



Review Article

Factors that influence the implementation of dietary guidelines regarding food provision in centre based childcare services: A systematic review



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ABSTRACT

Children attending centre based childcare services consume as much as two thirds of their daily dietary requirements while in care. However, such services often fail to provide foods that are consistent with guideline recommendations. Developing strategies to improve childcare service adherence to menu dietary guidelines requires a comprehensive understanding of factors that may impede or promote implementation. The primary aim of this systematic review is to describe factors (barriers and facilitators) that may influence the implementation of menu dietary guidelines regarding food provision in centre-based childcare services and to map these factors to a theoretical framework.

Over 7000 citations were identified from all sources. Duplicate abstracts were removed and selection criteria applied. Twelve studies (1994–2015) were included in the review. Dual data extraction was conducted and the reported factors were synthesised using the theoretical domains framework (TDF).

Barriers and facilitators identified in qualitative studies were classified into 8 and 10 of the 14 TDF domains. Barriers and facilitators reported in quantitative studies covered 6 and 3 TDF domains respectively. The most common domain of which both barriers and facilitators to the implementation of menu dietary guidelines were identified was ‘environmental context and resources’.

This is the first study that comprehensively assesses literature to identify factors that influence the implementation of menu dietary guidelines in childcare services utilising a theoretical framework. Findings provide guidance to support researchers and policy makers design strategies to improve menu dietary guideline implementation and, as such have the potential to improve food provision in care.

1. Introduction

Poor dietary intake is a leading modifiable risk factor for non-communicable diseases including obesity, cardiovascular disease, stroke, type 2 diabetes and some cancers (World Health Organisation, 2004). For children, good nutrition is essential to support healthy growth and development (Australian Government, 2013). Furthermore, dietary patterns, food habits and food preferences developed in childhood track into adulthood and can prevent the onset of non-communicable disease (Huybrechts et al., 2008). As such, interventions to

improve dietary intake in children are recommended by the World Health Organization (World Health Organisation, 2004).

Centre based childcare services, which include pre-schools and long day care services (open for greater than 8 h per day) represent an opportunistic setting to improve the dietary intake of children as they provide access to large numbers of children during a key developmental period (Mikkelsen et al., 2014). In the United States (US) and United Kingdom (UK) approximately one third of children aged five years or younger attend centre based childcare services (Laughlin, 2013). In Australia, over 80% of children aged four to five years attend centre

Abbreviations: TDF, theoretical domains framework

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based childcare (Australian Bureau of Statistics, 2015). Furthermore, many centre based childcare services are responsible for providing meals to children while in care. Children attending such services consume as much as two thirds of their daily dietary requirements while in this setting (Radcliffe et al., 2002). The implementation of dietary guidelines in centre based childcare services therefore, have considerable potential to improve children's dietary intake (World Health Organisation, 2004).

A number of countries have developed specific recommendations to support the provision of healthy foods to children in centre based childcare. In the US, the American Dietetic Association recommends that centre based childcare services provide meals and snacks make up 50% to 70% of the child's recommended daily allowance (RDA) during eight hours of care (Benjamin Neelon et al., 2011). The UK Food Standards Agency (Crawley, 2006) recommends centre based childcare services provide 70% of children's daily dietary requirements while in 8 h of care, via two main meals and two snacks. In Australian states, such as New South Wales (NSW), childcare sector guidelines (NSW Ministry of Health N, 2014) recommend services provide at least 50% of children's recommended daily dietary intake, during 8 h of care, based on the national dietary guidelines (Australian Government, 2013).

Internationally, however, centre based childcare services fail to provide foods that are consistent with such guideline recommendations. An analysis of menus from 83 childcare centres in the US reported that the menus did not provide the recommended amount of carbohydrates, dietary fibre, iron, vitamin D and Vitamin E; and provided excessive amounts of sodium (Frampton et al., 2014). Similar findings also have been reported in the UK. One study audited 118 menus from nurseries (enrolling children under 5 years of age) and reported that none complied with nutrition guidelines (Local Authorities Coordinators of Regulatory Services, 2010). In Australia, a 2012 audit of 46 menus from centre based childcare services within NSW found that no service provided food that was compliant with nutritional guideline recommendations (Yoong et al., 2014). Such findings indicate that children's nutrition requirements are not being met while in care and highlight the need for interventions to improve the implementation of dietary guidelines in this setting (Landers et al., 1994; Gelissen et al., 1992).

Developing strategies to improve centre based childcare services' compliance with menu dietary guidelines requires a comprehensive understanding of factors that may impede or promote guideline implementation. A number of studies have identified that a lack of formal training and professional development opportunities for childcare service cooks, lack of time, and the limited availability of practical and up to date menu-planning resources impede the implementation of dietary menu guidelines (Pollard et al., 1999; Moore et al., 2005; Lyn et al., 2014; Romaine et al., 2007). The application of theoretical frameworks, such as the theoretical domains framework (TDF), to assess factors that influence implementation, ensures a broad range of implementation factors are considered. However, to our knowledge, there has been no previous systematic review, that utilised a theoretical framework to describe factors that may influence the implementation of menu dietary guidelines by centre based childcare services. Given this evidence gap, the primary aim of this systematic review is to describe factors (barriers and facilitators) that may influence the implementation of dietary guidelines regarding food provision in centre based childcare services and to map these factors to the TDF. Given the extensive range of factors considered within the TDF, use of this theoretical framework will reduce the likelihood that any factors influencing guideline implementation are inadvertently missed.

