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The effect of healthy food guidance for schools on food availability, purchasing, and consumption among school children in New Zealand and Australia: An integrative review

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ABSTRACT

Modifying the food environment holds promise for instilling healthier behaviours in children and may be an effective public health strategy for preventing childhood obesity and adverse health outcomes. The school food environment is a valuable setting to influence most children's dietary behaviours from an early age, yet evidence suggests that the New Zealand and Australian school food environment is not conducive to healthy food and drink consumption. The present study aimed to investigate the level of compliance in New Zealand and Australia with government guidelines for food and drink availability within schools and the subsequent effect on food consumption and purchasing behaviours of children. A systematic review utilising three databases; 'PubMed', 'Scopus', and the 'Cochrane Library' was conducted. The research covered peer-reviewed studies from both New Zealand and Australia that met predefined inclusion criteria. Fifteen studies focussed on assessing food availability within schools based on government guidelines, and ten studies explored food purchasing and consumption by students influenced by changes to the school food environment. Results showed low compliance with government healthy food guidelines for schools, and significant socioeconomic disparities. Western Australia's clear targets as well as the mandatory monitoring systems in place stand out as being a significant enabler of greater compliance with government food policies. Interventions aimed at improving healthy food availability and promoting healthy options in the canteen may positively influence student purchasing and consumption habits. Strategies such as feedback models and incentivisation hold promise for promoting healthier school environments and influencing children's food choices.

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INTRODUCTION

Globally, one in six children are classified as overweight or obese [1] with higher rates reported in New Zealand and Australia where one in three children in New Zealand, and one in four children in Australia are classified as overweight or obese [1; 2; 3]. Habitual dietary intakes and nutrition behaviours developed during childhood and adolescence pave the way for similar behaviours to manifest in adulthood [4; 5]. However early modification in eating behaviours might decrease the risk of obesity and diet related disease. Evidence suggests altering the food environment offers opportunities for children to adopt healthier behaviours and seems to be an effective strategy to prevent childhood obesity [6; 7]. Given that children spend much of their weekday waking hours at school, alterations to the school food environment may provide an opportunity to improve dietary behaviours [8]. School food provision in New Zealand and Australia is similar where children may purchase food and beverages during break times (morning tea and lunch) from the school canteen which may be catered for internally by the school or by external food suppliers such as local bakeries, and convenience stores. The majority of schools in New Zealand and Australia are publicly funded, meaning government school food environment policies have significant potential to improve targeted dietary behaviours [9]. However, in New Zealand and Australia, evidence suggests that schools do not encourage healthy food and drink consumption [8], with poor implementation of food policies [10; 11], unhealthy food and drink availability using canteen profit-models [8; 12; 13], and a time-scarce curriculum with little room for nutrition education [14; 15]. It is therefore unsurprising that children consume more unhealthy foods on school-days compared to non-school-days as a result [16].

Within New Zealand, previous legislation has sought to improve the food environment in schools. In 2008, all government-funded schools were required to promote healthy food choices and have *only* healthy options available where food and beverages were sold on school premises [17; 18]. Despite a 66% uptake of this legislation [18], following a change in government in 2009 the requirement for *only* healthy food options was removed, placing the onus on the school boards of trustees to mandate healthy food and drinks within schools [17; 18]. More recently, New Zealand schools have used the Food and Beverage classification system (FBCS) to guide decisions about which foods to provide within schools, with the majority of schools still providing unhealthy food options at cheap prices [8; 19]. The Food and Beverage classification system utilised a three-tier approach classifying foods as ‘every day’

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(such as sandwiches and vegetables), 'sometimes' (such as pizza and muffins), and 'occasionally' (such as pastry and deep-fried items) [20].

Superseding the FBCS, the New Zealand government introduced the *Healthy Food and Drink Guidance for Schools* in 2020 with the aim to improve the food environment within schools [21]. This voluntary guidance utilises a traffic-light classification system to categorise foods as 'green', 'amber', or 'red'. Many Australian states have also adopted a state-school mandated traffic-light system with varying recommendations for the degree of 'green', 'amber', and 'red' food availability (Table 1) [22]. Although one of the most effective food-labelling systems to aid consumer understanding of nutrition is the traffic-light system [23; 24], evidence suggests this does not necessarily translate into healthy consumer purchasing and consumption behaviours [23]. Alternatively the *Healthy Food and Drink Guidance for Schools* suggests increasing the availability of 'green' foods which provide a good source of nutrition such as fruits, vegetables, and wholegrains, limiting 'amber' foods which provide some nutritional value (usually defined with a Health Star Rating >3.5) such as white bread and processed meats, and avoiding 'red' foods which have poor nutritional value such as pastries, confectionary, and sugar-sweetened beverages [21]. Prediction models suggest that limiting unhealthy foods, and increasing healthy food options to at least 70% of the total menu will result in the majority of children's food purchases (>50%) being healthy [25]. Previously however, even when New Zealand schools restricted the availability of foods considered 'sometimes' and 'occasional' foods, these still accounted for a high proportion of total sales [26]. Since its implementation, only one study has assessed school compliance with the new Ministry of Health Food and Drink Guidance for Schools in New Zealand [27]. Similar traffic-light guidance has been implemented in Australia with variable uptake across states and territories despite being mandated in several states [28; 29; 30].

Given Australian schools closely resemble the structure of New Zealand schools with regards to canteen models and school hours, an assessment of the level of implementation of Australian traffic-light school policies may provide useful insights for expected implementation in New Zealand. A systematic review previously assessed the compliance of healthy canteen policies for Australian schools utilising data up to January 2015 [31], however, did not assess the implications for food purchase and consumption by students. Investigating to what extent government school food guidelines are implemented within schools and how this impacts children's food choices can help inform future policy in New Zealand,

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particularly around mandating the Healthy Food and Drink Guidance, and/or re-introducing the 'healthy food *only*' clause of the National Administration Guidelines in New Zealand.

OBJECTIVES

The aim of this review is to evaluate the effectiveness of government-implemented school food guidance on school food availability, canteen purchasing, and consumption in New Zealand and Australian primary, intermediate, and secondary schools. The following research questions were developed:

1. Do government-implemented school food guidelines increase the healthiness of the foods available for purchase by students from school canteens, vending machines and/or other outlets within New Zealand and Australian primary, intermediate, and secondary schools; and what are the enablers and barriers to successful implementation?
2. Does improving the healthiness of foods available to purchase within New Zealand and Australian primary, intermediate and secondary schools, decrease unhealthy food and drink purchasing and consumption (reduction of sugar-sweetened beverages, and/or reduction of foods high in sugar/fat and/or 'red'/'amber' traffic light food) by students within school hours?

METHODS

Study Design

This study used a systematic approach to retrieve and select relevant literature. A guide to conducting integrative reviews was used to develop and inform the different sections of this review [(32)].

