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How to enable healthier and more sustainable food practices in collective meal contexts: A scoping review.

João Graça [a,b,*], Lúcia Campos [b,c], David Guedes [b,c], Lisa Roque [c], Vasco Brazão [d], Monica Truninger [b], Cristina Godinho [e]

[a] University of Groningen, Groningen, the Netherlands
[b] Instituto de Ciências Sociais da Universidade de Lisboa (ICS-ULisboa), Lisboa, Portugal
[c] Iscte - Instituto Universitário de Lisboa, CIS_Iscte, Portugal
[d] CLOO Behavioral Insights Unit, Porto, Portugal
[e] NOVA National School of Public Health, Public Health Research Center, Comprehensive Health Research Center, CHRC, NOVA University Lisbon, Lisbon, Portugal

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ABSTRACT

Collective meal contexts such as restaurants, cafeterias and canteens can help accelerate transitions to healthier and more sustainable diets. However, evidence from intervention studies on these contexts lacks integration. This scoping review aimed to map determinants of dietary change in collective meal contexts across multiple settings, interventions, target groups, and target behaviors. The review provided two main outcomes: (i) identifying intervention components to promote dietary change in collective meal contexts, based on the existing body of evidence; and (ii) classifying and integrating these intervention components into an overarching framework of behavior change (i.e., COM-B system). The review encompassed twenty-eight databases via two indexing services and extracted information from 232 primary sources (27,458 records selected for title and abstract screening, 574 articles selected for full-text screening). We identified a total of 653 intervention activities, which were classified into intervention components and grouped under three broad themes, namely contextual and environmental changes, social influence, and knowledge and behavioral regulation. Multi-component interventions tended to report overall positive outcomes. The review proposes several directions for future research, including: (i) moving toward more theory-based interventions in collective meal contexts; (ii) providing more detailed information about intervention settings, implementation, target groups, activities, and materials; and (iii) improving the use of open science practices in the field. Furthermore, the review offers a free, original, open-access list and synthesis of 277 intervention studies in collective meal contexts, which can help intervention planners and evaluators optimize their efforts to promote healthier and more sustainable food practices in these contexts.

1. Introduction

Globalization, accelerated economic development, and urbanization, as well as the modernization of agricultural and food-processing techniques during the last century, have led to profound changes in dietary patterns that raise important health and sustainability concerns (Popkin, 2006; Rose et al., 2019; Willett et al., 2019). To address these concerns, large-scale shifts towards healthier and more sustainable diets are necessary across socioeconomic, cultural, and geographical backgrounds, as reported in several reviews and reports (Eisen & Brown, 2022; IPCC, 2022; Powell et al., 2019; Stoll-Kleemann & Schmidt, 2017; Weihrauch-Blüher et al., 2018; Willett et al., 2019; Xu et al., 2021). Healthy and sustainable diets are typically characterized by the intake of whole grains, vegetables, fruits, legumes, and nuts while limiting salt, added sugars, refined grains, and saturated and trans fats (WHO, 2021; Willett et al., 2019). Such diets are flexible to accommodate cultural and personal preferences and variations, but changing food practices is a difficult endeavor, as these practices are complex and shaped by a range of factors operating at multiple levels (Afshin et al., 2014; Contento, 2015; Warde, 2016). These factors and levels may include individual variables (e.g., age, education, taste preferences), communities (e.g., food availability in local stores), culture (e.g., social and cultural

* Corresponding author. University of Groningen, 9700 AS, Groningen, the Netherlands.
E-mail address: joao.graca@rug.nl (J. Graça).

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norms), industry (e.g., food production and distribution systems), governance (e.g., food and agricultural policies; food assistance programs), as well as distal influences ranging from the climate and season to international food standards and trade agreements (Contento, 2015; Köster, 2009; Mozaffarian et al., 2018; Stoll-Kleemann & Schmidt, 2017). The present review focuses on collective meal contexts as food environments at the interface of structural and individual-level variables pertaining to food provision and consumption, which can be expected to help accelerate healthy and sustainable food transitions.

1.1. The potential of collective meal contexts to accelerate healthy and sustainable food transitions

Globalization and pressures associated with modern living have led to an increase in the consumption of meals away from home (Jabs & Devine, 2006), despite links and concerns related to obesity and chronic disease (Cohen & Story, 2014; Krishnan et al., 2010), rendering collective meal contexts (e.g., school canteens, workplace cafeterias, restaurants) ubiquitous in relation to food consumption. Collective meal contexts may be relevant settings for interventions promoting healthier and more sustainable food practices, as the evidence points to the importance of social and physical features of food contexts (including the organizational and logistical structures of food provisioning systems) in shaping what and how people eat (Köster, 2009; Warde, 2016). Collective meal contexts also have the potential to shape the habits of large groups of consumers with varied cultural and socioeconomic backgrounds (Cohen et al., 2021; Geaney et al., 2016; Mandracchia et al., 2021; Naicker et al., 2021; Roque et al., 2022; Trapp et al., 2015; Verain et al., 2020, 2022; Vermeir et al., 2020), which is relevant for the potential large-scale impact of interventions in these contexts and to contribute for diminishing socioeconomic inequalities in food consumption (Black et al., 2014; Martikainen et al., 2003; Velhinho & Perelman, 2021). Moreover, the range and diversity of collective meal contexts should allow for tailoring intervention activities to different settings, target groups, and target behaviors, thus helping to strengthen positive and cumulative outcomes in health and sustainability domains. For example, previous research in collective meal contexts has focused on a range of variables including food quality and quantity, price, knowledge, and motivation, with positive results on outcomes such as higher intake of fruit and vegetables, improved health indicators (e.g., blood pressure, metabolic disorders), and increased sales of healthier food products (Geaney et al., 2016; Hjarnoe & Leppin, 2013; Iriyama & Murayama, 2014; Mazza et al., 2018; Naicker et al., 2021; Sonnenberg et al., 2013).

Relevant intervention settings have included educational environments, such as schools, targeting children and adolescents (Evans et al., 2012; Gordon et al., 2018; Reynolds et al., 2019; Wolfenden et al., 2010), as well as interventions in worksites, restaurants, and cafeterias, targeting adults across the life span (Janssen et al., 2015; Thorndike et al., 2016; van Kleef et al., 2015). This growing interest in promoting healthier and more sustainable food practices in collective meal contexts has created a rich and diverse corpus of evidence. However, this corpus remains scattered and lacking in integration, which may limit efforts from intervention planners and evaluators to accelerate progress toward healthier and more sustainable food contexts. Programme design frameworks such as the Behavior Change Wheel (BCW; Michie et al., 2014) are helpful in classifying different types of intervention functions (e.g., education, training, modeling, environmental restructuring), investigating their action mechanisms, and linking them with behavior change models that propose target-specific barriers and enablers across behavioral domains, such as Capability, Opportunity, and Motivation to change (Fig. 1, COM-B system; Michie et al., 2011; 2014).

According to the COM-B system, which has been increasingly used to enable dialogue and integrate evidence in diverse health- and environment-relevant topics (e.g., Buchanan et al., 2021; Craveiro et al., 2021; Graça et al., 2019; Howlett et al., 2019; Law et al., 2021; Onwezen, 2022; van den Berg et al., 2022; Willmott et al., 2021), variables across three broad domains must be aligned for behavior change to occur and become embedded into sustained practice. The domains identified in the COM-B have been articulated with a comprehensive grouping of overlapping constructs from different behavioral theories that form the Theoretical Domains Framework (Cane et al., 2012). The Capability domain of the COM-B model includes all psychological (e.g., knowledge and behavioral regulation processes, such as planning) and physical (e.g., dexterity, physical skills) variables necessary to perform the behavior. The Opportunity domain entails the social (i.e., social influences, including interpersonal influences, social cues and cultural norms) and physical (i.e., environmental context and resources, such as material resources or availability) variables to support the behavior. The Motivation domain pertains to the reflective (i.e., deliberate thinking, such as goals, beliefs about consequences and beliefs about capabilities) and automatic (e.g., emotional reactions, reflex responses and reinforcement) psychological processes that activate and mobilize the behavior.

