RESEARCH



Professional training to implement the dietary guidelines for the Brazilian population in primary health care: development and content validity of a massive open online course

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Abstract

Background The Dietary Guidelines for the Brazilian Population provide recommendations for healthy diets to prevent noncommunicable chronic diseases, emphasizing the golden rule: always prefer natural or minimally processed foods and freshly prepared dishes and meals to ultra-processed foods. While widely recognized, the integration of dietary advice based on the Dietary Guidelines recommendations has not yet been sufficiently incorporated into Primary Health Care. Protocols based on the Brazilian Dietary Guidelines for Individual Dietary Advice were developed to support healthcare professionals in providing individualized dietary advice based on the Brazilian Dietary Guidelines tailored to different stages of lifetime. Training healthcare professionals to use the Protocols might increase their confidence and is a strategic step toward implementing the Guidelines in routine care. This study aimed to develop and validate a Massive Open Online Course (MOOC) on the Protocols based on the Brazilian Dietary Guidelines for individual dietary advice.

Methods This methodological study investigated the development and content validity of a Massive Open Online Course designed to qualify Primary Health Care professionals in dietary advice based on the Protocols. Development and validation involved defining objectives, theoretical frameworks and learning skills; creating content and structure; conducting content validity assessments through a panel of experts; analyzing the results via content validity index scores and thematic content analysis with a comprehensive approach; and refining pedagogical tools in the virtual learning environment.

Results A Massive Open Online Couse, titled QualiGuia, was developed. All the content sessions achieved content validity index scores above the cutoff grade (0.8). Experts' perceptions were categorized to assess content adequacy, clarity, relevance, and alignment with the theoretical framework. Suggestions for improvement and potential implementation challenges were also addressed. The course included case studies reflecting typical Primary Health Care situations with appropriate complexity and depth, effectively meeting learning objectives.

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Conclusions The Massive Open Online Course QualiGuia was validated as an effective tool for training Primary Health Care professionals to use the Protocols based on the Brazilian Dietary Guidelines. Its content and structure align with the goals of the Guidelines, supporting healthcare providers in integrating dietary advice into Primary Health Care practices.

Keywords Dietary Guidelines, Primary Health Care, Capacity Building, Practice Guideline, Distance Education, Health Promotion, Ultra-processed foods

Background

In recent decades, several countries have faced the burden of malnutrition and obesity related to diet-related chronic noncommunicable diseases and climate changes that impact food systems [1]. Improving dietary patterns could prevent one in five deaths worldwide [2]. Evidence highlights that increasing consumption of ultra-processed food underpins this complex scenario, contributing to rising rates of diseases and adverse outcomes for human and planetary health [3].

Ultra-processed foods are industrial formulations made from food derivatives, additives, and cosmetic ingredients through extensive processing steps [4]. Because they are designed to be cheap, highly palatable, and profitable for manufacturers, ultra-processed foods stimulate excessive consumption [5, 6]. High intake has been consistently associated with more than 30 chronic conditions, including diabetes, obesity, and hypertension [3, 7].

The Dietary Guidelines for the Brazilian Population, hereinafter referred to as Brazilian Dietary Guidelines (BDG), is Brazil's official guide for promoting adequate and healthy eating within the National Public Health System, called the Unified Health System (SUS, acronym in Portuguese) [8]. Groundbreaking for adopting the Nova classification system, BDG emphasizes minimizing the consumption of ultra-processed foods while respecting Brazilian food culture, considering culinary skills and promoting sustainable food systems. It also addresses the determinations of health and presents strategies to overcome barriers to healthy eating [9, 10].

Brazil's Primary Health Care (PHC) system, with over 80% coverage [11], plays a strategic role in reducing health inequities and improving population health by addressing infant mortality, preventable deaths, and hospitalizations for sensitive conditions [12]. Key responsibilities include promoting healthy eating, providing dietary advice, and conducting food and nutritional surveillance [13–15].

