

RESEARCH ARTICLE OPEN ACCESS

# New Zealand Early Learning Service Menus Do Not Meet Health New Zealand Guidelines for Providing Healthy Menus and Reducing Food-Related Choking in Children

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**Correspondence:** Ajmol Ali ([a.ali@massey.ac.nz](mailto:a.ali@massey.ac.nz))**Received:** 13 May 2024 | **Revised:** 20 October 2024 | **Accepted:** 13 December 2024**Handling Editor:** Williams Carmel**Funding:** The Healthy Active Learning initiative was funded by the NZ Government. A.A. and C.W. secured funding to undertake the evaluation of the initiative.**Keywords:** children | choking | food environment | health outcomes | healthy eating habits | nutritional quality**ABSTRACT**

**Objective:** To assess alignment of food and drinks served to New Zealand (NZ) children in early learning services (ELS) with the Health NZ (formerly known as Ministry of Health) *Healthy Food and Drink* (HFD) and *Reducing Food Related Choking* (choking) guidance.

**Methods:** Menus (271) collected remotely from 148 ELS from November 2020–March 2021 were analysed for their nutritional quality based on a ‘traffic light’ classification of ‘green’ (most nutritious), ‘amber’ (moderately nutritious) and ‘red’ (least nutritious) based on the guidance.

**Results:** Overall, 2.6% of menus met the guidance, and alignment was greater for menus for over 2-year-olds (over-2s) than under 2-year-olds (under-2s;  $p < 0.01$ ). One-fifth (18.5%) of menus met the *choking* guidance. Services with a *Healthy Heart Award* (HHA) from the Heart Foundation provided more ‘green’ items to over-2s ( $p = 0.039$ ) and under-2s ( $p = 0.01$ ), and less ‘red’ items to over-2s ( $p = 0.04$ ). Providing more green menu items was inversely correlated with providing less high choking risk foods ( $p < 0.01$ ). Menu scores did not vary by service location, neighbourhood socioeconomic deprivation or type (services operating independently versus those part of an education group chain).

**Conclusions:** Alignment with Health NZ nutritional guidance is low, particularly in ELS caring for very young children (under-2s). Service characteristics, except for HHA status, are a poor predictor of nutritional quality of menus at ELS.

**So What:** Greater uptake of the HHA scheme could assist ELS to provide healthier food and drinks. Early learning services need further support from the public health sector to implement national nutritional guidelines.

**1 | Introduction**

Food intake from birth to 6 years is especially important as early life is a period for healthy flavour learning [1], rapid growth [2] and establishing long-term eating patterns [3]. Early learning services (ELS) provide an influential environment outside of the

home where young children consume 50%–75% of their daily nutritional requirements [4].

The early childhood education sector in NZ is diverse, including teacher-led kindergartens, parent-led playgroups and Māori mediums such as te kōhanga reo [5]. With 97.1% of 3- and

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4-year-olds attending ELS at some point before starting school, and time spent in childcare increasing with age [6], these settings have the potential for widespread impact on health promoting behaviours in young children. Nutritious ELS menus can increase children's preferences for healthy foods, help them to maintain a healthy weight and engage with learning [7]. Menu evaluation against recommendations from the Ministry of Health allows for improvement by nutrition promotion in ELS which can help to improve child health through the prevention of childhood obesity, other non-communicable diseases as well as food-related choking.

Understanding the foods and drinks available within ELS is crucial to address health issues young children may face during their formative years, such as an increased risk of choking [8], overweight and obesity [9], and subsequent development of cardiovascular diseases [10] and diabetes [11]. Globally, rates of obesity have nearly tripled since 1975 and 39 million children under the age of five were classified as either overweight or obese in 2020 [12]. According to the 2020/21 NZ Health Survey nearly one-third (30.8%) of children aged two to 14 are either overweight or obese, and infants and children of Māori and Pasifika ethnicity have a higher prevalence of early life risk factors for obesity [13]. Subsequently, while national trends in obesity prevalence among NZ 4-year-olds between 2011/12 and 2015/16 indicated a slight downward trend (−0.24% each year), for Māori and Pasifika children they trended upward by 0.83% and 2.13% per year, respectively [14].