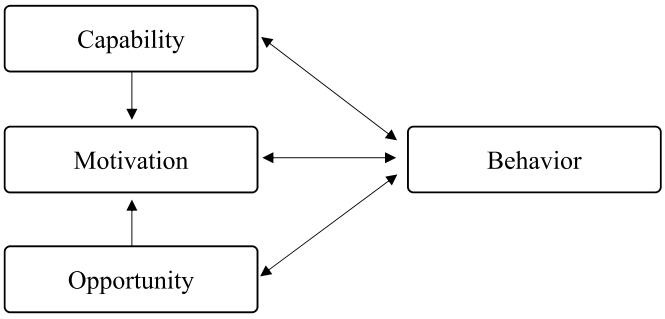

Fig. 1. The COM-B system for understanding behavior change (Michie et al., 2011, 2014).

1.2. The present work: aim and outcomes

The scale, reach, and nature of collective meal contexts offer opportunities for promoting healthier and more sustainable food practices. Research on interventions in collective meal contexts is prolific, but its lack of integration may limit the ability of researchers, public agencies, civic organizations, and market actors to harness the potential of collective meal contexts for accelerating necessary healthy and sustainable food transitions (e.g., Planetary Health Diet; Willett et al., 2019). To address this limitation, the current scoping review aims to map determinants of dietary change in collective meal contexts across multiple settings, interventions, target groups, and target behaviors. This is expected to yield two main contributions. The first contribution is to identify intervention activities to promote dietary change in collective meal contexts based on the existing body of evidence. The second contribution is to classify and integrate those activities into an overarching framework, which conceptualizes Capability, Opportunity, and Motivation as broad domains to promote and sustain behavioral change (COM-B system of behavior; Michie et al., 2011, 2014), and links them with their corresponding intervention functions (BCW; e.g., education, training, modeling, environmental restructuring; Michie et al., 2011, 2014). The review also assesses the studies based on a quality checklist and a set of open science indicators. We expect that these contributions inform diverse audiences interested in designing and evaluating interventions that enable healthy and sustainable food transitions in collective meal contexts.

2. Methods

2.1. Search strategy

Twenty-eight databases (Complementary Index, Academic Search

Complete, CINAHL Plus, MEDLINE, ScienceDirect, Directory of Open Access Journals, Supplemental Index, SPORTDiscus, Business Source Complete, Science Citation Index, Social Sciences Citation Index, ERIC, Psychology and Behavioral Sciences Collection, SciELO, Health Business Elite, Scopus, Information Science and Technology Abstracts, Science in Context, MedicLatina, IEEE Xplore Digital Library, Digital Access to Scholarship at Harvard, Oxford Scholarship Online, SciTech Connect, Arts & Humanities Citation Index, OAPEN Library, American National Biography Online, Literature Resource Center, Social Science Open Access Repository) were searched in two rounds via two indexing services (B-On and Web Of Science). Three sets of keywords were used to encompass: 1) collective meal contexts (i.e., restaurant*, cafeteria*, canteen*, dining setting*, lunchroom*, working site*, snack bar*, bar*, coffee shop*, dining room*, inn*, chophouse*, grill*, pizzeria*, eating house*, eating place*); 2) consumer choice, appraisal or behavior (i.e., food choice, eating, food consumption, food purchase, serving*, food intake, food option*, diet*, meal); and 3) intervention studies (i.e., intervention, program*, randomized control trial, RCT, change method*, change technique*, policy, policies).

2.2. Inclusion and exclusion criteria

Intervention studies targeting food consumption and/or provision in collective meal contexts were considered for inclusion in the review. We included full-text papers in English that reported empirical (quantitative or qualitative) findings from field studies on food provision/consumption in collective meal contexts with adults, adolescents, and children. The exclusion criteria and the number of studies included and excluded in the different stages of the review are detailed in the flow chart below (Fig. 2; PRISMA flow diagram).

2.3. Selection of studies

The search results were managed in Endnote version X7, duplicates were removed, and the remaining results were exported to the online reference management platform Rayyan (Ouzzani et al., 2016), where the title and abstract screening were conducted. The first round of search was conducted in January 2019 and covered all available literature matching the search terms published in the databases selected for the review. After the removal of duplicates, 24152 records were identified and screened by two reviewers (LC, DG) with guidance and support from a third reviewer (JG). Reliability in inclusion and exclusion decisions was assessed by the dual screening of 1000 randomly selected records, with an agreement rate of 97.8%. Afterward, 368 full texts were screened by the same reviewers using the inclusion and exclusion criteria mentioned above, which led to the exclusion of 168 additional records. Given the volume and duration of the screening process combined with the quantity and detail of information in the data extraction (see Table SM1 in Supplementary Material), we conducted an additional round of search in January 2021 using the same parameters but limited

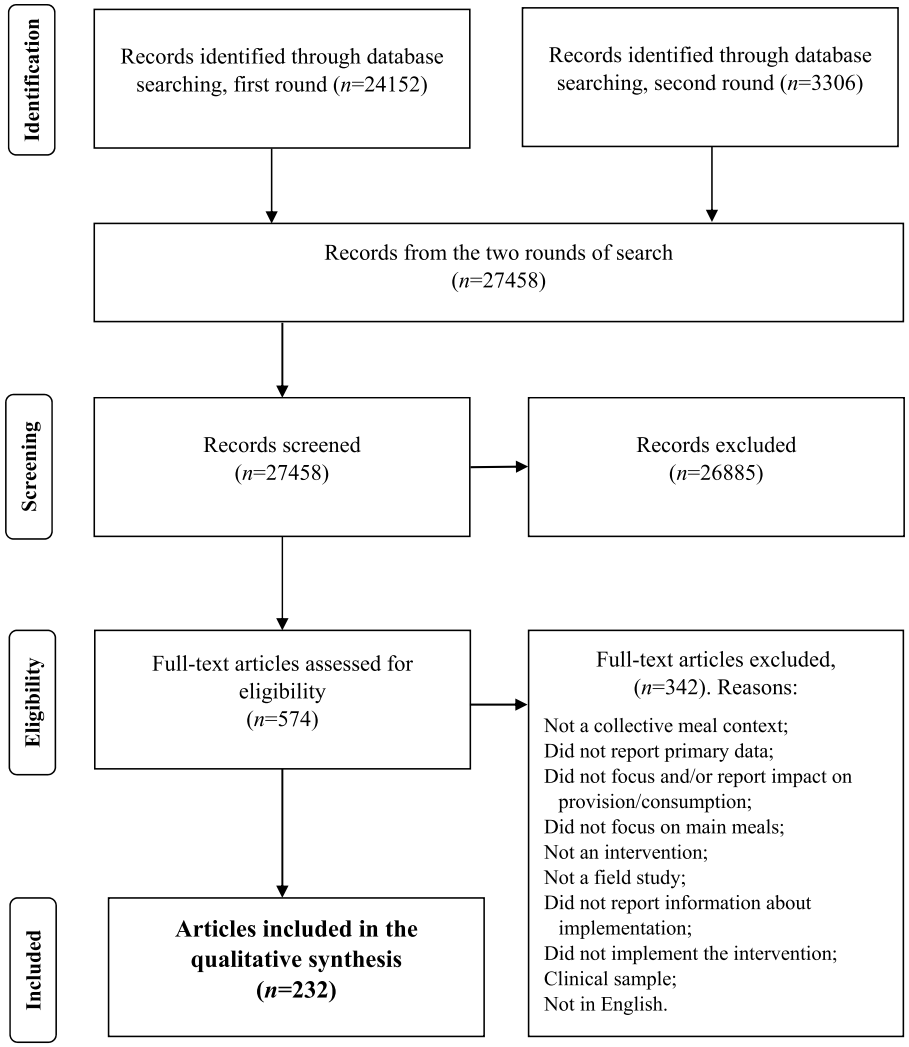

Fig. 2. Flow diagram of the review.

to articles that were published since the first round (i.e., from January 2019 to January 2021). The goal was to optimize our extraction and classification procedures in light of latest developments in the field. A total of 3306 additional records (i.e., title and abstract) and 205 full texts were screened in the second round by the same reviewers, and 32 full texts were included and subjected to data extraction. Thus, the current scoping review covered a total of 27458 unique records, screened 574 full texts, and extracted information from a total of 232 relevant articles (Fig. 2). The table provided in the Supplementary Material reports all 574 articles that were subjected to full-text screening, as well as the reasons for the exclusion of each article not included in the analysis and extraction (Table SM1 in Supplementary Material).