2. Methods

2.1. Types of studies

Non-experimental studies, of any design, which qualitatively and/or quantitatively examined factors (barriers or facilitators) that influence the implementation of dietary menu guidelines regarding food provision in centre based childcare services were included. Such factors could include those that impede or facilitate guideline implementation. Centre based childcare services included pre-schools, nurseries, long day care services and kindergartens that enroll children prior to compulsory schooling (typically up to the age of five to six years). To be eligible, studies needed to be conducted in or with staff reporting on centre based childcare services that provide at least one main meal to children while in care. Manuscripts or reports not published in English were excluded as were studies of childcare services provided in the home.

2.2. Types of participants

Study participants could include managers, cooks, or other staff, involved in the operation of centre based childcare services. Participants also included officials from other government or non-government organisations or regulatory agencies that may influence food provision in such services.

2.3. Types of measures

Any factors (barriers and facilitators) that were reported to influence the implementation of dietary menu guidelines were included. Data collected via a variety of methods, including childcare service records, interviews, questionnaires or surveys completed by childcare services cooks, managers and other staff or stakeholders that may influence guideline implementation were included. For this review, a barrier was defined as "a circumstance or obstacle that keeps people or things apart or prevents communication or progress" (Oxford U, n.d.), whereas a facilitator was defined as "a person or thing that makes something possible" (Oxford U, n.d.).

3. Search methods for identification of studies

3.1. Electronic searches

We searched the following electronic databases: Medline, Medline in Process, PsycINFO, ERIC, Embase and CINAHL. The search strategy included filters for the setting (childcare) as well as terms for barriers or facilitators and dietary menu guidelines using terms from previous reviews and relevant studies (Wolfenden et al., 2016). We adapted the Medline search strategy for the other databases (see Appendix 1). An experienced librarian assisted with developing search terms and mapping across electronic databases.

3.2. Searching other resources

We searched the reference lists of all included studies for citations of other potentially relevant studies. We conducted hand searches of all publications in the past five years in the journal 'Implementation Science'. To identify published government reports and other grey literature we searched the web-engine 'Google' using the phrase 'barriers or enablers to dietary guideline implementation in childcare'. The first 200 google citations were examined. We also contacted the authors of all included trials (n = 12), and experts in the field of implementation science to identify any relevant ongoing or unpublished studies, or grey literature publications.

4. Data collection and analysis

4.1. Selection of studies

Two review authors (KS and MF) independently screened all abstracts and titles. Review authors were not blind to author or journal information. Screening was conducted using a standardised screening tool developed for the review, which was piloted before use. The tool was piloted for comprehension and consistency of application by the review authors who conducted the screening on a sample of studies examining barriers to guideline implementation prior to the execution of the search strategy. For all potentially eligible studies, we obtained the full text of manuscripts for further examination. A verbal consensus process was used to resolve any discrepancies regarding study eligibility between review authors. In instances where the study eligibility could not be resolved via consensus, a third review author was consulted for a decision (JJ).

4.2. Data extraction and management

Two review authors (KS, MF), not blind to author or journal information, independently extracted information from the included studies. The data extraction form was piloted before the initiation of the review and any discrepancies between review authors regarding data extraction was resolved by consensus and, when required, via a third review author (JJ).

We extracted the following information:

1. Study design, sampling method and size, recruitment method, inclusion/exclusion criteria, year of publication, childcare service type, country and participant/service demographics and socio-economic characteristics.
2. Data collection method (including whether factors were prompted or not), the factors (barriers and facilitators) identified, and the validity of measures used.
3. For qualitative studies, examples of participant quotes relating to each domain.
4. For quantitative studies, any reported measure of association with the implementation of menu dietary guidelines.

5. Data synthesis and analysis framework

Factors reported to influence implementation were synthesised using the TDF. The TDF includes 14 theoretical domains synthesised from 33 behaviour change theories and 84 theoretical constructs in a single framework (Cane, 2012). Factors (barriers and facilitators) which influence the implementation of dietary menu guidelines in centre based childcare services were extracted from included trials and were then assigned to the relevant TDF domain according to definitions pre-specified in a coding manual developed by members of the research team. See Table 1 for definitions of each domain and associated constructs.

The TDF coding manual was developed by two authors for the purpose of this review using the domain definitions reported by Cane (2012) and domain definitions for the childcare setting applied in previous studies by the research team (unpublished) (see Table 1). Two review authors (KS and MF) independently assigned the identified factors to the TDF domains using the manual. Discrepancies in domain allocated between the two review authors were resolved by a third author (JJ). For all included studies, we reported the number of studies reporting factors assigned to each of the TDF domains. In addition, for quantitative studies, we also reported the frequency in which factors were reported in individual studies. When examined within a study, the associations between reported factors to guideline implementation and a measure of actual implementation of dietary guidelines also were reported.

6. Results

6.1. Results of search

The electronic search, conducted on the 26 August 2016, yielded 5610 citations (Fig. 1). We identified 1432 records via our additional search methods. Following the screening of titles and abstracts, we attempted to obtain the full text of 120 manuscripts for further review. Of these, 108 were excluded (89 due to study outcomes; 9 due to participants; 1 manuscript was not available in English; and 9 full text manuscripts were unable to be located) and 12 manuscripts were included (6 quantitative and 6 qualitative studies).