Search Strategy

A search strategy was developed in consultation with the research librarian at Massey University. A comprehensive literature search was conducted on the 2nd February 2024, and updated on the 8th August 2024 with three electronic databases: Scopus, PubMed, and the Cochrane Library, and included published data up to August 2024. An advanced search of all fields including MeSH headings were conducted using the search terms and strings outlined in Table 2 and Table 3 for each of the respective research questions. All results were exported into Endnote software and duplicates removed using automation, and then manually verified

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to ensure accuracy. Studies were independently screened by two researchers based on title and abstract. Any discrepancies were resolved through discussion to reach a unanimous decision. Full-text articles were sought for relevant literature. Forward and backward citation screening of the selected studies was used to identify additional studies.

Study Selection

For all potentially relevant articles, full texts were retrieved and assessed against the inclusion and exclusion criteria. Studies were considered if they described school food availability and had school food guidelines, policies, or programmes that were in line with government school food policies at the time of publication. Schools were defined as providing primary, intermediate, or secondary education.

For inclusion, schools needed to provide a canteen-based or similar food-purchasing provision system such as tuck-shops, and/or vending machines. When assessing food purchasing and consumption, studies were included if they described student food purchasing or consumption within the school with specific reference to a traffic-light scheme (‘red’, ‘amber’, ‘green’ categorised foods), or a clearly defined categorisation of healthy or unhealthy foods such as ‘foods high in sugar’, ‘foods high in fat’, ‘sugar-sweetened beverages’ (SSB) as per country/state specific guidelines. Studies were restricted to the New Zealand and Australian context. Studies were excluded if there was no assessment of food and beverage availability, and/or focused only on changes to knowledge/attitudes of key stakeholders within schools. Early childhood education and tertiary institutions were excluded. Schools provided with free school lunches or those that had described free food provision such as free fruit or charitable donations were excluded due to the reduced control that schools had over the provision of these foods. Review papers (systematic, meta-analyses, narrative) were removed during the screening process; however, the reference lists of relevant review articles were still assessed to identify additional studies pertinent to the present review. There were no restrictions on study design or publication date, only that grey literature was excluded to enhance the strength of the review by utilising peer reviewed publications only. The inclusion criteria limited papers to those published in the English language.

The PRISMA flow diagram [33] was used to document the number of articles at each stage for the two separate searches regarding food availability, and food purchasing and consumption (Figure 1).

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Methodological Quality Assessment

The studies included in this review were all assessed for methodological quality using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist [34] for cross-sectional analyses, cohort studies, and randomised controlled trials, as deemed appropriate. The risk of bias evaluation was used to help evaluate the quality of evidence from each study but not to exclude any studies from this review. This assessment was undertaken by the primary researcher.

Analysis

Data analysis was conducted by one researcher using a general inductive approach to systematically organise, analyse, and describe the data sets. The process involved familiarisation with the dataset, generating initial codes, and summarising key findings. NVivo version 13 (Lumivero 2020) software was used to assist in coding and organising the data. Coding was data-driven and guided by the review questions, with initial codes generated based on recurring themes and concepts in the data. These codes were then refined to align with the research objectives. The data was then exported and aggregated manually to find commonalities and differences between the articles. Data was summarised and described in relation to the present research objectives, focusing on key barriers as factors that hinder or restrict effective school food availability and purchasing, and enablers as factors that enhance or support the school food environment.

Results

Food Availability within Schools

Study Designs and Population

The screening process revealed a significant gap in data on school food availability and compliance with healthy school food guidance in New Zealand. Most of the studies analysed focused on adherence to Australian school food guidelines (n=13), while only two studies from New Zealand reported on food availability in schools [27; 35] (Table 4). The number of menus analysed varied, with at least 38 schools [25] and up to 265 schools at most [36]. While most studies examined compliance with territory-specific school food guidance, five also proposed interventions to promote healthy food environments within schools. These interventions included multi-component strategies that involved direct audit and feedback models for schools [37; 38; 39; 40], as well as incentive schemes such as the *Heart Foundation*

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Heartbeat Award [35]. Dietitians and/or nutritionists were primarily involved in assessing and coding school menus based on the specified criteria of the school food guidance.

Study Quality and Risk of Bias

Overall, the quality of the 11 cross-sectional studies were assessed as high, meeting more than 75% of the JBI [34] criteria (supplementary file A), with well-defined methodologies and appropriate analyses. The identification and control for confounding factors was limited among five of the included studies [27; 29; 30; 35; 37] whereas others employed multivariable regression models for better confounder control. Outcome measurements were consistently clear, assessing compliance with state/country specific healthy food and drink policies. There was only one cohort study assessed as having moderate levels of bias due to lack of clarity around exposure measurements and follow up [36]. The three randomised controlled trials were assessed as having low levels of bias [38; 39; 40]. Due to the proposed interventions, it was not feasible for schools to be blinded to their 'treatment' arm. School canteen menus were provided by canteen managers which may introduce reporting bias; however, this was done prior to randomisation into control or intervention arms which may have lessened the effect. All menus were analysed by dietitians blind to allocation groups using validated methods to reduce assessment bias.

Compliance with Government Healthy Food Guidelines for Schools

Compliance with healthy school food guidelines across all studies was low. On average, 'green' food items represented between 12.1% - 70.0%, 'amber' food items between 28% - 57.7%, and 'red' food items between 2% - 40% based on menu analyses completed by dietitians according to the state/country specific school food policy. New Zealand schools had the lowest compliance with the healthy food and drink policy with up to 40% of canteen menu items categorised as 'red' food items [27]. In Australia, a recent assessment of Victorian schools found that 94% of school menus still contained a 'red' or 'banned' food item [41]. Schools in Western Australia had the highest levels of compliance with healthy food and drink policy with 48% of school canteen menus meeting all three traffic-light targets (≥60% 'green' items, ≤40% 'amber' items and have no 'red' items) [29]. Western Australia is the only state to set clear targets on the proportion of menu items that may be offered in each traffic-light category as opposed to qualitative descriptions such as 'majority to be green' [29] and this may have led to higher compliance.

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Barriers to a Healthy School Canteen

Socioeconomic Deprivation

Schools in affluent areas across Australia had lower odds of offering 'red' food items such as sugary drinks, meat pies and other savoury pastries [42]. Similarly, logistic regression models found that schools in lower socioeconomic areas in Victoria, Australia were 1.3 times more likely to have 'red' food items on the menu compared to schools in higher socioeconomic areas [36]. A modest but significantly lower percentage of 'green' food items were also found in New Zealand schools in areas of high deprivation compared to those in areas of low deprivation (14.2% vs 8.6%) [27]. Although not statistically significant, similar results were reported in New South Wales (NSW) schools where a smaller proportion of schools in disadvantaged areas reported having a menu that primarily consisted of healthier items [43].

School characteristics

Medium-sized schools across Australia had lower odds of offering potato chips and other packaged savoury snacks, as well as sugary drinks compared to small schools [42]. Similarly, the odds of having a 'red' item on the menu was 1.9 times higher for small schools compared to large schools in Victoria [36]. Small schools in New Zealand also provided a lower percentage of 'green' foods (7.1%) and a higher percentage of 'red' foods (61.5%) compared to medium and large schools [27]. The odds of having 'red' food items were higher in non-government schools and rural schools in Victoria [36]. However, an earlier and similar study in Victoria reported no significant differences in school food menus in government and non-government schools [28]. Secondary schools across multiple Australian states were less likely than primary schools to meet the requirements of the healthy food and drink policy, and more likely to offer 'red' food items on their school menus [28; 29; 30].