2.4. Data extraction

Two reviewers conducted the process of data extraction, synthesis, and integration (LC, DG) with guidance and support from a third reviewer (JG). Data were extracted regarding the studies' general characteristics (e.g., authors, year of publication), sample (e.g., country, sample size, gender, age group, target group), theoretical framework (if any), focal topic, study characteristics (i.e., design, duration, if there was a follow-up, measures), intervention components, and results. Age groups were classified as children (0–9 years old), early adolescents and adolescents (10–19 years old), younger adults (20–40 years old), middle adults (41–65 years old), and older adults (more than 65 years old). Intervention components were systematized and classified according to the components of the COM-B system of behavior, as well as the intervention functions linked with these components (BCW; Michie et al., 2014).

2.5. Quality and reporting checklist

All articles included in the review were assessed through a checklist based on the criteria of study sample and design, theoretical grounding, and reporting of key study information. Each study was rated independently by two reviewers (LC, DG) with guidance and support from a third reviewer (JG). The rating scheme and the rating items were developed to meet the aims of our scoping review based on quality rating schemes from other reviews (Ammerman et al., 2002 for quantitative studies; Lorenc et al., 2014 for qualitative studies). For quantitative studies, the papers were scored for absence (i.e., 0 points) or presence (i.e., 5 points) of clear and adequate descriptions of the following criteria: (1) general information (i.e., gender, age, target group, focal topic, study duration, follow-up, measures, and results); (2) theoretical base (i.e., theoretically driven interventions); and (3) study design (i.e., control group, randomization, and baseline). Zero points were attributed to an absent, unclear, or insufficient description of any of the criteria. For study design, a composite score was computed based on the criteria of having a control group, randomization, and baseline, thus ranging between 0 and 15 points. The maximum possible score for a quantitative study was 50. A similar rating scheme was used for qualitative studies, adjusting for differences in sample size and study design. In this case, a maximum of 5 points was attributed if the sample and design were deemed adequate for the research purposes. Zero points were attributed to absent, unclear, or insufficient descriptions. The maximum possible score for qualitative studies was 40. Given the aim of our review, we did not exclude any studies from the extraction and synthesis based on this assessment. The assessment was conducted only for descriptive purposes. The full list of items and scoring procedures is presented in Table 1 (quantitative studies) and Table 2 (qualitative studies).

2.6. Open science indicators

All articles included in the review were assessed on eight open science indicators: (1) existence of a pre-registration (i.e., specification of important aspects of the study, typically hypotheses, methods, and/or analysis plan prior to commencement of the study or the data analyses) and whether a link to the pre-registration was provided; (2) protocol sharing (i.e., details about the study design, methods, and analysis plan), and whether a link to the protocol was provided (or, in specified cases, if the protocol was included in the article, as an appendix); (3) open data; (4) open materials, and/or (5) open analysis script, and whether a link was provided for this information; (6) whether the manuscript reported

Table 1
Quality and reporting checklist and scoring procedures for quantitative studies.

Quantitative studies	
Criteria	Scoring
Participants Country Gender Age Target group	5 – Present with complete data/information 0 – Absent or incomplete data/information
Theoretical framework	5 – Theoretically-driven intervention 0 – Atheoretical or non-specified
Design Baseline Control Group Randomization	15 – All elements present and/or specified 10 – Only two elements present and/or specified 5 – Only one present and/or specified 0 – Absent or incomplete information
Intervention Intervention components Duration Focal topic/variable	5 – Present with complete data 0 – Absent or incomplete data
Follow-up	5 – Present with complete data 0 – Absent or incomplete data
Measures	5 – Present with clear/complete information 0 – Absent, incomplete, or unclear information
Ecological validity	5 – Field study 0 – Lab study, online study or not reported
Results	5 – Present with complete data/information 0 – Absent or incomplete data/information

Table 2
Quality and reporting checklist and scoring procedures for qualitative studies.

Qualitative studies	
Criteria	Scoring
Participants Country Gender Age Target group	5 – Present with complete data/information 0 – Absent or incomplete data/information
Theoretical framework	5 – Theoretically-driven intervention 0 – Atheoretical or non-specified
Design	5 – Adequate to the research purposes with complete information 0 – Inadequate or incomplete information
Intervention Intervention components Duration Focal topic/variable	5 – Present with complete information 0 – Absent or incomplete information
Follow-up	5 – Present with complete data 0 – Absent or incomplete data
Measures	5 – Present with complete information 0 – Absent or incomplete information
Ecological validity	5 – Field study 0 – Lab study, online study or not reported
Results	5 – Present with complete data/information 0 – Absent or incomplete data/information

replication of a previous study (i.e., repetition of a previous study's methods in order to ascertain whether similar findings could be obtained); (7) whether the paper was published as an open access publication (by entering the DOI, when available, or the article title, in the Open Access Button); and (8) whether a sample size justification was present (i.e., the rationale for the number of participants/observations included in the study). Two reviewers (LC, VB) coded the studies with the coding scheme presented in Table 3, which was adapted from the form used by Norris, He, Loh, West, and Michie (2021), available at https://osf.io/3tzhj/, as well as the protocol used by Hardwicke et al. (2020), available at https://osf.io/q96eh/. Given the aim of our review, we did not exclude any studies from the extraction and synthesis based on the assessment of open science indicators. The assessment was conducted only for descriptive purposes.

3. Results

3.1. Studies characteristics

In total, 232 articles met the inclusion criteria. These articles were published between 1984 and 2021; however, 50% of the articles were published after 2015, which suggests a growing interest in interventions in collective meal contexts. There were articles from 26 countries, with studies conducted in North America ($n = 212$), Europe ($n = 84$), Oceania ($n = 15$), Asia ($n = 9$), and South America ($n = 4$).

Thirty-one articles were multi-study papers, varying from two to four studies per article. A total of 33 studies did not report a sample size. Some studies did not report the total number of participants, but reported the number of groups or dyads included in the study ($n = 5$), observations made ($n = 19$), meals/sales records ($n = 14$), schools ($n = 15$), meal settings ($n = 8$), and worksite cafeterias ($n = 2$). A total of 139 studies did not report participants' gender, and 151 did not report participants' age or age group. Among the studies that reported participants' age or age group, 33 targeted children, 11 targeted adolescents, 27 targeted young adults, and 15 targeted middle adults; no studies targeted exclusively older adults. Additionally, 41 studies targeted more than one age group (e.g., studies conducted in restaurants, studies targeting child-parent dyads).

The large majority of the studies included in the review were not guided by a theoretical framework ($n = 205$, 74%). The studies that reported an explicit theoretical framework sometimes used more than one theory. The frameworks used more often were Choice Architecture ($n = 23$), the Social Learning Theory or Social Cognitive Theory ($n = 20$), and variants of the Theory of Planned Behavior or Theory of Reasoned Action ($n = 7$). Regarding the focal topics of the studies reviewed, 110 studies focused on healthy eating patterns, 83 studies focused on fruit and vegetable consumption, 65 studies focused on caloric and nutrient intake, 19 studies targeted plant-based and sustainable consumption, and five targeted breakfast consumption.

Regarding the design of the studies, 15 were qualitative and 261 were quantitative. Thirty-five were cross-sectional studies, ten were longitudinal, 164 were quasi-experimental and 67 were experimental studies. One study did not provide sufficient information about the research design. Of the quasi-experimental and experimental studies, the majority did not report a follow-up measurement, 47 studies reported one follow-up, six studies reported two follow-ups, and one study reported three follow-up measurements. Specific characteristics at the study level are reported in the Supplementary Materials (Table SM1).

3.2. Quality and report assessment

In the analysis of quantitative studies, with a total potential score of 50, the mean score of the studies was 30 and the maximum score was 50. Regarding the qualitative studies, the maximum possible score was 40, the maximum score observed was 30, and the mean score was 21. In both quantitative and qualitative studies, the criteria that received the lowest scores were (the lack of) follow-up measurement, (the lack of) theoretical framework, and (inadequate or insufficient) sample

Table 3
Open science indicators coding.