6.2. Included studies

A full description of each included study is reported in Additional file 1.

6.2.1. Types of studies

The majority of the studies were conducted in Canada ($n = 5$) (Romaine et al., 2007; Farmer et al., 2015; Gabor et al., 2010; Chow and Humbert, 2011) and the US ($n = 4$) (Lyn et al., 2014; Hughes et al., 2010; Kelly et al., 2016) (Brewer and Rieg, 2013; Briley et al., 1994), followed by Australia ($n = 1$) (Pollard et al., 1999), Ireland ($n = 1$) (Jennings et al., 2011) and New Zealand ($n = 1$) (Gerritsen et al., 2016). Studies were conducted between 1994 and 2015, and 10 studies employed a cross-sectional design.

6.2.2. Types of participants

Participants were service cooks, educators, service directors or service managers from centre based childcare services. The number of participants within the included studies ranged from eight to 2841. One study limited their study sample to 'Head-start' childcares services within the U.S. (Hughes et al., 2010). Head start is an early childhood education program of the U.S. Department of Health and Human Services, which provides health care services, meals, snacks and nutrition education to low income families.

6.2.3. Types of measures

6.2.3.1. Qualitative. Six out of the 12 studies utilised qualitative methods. Four studies conducted face-to-face semi structured interviews (Lyn et al., 2014; Farmer et al., 2015; Chow and Humbert, 2011; Briley et al., 1994) and the remaining two studies undertook focus groups (Gabor et al., 2010; Brewer and Rieg, 2013). Two qualitative studies reported the duration it took participants to complete the semi-structured interview, which ranged from 30 to 60 min per interview (Lyn et al., 2014; Farmer et al., 2015).

6.2.3.2. Quantitative. Six out of the 12 studies used quantitative methods (Pollard et al., 1999; Romaine et al., 2007; Hughes et al., 2010; Kelly et al., 2016; Jennings et al., 2011; Gerritsen et al., 2016). The number of items in the surveys ranged from 49 to over 150 items. The method of administration of the surveys included telephone (2 studies) (Pollard et al., 1999; Jennings et al., 2011); pen and paper (2 studies) (Romaine et al., 2007; Hughes et al., 2010); and an online tool (Gerritsen et al., 2016). One study did not describe the method of survey administration (Kelly et al., 2016).

6.2.3.3. Study design characteristics. Eleven of the 12 included studies were cross-sectional (Pollard et al., 1999; Lyn et al., 2014; Romaine et al., 2007; Gabor et al., 2010; Chow and Humbert, 2011; Hughes et al., 2010; Kelly et al., 2016; Brewer and Rieg, 2013; Briley et al., 1994; Jennings et al., 2011; Gerritsen et al., 2016). One study employed a multi-case exploratory design, which explored the difference between two 'early adopter' urban childcare centres (Farmer et al., 2015). Early adopters were chosen for this study, as they could provide key insights

Table 1
Theoretical domain framework definitions.

Domain	Constructs (Cane, 2012)	Definition (Cane, 2012)
1. Knowledge	Knowledge (including knowledge of condition/scientific rationale), procedural knowledge, knowledge of task environment	An awareness of the existence of something
2. Skills	Skills, skills development, competence, ability, interpersonal skills, practice, skill assessment, coping strategies	An ability or proficiency acquired through practice
3. Professional role and identity	Professional identity, professional role, social identity, professional boundaries, professional confidence, group identity, leadership, organisational commitment	A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting
4. Beliefs about capabilities	Self-confidence, perceived competence, self-efficacy, perceived behavioural control, beliefs, self-esteem, empowerment, professional confidence	Acceptance of the truth, reality, or validity about an ability, talent, or facility that a person can put to constructive use
5. Optimism	Optimism, pessimism, unrealistic optimism, identity	The confidence that things will happen for the best or that desired goals will be attained
6. Beliefs about consequences	Beliefs, outcome expectancies, characteristics of outcome expectancies, anticipated regret, consequents	Acceptance of the truth, reality, or validity about outcomes of a behaviour in a given situation
7. Reinforcement	Rewards (proximal/distal, valued/not valued, probable/improbable), incentives, punishment, consequents, reinforcement, contingencies, sanctions	Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus
8. Intentions	Stability of intentions, stages of change model, trans-theoretical model and stages of change	A conscious decision to perform a behaviour or a resolve to act in a certain way
9. Goals	Goals (distal/proximal), goal priority, goal/target setting, goals (autonomous/controlled), action planning (with relation to their intention to implement	Mental representations of outcomes or end states that an individual wants to achieve
10. Memory, attention and decision processes	Memory, attention, attention control, decision making, cognitive overload/tiredness	The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives
11. Environmental context and resources	Environmental stressors, resources/material resources, organisational culture/climate, salient events/critical incidents, person $\times$ environment interaction, barriers and facilitators	Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour
12. Social influences	Social pressure, social norms, group conformity, social comparisons, group norms, social support, power, intergroup conflict, alienation, group identity, modelling	Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviours
13. Emotions	Fear, anxiety, affect, stress, depression, positive/negative affect, burn-out	A complex reaction pattern, involving experiential, behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event
14. Behavioural regulation	Self-monitoring, breaking habit, action planning (with relation to monitoring their habits)	Anything aimed at managing or changing objectively observed or measured actions

