemination lack the necessary education/training in and knowledge of their importance; there is no pilot testing or validation of the guidelines with nutritionists and their target audience; their recommendations are not effectively transformed into educational materials or disseminated across various media; and the time devoted to FNE activities is inefficient: All of these issues are obstacles that hinder an adequate implementation of the recommendations and dietary guidelines[8].

In addition, the production and distribution of educational materials in various media (folders, booklets, videos, among others) and the training of professionals who disseminate the relevant recommendations are fundamental in the

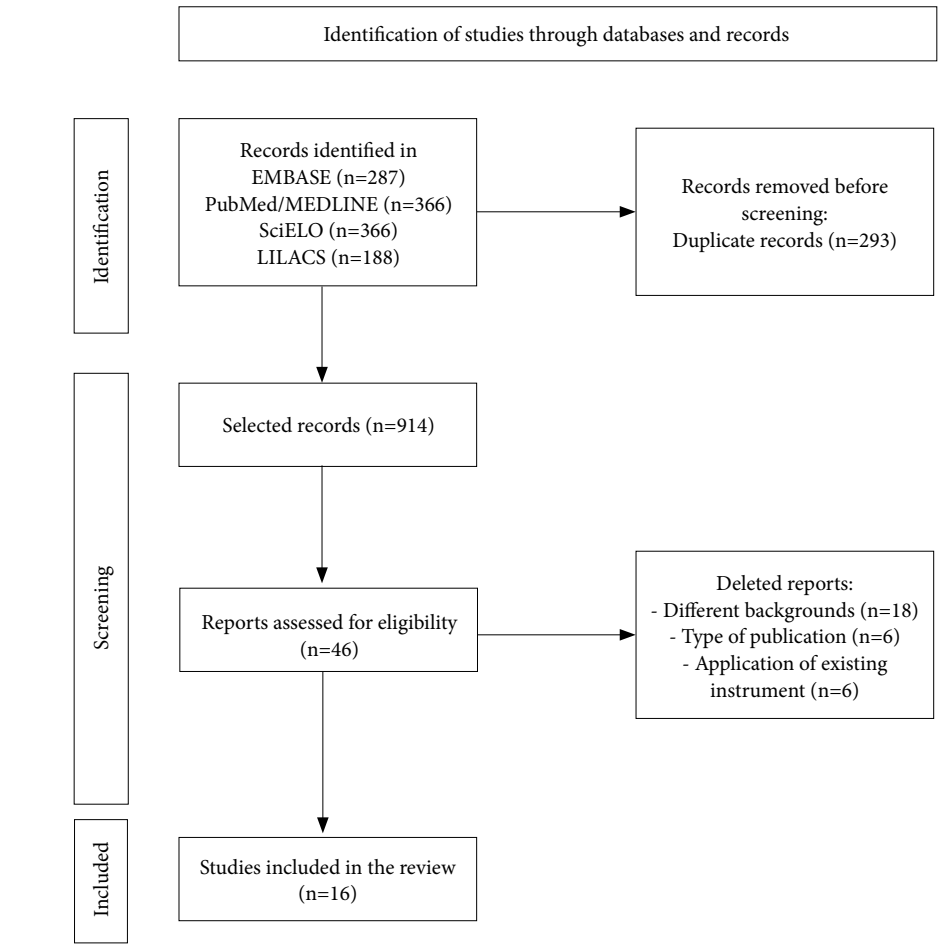

Figure 1. Flowchart of the search and selection of studies for inclusion in the scoping review.

Source: Adapted from Page *et al.*[11].

successful implementation of dietary guidelines and, consequently, the adoption of adequate and healthy eating habits by the population[32]. Thus, the tools discussed in this article facilitate overcoming such obstacles and act as facilitators in the implementation of FGBP recommendations, rendering these messages more accessible to the Brazilian population while encouraging the adoption of an adequate and healthy diet.

Tools for the promotion of adequate and healthy eating based on the Food Guide for the Brazilian Population

In this review, three studies[14-16] developed tools based on mHealth to disseminate FGBP recommendations among the population. Khandpur *et al.*[16] developed 28 messages based on FGBP recommendations, sent through a digital platform. Melo *et al.*[15] used smartphones and WhatsApp messages for promoting healthy eating, and Chagas *et al.*[14] developed a digital game (use on smartphones and tablets) to present this concept to the adolescent public. Therefore, the use of mHealth can be an important strategy for promoting adequate and healthy eating practices during the nutritional counseling process in different age groups.