Criteria	Coder questions	Coding options
Pre-registration	Does the article state that the study (or some aspect of the study) was pre-registered?	"Yes" - A pre-registration is reported as having been carried out; "No" - A pre-registration is not reported as having been carried out.
Link to pre-registration	Does the article state that a protocol is available?	"Yes"; "No".
Link to protocol	Is the link to the protocol available in the article?	[Link] - If one is reported, the link to where it is reported as being available; "Not found" - If one is reported, but no link is found; "N.A." - None is reported, so no link is expected.
Open data	Does the article state that data are available?	"Yes" - The statement says that the data (or some of the data) are available; "No" - There is no data. availability statement, or it says "data available upon request".
Link to data	Is the link to the data available in the article?	[Link] - If one is reported, the link to where it is reported as being available; "Not found" - If one is reported, but no link is found; "N.A." - None is reported, so no link is expected.
Open materials	Does the article state that materials are available?	"Yes" - The statement says that the materials (or some of the materials) are available; "No" - There is no materials availability statement.
Link to materials	Is the link to the materials available in the article?	[Link] - If one is reported, the link to where it is reported as being available; "Not found" - If one is reported, but no link is found, or it could not be opened without institutional access; "N.A." - None is reported, so no link is expected.
Open analysis script	Does the article state that the analysis scripts are available?	"Yes" - The statement says that the analysis scripts (or some of the analysis scripts) are available; "No" - There is no analysis script availability statement.
Link to analysis script	Is the link to the analysis scripts available in the article?	[Link] - If one is reported, the link to where it is reported as being available; "Not found" - If one is reported, but no link is found; "N.A." - None is reported, so no link is expected.
Replication of a previous study	Does the article claim to report a replication study?	"Yes"; "No".
Open access publication	Is the article open access?	"Yes" - Found via open access button; "No" - Could not access the article via the open access button.
Sample size justification	Do the authors provide a rationale behind the sample size?	"Yes" - Authors give a reason for their number of observations; "No" - No reason is given regarding sample size (including statements regarding the number of individuals that usually visit or attend a specific space, without stating it as an explanation for the choice of place).

description. The quality and report assessment at the study level is reported in the Supplementary Materials (Table SM1).

3.3. Open science indicators

More than half (59.2%) of the articles included in the review were published or available as open-access publications. Around 16% from a total of 277 studies (published in 232 articles) presented a sample size justification, 4% presented a pre-registration, 4.3% shared the used protocol, 5.1% had open data, 10.1% had open materials, and only one study had open analyses scripts. Likewise, only one study was a replication of a previous study. The analysis of open science indicators at the study level is reported in the Supplementary Materials (Table SM1).

3.4. Description and characterization of intervention components

The studies included in the review often reported more than one intervention activity (e.g., reducing meat portions, increasing vegetable portions). A description of the intervention activities per study is provided in the Supplementary Materials (Table SM1). To enable integration in the scoping review, all intervention activities were identified and classified into intervention components, grouped under three broad themes (Table 4): (i) contextual and environmental changes, (ii) social influences, and (iii) knowledge and behavioral regulation. The activities of six interventions were not sufficiently described in the primary source and were therefore not included in this list.

3.5. Synthesis of intervention components

Given the large number of studies and intervention components included in the review, a summary of these components is presented below based on the focal topics of the studies (healthy eating patterns; fruit and vegetable consumption; caloric and specific nutrient intake; plant-based/sustainable consumption; breakfast consumption). To deepen the interpretation of this synthesis we encourage readers to also engage with the table provided in the Supplementary Material (Table SM1), which describes the focal topics and intervention components per study, as well as the target groups (e.g., elementary school students, worksite employees, restaurant patrons), theoretical framework (e.g., Choice Architecture, Health Belief Model, Social Cognitive Theory), method (e.g., study design, measures), and outcomes (primary outcomes and evidence synthesis).

3.5.1. Healthy eating patterns

Healthy eating patterns, i.e., interventions promoting globally healthier eating patterns, without further specification (i.e., not targeting a particular food or nutrient group) were tested in 110 studies. Twenty-seven studies were experimental, 66 were quasi-experimental, 16 were cross-sectional, and one was longitudinal. A vast number of studies did not report the targeted age group ($n = 55$); of those that reported participants' age or age group, most interventions targeted adults ($n = 33$).

The most common intervention components were contextual and environmental changes such as labeling (e.g., health claims; White et al., 2016), prompting (e.g., changes in decoration; Prell et al., 2005), and increasing or decreasing availability of items (i.e., removing unhealthy items and/or offering healthier items; e.g., Anzman-Frasca et al., 2015). Interventions on this focal topic also focused on the acquisition/-transmission of knowledge, either by promoting learning (e.g., integrating the topic into school curricula; e.g., Uglem et al., 2013), training skills (such as cooking; Vitale et al., 2018) or providing information (e.g., linking healthy eating habits to health outcomes; Acharya et al., 2006; Michels et al., 2008). Fewer interventions focused on social influences, mainly targeting the involvement of students (e.g., encouraging students to partake in meal decisions; Prell et al., 2005) or the involvement of other stakeholders such as parents (e.g., sending a newsletter to parents about the objectives of the intervention and tips to promote healthy eating at home; Goldberg et al., 2015), the school community (e.g., creating teams with representatives from various school sectors; Alaimo et al., 2013) or the broader community (promoting community events such as seminars and workshops; Acharya et al., 2006).

Most interventions on this focal topic comprised multiple intervention components and reported globally positive outcomes, for example, increasing fiber and fruit intake (Alaimo et al., 2013). As for studies using a single intervention component, labeling was the most applied strategy and showed mainly positive results (although the effects of labeling were not entirely consistent in promoting healthy eating habits; e.g., Feldman et al., 2009; Seenivasan & Thomas, 2016). The description of the findings per study is provided in Table SM1. Overall, intervention components in studies targeting this focal topic covered the COM-B domains Psychological Capability (43%; i.e., knowledge, skills and memory, attention and decision processes), Physical Opportunity (32%; i.e., environmental context and resources), Automatic Motivation (9%; i.e., reinforcement), Social Opportunity (8%; i.e., social influences), and Physical Capability (3%; i.e., environmental context and resources). These domains were targeted via the intervention functions Environmental Restructuring (44%), Education (27%), Enablement (10%), Training (6%), Restriction (4%), Modelling (4%), Persuasion (2%), or Coercion (1%). The description of the targeted COM-B domains and corresponding intervention functions per study is provided in Table SM1.

3.5.2. Fruit and vegetable consumption

A total of 83 studies focused on fruit and vegetable consumption. Twenty-two studies were experimental, 53 were quasi-experimental, four were cross-sectional, and four were longitudinal. Most of the interventions ($n = 54$) did not specify a target age group; of those who reported it, 16 were focused on children, 11 on adults, and two on adolescents.

The main intervention components used to target this focal topic were contextual and environmental changes to prompt the behavior – for example, presenting messages at point-of-decision (Reed et al., 2011). Other components consisted of increasing the availability of fruit and vegetables (e.g., by introducing a salad bar; Suarez-Balcazar et al., 2014), decreasing the price of fruit and vegetables, and increasing the price of less healthy foods (Wolfenden et al., 2015), increasing portion sizes of fruit and vegetables (Lassen et al., 2004), increasing the visual appeal by placing fruit and vegetables in attractive containers (Greene et al., 2017), and creating exposure through taste testing (Pope et al., 2018). Additional activities included adding structural/physical/material resources (e.g., canteen manuals; Newell et al., 2004), enhancing nutritional and sensory features by seasoning vegetables (Manero et al., 2017), labeling products mainly consisting of vegetables (Bandoni et al., 2010), repositioning products, for example by placing them in more accessible locations, such as by the cash register (Thompson et al., 2017), promoting bundles at reduced prices (Wolfenden et al., 2015) and providing resources to elicit fruit and vegetable consumption, such as manuals for teachers on how to incorporate fruit and vegetable consumption in classroom curricula (Newell et al., 2004). Intervention components also included changing the school or context regulations, such as enacting a rule where children had to take at least one serving of fruit or vegetable (Just & Price, 2013), or moving recess to a period before lunch (Price & Just, 2015).

Intervention components in the topic of fruit and vegetable consumption also focused on education. Acquisition/transmission of knowledge included providing nutrition education (Suarez-Balcazar et al., 2014) and teaching food preparation techniques to students (Perry et al., 1998) and kitchen staff (Perry et al., 2004). Several studies provided relevant information, such as facts about fruit and vegetables (Kushida & Murayama, 2014).