Variability in School Guidelines

School-based guidelines and policies regarding the availability of nutritious food options show considerable variation [25; 42]. Some policies prohibit the sale of specific products like soft drinks, while others place limits on the proportion of unhealthy foods, such as deep-fried items [25]. Recommendations for menu composition also differ, ranging from strict requirements for a majority of 'everyday' options to more flexible guidelines suggesting at least 50% of healthier choices [42]. However, all policies agree on not selling 'red' foods and certain energy-dense, nutrient-poor items like confectionery and sugary drinks. The

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classification of sugary drinks varied across Australian states, with some definitions encompassing a wider range of beverages [42]. Notably, while the healthy food and drink policy for schools is mandated in most states of Australia there is currently no monitoring or consequences in place for schools that fail to uptake and adhere with these guidelines [38].

Enablers of a Healthy School Canteen

Improved Availability, Clear Targets, and Monitoring Systems

Limiting the availability of foods and beverages with low nutritional value or increasing the availability of products with high nutritional value, could have a positive impact on child nutrition. General linear models predicted that as the availability of healthier items on a canteen menu increased, so did the purchasing of these items [25]. It has been suggested that in order for the majority of students to purchase healthier foods, a menu would need to consist of over 70% 'green' items [25]. Many Australian states have a defined amount of 'green' food items that should be available on the menu ranging from 50% to >75%, yet few define the proportion of 'amber' foods that should follow (Table 1).

Western Australia stands out from other states in Australia by setting clear and stringent targets for the proportion of menu items that can be offered in each traffic-light category [29]. The criteria imposed in Western Australia has shown that having quantifiable targets (>60% 'green' items, <40% 'amber' items, and no red items) led to a greater level of success in compliance with the policy, particularly in primary schools (89% meeting that target) [29]. Additionally, school principals are mandated to assess canteen menus each year and submit findings to the relevant government department, which has contributed to a high level of compliance. Enforcement is critical for policy adoption, implementation, and subsequent impact [29; 38]. Only two other Australian states, New South Wales and Queensland, had implemented monitoring systems, albeit on a voluntary basis and utilising self-assessment tools [25; 42], and may explain the lower level of compliance with the subsequent healthy food and drink policies for schools.

School Characteristics

The provision and promotion of healthy food and drinks in schools can be influenced by several school characteristics. For instance, larger schools and those situated in affluent areas in NSW and across New Zealand offered more 'green' food items [27; 36; 43] . However, other studies in NSW, including those by Nathan *et al.* [38] and Reilly *et al.* [37], found no significant

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association between school size and the availability of healthy food. Contrastingly, Haynes *et al.* [42] reported that large schools across several Australian states had lower odds of meeting the menu guideline of at least 50% green items compared to small schools. Primary schools in Western Australia were found to have higher compliance with canteen guidelines and were more likely to offer plain milk and fruit than secondary schools [29].

Several studies across NSW and Victoria [28; 37; 43] found that government schools were more likely to have menus that comply with policies than catholic or independent schools. Government schools in NSW were also more likely to prioritise healthy food placement at eye level and implement comprehensive canteen policies whereas non-government schools had lower odds of doing the same [43]. Both medium and large schools in NSW were more likely to position healthy foods prominently, with medium schools also implementing comprehensive canteen policies that covered pricing, promotion, and availability of healthy options [43].

Feedback Models and Incentivisation

Findings suggest that a multi-strategy intervention which includes training, performance monitoring, feedback, telephone, and text messaging support can improve schools' implementation of healthy canteen policies [37; 38]. In one study conducted in NSW, this type of intervention was found to be helpful by over 45% of canteen managers surveyed, with menu audit and feedback reports rated as the most helpful component [39]. Feedback models have the potential to influence school food availability and food sales. In New Zealand, the introduction of the Heartbeat Award[1] resulted in an increase in sales of sandwiches and filled rolls, and a decrease in sales of doughnuts and cream buns [35]. Audit and feedback cycles implemented in several Australian states were shown to be positively associated with a higher proportion of schools having menus without 'red' or 'banned' items, and with menus where more than 50% of items were classified as 'green' compared to schools that did not have any feedback models [37; 38; 39; 40]. It is likely that more than one contact is needed to maximise the effectiveness of audit and feedback interventions and the use of telephone and text messaging support can enhance the scalability of the intervention, making it easier to implement on a larger scale.

[1] an incentive scheme by the New Zealand Heart Foundation where if schools implemented nutrition policies and a greater selection of healthy food choices for students they could then apply for a “Heartbeat Award”.

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Food Purchasing and Consumption

Study Design and Population

Ten studies were included in the exploration of strategies for enhancing school food environments and promoting healthier food purchasing and consumption (Table 5). Eight were conducted in Australia across several states, and two conducted in New Zealand. One compared traditional and online canteen ordering, evaluating menu characteristics and nutritional content [44], while four studies modified online ordering systems to encourage healthier choices [45; 46; 47; 48]. Two studies implemented interventions using policy support, training, and recognition [39; 49]. Additional studies employed implementation support strategies [35], used image data for assessment [50], and conducted telephone interviews and menu audits to understand student purchasing behaviour and improve school food environments [25]. Study populations differed depending on the aims of the intervention. Those where schools were the focus had a range of n=6-202 schools participating, whereas those where students were the focus had a population of n=158-2714 students.

Study Quality and Risk of Bias

Overall, the quality of the four cross-sectional studies were assessed as high, meeting 75% or more of the JBI criteria (supplementary file A), with appropriate methodologies and analyses. Identification of confounding factors and controlling for these were limited in two out of the four studies [35; 50], whereas the other two utilised multivariable regression models for better confounder control [25; 50]. There were six randomised controlled trials which were assessed as having low levels of bias [39; 45; 46; 47; 48; 49]. Due to the type of interventions, which ranged from multicomponent feedback models for schools to modifications in online ordering systems, blinding of schools to their assigned ‘treatment’ arm was not feasible. Three studies used online software capturing student purchases which minimised reporting bias [44; 45; 48], and four studies assessed purchasing through direct observation [25; 39; 44] or wearable cameras [50]. One study used a validated online survey to assess nutritional intake [49], and another relied on staff-reported sales data [35] which may have introduced some reporting bias. To reduce assessment bias, all menus were analysed by dietitians who were blinded to the allocation groups and used validated methods.