In Brazil, all PHC professionals are involved in promoting healthy eating. Additionally, degree-holding professionals—including physicians (general practitioners), nurses, dentists, nutritionists or dietitians (considered synonyms), physiologists, physiotherapists, voice therapists, labor therapists and others—also deliver individualized dietary advice. However, dietary advice in PHC remains not yet fully integrated due to knowledge gaps, insufficient training, and low confidence in delivering dietary advice among professionals [16, 17].

The Protocols based on the Brazilian Dietary Guidelines for Individual Dietary Advice, hereinafter called Protocols, were published by the Ministry of Health in 2021-2022 to support healthcare professionals in delivering individualized dietary advice across different life stages (adults, elderly, pregnant, children aged 2-10 years, and adolescents) [18-25]. They address the gap in systematizing BDG recommendations for individual care. The Protocols begin with a dietary intake assessment via a form integrated into Brazil's Food and Nutrition Surveillance System and PHC electronic medical records. This form evaluates ultra-processed food consumption and dietary diversity [26]. Based on this diagnosis, a stepwise flowchart for decision-making guides professionals in providing recommendations aligned with the BDG's golden rule, offering tailored dietary advice, explanations and strategies to overcome barriers to healthy eating. While Protocols are valuable tools, training healthcare professionals to use them is essential for implementing BDG recommendations in PHC [8, 27]. Such training can increase professionals' confidence and skills in providing dietary advice [23].

Massive Open Online Courses (MOOCs) are courses offered through virtual learning environments in an open and accessible format, enabling anyone in the target audience with internet access to participate. These courses are described as massive because they can reach many participants, accommodating diverse populations across extensive geographic areas and showcasing substantial potential for widespread dissemination. Furthermore, MOOCs provide flexibility, allowing participants to determine their study schedules and complete activities at their own pace, making them adaptable to varying individual needs and learning preferences [28].

This study aimed to develop and validate a Massive Open Online Course (MOOC) on the Protocols based on the Brazilian Dietary Guidelines to support healthcare professionals in delivering individualized dietary advice in Primary Health Care.

Methods

This is a methodological study that presents the methods utilized to translate the BDG recommendations and the usage of the Protocols into teaching–learning material for healthcare professionals. Figure 1 provides a flowchart summarizing the methodological stages of the study, with the detailed steps described in the following sections.

Course formulation: definition of the objective, theoretical framework and learning skills

The course aimed to equip healthcare professionals with the knowledge and skills to apply the BDG and the Protocols in dietary advice within PHC settings. By the course's end, participants were expected to deliver dietary advice grounded in the Protocols, update their practices and improve the quality of care.

The evidence supporting the course design includes a validated educational workshop based on the BDG, which demonstrated effectiveness in increasing healthcare professionals' knowledge, self-efficacy, and practice changes [29–31]. Additionally, healthcare professionals involved in developing the Protocols recognized training as crucial for enhancing their implementation [23, 25].

The target audience included degree-holding healthcare professionals who deliver individual care in PHC, including physicians (general practitioners), nurses, dentists, nutritionists, physiotherapists, voice

Course formula- tion	 Definition of the objetive Definition of the theoretical framework Definition of the learning skills
Course construc- tion	 4 Definition of the format 5 Content construction 6 Structure construction
Course content validity	 Panel of judges Content Validity Index Focus Groups
Course develop- ment	 10 Analysis of the results 11 Content review 12 Development of pedagogical tools in the virtual learning environment

Fig. 1 Flowchart of the methodological steps for the development and content validity of the course

therapists, labor therapists and others. Nutritionists, although already knowledgeable in food and nutrition, were included to familiarize them with the Protocols, enabling them to systematize individual care and support other team members in delivering dietary advice as part of a multiprofessional PHC support team.

The courses' theoretical framework was as follows: 1) Primary Health Care: PHC serves as the first level of care in universal health systems, coordinating care comprehensively, considering social determination of health, and promoting multidisciplinary approaches. It plays a critical role in fostering health and encouraging adequate and healthy eating [13, 32-34]. 2) Continuing Health Education (CHE): effective professional qualification requires context-based learning strategies aligned with PHC realities, fostering reflection and transformation of practices. CHE ensures that healthcare professionals stay up-to-date and are prepared to deliver evidence-based and high-quality care [35, 36]. This framework informed the design of the course activities and materials, such as contextualized case studies for learning how to use the Protocols.