Some intervention components focused on social influences by

Table 4
Intervention components: examples, and frequency.

Intervention components	Examples (based on the description in the primary sources)	*n*	%
1. Contextual and environmental changes			
1.1. Labeling	Using visual or written cues to add or highlight existing information. *E.g., Carbon labeling.*	108	16.5
1.2. Changing availability		80	12.4
1.2.1. Increasing availability	Introducing new products or increasing the availability of already existing food items. *E.g., Introduction of new sugar-free products.*	63	9.7
1.2.2. Decreasing availability	Removing or decreasing the availability of target food products. *E.g., Removing juice products; Restricting* à la carte *items to only milk and fruit.*	16	2.5
1.2.3. Substitution of items	Direct substitution of selected items for comparable alternatives. *E.g., Substitution of high-fat for low-fat items.*	1	0.2
1.3. Prompting	Changing the physical environment to cue a target behavior. *E.g., Changes in cafeteria decoration (inclusion of fish-related objects).*	74	11.3
1.4. Manipulating price	Changing pricing to promote or discourage the choice of target food items. *E.g., Price increase contingent on French fries' purchase.*	28	4.3
1.5. Product repositioning	Changing the positioning of target food items to increase accessibility and convenience. *E.g., Moving healthier food and beverage items to make them more visible.*	24	3.7
1.6. Enhancing nutritional/sensory features	Employing new cooking methods, recipes and/or products in order to enhance food's nutritional composition and/or sensory appeal. *E.g., New menus to improve the healthiness and palatability of all meal components.*	19	2.9
1.7. Taste testing	Promoting tasting of new or disliked food products to promote familiarity and/or hedonic appraisal. *E.g., Students were invited to taste a sample of the new entrée the day before it was served.*	13	2
1.8. Shaping structural/physical resources	Adding material resources or creating infrastructures to facilitate behavior. *E.g., Instructional gardens (hands-on learning experiences including recycling and composting.*	13	2
1.9. Changing school/context regulations	Implementing new rules to regulate behavior. *E.g., Rule where children are required to take at least one serving of fruit or vegetables of their choosing.*	12	1.8
1.10. Increasing visual appeal	Changing the visual presentation of food items to increase attractiveness. *E.g., Enhance the attractiveness of fruits and vegetables that were served every day to students at school lunch.*	9	1.4
1.11. Shaping portion size		9	1.4
1.11.1. Increasing portion size	Increasing the size of meals or the proportion of specific food groups. *E.g., Vegetables on the plates of main dishes doubled.*	5	0.8
1.11.2. Decreasing portion size	Decreasing the size of meals or the proportion of specific food groups. *E.g., Meat reduced by an average of 12.5%.*	4	0.6
1.12. Shaping choice	Emphasizing or restricting behavioral alternatives to influence food choice. *E.g., Pairing a less healthy item with a healthier alternative.*	8	1.2
1.13. Adding material/technical resources	Providing technical and/or pedagogical resources to facilitate the implementation of promotional activities. *E.g., Distributing teaching materials (worksheets, audiovisual materials).*	6	0.9
1.14. Bundling	Creating default combinations of products, usually alongside a reduction in price. *E.g., Packing fruit and vegetable products together at a reduced price.*	3	0.5
1.15. Changing default options	Facilitating the choice of a target item by making it the default option. *E.g., A carton of milk was placed on each tray at the beginning of the line by the cafeteria staff.*	1	0.2
Subtotal		**407**	**62.3**
2. Social influences			
2.1. Participation and involvement		44	6.8
2.1.1. Promoting parental involvement	Obtaining explicit support and/or involving parents in the implementation of promotion activities. *E.g., Ideas of low-fat bag lunches printed in schools' parent newsletters.*	22	3.4
2.1.2. Promoting school-wide involvement	Obtaining explicit support and/or involving elements of the school community in the implementation of promotion activities. *E.g., Implementation of a coordinated school health team with representatives from various school sectors.*	8	1.2
2.1.3. Promoting community-wide involvement	Obtaining explicit support and/or involving elements of the wider community (i.e., besides the primary target group) in the implementation of promotion activities. *E.g., Outreach and distribution of food samples in the neighborhood (apartments, businesses).*	7	1.1
2.1.4. Promoting students' participation	Involving groups of students in decision-making and/or implementation of promotion activities. *E.g., Students were assigned to be "table captains" and served the other students at the table.*	6	0.9
2.1.5. Promoting employee participation	Involving groups of employees in decision-making and/or implementation of promotion activities. *E.g., Constitution of an employee advisory board, responsible for tailoring the intervention activities to their worksites, implementing activities, and for recruiting volunteers.*	1	0.2
2.2. Promoting contests	Promoting competitions to encourage behavior. *E.g., Implementation of a game (progress was contingent on students' fruit and vegetables consumption).*	8	1.2
2.3. Modeling	Providing role models to support learning or elicit desired behaviors. *E.g., Messages from fictional characters encouraging fruit and vegetables consumption.*	7	1.1
2.4. External advising/mentoring	Drawing on experts/facilitators to guide and support change. *E.g., Facilitator to work with students on improving school nutrition environments and policies.*	6	0.9
2.5. Shaping social norms	Delivering messages to influence perceived social norm. *E.g., Social norm intervention using posters: "Most people here choose to eat vegetables with their lunch".*	5	0.8
2.6. Providing social support	Facilitating the provision of support from one social group to another. *E.g., Increased social support from teachers and school staff.*	1	0.2
2.7. Benchmarking	Promoting contact with exemplary individuals or organizations. *E.g., Networking with schools making good profits from healthy canteen sales.*	1	0.2
Subtotal		**72**	**11**
3. Knowledge and behavioral regulation			
3.1. Learning		66	10.2
3.1.1. Knowledge	Providing opportunities for knowledge acquisition. *E.g., Instructing about benefits of fruit and vegetables and whole grains consumption in a session.*	26	4
3.1.2. Skills	Providing opportunities for skill development. *E.g., Cafeteria staff training on meals preparation.*	22	3.4
3.1.3. Knowledge and skills	Providing opportunities both to acquire knowledge and to develop practical skills. *E.g., Learning by doing in cooking classes.*	18	2.8
3.2. Providing information		36	5.5
3.2.1. General information	Providing information through educational resources. *E.g., Distribution of educational material regarding the links between diet and health/disease.*	34	5.2

(*continued on next page*)

Table 4 (*continued*)

Intervention components	Examples (based on the description in the primary sources)	*n*	%
3.2.2. Tailored information	Providing individualized information or data. *E.g., Communications tailored to military personnel linking eating motivations to food provision.*	2	0.3
3.3. Providing incentives		31	4.7
3.3.1. Verbal incentives	Verbal prompts incentivizing a target behavior. *E.g., Verbal prompts by cafeteria staff for fruit and vegetable tastings.*	19	2.9
3.3.2. Financial incentives	Funds or financial discounts incentivizing a target behavior. *E.g., Financial discounts on low-energy-dense foods.*	8	1.2
3.3.3. Material incentives	Material prompts incentivizing a target behavior. *E.g., Children were offered a bag with main ingredients encouraging them to prepare a simple vegetable snack.*	4	0.6
3.4. Rewarding		30	4.6
3.4.1. Material rewards	Material reward following the achievement of a behavioral goal. *E.g., Daily stickers contingent on F&V intake.*	19	2.9
3.4.2. Verbal rewards	Verbal reinforcement following the achievement of a behavioral goal. *E.g., Teachers praising success upon the achievement of certain goals.*	4	0.6
3.4.3. Relational rewards	Relational or interpersonal reinforcement following the achievement of a behavioral goal. *E.g., At the end of each workshop, the children set the table and enjoyed a meal together with the teaching personnel involved.*	3	0.5
3.4.4. Financial rewards	Financial reward following the achievement of a behavioral goal. *E.g., Implementation of a healthy foods passport or frequent diner's program.*	2	0.3
3.4.5. Unspecified rewards	Reward of unspecified nature following achievement of a behavioral goal. *E.g., Reward mechanisms in food selection video games to address attitudes.*	2	0.3
3.5. Providing feedback		5	0.8
3.5.1. Self-monitoring	Promoting active observation and monitoring of own behavior. *E.g., Charts enabling children to record fruit and vegetable consumption.*	3	0.5
3.5.2. Feedback on behavior	Providing information on own behavior. *E.g., Monthly letters with feedback on the proportion of the employee's cafeteria purchases from the prior month that were labeled red, yellow, and green.*	2	0.3
Subtotal		**168**	**25.7**
Insufficient information		6	0.9
Total		**653**	**100**