Previous NZ studies have examined ELS food environments from the perspective of food policies and practices [15], food groups [16] and nutrition-related behaviours [17]. Findings indicate that kindergartens are more likely than other service types (e.g., education and care services) to employ nutrition practices such as teaching children nutrition concepts [15] and services involved with the Heart Foundation's *Healthy Heart Award* (HHA; [18]) scheme are more likely to serve healthy food and drinks [16]. The HHA scheme is a voluntary, government-funded ELS nutrition promotion initiative run by the Heart Foundation, providing support to ELS to develop and maintain healthy menus, physical activity policies and food policies. One of three award levels (rito/bronze, whānau/silver and pā-harakeke/gold) can be obtained. Food availability in ELS has not yet been examined using the Health NZ *Healthy Food and Drink* (HFD; [19]), which recommends altering food and beverage provision for under-2s compared with over-2s, or the choking guidance [20].

Therefore, the aim of this study was to assess the alignment of early learning service (ELS) menus with the Health NZ (formerly known as Ministry of Health) *Healthy Food and Drink Guidance-Early Learning Services* and guidance for *Reducing Food-Related Choking for Babies and Young Children at Early Learning Services* and determine whether this differs for menus over-2s and under-2s. (Please note, the national leadership of Healthy Active Learning transitioned to National Public Health Service within Health NZ in 2022. For an international audience we are using Health NZ throughout this paper.)

## 2 | Materials and Methods

A convenience sample of ELS menus was investigated, as part of a baseline analysis for a nationwide health promotion initiative (*Healthy Active Learning*; [21]) where all ELS in the country were invited to participate. *Healthy Active Learning* is a government-led initiative aiming to improve health outcomes for tamariki (children) by building capacity for ELS and schools to promote healthy eating and active play through the provision of education and resources. The Health NZ staff worked with ELS to support and introduce the implementation of the healthy food and drink policies. This study provides an important snapshot of the food environment in NZ ELS prior to the initiation of curriculum and environmental changes through *Healthy Active Learning*.

### 2.1 | Data Collection

The data for this study (ELS menus and supplementary food availability survey) was collected cross-sectionally between November 2020 and March 2021 by the *Healthy Active Learning* project team at Massey University. The overall project received ethical approval by Massey University Human Ethics Committee (NOR 20/07). Both the menus and responses to food availability queries informed the menu analysis.

The names of licensed ELS in NZ were obtained via the website Education Counts, a governmental directory of education services (6 not 18). All ELS with a valid email address on their webpage, or a 'contact us' page were invited to participate. To appeal to as many centres as possible we did not limit our recruitment to those ELS that were working with HHA or HAL advisors. A total of 152 services provided a menu(s) and 161 provided a food availability response which represents 3.2% and 3.4% of all licensed services in the country, respectively ( $n = 4687$ ; as of 2020 according to Education Counts [6]).

The food availability survey was developed using the *School-FERST (Food Environment Review and Support Tool) National Survey* [22] and refined during consultation with representatives from health promotion agencies (the Health NZ and the Heart Foundation), Massey University and the University of Auckland, including Māori and Pasifika cultural advisors. The surveys were pilot tested at an ELS in July 2020, and final versions were uploaded into the secure online survey software tool Qualtrics.

Food availability responses, collected via email, concerned the type of bread used, use of salt in cooking, whether deep-fried foods, sausages/dried meat products, popcorn and vegetables were served to children and whether plain milk and water were the only available drinks. Services were asked to attach a copy of their ELS menu(s), if available. Among 19 services who did not provide a menu, follow up emails were sent between May and June 2022 with a maximum of two emails over 3 weeks and eight additional menus were collected. Early learning services ( $n = 12$ ) who only provided food occasionally (once a week or less), or to supplement the intake of children without food from home were excluded from the analysis sample. Six ELS falsely reported having a HHA (four had signed up but not started the programme and two had expired awards) which was corrected using Heart Foundation records.

## 2.2 | Measures

Service type (e.g., education and care service, kindergarten or playcentre), age-range (over and under-2s) and ‘chain’ versus ‘independent’ status were derived from Education Counts [6]. Neighbourhood socioeconomic deprivation was determined using the 2018 NZ Deprivation scores [23], where deprivation scores are derived from 2018 census data relating to income, home ownership, employment, qualifications, family structure, housing, access to transport and communications. Each ELS was allocated a decile score from 1 to 10 based on their address, and subsequently scores were collapsed into levels of low (deciles 1–3), medium (deciles 4–7) and high deprivation (deciles 8–10; [24]). Urban accessibility was determined using 2022 Urban Accessibility criteria [25]. Menu length (‘full’ or ‘partial’) was determined by the researcher after examining the number of meals and/or snacks provided on menus.