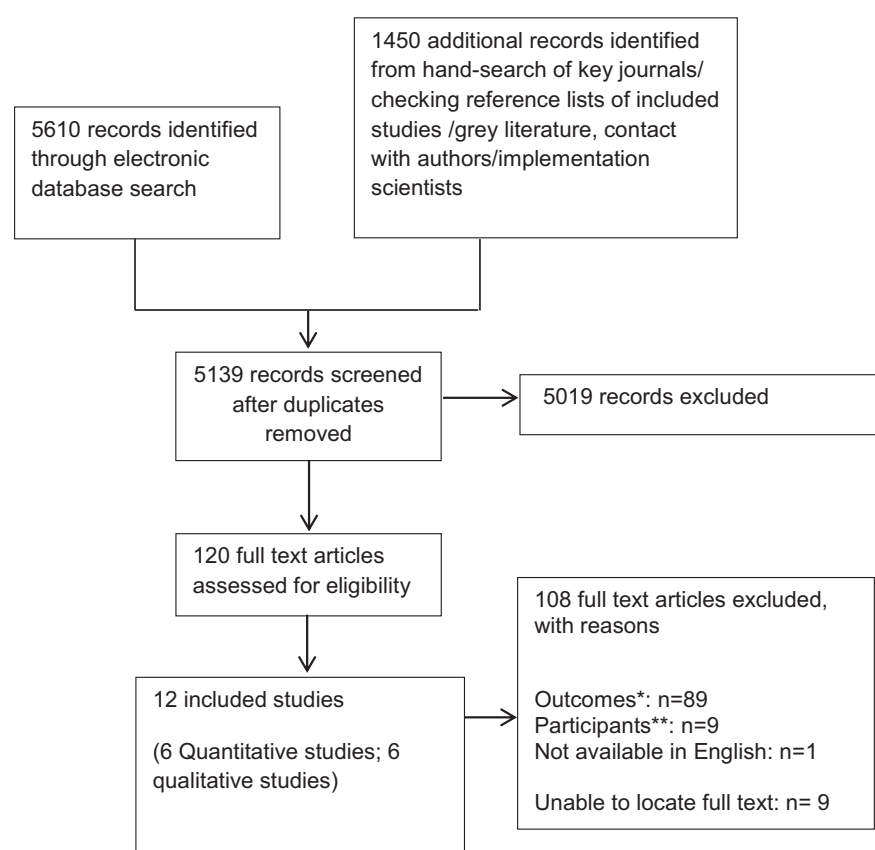


Fig. 1. Study flow diagram.

*Examples include: Study did not report on factors that enable or impede nutrition guideline implementation as an outcome; study reported on barriers to child food intake not barriers to nutrition guideline implementation.

**Examples include: Not a centre-based childcare service; participants were parents and children not childcare service staff.

Table 2
Identified factor (barriers and facilitators) domains and factor prevalence.