Note: Table SM1 (Supplementary Materials) can group and display all primary sources that used each intervention component via the filtering option in the keywords column under "component classification" (data extraction sheets, column AD).

involving students (Song et al., 2016), employees (Beresford et al., 2001), parents (Dave et al., 2015), the school (Cullen, Chen, Dave, & Jensen, 2015), and the broader community (Newell et al., 2004) in the interventions, or promoting contests to stimulate fruit and vegetable consumption (Jones, Madden, Wengreen, Aguilar, & Desjardins, 2014). Concerning intervention components applied in schools, some studies forged alliances with other schools that had previously successfully attained the objectives of the intervention (Newell et al., 2004), while others established connections with external advisors to support the implementation (Lassen et al., 2004). Intervention components also included changing perceived social norms by communicating a descriptive norm regarding vegetable consumption (Thomas et al., 2017), modeling (e.g., showing fictional heroic characters consuming fruits and vegetables; Slusser et al., 2007), and self-monitoring (e.g., by promoting participants' register of their fruit and vegetable consumption (Horne et al., 2004).

Additional knowledge and behavioral regulation interventions were present such as giving feedback on lunchboxes (Newell et al., 2004) and giving incentives - both material (e.g., ingredients to prepare a meal; Nicklas et al., 2017) and verbal (e.g., prompts by cafeteria staff to taste fruits and vegetables (Song et al., 2016). Rewards were also applied, namely financial rewards (e.g., discount cards; Song et al., 2016), material rewards (e.g., stickers; Hoffman et al., 2011), relational rewards (e.g., offering lunch with a school's principal; Song et al., 2016), and verbal rewards (e.g., praise by teachers; Jones, Madden, & Wengreen, 2014).

Most studies on this focal topic tested multi-component interventions. In these multi-component interventions, the results reported in the primary sources were globally positive and reported significant increases in the consumption of fruit and vegetables (e.g., Lassen et al., 2004; Song et al., 2016). Most studies with intervention components that focused solely on contextual and environmental changes also reported effects in increasing fruit and vegetable consumption (e.g., Rioux et al., 2018; Snelling et al., 2017). One intervention focused on social influences showed positive effects of changes in social norms on fruit and vegetable consumption (Thomas et al., 2017). The description of the findings per study is provided in Table SM1. Overall, intervention components on this focal topic targeted the COM-B domains Psychological Capability (38%; i.e., knowledge, skills, behavior regulation and memory, attention and decision processes), Physical Opportunity (32%; i.e., environmental context and resources), Social Opportunity (14%; i.e., social influences), Automatic Motivation (8%; i.e., reinforcement), Reflective Motivation (6%; i.e., goals, beliefs about consequences) and Physical Capability (2%; i.e., skills), via the intervention functions Environmental Restructuring (41%), Education (25%), Enablement (14%), Modelling (8%), Training (6%), Persuasion (4%) and Restriction (1%). The description of the targeted COM-B domains and corresponding intervention functions per study is provided in Table SM1.

3.5.3. Caloric and specific nutrient intake

Studies focused on reducing the intake of calories and specific nutrients ($n = 65$; e.g., fat, sodium, sugar) were grouped under this focal topic. The most common research design was quasi-experimental ($n = 35$), followed by experimental ($n = 17$), cross-sectional ($n = 6$) and longitudinal ($n = 6$). One study did not provide sufficient information to identify its research design. A considerable number of studies did not specify the age group ($n = 27$), and 29 studies targeted adults. The most common intervention components on this focal topic were contextual and environmental changes, such as labeling – which included presenting the energy and nutrient content of foods on menus (Yamamoto et al., 2005), signaling healthy choices (Vanderlee & Hammond, 2014), or using traffic light symbols (i.e., highlighting healthier items as green and unhealthy items as red; Ellison et al., 2014). Regulating the offer was also a frequent strategy, such as increasing or decreasing product availability (Pechey et al., 2018) and decreasing or increasing portion sizes (Dilberti et al., 2004). Interventions on this topic also included adding posters, flyers, placemats, and other promotional materials to the physical environment, usually alongside or in support of other intervention components (e.g., Roy et al., 2016). Some interventions also changed the nutritional or sensory features of meals and products, such as using lower-fat ingredients (Sallis et al., 2003) or creating buffets with only low-sodium foods (Janssen et al., 2015). Price manipulations were employed to support healthier choices, for instance, by increasing the price of unhealthy items and reducing the price of healthier alternatives (Ellison et al., 2014). Reinforcement, information, and knowledge were also relevant intervention components in this focal topic and included educational programs and activities for school children (e.g., Demas,

1998), parents, and kitchen staff (Wolfenden et al., 2017), as well as conveying information through material resources (e.g., displaying nutrition information on salt reduction; Geaney et al., 2010). Encouragement and incentives were used to support portion size reductions, for instance, by applying downsizing discounts (e.g., Schwartz et al., 2012), or employing material and financial rewards to incentivize the choice of smaller portions (e.g., Reimann et al., 2015). Other forms of encouragement included verbal incentives, such as inviting customers to take a smaller portion of their side dish (e.g., Schwartz et al., 2012) or to choose lower-fat foods (Sallis et al., 2003), and material incentives, such as pairing smaller meals with a toy gift (Reimann & Lane, 2017).

Most studies ($n = 45$) on this focal topic reported single-component interventions. Labeling was often reported to be effective (e.g., Pang & Hammond, 2013), with some exceptions (e.g., Elbel et al., 2011; Finkelstein et al., 2011). Some studies reported that the effectiveness of labeling strategies fluctuated due to individual differences (e.g., gender, Gerend, 2009). One study suggested that nutrition labeling might affect some nutrients or components (e.g., calories) but not others (e.g., carbohydrates) (Pulos & Leng, 2010). Changing portion sizes was also reported as an overall effective strategy (Dilberti et al., 2004) but yielded mixed results (Hollands et al., 2018). Enhancing nutritional/sensory features also produced significant results – e.g., reducing sodium in food helped reduce participants' sodium intake, without altering the liking and perception of taste and saltiness (Janssen et al., 2015). Regarding structural and physical resources, the results were mixed. For example, one study found that the lack of trays in the cafeteria helped reduce portion sizes while increasing salad consumption (Rajbhandari-Thapa et al., 2018), but a different study found no differences in dessert consumption (despite increases in salad consumption; Wansink & Just, 2015). Multi-component interventions generally reported effects in reducing caloric and specific nutrient intake (e.g., Belanger & Kwon, 2016; Hartstein et al., 2008; Torres et al., 2015), but some studies failed to show significant changes (e.g., Sallis et al., 2003; Steenhuis et al., 2004). The description of the findings per study is provided in Table SM1. Overall, the COM-B domains targeted in this focal topic were Psychological Capability (48%; i.e., knowledge and memory, attention and decision processes), Physical Opportunity (31%; i.e., environmental context and resources), Automatic Motivation (7%; i.e., reinforcement), Social Opportunity (7%; i.e., social influences), Physical Capability (2%; i.e., skills) and Reflective Motivation (2%; i.e., goals, beliefs about consequences). These domains were targeted via the intervention functions Environmental Restructuring (49%), Education (27%), Enablement (10%), Restriction (5%), Training (4%), Modelling (2%), and Coercion (1%). The description of COM-B domains and corresponding intervention functions per study is provided in Table SM1.

3.5.4. Plant-based/sustainable consumption

Nineteen studies focused on the choice or consumption of more plant-based meals and more sustainable food choices. Twelve studies had a quasi-experimental design and seven were cross-sectional. Intervention components on this focal topic were primarily based on contextual and environmental changes ($n = 35$). The most frequent component referred to labels - for example, carbon footprint labeling (Spaargaren et al., 2013) or labeling of plant-based foods (Ensaff et al., 2015). Intervention components also included decreasing portion sizes (Visschers et al., 2020), as well as product repositioning making plant-based dishes more accessible and visible (Ensaff et al., 2015) and prompting vegetarian dishes by moving the vegetarian option to the top of the menu (Kurz, 2018). Knowledge and behavior regulation-based strategies were also present – mainly by providing information, for example with information posters about food waste (Lorenz-Walther et al., 2019), and rewarding participants (Prescott et al., 2019).