The course's learning skills were designed as part of a continuous development process, ensuring that participants remain up-to-date and confident in delivering healthcare. Training initiatives were aligned with the health system's principles and responsibilities, with a focus on developing skills that meet system needs [37–39]. Additionally, these skills aimed to improve the quality and effectiveness of nutritional advice provided in PHC.

Course construction: format, content and structure

The course format and structure were designed to enable nationwide accessibility while maintaining low costs for the health system. The training was structured to be compatible with professional schedules, allowing completion during working hours as part of health service activities.

Course content was grounded in the BDG and the Protocols, contextualized within the framework of nutritional care in PHC [8]. The training was aligned with the National Food and Nutrition Policy (PNAN, in its acronym in Portuguese), which aims to enhance health and nutrition, ensuring the human right to health and food. The course emphasized PNAN's guidelines for promoting adequate and healthy eating, integrating strategies for fostering better dietary practices [14, 40, 41].

The first version of the course content, pedagogical resources, and structure was developed by a team of experienced nutritionists, guided by this comprehensive content matrix and relevant references.

Course content validity: panel of experts, Content Validity Index and focus groups

Content validity ensures that materials are theoretically representative and aligned with their framework, which is commonly assessed by expert panels [42]. These panels are frequently employed in clinical protocol development [23] and have also been used in educational course development. This methodological step is critical for guaranteeing high-quality content and reliable evaluation metrics [29, 43, 44].

The course content underwent content validation by a panel of experts in Food and Nutrition, BDG, the Protocols, PHC, CHE and Distance Education. Experts were selected based on their experience in these relevant fields, using a convenience sample. To balance the workload and facilitate online focus group participation, 12 experts evaluated Module I, and another 12 assessed Module II.

The experts evaluated the course content for clarity, relevance and adequacy of the theoretical framework. Clarity determined if the content was understandable for the target audience; relevance assessed the alignment of strategies and tools with the course objectives; and adequacy evaluated if the content reflected the chosen theoretical framework.

Each attribute is assessed on a scale from one to four, where a value of one indicates that the item does not exhibit the attribute's domain, and a value of four indicates that the item fully meets the attribute's domain [42]. To facilitate the experts'assessment, a 4-point Likert scale was developed based on the evaluation values proposed in the literature. The scale was applied to each attribute according to the predefined definitions. For clarity, the question and answers were: do you assess that the item is clear to the target audience of the course? 1—The item is not clear; 2-Major revisions are needed to make the item clear; 3-Minor revisions are needed to make the item clear; 4-The item is clear. For relevance, the guestion and answers were: is the highlighted item relevant to the composition of the course? 1—The item is not relevant; 2-Major revisions are needed to make the item relevant; 3-Minor revisions are needed to make the item relevant; 4—The item is relevant. For adequacy, the question and answers were: is the content of the item appropriate to the chosen theoretical framework? 1—The content of the item is not adequate; 2-Major revisions are needed to make the item adequate; 3-Minor revisions are needed to make the item adequate; 4—The content of the item is adequate.

Based on the assessment and the scores assigned to each course item, the Content Validity Index (CVI) calculated the proportion of experts who agreed with each construct [42]. Experts provide feedback and suggestions for improvement via individual assessments on a Research Electronic Data Capture (REDCap) form [45].

To gain deeper insights, two online focus groups were held to capture experts' perceptions in a group discussion to build consensus or identify divergences [46–48]. Each session followed a structured script addressing overall perceptions of course appropriateness and relevance, specific content evaluations, and proposals for pedagogical improvements. Conducted online via Microsoft Teams, the focus groups included a moderator, an observer and a rapporteur, with consent for analysis. The remote format allowed broad geographic participation while maintaining engagement and fostering dynamic interactions, close to in-person group discussions [49].