An 8-point menu-scoring criteria was applied (Table 1) based on the Canadian Diet Quality Index (DQI-C; [26]). Part A provided a quality score of 0–3 based on increasing %green, and Part B on decreasing %red. A score of three (‘high’ quality) represented alignment with the Health NZ guidance. The scores were aggregated to give a total menu score of between 0 and 6.

Foods that present a choking hazard, have low nutritional value and/or are not practical to alter to increase safety. This includes foods like:

- Whole nuts or pieces of nuts.
- Large seeds, like pumpkin or sunflower seeds.
- Hard or chewy sweets or lollies.
- Crisps or chippies and corn chips.
- Hard crackers (including rice crackers).
- Dried fruit (except as part of baked items that are classed as amber).
- Sausages, saveloys and cheerios.
- Popcorn.
- Marshmallows.

## 2.3 | Data Analysis

A menu analysis toolkit (‘Early Learning Service Toolkit’) was developed to allow for comparison of each menu with the Health NZ guidance, which is based on a ‘traffic light’ classification of ‘green’ (most nutritious), ‘amber’ (moderately nutritious) and ‘red’ (least nutritious) items. The toolkit is available on request.

Menus were entered and analysed in Microsoft Excel between May and July 2022. When a menu cycle of more than 1 week was provided, the first week in the cycle was analysed. Each menu was broken down into individual meal items (e.g., apple) and mixed meals (e.g., lasagne) and categorised as either ‘red’ (%red), ‘amber’ (%amber), ‘green’ (%green) or ‘uncategorisable’. Items were analysed every time they appeared on the weekly menu, to represent their percentage contribution to food availability. Separate analyses were completed for services that served food and drinks to under-2s and over-2s (this information was derived from Education Counts), as menu item classifications differ for these age groups in the guidance. Menu items that fit the definition of ‘high-choking-risk foods to exclude’ (%high-choking-risk) were also categorised [19].

Uncategorisable items were those where the menu provided insufficient information for a decision between categories [27]. For example, in a ‘roast’ lunch meal that did not specify the cut of meat it was unclear whether this was ‘green’ (no visible fat) or ‘red’ (visible fat). Due to changes in the *Healthy Active Learning* initiative following Covid-19 pandemic disruptions, it was not possible to contact ELS for this information. Therefore, uncategorisable items were discussed among the primary dietetic research team and Health NZ staff were consulted when necessary. In most cases, it was conservatively estimated that the item fit the rating of higher nutritional quality (e.g., green for roast meat; [28]).

## 2.4 | Statistical Analysis

Data was downloaded from Microsoft Excel and analysed in IBM SPSS statistical package version 25 (IBM corporation, New York, USA). Variables were tested for normality using the Kolmogorov–Smirnov and Shapiro Wilk test and

**TABLE 1** | Early learning service menu-scoring criteria.

<b>Part A: Availability of healthy food and beverages (‘green’ items)</b>			
Quality level	Over-2s	Under-2s	Score
High (alignment with guidance)	75%–100%	100%	3
Medium	50%–74%	75%–99%	2
Poor	25%–49%	50%–74%	1
Very poor	Less than 25%	Less than 50%	0
<b>Part B: Exclusion of unhealthy food and beverages (‘red’ items)</b>			
Quality level	Over-2s	Under-2s	Score
High (alignment with guidance)	0	0	3
Medium	Less than 12.5%	Less than 12.5%	2
Poor	12.5%–25%	12.5%–25%	1
Very poor	Over 25%	Over 25%	0
Overall menu score (Part A + Part B)			0–6

Note: Score of 0–6 awarded to each menu based on the combined score from Part A and Part B. Part A score awarded based on percentage of green menu items and Part B awarded based on percentage of red menu items.

homogeneity using the Levene's test. Normally distributed data was expressed as mean  $\pm$  SD (standard deviation) and data not normally distributed was expressed as median [25th–75th percentiles]. Analyses were conducted using *t*-test when comparing means of two groups and ANOVA when comparing three or more groups (normally distributed variables), Mann–Whitney when comparing medians of two groups and Kruskal–Wallis when comparing three or more groups (non-normally distributed variables). Spearman's correlation examined the relationship between two variables.  $p > 0.05$  was considered statistically significant,  $r = 0.1$  was considered a weak correlation,  $r = 0.3$  a moderate correlation and  $r = 0.5$  a strong correlation [29].