	Qualitative studies (n = 6)			Quantitative studies (n = 6)		
	Was the factor identified by one or more studies	No. of studies that identified factor		Was the factor identified by one or more studies	No. of studies that identified factor	Median (range) prevalence of barrier reported within studies
<i>Barriers</i>						
1. Knowledge	✓	3 out of 6 studies (Gabor et al., 2010; Brewer and Rieg, 2013; Briley et al., 1994)		✓	3 out of 6 studies (Romaine et al., 2007; Hughes et al., 2010; Jennings et al., 2011)	21% (11–33%) of participants identified this factor
2. Skills	✓	1 out of 6 studies (Gabor et al., 2010)		✓	4 out of 6 studies (Romaine et al., 2007; Kelly et al., 2016; Jennings et al., 2011; Gerritsen et al., 2016)	44% (4.3–98.1%) of participants identified this factor
3. Professional role and identity	✓	1 out of 6 studies (Briley et al., 1994)		✓	1 out of 6 studies (Kelly et al., 2016)	Not reported
4. Beliefs about capabilities	✓	2 out of 6 studies (Gabor et al., 2010; Briley et al., 1994)		✗		
5. Optimism	✗			✗		
6. Beliefs about consequences	✓	2 out of 6 studies (Brewer and Rieg, 2013; Briley et al., 1994)		✗		
7. Reinforcement	✗			✗		
8. Intentions	✗			✓	1 out of 6 studies (Jennings et al., 2011)	14.8% of participants identified this factor
9. Goals	✗			✗		
10. Memory, attention and decision processes	✗			✗		
11. Environmental context and resources	✓	4 out of 6 studies (Gabor et al., 2010; Chow and Humbert, 2011; Brewer and Rieg, 2013; Briley et al., 1994)		✓	5 out of 6 studies (Pollard et al., 1999; Hughes et al., 2010; Kelly et al., 2016; Jennings et al., 2011; Gerritsen et al., 2016)	23.5% (5.2–72%) of participants identified this factor
12. Social influences	✓	5 out of 6 studies (Lyn et al., 2014; Gabor et al., 2010; Chow and Humbert, 2011; Brewer and Rieg, 2013; Briley et al., 1994)		✓	4 out of 6 studies (Hughes et al., 2010; Kelly et al., 2016; Jennings et al., 2011; Gerritsen et al., 2016)	16.9% (4–42.5%) of participants identified this factor
13. Emotion	✓			✗		
14. Behavioural regulation	✗	1 out of 6 studies (Gabor et al., 2010)		✗		
<i>Facilitators</i>						
1. Knowledge	✓	2 out of 6 studies (Lyn et al., 2014; Farmer et al., 2015)		✓	1 out of 6 studies (Pollard et al., 1999)	70% of participants identified this factor
2. Skills	✓	3 out of 6 studies (Farmer et al., 2015; Gabor et al., 2010; Chow and Humbert, 2011)		✓		
3. Professional role and identity	✓	2 out of 6 studies (Farmer et al., 2015; Gabor et al., 2010)		✗		
4. Beliefs about capabilities	✓	2 out of 6 studies (Lyn et al., 2014; Briley et al., 1994)		✗		
5. Optimism	✗			✗		
6. Beliefs about consequences	✓	1 out of 6 studies (Lyn et al., 2014)		✗		
7. Reinforcement	✓	1 out of 6 studies (Farmer et al., 2015)		✗		
8. Intentions	✓	1 out of 6 studies (Lyn et al., 2014)		✗		
9. Goals	✓	3 out of 6 studies (Lyn et al., 2014; Gabor et al., 2010; Brewer and Rieg, 2013)		✗		
10. Memory, attention and decision processes	✗			✗		
11. Environmental context and resources	✓	5 out of 6 studies (Lyn et al., 2014; Farmer et al., 2015; Gabor et al., 2010; Chow and Humbert, 2011; Brewer and Rieg, 2013)		✓	5 out of 6 studies (Pollard et al., 1999; Romaine et al., 2007; Hughes et al., 2010; Kelly et al., 2016; Jennings et al., 2011)	43.5% (28–72%) of participants identified this factor
12. Social influences	✓	3 out of 6 studies (Lyn et al., 2014; Farmer et al., 2015; Gabor et al., 2010)		✓	2 out of 6 studies (Romaine et al., 2007; Kelly et al., 2016)	51% of participants identified this factor
13. Emotion	✗			✗		
14. Behavioural regulation	✗			✗		

✓ = factor not identified by any included study; ✗ = factor not identified by any included study.

into the practices that facilitate the adoption of menu dietary guidelines.

Two studies reported on childcare service staff perceptions and experiences of their involvement in obesity prevention interventions that aimed to improve the implementation of healthy eating and physical activity policies and practices (Lyn et al., 2014; Brewer and Rieg, 2013). The remaining 10 studies aimed to assess factors such as the organisational characteristics; staff behaviours and practices that influence the services adoption of menu dietary guidelines. Of these, three studies also sought to identify the perceived needs of childcare services to enable them to implement the menu dietary guidelines (Pollard et al., 1999; Kelly et al., 2016; Jennings et al., 2011).

7. Outcomes

7.1. Qualitative studies

7.1.1. Barriers

From the six qualitative studies, barriers that impede services' implementation of the menu dietary guidelines were identified for eight of the 14 TDF domains (Table 2). Across studies, the most frequently identified TDF domains were 'social influences' (e.g. staff perceptions of what foods children liked or disliked) (five studies); 'environmental context and resources' (e.g. insufficient menu planning tools and resources; insufficient time) (four studies); 'knowledge' (e.g. staff have limited general nutrition knowledge and poor knowledge of the sector menu dietary guidelines) (three studies); 'beliefs about capabilities' (e.g. food service staff lack confidence in their kitchen math skills and cooking skills) and 'beliefs about consequences' (e.g. the impact of menu changes on food budget; increased food wastage as a result of menu changes) (two studies). Examples of participant responses from included studies categorised by each TDF domain are included as Additional file 2.

7.1.2. Facilitators

From the six qualitative studies, ten of the 14 TDF domains were identified as facilitators that enable services' implementation of the menu dietary guidelines (Table 2). The most frequently identified TDF domains were 'environmental context and resources' (e.g. the availability of sample menus; the service creating a supportive environment by enforcing nutrition policies and role modelling healthy eating behaviours) (five studies); 'social influences' (e.g. staff communicating and collaborating; well established social networks to share information), 'skills' (e.g. highly trained and skilled staff for menu planning) and 'goals' (e.g. planning menus in advance; making a gradual transition to serving healthier foods; planning strategies to contain food costs as a result of menu changes) (three studies).

7.2. Quantitative studies

7.2.1. Barriers

From the six quantitative studies, six of the 14 TDF domains were identified as barriers that impede services' implementation of the menu dietary guidelines (Table 2). Across studies the most frequently identified TDF domains were 'environmental context and resources' (five studies); 'social influences' and 'skills' (four studies); and 'knowledge' (three studies). Table 2 displays the prevalence of barriers reported by participants within included studies. Within studies participants reported barriers classified as the domain 'skills' as the most prevalent (Median 44%).

7.2.2. Facilitators

Within the six quantitative studies, three of the 14 domains were identified as facilitators that enable services' implementation of the menu dietary guidelines (Table 2). The most frequently identified TDF domains were 'environmental context and resources' (five studies);

'social influences' and 'skills' (one study). The domain 'skills' was the most prevalent (70% of participants) facilitator reported within included studies (Table 2).