Course development: analysis of results, review and development of pedagogical tools in the virtual learning environment

The CVI was calculated based on the proportion of ratings 3 and 4 on the Likert scale relative to the total number of expert evaluations. Separate CVI calculations were conducted for clarity, relevance, and theoretical adequacy of each activity's content. Activities with a CVI > 0.80were considered satisfactory, and no changes were made; however, the most recurring recommendations were incorporated to refine the course [42]. Data collection and analysis were supported by REDCap software [45].

Focus group data were analyzed using a comprehensive approach in thematic content analysis, identifying core themes from the experts' perceptions and discussions. This approach involves both explicit content and the context of the interactions, applying a hermeneutic-dialectic perspective. This method considers the historical, professional, and systemic contexts of the experts' perspectives, linking their evaluations to the interface with food and nutrition in the PHC context. Thus, speech is considered an expression of the relationships between time and space, circumscribed within reality [47]. The steps for the analysis were as follows: transcription of the focus groups; floating reading and identification of previously expected themes and identification of emerging themes that arise from the interaction of the groups [50]; identification of expressions and mentions that demonstrated the experts'opinions regarding the analytical attributes of content validity; classification of recurring categories that are expressions that give meaning to the organization of the content of the speeches; and categorization of the expressions and mentions into cores of themes for analytical interpretation. NVivo software (QSR International Pty Ltd., Victoria, Australia) was used to support the data organization and analysis.

The project received ethical approval from the Research Ethics Committees of the Beneficência Portuguesa

Table 1 Characterization of the participants of the experts' panel (n = 15)

Characteristic	Absolute frequency	
Profession		
Nutritionist	15	
Academic qualifications		
Masters—Nutrition/Public Health	3	
PhD—Nutrition/Public Health	12	
Expertise in panel's theoretical reference	ce	
Dietary Guidelines for the Brazil- ian Population	5	
Primary Health Care	6	
Health Continuing Education	4	

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Results

Validation of course content: characterization of the panel of experts, Content Validity Index and focus groups

The panel of experts included 15 nutritionists with postgraduate education in the fields of interest for the course. Table 1 summarizes their main characteristics.

The course was divided into sessions, and the CVI was calculated for the 76 content sessions (27 in Module I and 49 in Module II) based on the expert ratings for clarity, relevance and alignment with the theoretical framework. The 15 experts were divided into two groups according to their main speciality, 8 of whom assessed Module I and 7 of whom assessed Module II. The results are presented in Table 2. However, Module II received more suggestions to improve the content, mainly to enhance clarity.

All the experts were invited to a focus group, which involved seven and three participants in two separate sessions. Using thematic content analysis with a compre-

hensive approach, three key categories were identified. Mentions about the content, its suitability, appropriateness and suggestions for improvement were the expected themes and are identified in Category II. Furthermore, it was also possible to observe mentions about the relevance and recognition of the course for the healthcare system and perceptions of its implementation in health services. These expressions are included in categories I and III, respectively. Table 3 presents these themes.

Table 4 highlights excerpts that capture the content and meaning of the group's discussion on each category. The interpretation of the content focused on the direct messages identified in the expressions, considering the context of the messages within the reference framework previously outlined for course development.

The category "appropriateness of the proposal and recognition for PHC" emphasized the course's strategic role in advancing BDG implementation in PHC. It highlighted the Protocols as an innovative tool and considered the course a strategic strategy to support healthcare professionals in using the Protocols. Additionally, the course was recognized as a strategy to expand reach and train professionals to integrate dietary advice into their practice.

The "content adequacy" category confirmed that the course content and its distance education methodologies were adequate and validated based on the analytical attributes analyzed. The experts understood that the content was designed to be aligned with the best care practices in PHC, reflecting the reality faced by healthcare professionals and fostering critical reflection to support practice changes. Case studies were considered the right methodology to learn how to use the Protocols in the context of PHC. Additionally, they were considered accurate in reflecting PHC scenarios with appropriate complexity and depth, effectively meeting the course's learning objectives.