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Factors Influencing Food Purchasing and Consumption

Food availability

In a study involving 38 schools in NSW, despite similar access to 'green' and 'amber' food items, 'amber' items were purchased at a significantly higher rate than 'green' items [25]. General linear models indicated that for students to favour 'green' items (>50% of purchases), the menu should consist of over 70% 'green' items (R^2=0.66). Additionally, each 1% increase in 'green', 'amber', or 'red' items led to a 1.21%, 1.35%, and 1.67% increase in purchasing, respectively [25]. The results suggest that restricting low-nutritional-value items or increasing high-nutritional-value options in a school canteen could significantly impact purchasing behaviours. An analysis where students in New Zealand used wearable cameras found that the availability of core drinks (water and milk) was 12 times that of non-core drinks (SSBs: sugary carbonated beverages, flavoured milk, fruit juice, or fruit smoothies) on school days and core beverages were more frequently consumed compared to non-core drinks [50]. Almost all (94.1%) the children's purchases however were for non-core drinks whether within the school or outside the school [50].

Contrastingly, in an analysis of online and paper-ordering canteen models in NSW, both systems offered similar proportions of 'everyday', 'occasional', and 'should not be sold' foods: online systems had 68% 'everyday', 17% 'occasional', and 15% 'should not be sold' foods, while paper systems had 67% 'everyday', 18% 'occasional', and 6% 'should not be sold' foods. Despite the online system having a marginally higher percentage of 'should not be sold' foods, there were no significant differences in the types of foods purchased between the two systems [44].

Healthy Food Promotion

Promoting healthy foods in canteens may have a positive effect on children's food choices. Decreases in children's consumption of saturated fat and total energy were observed when principles of 'choice architecture' were applied to online school-canteen ordering systems in NSW which included changes to menu labelling (using coloured symbols for 'everyday', 'occasional', and 'caution' or 'green', 'amber', 'red' according to the state-specific food policy), positioning healthier foods more prominently, prompting for healthier food choices, incentives with a reward symbol or text, and providing feedback to users on their choices [12; 45; 47]. During an eight-week analysis of the intervention outcomes, notable differences emerged in the distribution of 'green' and 'red' items between the intervention and control

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schools [45]. Student purchases from the intervention schools displayed a significantly higher proportion of ‘green’ food items (51.21% compared to 37.93% in control schools) and a markedly lower proportion of ‘red’ food items (1.21% versus 11.11% in control schools) [45]. Despite similar availability in the online school-canteen ordering system, in a subsequent 18-month follow-up of the same intervention, the intervention schools exhibited a 3.8% increase in purchases of 'everyday' items and a corresponding 2.6% decrease in purchases of 'caution' items in contrast to the control schools, with no significant differences in ‘occasional’ food item purchasing [48].

A similar intervention study in NSW which targeted an in-school canteen model aimed to change the availability and placement of SSB by removing it from eye level and displays, reducing the promotion of SSB, changing the price to make them more expensive compared to ‘occasional’ and ‘everyday’ beverages, and increasing the availability and promotion of water found that there were no significant changes to SSB consumption by students after a three-month intervention period [49]. Differences between the online-ordering system and the in-person canteen models could be attributed to consumption and environmental behaviours, particularly peer-influence and personal preferences of students versus an online-ordering model where parents may have more control over foods purchased for the child.

School Incentivisation

An evaluation of the Heartbeat Award, which New Zealand schools could earn if they improved the variety and nutritional value of the food provided within the school canteen, showed that more awards significantly correlated with increased sales of sandwiches and filled rolls (76.7% more), and decreased sales of unhealthy items like doughnuts (28.4% less), pies (46.3% less), crisps (24.7% less), and sweets (26.8% less) [35]. Schools participating in the programme over time and achieving subsequent Heartbeat awards reported further reductions in unhealthy food sales and increased sales of healthier options. Overall, the findings suggest that the Heartbeat Award programme in New Zealand positively impacted children's food consumption by increasing the availability and sales of healthier options while reducing the consumption of unhealthy items.

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Discussion

The aim of this review was to evaluate the effectiveness of government-implemented school food guidance on school food availability, canteen purchasing, and consumption in New Zealand and Australian primary, intermediate, and secondary schools. Findings revealed a low compliance with healthy school food guidelines across the studies, with few schools fully eliminating 'red'/'banned' food items from school canteens. Contrasting guidelines across different territories meant that there were challenges to policy adherence and varying degrees of restrictions on specific products. However, there was an overall theme across the guidelines to remove 'red' and 'caution' foods altogether, making the healthy choice the only available option. Small schools, which tended to offer more 'red' food items on their menus, may need additional support compared to larger schools that generally have greater resources and capacity to implement healthy canteen initiatives.

Schools may have concerns that canteen profits and school revenue could be impacted by providing more healthy options and less unhealthy options which are more appealing to the demographic [51]. However, where canteen revenue was assessed in the present review, there were no significant changes to revenue over time between schools who had improved their school canteen, and those who had not [39; 45; 46; 47]. This perceived school barrier could be appeased through pricing policies by implementing strategies to subsidise or reduce the cost of healthy menu items and disincentive 'red' food items by marking them up, subsequently encouraging healthier choices [13].

The mode of delivery could also play a role in the food choices of children. Online versus in-person canteen models revealed differing outcomes from similar intervention strategies, possibly due to the influence of personal preferences, parental oversight, and peer influences in the school environment. Online canteen ordering systems have the ability to implement promotional strategies, feedback, and incentives, and likely have parental oversight that would not be feasible for in-person models [45; 48]. Peer modelling and education are potential strategies to work around this. Implementing peer-led campaigns showcasing healthy eating as the social norm could encourage students to opt for healthier choices at school as evidence suggests that children are more likely to engage in either healthy or unhealthy eating behaviours depending on what is favoured in their environment [52; 53].

Concerningly, schools in marginalised areas were more likely to offer unhealthy food items on their school canteen menu compared to schools in affluent areas [27; 36; 42]. There is a strong

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association between neighbourhood deprivation and access to unhealthy food outlets in New Zealand [54]. The density of junk food outlets and unhealthy food advertising around schools might create a challenging environment for school canteens, potentially discouraging the provision of healthy food items [55]. Additionally, surveys indicate that children in areas of high deprivation are less likely to meet their fruit and vegetable intake targets, and more likely to consume SSBs and takeaways [56]. This underscores the potential concerns in schools within the most neglected areas regarding the acceptability and familiarity of healthy foods. Addressing these disparities is essential for ensuring equitable access to nutritious food choices and could have the greatest positive impact in underprivileged areas.

Multi-component interventions are crucial given the complexity of implementing effective healthy food and drink policies in school settings. Theoretical frameworks such as the Theoretical Domains Framework (TDF) and the Diffusion of Innovation theory provide a basis for understanding behavioural, contextual, and organisational factors that influence policy implementation. The success of multi-component interventions that integrate leadership support and engagement, staff training and education, provision of tools and resources, and performance monitoring have been shown to improve the implementation of healthy food and drink policies within schools [37; 38; 39]. A key commonality among these theoretical frameworks for policy implementation is the use of feedback cycles and audits to support policy adoption and implementation. Addressing multiple elements, including the provision of necessary tools and human resources for monitoring rather than relying solely on policy implementation, can more effectively overcome barriers to change.