Mobile health is a medical and public health practice supported by the use of cell phones, user monitoring devices, personal digital assistants and other wireless devices, which improve communication between health professionals and users and promote healthy lifestyles. Mobile

Chart 4. Psychometric evaluation of the tools for the promotion and evaluation of adequate and healthy eating based on the Food Guide for the Brazilian Population.

Tools for the promotion of adequate and healthy eating	
Author/Year	**Evaluation of the psychometric properties of the tool**
Geraldi *et al.*, 2017[12]	It did not.
Chagas *et al.*, 2018[14]	Evaluation of feasibility, usability and attractiveness (focus group with adolescents).
Jaime *et al.*, 2018[13]	Content validation (expert panel - CVI calculation).
Khandpur *et al.*, 2021[16]	Content validation (expert panel).
Melo *et al.*, 2020[15]	Validation of content through an online questionnaire with two research groups, then analysis of validation responses and editing of messages through panels of experts (researchers).
Louzada *et al.*, 2022[18]	Content and face validation (panel of experts and health professionals) through thematic content analysis: preanalysis (transcription and definition of themes to guide the analysis); exploratory reading of transcripts; analysis of results: coding and summarization of results; inference and interpretation
	Tools for the assessment of adequate and healthy diet
Crivellenti *et al.*, 2018[19]	Assessment of the degree of agreement (joint classification of the estimated quartiles of food group intake and weighted squared Kappa).
Santos *et al.*, 2021[26]	Evaluation of the relevance and clarity of the items (focus groups with nutritionists and exploratory content analysis: transcriptions, coding and analysis of coding agreement using the Kappa coefficient for interexaminer reliability). Evaluation of the comprehensibility of the items through an online questionnaire (applied to Brazilian adolescents and adults). Reliability assessment (item dimensionality and item response theory).
Borges and Jaime, 2019[20]	Content validation (expert panel - CVI calculation). Evaluation of reliability and reproducibility (percentage of agreement and Kappa coefficients).
Gabe and Jaime, 2019[6]	Content validation (expert panel - CVI calculation), face (pretest with the target audience) and construct (factor analysis). Evaluation of internal consistency (Cronbach's α coefficients) and reproducibility (intraclass correlation coefficient).
Martins *et al.*, 2019 [21]	Face validation (experts: group consensus and individual response to an online questionnaire). Reliability assessment: internal consistency (Cronbach's α coefficients) and reproducibility (weighted quadratic kappa and prevalence-adjusted kappa).
Reis and Jaime, 2020[22]	Content validation (expert panel - calculation of mean representativeness and clarity scores) and face (focus group with nutritionists). Assessment of agreement and reliability (weighted kappa).
Borges *et al.*, 2021[23]	Construct validation (Kruskal-Wallis test and Dunn test) and evaluation of internal consistency (Cronbach's α coefficients).
Reis and Jaime, 2021[24]	Validation of content (expert panel - calculation of mean representativeness and clarity scores), face (focal group of potential users of the instrument) and construct (confirmatory factor analysis).
Reis and Jaime, 2021[25]	Validation of content (expert panel - calculation of mean representativeness and clarity scores), face (focal group of potential users of the instrument) and construct (confirmatory factor analysis).
Silva *et al.*, 2021[17]	Content validation (expert panel (nutritionists, educators and psychologists) - CVI calculation), face (experts and children - pilot test) and construct (exploratory factor analysis) validation. Analysis of reproducibility (intraclass correlation coefficient), level of agreement (kappa coefficient), internal consistency (Cronbach's α coefficients) and validity.

CVI: Content Validity Index.

Source: Authors.

Chart 5. Tools for the promotion and evaluation of adequate and healthy eating based on the Food Guide for the Brazilian Population.