7.3. Association between barrier or facilitator and menu guideline implementation

We obtained only one study that included a measure of association (Romaine et al., 2007). The study included 101 centre based childcare services and aimed to determine menu planners relevant knowledge, attitudes and practices in relation to menu planning and assess the nutritional adequacy and quality of centre menus. Romaine et al. reported that there was significant ($p = 0.016$) association between menu planners attending menu planning training and higher 'menu quality' scores (Romaine et al., 2007). However, no significant difference was observed between the menu quality scores for those who reported using the sector nutrition guideline manual and those who did not.

8. Discussion

This is the first systematic review to comprehensively assess factors that influence the implementation of dietary guidelines in centre based childcare services and synthesise findings using an implementation framework. The review identified that 'environmental context and resources' and 'social influences' were each the most common domains within which barriers and facilitators to the implementation of menu dietary guidelines were identified by centre based childcare services. Barriers in these domains reflect that implementing new guidelines require acquisition of new foods, cooking instruments, recipes and upskilling of staff that increase expenses incurred by services. These barriers are further complicated when staff believe or experience that children do not like the new, healthy foods. Facilitators identified that could help alleviate these barriers included drawing on relationships with people who could provide assistance and support— e.g. working with food vendors, experienced cooks and using pre-tested recipes. These findings provide guidance to researchers, policy makers and practitioners in the design of support strategies to improve dietary guideline implementation.

The factors identified by this review are consistent with those reported in the literature as influencing the implementation of nutrition policies and healthy eating practices in the childcare setting more broadly. For example the implementation of policies and practices such as nutrition curricula, lunchbox guidelines and healthy eating learning experiences are reportedly impeded by a lack of suitable resources, support from service management or parents, and a lack of training, knowledge and skills (Moore et al., 2005; Wolfenden et al., 2016; Pollard et al., 2001; Drake, 1992). Similarly, research in the primary school setting has identified a lack of resources, views of other school community groups, and difficulty in interpreting nutrition guidelines as barriers to the implementation of school nutrition policies targeting availability of healthy foods to children (Ardzejewska et al., 2013; Woods et al., 2014). Collectively, such findings suggests that 'environmental context and resources', 'social influences' and 'skills' are key drivers of the implementation of menu dietary guidelines. Research by Michie et al. suggests that strategies, such as the provision of resources, professional development opportunities and role modelling, may be particularly important in efforts to address these domains (Michie et al., 2005). Implementing such strategies will likely require investment by governments and childcare accreditation agencies responsible for providing oversight of childcare service operational standards. Specifically investment in resource development, and incorporating skill development and role modelling strategies into professional development currently available to childcare services may facilitate improvements in guideline implementation.

Qualitative studies included in the review identified a greater

number of TDF domains as barriers or facilitators, compared to included quantitative studies. Of the studies which employed quantitative methods, only one reportedly allowed respondents to report additional barriers or facilitators to guideline implementation than was listed in closed survey response options (Hughes et al., 2010). In doing so, most quantitative studies presuppose the key factors influencing guideline implementation. The discrepancy between qualitative and quantitative findings in this review suggests that quantitative studies may have overlooked many important factors influencing guideline implementation in this setting. For example, in addition to the factors identified in quantitative studies, qualitative studies identified ‘beliefs about capabilities’, ‘beliefs about consequences’ and ‘emotion’ as domains impeding implementation and ‘knowledge’, ‘professional role and identity’, ‘beliefs about capabilities’, ‘beliefs about consequences’, ‘reinforcement’, ‘intentions’ and ‘goals’ as important domains enabling implementation. The inclusion of both quantitative and qualitative studies in this review, therefore, provides a more comprehensive understanding of factors that influence menu guideline implementation. The findings of the study, therefore, support recommendations for the application of mixed methods to improve assessment and understanding of factors that may impede or promote implementation (Green et al., 2015).

None of the included studies reported barriers or facilitators to guideline implementation relating to the TDF constructs of ‘optimism’, ‘memory’, ‘attention and decision processes’ and ‘behavioural regulation’. The absence of these constructs, coupled with the broad search strategy employed, suggests that the state of the literature on the implementation of dietary guidelines is focused on early implementation stages— that of adopting a new practice. During later stages of implementation, as practice becomes “embedded,” or, routinely incorporated into everyday work barriers captured by constructs that relate to sustaining a practice (e.g. attention and decision processes or behavioural regulation) may be anticipated (May and Finch, 2009). An understanding of barriers and facilitators to sustaining implementation of nutrition guidelines such as a how supportive organisational policies may be or the presence (or absence) of monitoring systems would provide a valuable contribution to the literature. Such studies that utilise samples or subgroups of childcare services where sustained implementation has and has not been achieved would be particularly worthwhile.

The findings of this review also highlight that empirical evidence identifying associations between barriers or facilitators with guideline implementation is lacking. The review identified an association in just one such study which found there was significant evidence of a relationship between menu planning training and higher ‘menu quality’ scores. Such findings indicate that further research, including using prospective research designs such as cohort studies or mediation models, is warranted to confirm that reported barriers identified in this review are indeed impeding or facilitating guideline adherence.