Overall, the results from these interventions reported effects in increasing sustainable and plant-based consumption. However, one qualitative study that used labeling suggested that consumers needed more information to understand the carbon footprint (Filimonau et al., 2017). The description of the findings per study is provided in Table SM1. The intervention components on this focal topic targeted the COM-B domains Psychological Capability (47%; knowledge and memory, attention and decision processes), Physical Opportunity (45%; environmental contexts and resources), Social Opportunity (5%; i.e., social influences), and Automatic Motivation (3%; i.e., reinforcement), via the intervention functions Environmental Restructuring (61%), Education (22%), Enablement (7%), Restriction (6%), and Modelling (4%). The description of COM-B domains and corresponding intervention functions per study is provided in Table SM1.

3.5.5. Breakfast consumption

Despite the modest number of studies in this category ($n = 5$), the focal topic of breakfast consumption (i.e., interventions targeting access and/or adherence to breakfast) was addressed separately from the other categories. The five studies on this topic were conducted in school settings. Two studies were cross-sectional, two were experimental, and one was quasi-experimental. Intervention components to improve breakfast adherence focused predominantly on contextual and environmental changes, namely, by altering context regulations (e.g., allowing to eat in the hallway, Haesly et al., 2014; giving children more time to eat breakfast, Moeltner et al., 2019), increasing availability (e.g., grab-and-go cart or second-chance breakfast lines; Larson et al., 2018), product positioning (e.g., more convenient serving locations; Haesly et al., 2014). Intervention components that focused on the social context were also implemented – namely, promoting social support (of teachers and school staff to students) and shaping social norms (promoting breakfast consumption through marketing campaigns; Larson et al., 2018), and promoting students' involvement in campaigns to promote school breakfast to their peers (Grannon et al., 2020). All five studies presented multi-component interventions and reported improvements in breakfast consumption rates. The description of the findings per study is provided in Table SM1. The COM-B domains targeted in this focal topic were Physical Opportunity (61%; i.e., environmental context and resources), Psychological Capability (22%; i.e., memory, attention and decision processes), and Social Opportunity (17%; i.e., social influences), via the intervention functions Environmental Restructuring (76%), Enablement (19%), and Restriction (5%). The description of COM-B domains and corresponding intervention functions per study is provided in the Supplementary Materials (Table SM1).

3.6. Capability, opportunity, and motivation domains across intervention components

The intervention components were often coded as potentially addressing several COM-B domains in parallel due to the multi-component nature of many of the interventions. Overall, the COM-B domains covered most frequently across focal topics were Capability and Opportunity. A total of 222 studies reported interventions covering features of Psychological Capability (80% of all studies included in the review). This was levered by the large frequency of (multi-component) interventions targeting several domains in parallel with labeling ($n = 92$), prompting ($n = 79$), provision of general information ($n = 34$), and learning (knowledge) ($n = 31$). Features of Physical Opportunity were covered in 178 studies (64% of all studies), mainly with prompting ($n = 69$) and increasing availability ($n = 66$), but also (multi-component) interventions linked with the enhancement of nutritional/sensory features ($n = 26$), product repositioning ($n = 24$), and shaping structural/physical resources ($n = 20$). Around a quarter of the studies included in the review addressed Social Opportunity ($n = 69$, 25%) or Automatic Motivation (n = 62, 22%), often with (multi-component) interventions targeting several domains in parallel via parental involvement ($n = 19$), promoting a supportive social environment with (verbal) incentives ($n = 19$), and modeling ($n = 13$) (Social Opportunity); or (multi-component) interventions that used pricing strategies ($n = 24$) or rewards ($n = 15$) (Automatic Motivation). Lastly, Reflective Motivation and Physical

Capability were addressed in 12% and 6% of all studies, respectively. Reflective Motivation ($n = 33$) was mostly targeted in (multi-component) interventions that included taste testing ($n = 15$), whereas Physical Capability ($n = 17$) was linked mostly with acquiring skills ($n = 11$). Overall, the limited information in the primary sources about the intervention activities and materials, coupled with the multi-component or multi-domain nature of many of the interventions, made it difficult to match specific intervention components with unique COM-B domains and specific intervention functions. Nevertheless, the discussion section provides an integrated overview of our results as well as directions for future research using the COM-B as an overarching framework.

4. Discussion

The scale, reach, and nature of collective meal contexts offer opportunities to enable healthy and sustainable food transitions. This scoping review aimed to map determinants of dietary change in collective meal contexts across multiple settings, interventions, target groups, and target behaviors. This is expected to inform efforts by audiences and stakeholders interested in harnessing the potential of collective meal contexts to enable dietary change, namely nutrition, health and environmental researchers, policymakers, and practitioners interested in food choice. The review provided two main outcomes: (1) identifying and mapping intervention components to promote dietary change in collective meal contexts, based on the existing corpus of evidence; and (2) classifying and integrating these intervention components into an overarching framework.

Generally, the intervention components mostly used in the studies included in the review were labeling, prompting, and increasing availability, which reveals a focus on contextual and environmental modifications to promote dietary change in collective meal contexts. This is consistent with previous evidence favoring interventions focused on restructuring local food environments to promote healthy eating choices across developmental stages (Bowen et al., 2015). Intervention components focused on knowledge and behavioral regulation were also identified in the review, such as providing general information and promoting knowledge acquisition. The review also identified intervention components focused on social influences, especially in school contexts where parental and school-wide involvement were used to promote dietary change.

We used the COM-B system (Michie et al., 2011, 2014) in this scoping review to classify and integrate intervention components into an overarching behavior change framework. According to the COM-B system, mobilizing changes in groups and individuals requires psychological (e.g., knowledge) and physical (e.g., dexterity) capability to enable the desired behaviors. Our findings suggest that the domain of psychological capability has been targeted in interventions across all focal topics considered in the review (i.e., breakfast consumption; fruit and vegetable consumption; healthy eating patterns; plant-based/sustainable consumption; and caloric and specific nutrient intake), whereas physical capability has been targeted in interventions on all focal topics except breakfast consumption and plant-based/sustainable consumption. This prevalence of capability-relevant variables is consistent with the results of a recent umbrella review of systematic reviews on nutrition and dietary choices (Perez-Cueto, 2019), which concluded that the provision of information through nutrition education is one of the most common (though not necessarily sufficient and self-standing) intervention strategies used to promote healthier dietary choices among the general population (An et al., 2019; Perry et al., 2017; Verghese et al., 2019). In light of the COM-B system (Michie et al., 2011, 2014), interventions in collective meals settings should also require a supportive and conducive environment that provides appropriate physical (e.g., price, availability) and social (e.g., perceived norms, social representations) opportunities for the desired behavior to occur. Our review identified interventions across all five focal topics that targeted physical opportunity (e.g., provision of environmental resources) or social opportunity (e.g., social support). Nevertheless, the review suggests that social opportunity has been targeted less than other domains. Studies conducted in educational settings seemed especially likely to report successful outcomes of promoting social support, modeling, and participation, which is consistent with the findings from a relatively recent umbrella review in this field (Matwiejczyk et al., 2018).

The COM-B system also highlights the importance of addressing reflective (e.g., deliberate thinking, goals, beliefs) and automatic (e.g., habits, emotional reactions, reflex responses) motivational processes that activate and energize behavior (Michie et al., 2011, 2014). The findings from the present review suggest that the motivational domain has been targeted in interventions in collective meal contexts, but less so than the capability and opportunity domains. This may indicate both a need and an opportunity for intervention studies to develop potentially effective ways of motivating target audiences to engage in healthier and more sustainable food practices in collective meal contexts – together with intervention activities establishing capability and opportunity to engage in these practices.