The Heartbeat Award programme in New Zealand highlighted the effectiveness of a school incentivisation scheme in promoting healthier options and reducing unhealthy consumption. Telephone-based monitoring and feedback systems could serve as a practical tool for ongoing support. Offering opt-in schemes that incentivise schools to participate could also foster a sense of accountability. Awards and recognition for schools that consistently maintain healthier canteen environments could further motivate schools to sustain their efforts. By coupling incentives with monitoring and feedback models, a culture of continuous improvement can be established, leading to lasting changes in school food environments.

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Limitations

Several limitations must be considered when interpreting the findings of these studies. Self-selection bias is likely to have played a role in many of the reported studies. Self-report measures are susceptible to social desirability bias, wherein respondents may provide answers they perceive as aligning with the researcher's expectations. As a result, school representatives and canteen managers providing reports on the healthfulness of their school menus and food availability may be more likely to be those who have a greater interest in health and nutrition, and a stronger motivation to follow the policy compared to those who did not participate in the studies.

Although sourcing the menus directly from school websites/online sources may reduce self-reporting and sampling bias, it does then result in restrictions on the types of menus available. For example, not all schools have an online presence or their menu available for download, particularly under-resourced schools. Additionally, online menus may fail to display the full extent of the school menu, additional items for sale on certain days of the week, and seasonal variances in menus, particularly in cross-sectional analyses taking data from one time point. This may provide bias towards a healthier canteen model, particularly if schools are aware that they are being monitored for their compliance of a healthy food and drink policy in that area.

All studies utilised a nutrition professional (either a nutritionist or dietitian) to analyse menus for compliance with a healthy food and drink policy. This is deemed the most appropriate way to accurately analyse a large group of menus. However, without additional information on ingredients, nutrient composition, and cooking methods, many categorisations by the researchers were biased towards a more positive picture of the nutritional quality of canteen menus, particularly for 'inconclusive' menu items which in many circumstances were assigned to a healthier category/rating.

This review demonstrates several key strengths. It employed a systematic and comprehensive review approach which, developed in consultation with a research librarian, ensured a thorough examination of the literature. Selection bias was minimised through the independent screening of studies by two researchers which enhanced the reliability of study inclusion. Methodological quality of the included studies were also assessed using validated methods, adding robustness to the evaluation of the evidence. However, this review has several limitations that should be also considered. The search strategy, though comprehensive, was

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restricted to three electronic databases which might not cover all relevant literature. Additionally, the decision to exclude grey literature might have overlooked valuable insights that are not published in peer-reviewed journals but still relevant to the topic such as PhD/Masters' theses and government-led reports. The exclusion of early childhood and tertiary education institutions may also limit the generalisability of the findings. Due to the limited data available in New Zealand, and significant contribution of data from Australia, in particular NSW, it is important to acknowledge that findings may not reflect the unique context and challenges faced by schools in New Zealand.

Future Directions

The generalisability of many of these studies is limited due to the variance in the healthy food and drink policies and small sample sizes. Although, similarities in food provision systems in New Zealand and Australia are striking, the data suggests that there is a need for more comprehensive New Zealand-based studies to investigate food availability within schools, compliance with government guidance, and the impact on student purchasing behaviours. Assessing the wider school food provision system may also provide insights particularly for special events, sports days, and field trips where menu deviation may occur. Examining key stakeholder responses and canteen revenue in response to the school canteen policy changes may also yield valuable perspectives on acceptability and future compliance.

Recommendations for Policy and Practice

New Zealand's limited research on school food environments highlights a need for more studies on this topic. Utilising data from Australian research provides valuable insights and strategies that can be applied to the New Zealand context, helping to improve the implementation and compliance with healthy school food policies. Key recommendations for policy and practice are outlined below:

- Reinstate the clause in the National Administration Guideline for "*only* healthy food" to be provided in schools, and mandate healthy food guidelines in schools.
- Adopt stringent guidelines with clear targets for 'green', 'amber', and 'red' foods. Develop guidelines that help schools to strategically phase out unhealthy food items.
- Increase targeted support and resources for schools in marginalised areas to address disparities and ensure equitable access to healthy food options.

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- Establish robust monitoring systems for compliance with healthy food policies such as annual or bi-annual reports and menu audits.
- Provide schools with external support to implement healthy food policies including feedback models, training, and resources, as well as support to assess the nutritional quality of foods available, and how to promote healthy foods in school canteens or through online-ordering systems.
- Develop and encourage incentive schemes to motivate schools to comply with new food policies.

Conclusion

The analysis highlights the complexity of factors influencing school food availability, compliance with guidelines, and strategies to promote healthier food choices. While challenges such as varying guidelines and socioeconomic disparities persist, clear targets, multi-component interventions, and school incentivisation emerge as promising strategies for creating healthier school food environments and influencing students' food purchasing and consumption behaviours.

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Table 1. Food and drink policies in New Zealand and Australia for studies included in this review.

Country/State	Policy Name	Mandated/Voluntary	Policy Type
National: New Zealand	Food and Beverage Classification System (2007-2020)	Voluntary. The board of trustees is required to promote healthy food and nutrition for all students [57].	Categorical system (Everyday, Sometimes, Occasionally). Specific policy recommendations were unable to be retrieved as the policy has been superseded.
	NZ Healthy Food and Drink Guidance for Schools (2020)	Voluntary. The board of trustees is required to promote healthy food and nutrition for all students [57].	Traffic Light System (Green, Amber, Red). Green items should make up >75% of the menu. Amber items should not dominate the menu. Red items are not available.
National: Australia	National Healthy School Canteen Guidelines (2008)	Mandatory for public schools. Voluntary for independent schools.	Traffic Light System (Green, Amber, Red). Green foods available everyday. Amber foods less prominent on the menu. Red foods not provided.
New South Wales, Australia	NSW Fresh Tastes @ School (2005-2017)	Mandatory for public schools. Voluntary for independent schools.	Traffic Light System (Green, Amber, Red). More than 50% green food items. Amber foods must not dominate the menu. Removal of all red foods.
	NSW Healthy School Canteen Strategy (2017)	Mandatory for public schools. Voluntary for independent schools.	Categorical System (Everyday and Occasional). Everyday foods should make up 75% of the menu. Occasional foods no more than 25%. No sugar-sweetened beverages.

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Victoria, Australia	School Canteens and other Food Services Policy Supported by the Go for your life – Healthy Canteen Kit Food Planner (2006)	Mandatory for public schools.	Traffic Light System (Green, Amber, Red, Black). Menus should contain >50% green. Amber foods should not dominate the menu (<50%). Red items should not be included but can be sold on up to two occasions during each of the four school terms. Black items are completed banned.
Western Australia	Western Australia Healthy Food and Drink Policy (2017)	Mandatory for public schools.	Traffic Light System (Green, Amber, Red). Minimum 60% green food items. Maximum 40% amber food items. Red items are not included on the menu.

Abbreviations: NZ, New Zealand; NSW, New South Wales.

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Table 2. Search terms and strings used in the integrative review: food availability.