8.1. Limitations

The research should be interpreted in the context of its methodological limitations. Although a comprehensive search of databases was undertaken, included studies were limited to those published in English. As such, relevant studies, particularly those arising from non-English speaking countries may have been missed. The majority of studies were conducted in North America. Barriers reported in other

jurisdictions with alternative models of childcare operations may differ. Additionally one study, although it reported using a quantitative survey, did not report quantified results for all factors investigated in the study (Kelly et al., 2016). Notwithstanding these limitations, the review makes an important contribution to the literature, providing a basis for researchers to develop implementation strategies and highlighting key gaps in the evidence base.

9. Conclusion

This is the first review that comprehensively and systematically assesses the literature to identify factors that influence (impede or facilitate) the implementation of menu dietary guidelines in centre based childcare services utilising a theoretical framework. While this review identifies important factors that may influence the implementation of menu dietary guidelines within centre based childcare services, it also highlights the need for further research to better understand their influence on menu composition. The findings of this review provides guidance to researchers, policy makers and practitioners in the design of support strategies to improve menu dietary guideline implementation and as such, have the potential to impact on child food intake while in care.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ypmed.2017.09.024>.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable

Availability of data and materials

The datasets during and/or analysed during the current study available from the corresponding author on reasonable request.

Conflict of interest

None.

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Authors' contributions

First author K.S. led the development of this manuscript. Authors L.W., S.Y., R.W. and K.S., conceived the review. Authors K.S., M.F. and J.J. completed the screening and data extraction. Authors K.S. and M.F. completed the TDF coding of identified factors. All authors contributed to, read and approved the final version of this manuscript.

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Appendix 1. Electronic database search strategy

#	Searches
1	Child, Preschool/
2	(pre-school* or preschool*).mp.

3 Child Day Care Centers/
 4 childcare*.mp.
 5 (daycare* or day care*).mp.
 6 early child*.mp.
 7 (nursery or nurseries).mp.
 8 Kinder*.mp.
 9 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8
 10 nutrition*.mp.
 11 (health* adj2 eat*).mp.
 12 Child Nutrition Sciences/
 13 Fruit/ or fruit*.tw.
 14 Vegetables/ or vegetable*.tw.
 15 canteen*.mp.
 16 Food Services/
 17 menu.mp.
 18 (calorie* or calories* or kilojoule*).mp.
 19 Energy Intake/
 20 Eating/
 21 Food Habits/
 22 Food/
 23 Menu Planning/
 24 feeding program*.mp.
 25 food program*.mp.
 26 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25
 27 (recommend* or guideline* or protocol* or polic* or procedure* or best practice* or guidance* or strateg*).tw.
 28 (barrier* or imped* or facilitat* or challenge* or adher* or factor* or hindrance* or hinder* or obstacle* or hurdle* or opportunit*).tw.
 29 9 and 26 and 27 and 28

Database(s): MEDLINE 1946 to present with daily update.