Overall, studies included in this review that presented multi-component interventions tended to report positive outcomes across focal topics (e.g., healthy eating patterns, fruit and vegetable intake, breakfast consumption). On the one hand, this is consistent with previous research emphasizing the prevalence of interventions with multiple intervention components and outcomes (Bauer & Reisch, 2019; Chang et al., 2023; Matwiejczyk et al., 2018; Perez-Cueto, 2019; Weihrauch-Blüher et al., 2018). On the other hand, this makes it difficult to disentangle the unique effects of each intervention component on specific outcomes vis-à-vis potential synergies and combined effects of engagement with multiple components. Inputs from this scoping review to address these and other issues in the field are presented below, with directions for future research and intervention studies.

4.1. Directions for future research and intervention studies

By mapping and integrating previous research into an overarching framework of change, this scoping review highlights recent developments in research and interventions in collective meal contexts and proposes priorities for future research. One important finding was that most studies lacked a clear theoretical framework, which emphasizes the need to move toward theory-based interventions in collective meal settings. Given the high heterogeneity of findings, small effects, and time boundaries in many behavioral change interventions, there have been calls to systematize and specify relationships between behavior change techniques and theoretical mechanisms of action, terminology, settings, populations, and modes of reporting (Michie et al., 2018). We reinforce these calls and recommend that future intervention studies in collective meal contexts rely on clear theoretical and operational frameworks (e.g., COM-B system; Behavior Change Wheel; BCT taxonomy) to (i) design their activities and materials, (ii) describe the intervention's setting and targets, (iii) report the development and the implementation of the intervention, and (iv) evaluate the intervention's effectiveness. The use of shared and established frameworks, such as the COM-B system (Michie et al., 2011, 2014) and the BCW framework (Behaviour Change Wheel; Michie et al., 2014), also enables interdisciplinary dialogue and helps to connect target-specific outputs from research and interventions across cultural contexts, meal settings, and methodological approaches (e.g., see the COM-B system applied to meat reduction and plant-based eating; Graça et al., 2019; Lacroix & Gifford, 2020; Onwezen, 2022; Sijtsema et al., 2021; van den Berg et al., 2022; White et al., 2022).

The current review also identified a general lack of information regarding intervention target groups (for example, gender of the participants, age groups, recruitment or data collection strategy), which may raise challenges when trying to transfer, generalize, or replicate the interventions. The use of reporting checklists, such as the Template for Intervention Description and Replication (TIDieR) Checklist (Hoffmann

et al., 2014), should thus be incentivized. In addition to providing a clear description of the target group's characteristics, future intervention studies would benefit from a more precise description of the intervention settings.

The analysis of open science indicators also revealed room for future research to improve the availability of databases, protocols, materials, and data. As input for future studies, we agree with previous suggestions that open science practices can be adopted progressively. A useful metaphor proposed by Christina Bergman is to consider open science as a buffet—one should pick the practices that are useful and accessible at the moment and not "bite off more than [one can] chew" (Wright & Bragge, 2018, p. 35). This would help make research outputs in the field progressively more transparent, trustworthy, and useable.

A related issue identified in the current review was the lack of detailed information about the intervention activities and materials that were planned and implemented, which led to a broader (as opposed to nuanced) classification of the intervention components. This also led to a tentative classification of components into COM-B domains, as we tried to maintain balance and consistency between the often-limited descriptions provided in the primary sources, the multi-component nature of many interventions, the diversity and high number of studies included in the review, and our aim of providing an overall conceptually coherent overview of the field. Future research on interventions to shape food practices in collective meal contexts would benefit from precise definitions and descriptions of the intervention activities and materials. As alluded to in the synthesis and discussion of results, these activities should preferably be described using an integrated taxonomy (e.g., BCT Taxonomy; Michie et al., 2013) to facilitate comparisons between different interventions and, therefore, enable qualitative and quantitative synthesis of the corpus of evidence (Colquhoun et al., 2014). This should also help address one of the main limitations of our scoping review – i.e., the review was not equipped to provide a detailed description of studies within each focal topic in the qualitative synthesis. Given the volume of the information we had to process and integrate, that limitation was a trade-off of one of the review's main strengths, which was to offer a broad-scope outline of interventions across meal settings, target behaviors, and target groups.

Another limitation of this work is that scoping reviews are appropriate to give an overview of broad and highly heterogeneous fields, such as the one analyzed here, but are not able to assess which interventions are most effective, for whom, and under what conditions, as this requires different approaches such as the ones used in meta-analyses. Additionally, the broad-scope nature of this review on collective meal contexts required us to collate inputs from segments that are substantially different in practice. For example, collective meal contexts may include canteens and cafeterias in organizational settings where consumers eat regularly and may have relatively limited choice, but also restaurants or coffee shops where patrons have more agency and different expectations in terms of value and experience. Additional reviews with narrower foci, such as systematic reviews and meta-reviews on specific settings and target groups, are still necessary to advance research and interventions in collective meal contexts.

Besides these inputs for future research, to strengthen our contribution and mitigate limitations linked with the broad-scope nature of this review, we designed the table provided in the Supplementary Material to allow diverse audiences to navigate, search, and identify interventions based on selected criteria. For example, using the search option, readers can screen for studies that focused on a specific topic (such as fruit and vegetable consumption or sustainable consumption), a particular target group (such as elementary school students or restaurant patrons), or a specific intervention component (such as labeling or modeling). After selecting their desired set of studies, readers can observe a synthesis of the findings reported in each study, as well as the scores those studies obtained in the quality and report assessment (overall and for each evaluation criterion) and whether they adhered to open science practices, which might be seen as proxies for strength of the evidence. This means the table can be used as a resource to benchmark the design and assessment of new interventions, and may eventually inform meta-analyses that assess the effects of interventions conducted in specific settings with specific target groups. Given the scope of this review, we refrained from placing too much emphasis on the outcomes reported in the primary sources, and future attempts to systematically measure such outcomes should assess and account for potential risks of bias in the literature (e.g., publication bias, *p*-hacking; Friese & Frankenbach, 2020).

4.2. Conclusions

Collective meal contexts have the potential to accelerate societal efforts to enable healthy and sustainable food transitions. This scoping review offered two main contributions to harnessing this potential. The first contribution was that it systematically identified and mapped intervention components to change food practices in collective meal contexts, based on a large and diverse set of studies. This can inform interventions across settings and target groups about which components may be considered when designing and planning the assessment of interventions in collective meal contexts. This also reinforces previous calls for interventions that follow and advance formal and standardized protocols whereby the links between behavioral change techniques and theoretical mechanisms of action are more clearly stated (Hagger et al., 2020). The second contribution of this review was that it classified and integrated relevant intervention components into an overarching framework of behavior change (i.e., COM-B model, Michie et al., 2011, 2014). This allowed for an overview of which intervention components have been used and can be considered in the future to enable change across the three domains proposed in the model (capability, opportunity, motivation). We suggest that future efforts to promote healthier and more sustainable food practices in collective meal contexts can consider this model to enable interdisciplinary dialogue, given the overview provided here and the links between the model and potential policies and intervention functions (Michie et al., 2011, 2014). Lastly, the database presented here as a table in the Supplementary Material offers a free, open-access resource that should assist intervention planners and evaluators in optimizing their efforts based on previous intervention studies within and across fields. The table allows diverse groups of researchers, practitioners, and decision-makers to use this broad-scope review for cross-pollination of ideas and approaches, while simultaneously enabling a focused view of the extracted data and synthesis based on specific research or intervention interests and needs. This resource should be especially beneficial for developing interventions in fields that are relatively new and still emerging (e.g., promoting plant-based eating and sustainable food practices in collective meal contexts), which can draw on inputs from fields that are already more consolidated and established.

Ethical statement

This article does not involve new studies or experiments performed by any of the authors.

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Contributors

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acquisition. **LC**: Conceptualization, Methodology, Formal analysis, Writing - Original Draft, Writing - Reviewing and Editing. **DG**: Conceptualization, Methodology, Formal analysis, Writing - Original Draft, Writing - Reviewing and Editing. **LR**: Writing - Original Draft, Writing - Reviewing and Editing. **VB**: Methodology, Formal analysis, Writing - Original Draft, Writing - Reviewing and Editing. **MT**: Conceptualization, Methodology, Writing - Reviewing and Editing. **CG**: Conceptualization, Methodology, Writing - Reviewing and Editing. All authors have seen and approved the final version of the manuscript.

Availability of data and other materials

Data extracted from included articles are provided as Supplementary Material.

Declaration of competing interest

All authors declare they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2023.106597.

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