### 3 | Results

#### 3.1 | Service Characteristics

Most of the 148 ELS that provided their menu(s) for analysis were education and care services ( $n = 140$ ; 94.6%), seven were kindergartens (4.7%) and one was a playcentre (0.7%). Only 6/148 services (3.8%) were located outside of urban areas, thus both 'ELS type' and 'urban accessibility' were disregarded as variables of interest (Table 2). There was a relatively even split between independent services ( $n = 88$ ; 59.5%) and those part of a chain, that is, operating under the same name and/or education group as other services ( $n = 60$ ; 40.5%). Auckland and Wellington based services

**TABLE 2** | Characteristics of the sample of early learning services.

Characteristic	Total	Respondents in	All of NZ, <i>n</i> (%)
		current study, <i>n</i> (%)	
		148	3729
Service type	Education and care service	140 (94.6)	2674 (71.7)
	Kindergarten	7 (4.7)	673 (18.1)
	Playcentre <sup>a</sup>	1 (0.7)	382 (10.2)
Chain or independent	Chain <sup>b</sup>	60 (40.5)	1173 (31.2)
	Independent	88 (59.5)	2566 (68.8)
Urban accessibility	Major urban area	114 (77.0)	1880 (50.4)
	Large urban area	16 (10.8)	569 (15.2)
	Medium urban area	7 (4.7)	353 (9.4)
	Small urban area	5 (3.4)	536 (14.3)
	Low urban accessibility	2 (1.4)	181 (4.8)
	Rural	4 (2.7)	210 (5.9)
Location	Major city (Auckland or Wellington)	115 (78)	1617 (43.4)
	Provincial area <sup>c</sup>	33 (22)	2112 (56.6)
Deprivation <sup>d</sup>	Low (deciles 1–3)	34 (23)	—
	Medium (deciles 4–7)	62 (42)	—
	High (deciles 8–10)	52 (35)	—
Age range	All ages	121 (81.8)	3724
	Over-2s	27 (18.2)	2606
Menu length	Full <sup>e</sup>	109 (73.6)	—
	Partial	39 (26.4)	—
Healthy Heart Award	Total engagement in NZ	—	1488 (39% of all ELS)
	Awarded	25 (16.9)	371 (25% of those engaged)
	Not awarded	123 (83.1)	1117 (75% of those engaged)

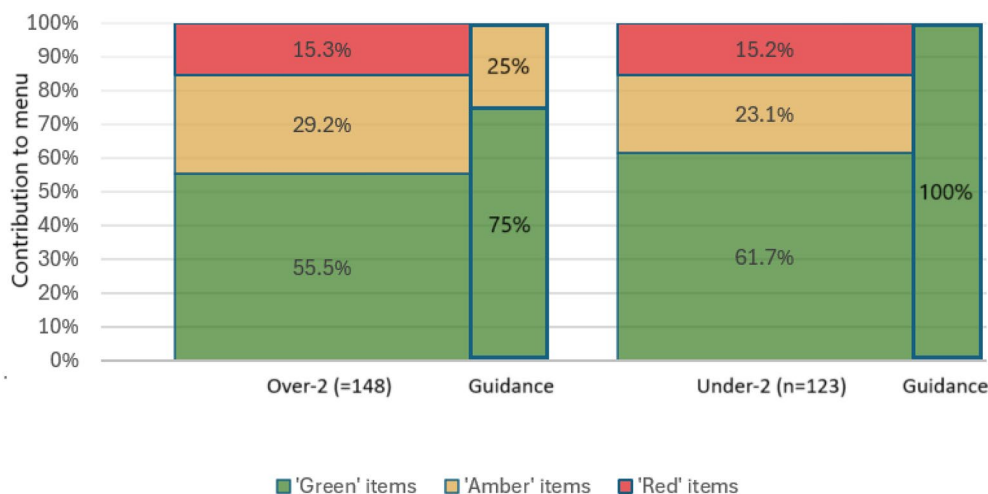
<sup>a</sup>Cooperatively managed by parents and supported by Playcentre staff at a regional and national level.