	Kura OR School* OR Primary School* OR Secondary school* OR College* OR Intermediate school* OR Educat*
AND	Polic* OR Intervention* OR Program*OR Promot* OR Guid*
AND	Food* OR Nutri* OR Diet* OR *Drink
AND	Availab* OR Access* OR Provis*
AND	Canteen*OR Menu*OR Food Service* OR Tuckshop* OR Vending OR Outlet* OR Cater*
AND	Australia* OR Zealand*

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Table 3 Search terms and strings used in the integrative review: food purchasing and consumption.

	Kura OR School* OR Primary School* OR Secondary school* OR College* OR Intermediate school* OR Educat*
AND	Polic* OR Intervention* OR Program*OR Promot* OR Guid*
AND	Food* OR Nutri* OR Diet* OR Drink*
AND	Availab* OR Access* OR Provis* OR Cost* OR Pric*
AND	Canteen* OR Menu* OR Food Service* OR Tuckshop* OR Vending OR Outlet* OR Cater*
AND	Purchas* OR Buy* OR Eat* OR Consum*
AND	Australia* OR Zealand*

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Table 4: Studies Assessing Food Policies and School Food Availability in New Zealand and Australia

Author	Title	Design	Sample	Intervention	Outcomes
Pillay, *et al. (2023) New Zealand*	Food menus within New Zealand primary school canteens: Do they meet the guidance?	Cross-sectional.	133 primary school menus across New Zealand collected in 2020 were assessed.	Ministry of Health Food and Drink Guidance for Schools (2020). Voluntary. Traffic-light system.	Most menu items belonged to the less healthy amber (41.0%) and red (40%) food categories. Green food items made up 12.5% of school canteen menus.
Hill, *et al. 2023 (Australia)*	How healthy and affordable are foods and beverages sold in school canteens? A cross-sectional study comparing menus from Victorian primary schools.	Cross-sectional.	48 primary schools in Victoria, Australia, taken from previous obesity prevention studies provided menus between 2016 and 2019.	School Canteens and Other School Food Services Policy (2006). Mandatory for public schools. Traffic-light system.	21% green food items, 53% amber food items, 25% red food items, and 2% black food items. Overall, 94% of canteen menus included at least one red or black food item.
Haynes, *et al. 2021 (Australia)*	Secondary school canteens in Australia: analysis of canteen menus from a repeated cross-sectional national survey.	Cross-sectional.	300 participating secondary schools, 244 provided a copy of the canteen menu. From NSW, VIC, QLD, Western Australia, South Australia, Tasmania, Northern Territory, and Australian Capital Territory. Samples taken from the	National Healthy School Canteen Guidelines (2008). Mandatory for public schools. Traffic-light system.	Half of the menus evaluated met the guideline (at least 50% 'green' items). Only one did not have any 'red' items available for purchase. The availability of discretional product categories declined between 2012-2018, although the only statistically significant reduction was seen in the availability of potato chips from 59.5% to 30.2% (p=0.01).

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			2012/2013 and 2018 National Secondary Students Diet and Activities surveys.		
Reilly, *et al. 2021* (Australia)	Secondary school implementation of a healthy eating policy.	Cross-sectional.	53 secondary schools in NSW (25 Catholic schools and 28 Government) provided a copy of the canteen menu. Data was collected between September – November 2017.	NSW Healthy School Canteen Strategy (2017). Mandatory for public schools. Foods classified as 'everyday' or 'occasional'. SSB banned.	Percentage of "Everyday items" on average was 54% (<75% recommended by the policy). No menus met all the criteria for food and beverage classification on menus.
Myers, *et al. 2019 (Australia)*	Objective assessment of compliance with a state-wide school food-service policy via menu audits.	Cross-sectional.	136 schools in Western Australia (primary and secondary) had a menu available for analysis. Data was collected in September 2017.	WA Healthy Food and Drink Policy (2017). Mandatory for public schools. Traffic light system.	48% of school canteen menus met all three traffic-light targets. Primary school canteens had higher levels of compliance compared to secondary schools.
Reilly, *et al. 2018 (Australia)*	Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy: findings of an intervention trial.	Non-controlled before and after study.	Primary schools located in NSW. 168 schools provided their menu for assessment, follow up had 157 school menus. Data was collected in February – April 2016 (baseline), and November – December 2016 (follow up).	NSW Fresh Tastes @ School Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system. All schools provided with the intervention. Intervention strategies involved leadership support, consensus processes, education, tools and resources, implementation support, audit and feedback.	35% of schools at follow-up (compared to 17% at baseline) complied with the NSW state policy.

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Clinton-McHarg, *et al. 2018 (Australia)*	Availability of food and beverage items on school canteen menus and association with items purchased by children of primary-school age.	Cross-sectional study part of a larger RCT.	38 government primary schools from NSW participated in the study. Data was collected from 2013-2015.	NSW Fresh Tastes @ School Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system.	47.9% of canteen items were classified as 'green' (less than the 50% requirement), and 4.7% of items classified as 'red'.
Wolfenden, *et al. 2017 (Australia)*	Multi-strategic intervention to enhance implementation of healthy canteen policy: a randomised controlled trial.	Randomised controlled trial.	124 Primary schools in NSW were selected. 70 eligible menus included (35 schools each randomised to either control or intervention arm). Data was collected from April to September 2013 (baseline) and November 2014 to April 2015 (follow-up).	NSW Fresh Tastes @ School Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system. Multi-strategic intervention provided to intervention schools: implementation support, executive support, consensus processes, training, tools and resources, monitoring, and feedback. Control schools included.	Intervention schools significantly more likely to have menus without 'red'/banned items, and to have at least 50% menu items classified as 'green' foods compared to controls. Purchases made by students were significantly lower in fat in intervention schools.
Nathan, *et al. 2016 (Australia)*	Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial.	Group randomised controlled trial.	53 primary schools in NSW (28 intervention, 25 control). Data collected in May/June 2014 (baseline) and May/June 2015 (follow-up).	NSW Fresh Tastes @ School Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system. The study interventions were informed by Theoretical Domains Framework (TDF) and implemented in intervention schools over 9 months included support, tools, and resources.	Intervention schools more likely to have a menu without 'red'/banned food items, and more likely to have at least 50% menu items classified as 'green' compared to control.
Yoong, *et al. 2016*	CAFE: a	Single-	72 primary schools in	NSW Fresh Tastes @ School	Proportion of schools without