Tools for the Promotion of Adequate and Healthy Eating		
Food and Nutrition Education	**mHealth**	**Professional Qualification in PHC**
- Iconographic instrument on the NOVA[12] classification	- Virtual Game (Rango Cards) for promoting healthy eating habits among adolescents[14]	- Educational workshop for the implementation of the FGBP[13] recommendations
	- Messages to encourage behavior change in adults[16]	- Clinical protocol for guidance on individual dietary advice[18]
	- Messages via WhatsApp, for PAHF among adolescents[15]	
Tools for the Assessment of Adequate and Healthy Diet		
Feeding Practices	**Consumer Food Environment**	**Professional Practice in PHC**
- Diet Quality Scale (SQUARE)[26]	- Audit instruments[20] and score[23] of the consumer food environment (AUDITNOVA)	- Evaluation scale of FNE practices[22]
- Scale to measure eating habits[6]		- Online instrument for assessing knowledge about the FGBP[24]
- Diet Quality Index Adapted for Pregnant Women[19]		- Online scale to measure the effectiveness in the application of FGBP recommendations[25]
- Questionnaire to assess knowledge about healthy eating habits and practices in children[17]		
- Index of evaluation of the degree of confidence in the performance of culinary skills[21]		

PHC: Primary Health Care. FNE: Food and Nutrition Education. GAPB: Food Guide for the Brazilian Population.

Source: Authors.

health applications present a good opportunity for behavioral change interventions that require sustained adherence by keeping users engaged during health monitoring[33-35].

The FGBP focuses on concepts and information that need to be transmitted to the population in an objective, didactic way that promotes knowledge retention. In this sense, the tool developed by Geraldi *et al.*[12] can be used as supporting material in individual and group nutritional consultations on FNE, mediating and facilitating guidance on NOVA classifications through iconographic visual resources that support individuals in making adequate and healthy food choices with more autonomy. Among the strategies in the health area aimed at PAHF, the FNE is included. The development of personal skills in food and nutrition implies thinking of FNS as a process of dialog between health professionals and the population, which is of fundamental importance in the exercise of autonomy, self-care and empowerment regarding the adoption of adequate and healthy eating practices[2,36]. The FNS represents a set of actions (problematic and active approaches and educational resources) that are essential in facilitating the voluntary adoption of healthy eating practices that lead to health promotion[36,37].

In addition, Jaime *et al.*[13] developed a protocol for a continuing education workshop for PHC professionals that promotes the implementation of GAPB recommendations among the population and, consequently, the adoption of adequate and healthy eating practices. Louzada *et al.*[18] developed a protocol for PHC professionals to apply the FGBP in individual dietary counseling. The creation of clinical guidelines may be an action for adapting professional practice and improving the quality and efficiency of care offered to users[38]. Thus, the important role of health professionals in the successful implementation of the recommendations of the dietary guidelines

among the population is highlighted. These professionals should be encouraged to acquire the basic information necessary to interpret the recommendations provided by dietary guidelines. For this, the education, qualification and training of these professionals can be planned to sensitize and educate them to fully understand the concepts and specific messages presented in the guidelines, whereby the actual implementation of the recommendations among the population occurs[8].

Health education consists of the production and systematization of knowledge related to training and development in health care, involving teaching practices, didactic guidelines, and curricular guidance. One of the modalities of health education is continuing health education, which consists of the learning process occurring in professionals' workspace, where learning and teaching are incorporated into daily life at organizations and during work[39].

Assessment tools for adequate and healthy eating based on the FGBP

The evaluation process is essential in verifying adherence to adequate and healthy eating practices, the extent to which the food environment promotes adequate and healthy eating, the acceptability and credibility of the salient recommendations, and what knowledge the population and health professionals should have acquired after the implementation of dietary guidelines and SAP tools. The results of an evaluation process can be used to modify or adjust these guidelines and tools, improving the impact and adherence of these recommendations among the population[8,40]. Given this context, tools such as the Diet Quality Index Adapted for Pregnant Women[19], a questionnaire for assessing knowledge of healthy eating habits and practices among children[17], the Culinary Skills Index[21], the Diet Quality Scale (SQUARE)[26], and the scale for measuring healthy eating practices[6] are relevant for implementing and disseminating GAPB recommendations for adequate and healthy eating practices based on prior knowledge about the eating practices in a specific population.