<sup>b</sup>Part of a group of services operating under the same name and/or Education group.

<sup>c</sup>Bay of Plenty, Canterbury, Gisborne, Northland or Southland.

<sup>d</sup>Derived from 2018 NZDeprivation decile scores of 1–10 and collapsed into low (1–3), medium (4–7) and high (8–10) deprivation. NZDeprivation decile scores have been replaced by the Equity Index since January 2023.

<sup>e</sup>Minimum of one meal and two snacks provided daily.



**FIGURE 1** | Mean composition (green, amber and red items) of menus for over-2s and under-2s compared with the National Public Health Service (Health NZ) Healthy Food and Drink Guidance.

( $n=115$ ; 78%) made up most of respondents with  $n=33$  (22%) in provincial areas (Bay of Plenty, Canterbury, Gisborne, Northland or Southland). Neighbourhood socioeconomic deprivation indices were mixed, with  $n=34$  low (23%),  $n=62$  medium (42%) and  $n=52$  high (35%). Services typically provided care to children of all-ages ( $n=121/81.8\%$ ) with just under one-fifth ( $n=27$ ; 18.2%) providing care to over-2s only. Services typically provided a 'full' menu(s) to children (at least one meal and two snacks daily— $n=109/73.6\%$ ), with 39 services (26.4%) providing only partial menus. Only 25 ELS (16.9%) had been awarded a HHA at the time of menu collection.

### 3.2 | Types of Food and Drinks Provided

A total of 148 menus were analysed for over-2s and 123 for under-2s. Of the 121 services who provided care to children of all ages, 95 (64%) used the same menu for both age groups, which was analysed twice, once for each age group.

The average menu composition for each age group compared with the guidance is shown in Figure 1; 55.5% green, 29.2% amber and 15.3% red for over-2s and 61.7% green, 23.1% amber and 15.2% red for under-2s.

Green items included most fruits and vegetables, lean meat, eggs, legumes, vegetable oil and lunch meals made up of at least 75% green ingredients with no red or high-choking-risk ingredients. Amber items were usually packaged items for which a rating was based, among other criteria, on *Health Star Rating* (HSR)—an Australian and New Zealand voluntary front-of-pack labelling system that assigns health ratings to packaged foods and beverages, using a scale of 0.5 to 5 stars [30]. Amber items included standard spreads (e.g., jam) and processed meat products with a HSR of 3.0 or lower. Baked items also met this category if they contained some wholegrains, wholemeal flour, fruit, or vegetables, and were of a suitable portion size. Red items included any sweetened drinks and baked items with poor nutritional value (i.e., those that did not meet the amber criteria) or a high-choking-risk (e.g., whole nuts), as well as lunch meals containing a red item or no green items.