	Content Validity Index (CVI)						
Component	Clarity	(min–max)	Relevance	(min–max)	Appropriateness	(min–max)	CVI average
Module I (n = 8)							
Learning Unit 1	1.00	(2–4)	1.00	(2–4)	1.00	(3–4)	1.00
Learning Unit 2	1.00	(3–4)	1.00	(1-4)	1.00	(3–4)	1.00
Module II (n = 7)							
Learning Unit 1	0.98	(2–4)	1.00	(3–4)	1.00	(3–4)	0.99
Learning Unit 2	0.97	(2-4)	1.00	(3–4)	1.00	(3-4)	0.99
Learning Unit 3	0.96	(2–4)	0.96	(2–4)	1.00	(3–4)	0.98
Learning Unit 4	0.95	(2–4)	0.96	(3–4)	1.00	(3–4)	0.97
Learning Unit 5	0.95	(2–4)	0.98	(2–4)	1.00	(3–4)	0.98
Learning Unit 6	0.95	(2–4)	0.97	(2–4)	1.00	(3–4)	0.98

 Table 2
 Averages of the content validity index

Table 3	Content analysis cat	egories, descriptions a	and frequency of referer	ces identified from	the judge panels
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Categories I. Appropriateness of the proposal and recognition for Primary Health Care		Description Specialists' perceptions about the relevance of the development of a course with these themes and objectives. Recognition of the role this course may play for the improvement of Primary Health Care	
	II.b. Suggestions for improving the course	Specialists'suggestions to improve the course content. The suggestions to change did not change the structure but refine the content proposal	
III. Challenges for implementing the course in Primary Health Care		Specialists' perceptions on steps to implement the course in Primary Health Care	

By comparing the "suggestions for improving the course" category with the CVI results, it was possible to confirm the quality of the content and its theoretical framework. However, Module II received lower clarity scores, prompting suggestions and ideas to refine the proposed learning tools and enhance case studies for greater alignment with PHC care practices and the use of the Protocols.

The "challenges for implementing the course in PHC" category highlighted the complexity of PHC's structure and the burdened daily routines of healthcare professionals, which tend to deprioritize professional training when courses are not part of their schedules. The experts proposed strategies to address these challenges based on the understanding that professional training is a key point for enhancing the population's care. The strategies proposed included management agreements to prioritize professional education and support scheduling and planning for training sessions.

Course formulation: validation of the objective, theoretical framework and learning skills

The objective, learning skills and theoretical framework were validated through CVI evaluation and focus groups. These validations confirmed the set of skills and competencies that the course aims to develop in healthcare professionals. The expected skills and competencies include understanding how to use the Protocols and its stepwise flowchart for decision-making; understanding the main concepts of the BDG; identifying the individual's socioeconomic and cultural circumstances and their influence on eating practices; recognizing the reasons behind unhealthy practices; determining when to apply the Protocols in their work context; diagnosing person's eating practices; practicing active listening during individual care; and applying the Protocols' stepwise flowchart for decision-making.

Course construction: confirmation of the format, content and structure

The course format and its structure remained unchanged after the content validation process. Although the CVI

results indicated no need for substantial content modifications, experts'suggestions were considered, and minor adjustments were incorporated into the final version.

The course was designed as a 30-h professional qualification MOOC, adopting this self-learning model in a distance education format. This approach can democratize access to training and qualifications because of its potential to support meaningful and reflective learning processes for daily work in PHC. Technologies used in the course aim to provide meaningful teaching–learning strategies contextualized to the realities of health services, with case studies as key examples [38, 51, 52].

Module I consists of two Learning Units. The first contextualizes healthcare professionals in the food and nutrition policies of the health system and the promotion of adequate and healthy eating within PHC. The second focuses on the BDG and its recommendations. The activities in this unit included interactive activities adapted from other educational resources designed to present these main Module's concepts [53–55].

Module II contains the course's core content, beginning with a Learning Unit that presents the Protocols and their practical application. The subsequent five Learning Units explore each of the specific Protocols in depth, employing case studies on common case scenarios of PHC, with common dietary intake characteristics of each life stage. These case studies, presented as animated videos, enable participants to understand how the Protocols can be integrated into daily care practices in PHC.

All the Modules share the same structure and were designed to facilitate the learning experience within the virtual environment. Each Learning Unit end with an assessment activity to evaluate the knowledge acquired at each stage. Table 5 outlines the course structure and learning objectives of each unit.