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(Australia)	multicomponent audit and feedback intervention to improve implementation of healthy food policy in primary school canteens: a randomised controlled trial.	blinded, parallel group randomised controlled trial.	NSW consented to receiving support (36 school each randomised to control or intervention arm). Data was collected in February-October 2013 (baseline) and September 2014-January 2015 (follow-up).	Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system. Intervention schools provided with an audit and feedback strategy to support the implementation of the policy.	'red'/banned items on their menu was not statistically different form the proportion of control schools. Compared to control schools, intervention schools were more likely to have a lower % of 'red' food items, and higher % of 'green' food items.
Hills, *et al. 2015 (Australia)*	Improvement in primary school adherence to the NSW Healthy School Canteen Strategy in 2007 and 2010.	Prospective cohort study.	265 primary school menus in NSW were provided for assessment. Data was collected between 2007-2010.	NSW Fresh Tastes @ School Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system.	The proportion of schools with no red items increased between 2007-2010. 22% of schools adhered to the guidelines in 2010.
Yoong, *et al. 2015 (Australia)*	Assessment of the School Nutrition Environment: A Study in Australian Primary School Canteens.	Cross-sectional.	170 primary school menus were obtained in NSW. Data was collected between 2012-2013.	NSW Fresh Tastes @ School Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system.	29% of menus consisted of >50% 'green' food items, 25% sold banned drinks. Only 11% of schools had menus that did not contain unhealthy foods.
Woods, *et al. 2014 (Australia)*	Australian school canteens: menu guideline adherence or avoidance?	Cross-sectional	263 school (primary and secondary) menus sources and assessment from multiple states in Australia. Data was collected between June and August 2012.	Assessed compliance with the state-specific Healthy School Canteen Policy. Mandatory for public schools. Traffic light systems.	Across all schools, green items ranged from being 7-64%, and red items being 0-29% availability.
Silva-Sanigorski, *et*	Government food	Cross-	132 schools across	School Canteens and Other	36.8% of schools included

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al. 2011 (Australia)	service policies and guidelines do not create healthy school canteens.	sectional.	Victoria. 106 menus available for analysis. Data was collected in 2008 and 2009.	School Food Services Policy (2006). Mandatory for public schools. Traffic-light system.	banned items. Government schools were more likely to comply with the policy compared to non-government schools. No school had a menu with >50% green items as recommended. Only one menu contained no red items. No menu complied with both the SCFS policy and the traffic light-based guidelines.
Carter, *et al. 1999 (New Zealand)*	Measuring the impact of a school food programme on food sales in New Zealand.	Cross-sectional.	Sample included 232 schools in NZ that had received a Heartbeat Award. 130 operated a canteen, 72 had a lunch ordering service. Data was collected from January 1996 to December 1997.	The Heart Foundations School Food Programme (Heartbeat Award) aligned with the "Healthy Eating – Healthy Action" strategy [58].	The more Heartbeat awards a school had, the more likely they were to report more sales of sandwiches and filled rolls, and fewer sales of doughnuts and cream buns, sausage rolls, chips, and sweets (R^2=0.76-0.92).

Abbreviations: NZ, New Zealand; NSW, New South Wales; VIC, Victoria; QLD, Queensland; WA, Wales; RCT, randomised controlled trial; TDF, theoretical domains framework; SCFS, School Canteens and Other Food Services.

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Table 5: Studies Assessing Food Policies and School Food Purchasing in New Zealand and Australia

Author	Title	Design	Sample	Intervention	Outcomes
Delaney, *et al. 2023 (Australia)*	Exploratory analysis of a cluster randomized controlled trial of a multi-strategy intervention delivered via online canteens on improving the nutritional quality of primary school students' pre-ordered foods & drinks at recess.	Cluster randomised controlled trial.	8 government primary schools in NSW with a total of 485 participants at baseline (aged 5-12 years). Data was collected at baseline (July – September 2016) and follow up (October- - December 2016).	A follow on of the 'Click and Crunch High Schools' intervention which utilises choice architecture through online menu ordering by adding menu labelling, changing the positioning of menu items, providing feedback, and prompts. Assessment of total energy, saturated fat, sugar, and sodium content of lunch orders, as well as compliance with the NSW Fresh Tastes @ School Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system. .	After 2 months, student recess orders in the intervention group were significantly lower in energy, saturated fat, and sodium compared to control. The proportion of 'green' food items purchased increased for students in the intervention group, however there were no significant differences in 'green' food items between intervention and control groups.
Delaney, *et al.* 2022	The efficacy of a	Cluster	9 secondary schools in	The 'Click and Crunch High	After 2 months, there was a

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(Australia)	multi-strategy choice architecture intervention on improving the nutritional quality of high school students' lunch purchases from online canteens (Click & Crunch High Schools): a cluster randomized controlled trial.	randomised controlled trial.	NSW (6 independent, 3 government) with a total of 1331 students at baseline and 999 students at follow up. Baseline data was collected between October – December 2020. Follow up data collected from February – April 2021.	Schools' intervention which utilises choice architecture through online menu ordering by adding menu labelling, changing the positioning of menu items, providing feedback, and prompts. Assessed against the NSW Healthy School Canteen Policy (2017).	significant increase in 'Everyday' items (5.5%) and a reduction in 'Should not be sold' items (4.4%) per student in the intervention arm compared to the control arm. No differences were observed for energy, sugar, and sodium consumption.
Sutherland, *et al. 2022 (Australia)*	A cluster randomised controlled trial of a secondary school intervention to reduce intake of sugar-sweetened beverages: Mid-intervention impact of switchURsip environmental strategies.	Cluster randomised controlled trial.	6 secondary schools in NSW were included (2 catholic, 4 independent). The study included 862 secondary school students in NSW. Baseline data collected in March/April 2018, and follow up in June/July 2018.	Intervention targeted SSB availability, placement, promotion, and pricing, as well as increased availability and promotion of water. Control schools continued as normal.	At 3-months mid-intervention, no significant differences were observed for mean daily SSB consumption. Significant effects were observed among girls.

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Leonard, *et al. 2021 (Australia)*	Investigating differences between traditional (paper bag) ordering and online ordering from primary school canteens: a cross-sectional study comparing menu, usage and lunch order characteristics.	Cross-sectional.	A sample of 6 primary schools (3 government, 2 catholic and 1 independent) across NSW were included. Data was collected between May and June 2019.	A cross-sectional analysis of the differences between quantity and nutrition quality of lunch orders placed based on paper menus or online menus. Assessed against the NSW Healthy School Canteen Policy (2017).	No significant differences between quantity of items and cost of orders, or the nutritional quality of orders between the two ordering systems.
Wyse, *et al. 2021 (Australia)*	Long-term Effectiveness of a Multi-strategy Behavioural Intervention to Increase the Nutritional Quality of Primary School Students' Online Lunch Orders: 18-Month Follow-up of the Click & Crunch Cluster Randomised	Cluster randomised controlled trial.	2207 students (aged 5-12 years old) from 17 non-government schools in NSW randomised to receive either a behavioural intervention or control. Assessed over an 8-week period at baseline (May-July 2018) and 18-month follow up (October-December 2019).	Multi-strategy behavioural intervention embedded within an existing online school lunch ordering system. Assessment of total energy, saturated fat, sugar, and sodium content of lunch orders, as well as compliance with the NSW Healthy School Canteen Strategy (2017). Voluntary for independent schools. Foods classified as ‘everyday’	Orders from intervention schools were lower in energy, saturated fat, but no differences with sugar and sodium. Purchasing of everyday items increased in intervention schools.