References

- Ardzejewska, K., Tadros, R., Baxter, D., 2013. A descriptive study on the barriers and facilitators to implementation of the NSW (Australia) Healthy School Canteen Strategy. *Health Educ. J.* 72, 136–145.
- Australian Bureau of Statistics, 2015. *Childhood Education and Care*. (Australia, June 2014).
- Benjamin Neelon, S.E., Briley, M.E., American Dietetic Association, 2011. Position of the American Dietetic Association: benchmarks for nutrition in child care. *J. Am. Diet. Assoc.* 111, 607–615.
- Brewer, H., Rieg, S., 2013. Preschool staff members' perceptions of the implementation of a grant-funded intervention program designed to combat childhood obesity: a phenomenological approach. *Education* 134, 255–265.
- Briley, M.E., Roberts-Gray, C., Simpson, D., 1994. Identification of factors that influence the menu at child care centers: a grounded theory approach. *J. Am. Diet. Assoc.* 94, 276–281.
- Cane, 2012. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implement. Sci.* 7.
- Chow, A.F., Humbert, L., 2011. Physical activity and nutrition in early years care centres: barriers and facilitators. *Can. Child.* 36, 5.
- Crawley, H., 2006. *Eating Well for Under-5s in Child Care*. Practical and Nutritional Guidelines, 2nd edition. St Austell, UK, The Caroline Walker Trust.
- Drake, M.A., 1992. Menu evaluation, nutrient intake of young children, and nutrition knowledge of menu planners in child care centers in Missouri. *J. Nutr. Educ.* 24, 145–148.
- Farmer, A.P., Nikolopoulos, H., McCargar, L., Berry, T., Mager, D., 2015. Organizational characteristics and processes are important in the adoption of the Alberta Nutrition Guidelines for Children and Youth in child-care centres. *Public Health Nutr.* 18, 1593–1601.
- Frampton, A.M., Sisson, S.B., Horm, D., Campbell, J.E., Lora, K., Ladner, J.L., 2014. What's for lunch? An analysis of lunch menus in 83 urban and rural Oklahoma child-care centers providing all-day care to preschool children. *J. Acad. Nutr. Diet.* 114, 1367–1374.
- Gabor, V., Mantinan, K., Rudolph, K., Morgan, R., Longjohn, M., 2010. Challenges and Opportunities Related to Implementation of Child Care Nutrition and Physical Activity Policies in Delaware. Altarum Institute.
- Gelissen, I.C., Wall, P.M., Lilburne, A.M., Truswell, A.S., 1992. Dietary intake of Australian preschool children at long day care centres. *Aust. J. Nutr. Diet.* 49, 4.
- Gerritsen, S., Wall, C., Morton, S., 2016. Child-care nutrition environments: results from a survey of policy and practice in New Zealand early childhood education services. *Public Health Nutr.* 19, 1531–1542.
- Australian Government, 2013. *Australian Dietary Guidelines*. Canberra, ACT, National Health and Medical Research Council.
- Green, C.A., Duan, N., Gibbons, R.D., Hoagwood, K.E., Palinkas, L.A., Wisdom, J.P., 2015. Approaches to mixed methods dissemination and implementation research: methods, strengths, caveats, and opportunities. *Admin. Pol. Ment. Health* 42, 508–523.
- Hughes, C.C., Gooze, R.A., Finkelstein, D.M., Whitaker, R.C., 2010. Barriers to obesity prevention in Head Start. *Health Aff. (Millwood)* 29, 454–462.
- Huybrechts, L., Matthys, C., Vereecken, C., Maes, L., Temme, E.H.M., Van Oyen, H., De Backer, G., De Henauw, S., 2008. Food intakes by preschool children in Flanders compared with dietary guidelines. *Int. J. Environ. Res. Public Health* 5, 243–257.
- Jennings, A., McEvoy, S., Corish, C., 2011. Nutritional practices in full-day-care preschools. *J. Hum. Nutr. Diet.* 24, 245–259.
- Kelly, E., Rossiter, M.D., Mann, L., 2016. Assessment of impact: the standards for food and nutrition in regulated child care settings in Nova Scotia. In: *Nutrition Standards in Child Care Project Report*. Mount Saint Vincent University.
- Landers, M.C.G., Warden, R.A., Hunt, K.A., Boulton, T.J.C., 1994. Nutrition in long day child care centres: are the guidelines realistic? *Aust. J. Nutr. Diet.* 51, 5.
- Laughlin, L., 2013. *Who's Minding the Kids? Child Care Arrangements*. Spring 2011. Bureau USC, pp. P70–135 (Washington, DC).
- Local Authorities Coordinators of Regulatory Services, 2010. *Nursery School Nutrition Survey Results*.
- Lyn, R., Evers, S., Davis, J., Maalouf, J., Griffin, M., 2014. Barriers and supports to implementing a nutrition and physical activity intervention in child care: directors' perspectives. *J. Nutr. Educ. Behav.* 46, 171–180.
- May, C., Finch, T., 2009. Implementation, embedding, and integration: an outline of Normalization Process Theory. In: *Sociology*.
- Michie, S., Johnston, M., Abraham, C., Lawton, R., Parker, D., Walker, A., Psychological Theory Group, 2005. Making psychological theory useful for implementing evidence based practice: a consensus approach. *Qual. Saf. Health Care* 14, 26–33.
- Mikkelsen, M.V., Husby, S., Skov, L.R., Perez-Cueto, F.J., 2014. A systematic review of types of healthy eating interventions in preschools. *Nutr. J.* 13, 56.
- Moore, H., Nelson, P., Marshall, J., Cooper, M., Zambas, H., Brewster, K., Atkin, K., 2005. Laying foundations for health: food provision for under 5s in day care. *Appetite* 44, 207–213.
- NSW Ministry of Health N, 2014. *Caring for Children Birth to 5 years*.
- Oxford U. *Oxford Dictionaries*.
- Pollard, C.M., Lewis, L.M., Miller, M.R., 1999. Food service in long day care centres - an opportunity for public health intervention. *Aust. N. Z. J. Public Health* 23.
- Pollard, C., Lewis, J., Miller, M., 2001. Start right-eat right award scheme: implementing food and nutrition policy in child care centers. *Health Educ. Behav.* 28 (3), 320–330.
- Radeliffe, B.C., Cameron, C.V., Baade, P.D., 2002. Nutrient intakes of young children: implications for long-day child-care nutrition recommendations. *Nutr. Diet.* 59, 187–190.
- Romaine, N., Mann, L., Kienapple, K., Conrad, B., 2007. Menu planning for childcare centres: practices and needs. *Can. J. Diet. Pract. Res.* 68, 7–13.
- Wolfenden, L.J.J., Williams, C., Finch, M., Wyse, R.J., Kingsland, M., Tzelepis, F., Wiggers, J., Williams, A.J., Seward, K., Small, T., Welch, V., Booth, D., Yoong, S., 2016. Strategies to improve the implementation of healthy eating, physical activity and obesity prevention policies, practices or programmes within childcare services. *Cochrane Database Syst. Rev.* (10), CD011779. <http://dx.doi.org/10.1002/14651858>.

- CD011779.pub2.
- Woods, J., Bressan, A., Langelaan, C., Mallon, A., Palermo, C., 2014. Australian school canteens: menu guideline adherence or avoidance? *Health Promot. J. Austr.* 25, 110–115.
- World Health Organisation, 2004. Global Strategy on Diet. In: *Physical Activity and Health*.
- Yoong, S.L., Skelton, E., Jones, J., Wolfenden, L., 2014. Do childcare services provide foods in line with the 2013 Australian Dietary guidelines? A cross-sectional study. *Aust. N. Z. J. Public Health* 38, 595–596.