Course development: organization into pedagogical strategies in the virtual learning environment

The course content was integrated into pedagogical tools in the virtual learning environment. The learning path

Categories I. Appropriateness of the proposal and recognition for Primary Health Care		Main references "Any kind of qualification and training opportunities for healthcare professionals is extremely important. Specifically, the Protocols, I think it helps a lot regard- ing using them because even though they are already a didactic tool, easy to handle and use, there is still a lot of insecurity among healthcare professionals, other than dietitians regarding giving dietary advice. Therefore, the possibility of having a course that strengthens and gives more, not strength, so that profes- sionals can speak with more confidence, I think is great"		
		"I believe that this course has brought everything that we can imagine that could be a potential tool to reach places where we have a certain difficulty. Not just in terms of access, as has been mentioned, in other formats that can be expanded further but also by bringing the language we need to healthcare professionals"		
II. Course content	II.a. Content adequacy	"I think that having a course on the Protocols, which are part of the Dietary Guidelines, is a provocation precisely because of this idea that nutritional care should be shared with other professionals. I thought it was very nice because you went through this throughout the material, I was able to read"		
		"I thought the study cases were excellent, truly good. I think it managed to cover the complexity of Primary Care, of the cases we attend to, and it also managed to include the diversity of Brazil, right? Because I can see cases in big cities, but I can also view these cases in a city in the countryside. Bringing in interesting professionals, which I thought, from the auxiliary, bringing in the access, bringing in the dentist, blurring the lines between just the doctor and the nurse, I thought it was very nice"		
		"Therefore, I truly liked the fact that the first module goes into more detail about the Dietary Guidelines. Explain what ultra-processed food is, bringing up the images, in short. There's still a lot of doubt"		
		"I liked the case study format you brought. I think it makes the course practical for professionals, and they might like it. We have also been working with distance learning courses, and we have seen compliments about these issues, when we put activities like this in place, they can see themselves and see their realities. Therefore, I think that was nice"		
	II.b. Suggestions for improving the course	"Perhaps my suggestion would be to put more emphasis on this interprofes- sionalism, I think something that needs to be made very clear is that the Dietary Guidelines is not only for dietitians, it is for all healthcare professionals. I think we will be the spokespeople, because of our affinity with the subject, but I think this must come from the top down"		
		"I like the idea of the study cases format being video and animation. I think this is one of the most central parts of the course, having a good video made. Because the script is great, now to see it turn into a video, I think you will manage that for sure, but I keep thinking that it is nice to have that narrative, that wealth of detail that you managed to put into the text, that must be in the video some- how"		
		"I think the workload of the course is fine. However, even though the mate- rial has not yet been recorded in e-book format, this has an impact on the size of what is going to be read. This is one of the great challenges for healthcare professionals because we do not always have a protected agenda for them to carry out their professional qualifications. When they start their professional qualification, they sometimes find it difficult to complete it because of its size. Some of the suggestions I made were along the lines of trying to reduce the size or change it to a simple audio programme, exploiting the resources you have already pointed out"		
		"We talk a lot about the difficulty of using the assessment made by food con- sumption markers and we bring up the issue of valuing the use of these markers. At the beginning, I was thinking of presenting the protocol and the stepwise flowchart, just as you have here in this module, but presenting the markers. I was thinking of a video that could show where within the e-SUS electronic health record, you can find the markers, because I think we hear this question of lack of knowledge, especially from professional categories other than dieti- tians, about the markers. Therefore, I was thinking about something in this practi- cal sense: where are they? How do I use them?"		