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	Controlled Trial.			or 'occasional'. SSB banned.	
Smith, *et al. 2019 (New Zealand)*	Children's healthy and unhealthy beverage availability, purchase and consumption: A wearable camera study.	Cross-sectional.	168 children (aged 11-14 years old) from 16 randomly selected intermediate schools across the Wellington NZ region. Data was collected during school terms from July 2014 to June 2015.	Each child wore a wearable camera (Autographer) all day for four days, Thursday to Sunday.	Findings suggest that the types of beverages children consume reflect the types of beverages that are made available to them.
Clinton-McHarg, *et al. 2018 (Australia)*	Availability of food and beverage items on school canteen menus and association with items purchased by children of primary-school age.	Cross-sectional.	38 government primary schools from NSW participated in the study. Data was collected from 2013-2015.	NSW Fresh Tastes @ School Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system.	Significant positive relationship between the availability and purchasing of 'green', 'amber', and 'red' foods. Each 1% increase in 'green', 'amber', or 'red' foods led to a 1.21%, 1.35%, and 1.67% increase in purchasing, respectively.
Delaney, *et al. 2017 (Australia)*	Cluster randomised controlled trial of a consumer behaviour intervention to	Parallel-group, cluster randomised controlled	10 government schools in NSW with an online ordering system were recruited between July-	Intervention strategies included feedback to improve availability of healthy foods, labelling food items, placement	Intervention schools had lower energy, saturated fat, and sodium in the lunch orders of students compared to control.

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	improve healthy food purchases from online canteens.	trial.	September 2016.All students who placed an order within the two-month period following (October – December 2016) were included. 2714 participants placed an online lunch order (1144 in the intervention group, 1570 in the control group).	of food items, and prompting. Healthy foods assessed against the NSW Fresh Tastes @ School Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system.	
Wolfenden, *et al. 2017 (Australia)*	Multi-strategic intervention to enhance implementation of healthy canteen policy: a randomised controlled trial.	Randomised controlled trial.	124 Primary schools in NSW were selected. 70 eligible menus included (35 schools each randomised to either control or intervention arm). Data was collected from April to September 2013 (baseline) and November 2014 to	NSW Fresh Tastes @ School Healthy Canteen Strategy (2005-2017). Mandatory for public schools. Traffic light system. Multi-strategic intervention provided to intervention schools: implementation support, executive support, consensus processes, training, tools and resources,	Intervention schools significantly more likely to have menus without red/banned items, and to have at least 50% menu items classified as green foods compared to controls. Purchases made by students were significantly lower in fat in intervention schools.

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			April 2015 (follow-up).	monitoring, and feedback. Control schools included.	
Carter, *et al. 1999 (New Zealand)*	Measuring the impact of a school food programme on food sales in New Zealand.	Cross-sectional.	Sample included 232 schools in NZ that had received a Heartbeat Award. 130 operated a canteen, 72 had a lunch ordering service. Data was collected from January 1996 to December 1997.	The Heart Foundations School Food Programme (Heartbeat Award) aligned with the "Healthy Eating – Healthy Action" strategy [58].	The more Heartbeat awards a school had, the more likely they were to report more sales of sandwiches and filled rolls, and fewer sales of doughnuts and cream buns, sausage rolls, chips and sweets.

Abbreviations: NSW, New South Wales; SSB, sugar-sweetened beverages; NZ, New Zealand

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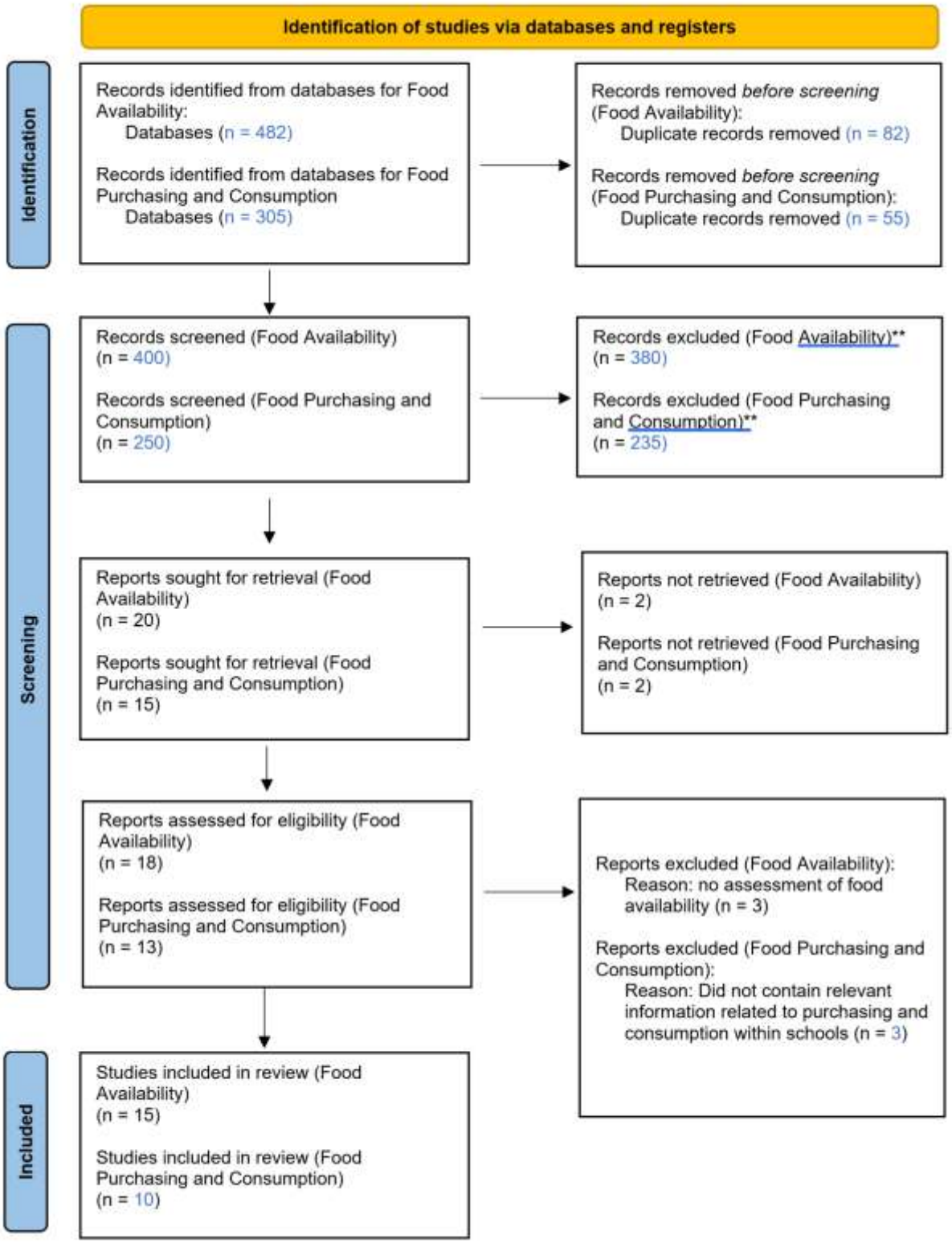

Figure 1 PRISMA Flow Diagram for study selection for 1) Food Availability, and 2) Food Purchasing and Consumption in New Zealand and Australian schools. **Records screened based on title and abstract.

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