In turn, the FGBP recognizes the role of the food environment in PAHF[3], defined as both the collective physical, economic, political and sociocultural space and the opportunities and conditions therein that influence the availability, access, selection, preparation and consumption of food and beverages, eating habits, the formation of eating habits, and nutritional status[41-43]. In this sense, the instrument for auditing the food environment (AUDITNOVA)[20] and its scoring system[23] make it possible to capture information such as availability, price, promotional and advertising strategy, number of brands available, and the healthiness of the consumer food environment by using, as a theoretical basis, the recommendations (NOVA classification) of the FGBP. In fact, this evaluation process is of fundamental importance because it can demonstrate the relationship between the consumer food environment and the development of CNCDs, thus supporting the creation of public policies that regulate the availability and advertising of food in these spaces[23].

According to the *Preparation and use of food-based dietary guidelines*[8], for the implementation of dietary guidelines to be successful, the professionals who act as the promoters of their recommendations need to have adequate knowledge of the information contained therein to optimally disseminate this information to the population. Thus, the evaluation of this knowledge among professionals[24], of the ability of health professionals to promote dietary advice[25], and of the FNE practices applied by these professionals[22] in promoting FGBP recommendations are fundamental for obtaining knowledge of the gaps and points that need improvement in food and nutrition guidance. Accordingly, mechanisms can be created to train health professionals, enabling the propagation of FGBP recommendations more efficiently and, consequently, achieving more success in PAHF among the population.

Evaluation of the psychometric properties of the tools

For a tool to be used in research or professional practice, its psychometric properties, that is, its reliability and validity, must be evaluated and considered appropriate. Reliability, one of the main quality criteria of an instrument, is the ability to reproduce a consistent result across time, space and different observers, demonstrating the aspects of stability (degree to which similar results are obtained at two different times), internal consistency (indicates whether the domains of an instrument measure the same characteristic) and equivalence (degree of agreement between two or more observers regarding the scores of an instrument)[44-46].

Validity, on the other hand, entails that an instrument measures exactly what it purports to

measure, i.e., it is based on the degree to which the content thereof adequately reflects the construct being measured (content validity). The degree to which a group of variables represents the construct to be measured (construct validity) and the degree to which the instrument is related to some external criterion are widely accepted measures (criterion validity)[44-46].

Of the sixteen studies included in this review, seven[6,17,20-23,26] assessed the validity and reliability of their FGBP-based tools. Notably, these tools must be accurate, valid and interpretable to allow their application in the population. Thus, when these studies present, in their methodologies, quality evaluations, either by validity or reliability, these help professionals to reliably and validly determine the most appropriate tool to be applied in professional practice according to the circumstances, population, type and purpose of each PAHF action[44-46].

Strengths and limitations

The articles included in this scoping review have observable strengths, such as their objective tools that are easily applied and used in professional routines to evaluate dietary practices, the consumer food environment, professional practices, and SAPS. However, these articles also have some limitations, such as a lack of standardization among the studies assessing psychometric properties and a divergence in the methodologies applied in the evaluation of reliability and validation. Moreover, not all the articles evaluated the reliability and validity of the focal tools. In addition, few studies developed nonvirtual tools or tools that do not depend on resources such as the internet, computers and cell phones for their application in professional practice. Finally, the development of more studies that address the creation of tools for the qualification of health professionals working in PHC is still necessary.

Conclusion

The present review has identified tools for the promotion and evaluation of adequate and healthy eating, their applicability, and the audience for which each of them is intended. These tools are essential for the implementation and dissemination of the recommendations proposed by the FGBP. This review can therefore assist health professionals in choosing the most appropriate instrument for the promotion and evaluation of healthy eating practices, thereby improving the actions for promoting healthy eating in health settings.

Collaborations

AP de Almeida and PVM Ribeiro participated in the study design, definition of the methodological design, data search and extraction, analysis and interpretation of data, writing and revision of the manuscript. DMUP Rocha participated in defining the methodological design, searching and extracting data, and review of the manuscript. LCV Castro participated in the study design and revision of the manuscript. HHM Hermsdorff participated in the project management, study conception, definition of the methodological design and review of the manuscript. All authors approved the manuscript to be published.

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