Categories	Main references
III. Challenges for implementing the course in Primary Health Care	"If you are in Primary Health Care, it is very much like that: times are very fast, people are very overwhelmed and, as several colleagues have said, there are often no resources to do it, whether it is technological resources or time to free up to do the training. This is a big challenge, people, regarding distance learning"
	"This online format is not something I particularly like, but considering the day- to-day work, I think it is an interesting possibility. I am just wondering how this could be incorporated into the work routine so that it does not become an extra work course and make it difficult for people to take it. Thinking about this as a policy, within the Ministry of Health, encouraging municipalities to provide this time, to have some hours set aside so that this can be done during working hours, I think that is very good"

Table 5 Course structure

Presentation			
Module I: Organization and tools for	nutritional care in PHC		
Learning Unit 1	Nutritional Care in PHC		
Learning Unit 2	Presenting the BDG		
Module II: Protocols based on the Brazil	ian Dietary Guidelines for Individual Dietary Advice at PHC		
Learning Unit 1	Presentation of the Protocols based on the Brazilian Dietary Guidelines for Individual Dietary Advice		
Learning Unit 2	Section 1—Protocols based on the Brazilian Dietary Guidelines for Individual Dietary Advice for Adults		
Learning Unit 3	Section 2—Protocols based on the Brazilian Dietary Guidelines for Individual Dietary Advice for elderly people		
Learning Unit 4	Section 3—Protocols based on the Brazilian Dietary Guidelines for Individual Dietary Advice for Pregnant People		
Learning Unit 5	Section 4—Protocols based on the Brazilian Dietary Guidelines for Individual Dietary Advice for Children aged 2 to 10 years		
Learning Unit 6	Section 5—Protocols based on the Brazilian Dietary Guidelines for Individual Dietary Advice for Adolescents		
Conclusion			
PHC Primary Health Care, BDG Brazilian	Dietary Guidelines		

was tested to ensure correct navigation and an effective learning experience for the participants. The course was named QualiGuia— 'quali' in Portuguese refers to qualification, a term commonly associated with this type of training, whereas 'Guia' refers to BDG. Together, the name signifies the qualification process focused on the BDG.

Discussion

The Brazilian health system offers an open platform for continuing health education, called the Open University of SUS (UNASUS, its acronym in Portuguese). This platform aims to promote education for healthcare professionals across Brazil so that they can always be trained to stay up-to-date in addressing health needs specific to their territories [38]. The QualiGuia course, validated in this study, is part of this model of distance education courses, which are classified as MOOCs, as they are available online at UNA-SUS.¹ Other UNASUS courses can be considered MOOCs, as they are selflearning courses with open enrollment for thousands of participants and with flexible study schedules [56, 57]. MOOCs have increasingly been used as a training strategy for healthcare professionals who already hold formal education but who require updates on specific topics to enhance their care practices [58]. These courses aim to provide high-quality qualification and training, based on the best evidence, and deliver this information to many

¹ The course QualiGuia is available at the Open University of SUS (UNASUS) in Portuguese. It is accessible at: https://www.unasus.gov.br/cursos/curso/47024.

professionals. A study reported that healthcare professionals were more engaged in completing a course when its learning objectives aligned with the skills required for their daily practices, when its content has practical application and when its content was concise, allowing quicker completion [59].

These findings highlight the potential role of MOOCs in continuing education processes in healthcare. Courses with well-defined themes and contextualized learning objectives that address specific qualification needs can respond to the demands of healthcare professionals. Continuing Health Education ensures that training processes are connected to the professionals' daily challenges, and sometimes, what affects professional performance is the need to learn a specific technique that is understandable and reflective. Such learning can also foster changes in care practices within the healthcare context.

For MOOCs to serve as effective tools for promoting reflective work practices, updating professional training, and driving changes in healthcare, the involvement of various stakeholders is crucial. Their engagement ensures effective implementation, with strategic contributions from each actor that plays a strategic role in this process—from the Ministry of Health, responsible for publishing materials such as the BDG and the Protocols and promoting implementation initiatives such as funding the development of courses, to local management teams, which support healthcare professionals, encourage their qualifications, and facilitate discussions on incorporating Protocols into their daily healthcare practics.

The validation process highlighted the importance of the case studies. In the focus groups, they were described as excellent teaching–learning strategies, bringing together elements that made the study case truly close to the reality of Brazilian PHC. Additionally, the cases were representative of the profile of dietary intake and the socioeconomic and health characteristics of those different life stages. The study cases were also aligned with the PHC care model, which enables professionals to be aware of the moments when they can carry out the interventions proposed by the Protocols.

Case studies are valuable teaching–learning methods, with great relevance in supporting students in applying theory to practice and reflecting on this integration and ways to implement best care practices. This course reaffirms the positive role that case studies can play, even if they are adapted to the format of animated videos, which is compatible with MOOC qualifications and training [60].

The development of the Protocols addresses a gap by being a tool to support healthcare professionals in delivering individual dietary advice based on the BDG. The implementation of BDGs and the Protocols is a shared responsibility of different stakeholders in the Brazilian National Health System, as they are official guidelines for healthy diets. Making these materials available to support clinical practice is a step toward adopting dietary guidelines. Therefore, professional qualification through MOOCs can further advance the implementation of these tools for better healthcare, considering that professional training can be effective in increasing degree-holding healthcare professionals confidence in incorporating the Protocols into practice [23].

Recent research has demonstrated that adherence to BDG's recommended eating practices is associated with better diet quality, characterized by higher consumption of fresh and minimally processed foods and lower consumption of ultra-processed foods. Adhering to the eating practices of BDG is associated with better diet quality. Consequently, the MOOC could strategically prepare healthcare professionals to provide evidence-based advice, potentially influencing the eating practices and dietary habits of people cared for in PHC [61].

In line with our findings, Floss et al. evaluated a MOOC designed for healthcare professionals to receive training on planetary health. Even when using a different validation method, it was possible to observe similar reflections on the potential for widespread access to training [62]. Similarly, another study described the methodological design for developing a MOOC, involving the participation of multiple actors to build an enhanced course for SUS healthcare professionals in the field of mental health [63].

One limitation of this study is the lack of a consensual development method for MOOCs, which limits the comparability of findings. Standardized methods could include steps to evaluate from development to training impact assessment processes [59]. However, other studies that describe the development of MOOCs have similar approaches, involving an extensive literature review, the organization of content by a specialized team and some stage of evaluation by experts for content enhancement [62–64].

Another limitation of the validation process was the composition of the panel of experts, which included only nutritionists, despite extended invitations to experts in medicine and nursing. Nevertheless, the participating experts had postgraduate training in public health, ensuring a broader perspective and not only having a focus on nutrition but also encompassing the context of Brazilian public health.

Future research could further evaluate the effectiveness of MOOCs in achieving the intended results in the context of training healthcare professionals within the public health system, as well as evaluating their impact on public health [59]. The next phase of this research will test the effectiveness of the QualiGuia MOOC in changing PHC professionals' confidence perceptions in providing dietary advice based on the Protocols.

Conclusion

The MOOC course QualiGuia, developed about the Protocols based on the Brazilian Dietary Guidelines for Individual Dietary Advice, proved to be valid for training PHC professionals. Both evaluation steps, quantitative and qualitative, were shown to be complementary and led to the construction of case studies based on the PHC setting.

Abbreviations

BDG	Dietary Guidelines for the Brazilian Population
SUS	Unified Health System
PHC	Primary Health Care
Protocols	Protocols based on the Brazilian Dietary Guidelines for Individual
	Dietary Advice
MOOC	Massive Open Online Course
CHE	Continuing Health Education
PNAN	National Food and Nutrition Policy
CVI	Content Validity Index
UNASUS	Open University of SUS

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Authors' contributions

VDCSC made substantial contributions to the conception of the research question and study design, analyzed and made a critical discussion of the data. RMS made substantial contributions to the study design and made a critical discussion of the data. PCJ made substantial contributions to the conception of the research question and study design, analyzed and made a critical discussion of the data. All authors reviewed the manuscript for critical intellectual content and approved the final version of the manuscript.

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Data availability

The databases with the transcripts are not publicly available to protect the privacy of the research participants, but the data can be made available by the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Before participation, all the experts received oral and written information about the aim and procedure of the study and provided written informed consent. The study project was approved by the Research Ethics Committees of the Hospital Beneficência Portuguesa (process no. 60875322.0.1001.5483) and the School of Public Health of the University of São Paulo (process no. 60875322.0.2001.5421).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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