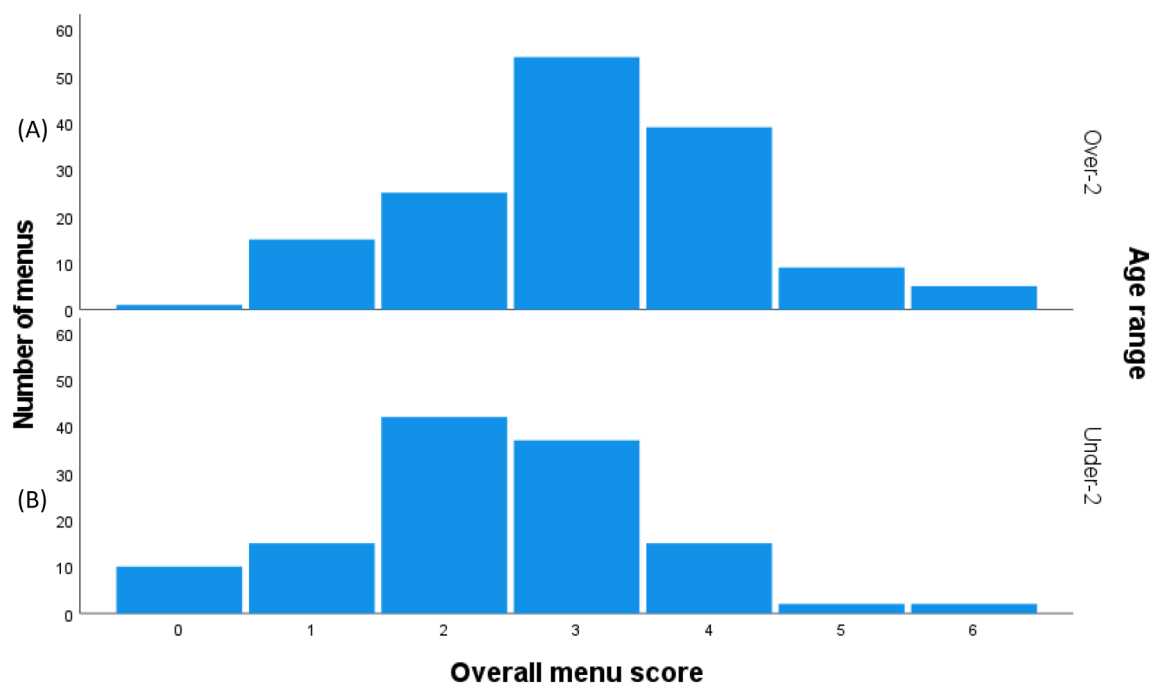
The distribution of overall menu scores for the respective age groups is shown in Figure 2. Only seven (2.6%) of menus ( $n=7$ ), from seven ELS (4.1%) met the current Health NZ HFD guidance for ELS (i.e., had a menu score of 6/6). One menu was a 'full menu' providing lunch and two snacks daily across the week, and the rest were partial menus providing only some meals and/or snacks.

### 3.3 | Comparison of Menu Characteristics by Service Characteristics and Age Groups

As shown in Table 3, the mean overall menu score for over-2s (3.09/6) was found to be significantly higher ( $p<0.01$ ) than that of the under-2s (2.37/6) and was not associated with service characteristics for either age group (all  $p>0.05$ ). The under-2s menus had a statistically higher %green compared with the over-2s ( $p<0.01$ ), but not %red ( $p=0.928$ ). There was no significant difference between the median %high-choking-risk foods on menus ( $p=0.214$ ) between over-2s (5.10%) and under-2s (4.90%). One-fifth (18.5%) of menus ( $n=50$ ), did not contain any high-choking-risk foods. Achieving a HHA showed a weak correlation with providing more green menu items to over-2s ( $p=0.04$ ,  $r=0.170$ ) and under-2s ( $p=0.01$ ,  $r=0.166$ ) and providing fewer red items to over-2s ( $p=0.04$ ,  $r=0.130$ ). There was no significant association between achieving a HHA and %red for under-2s ( $p=0.081$ ,  $r=0.158$ ). No other service characteristic showed an association with %green, %red or %high-choking-risk.

### 3.4 | Relationship Between Providing Nutritious and High-Choking-Risk Menu Items

For both the over-2s and under-2s menus, there was a significant inverse correlation ( $p<0.01$ ) between %green and %high-choking-risk (Figure 3). In the over-2s sample, there was a moderate negative linear relationship between these two variables ( $p<0.01$ ,  $r=-0.347$ ), and in the under-2s sample the relationship was strong ( $p<0.01$ ,  $r=-0.504$ ).



**FIGURE 2** | Distribution of overall menu scores for over-2s (A) and under-2s (B). Where a score of 6 reflects full alignment with the National Public Health Service (Health NZ) Healthy Food and Drink guidance, and alignment reduces with a decrease in overall menu score.

#### 4 | Discussion

The aim of this study was to assess alignment of food and drinks served to NZ children in ELS with *Healthy Food and Drink* and *Reducing Food-Related Choking* guidance. Our findings showed only 2.6% of 271 ELS menus achieved HFD guidance alignment while one-fifth met the choking guidance. The guidance alignment score of menus for over-2s was, on average, 12% higher than the score for under-2s. Early learning services with a HHA from the NZ Heart Foundation provided more green items to over-2s and under-2s, and less red items to over-2s. Providing more green menu items was inversely correlated with providing less high-choking-risk foods. Menu scores did not vary by service location, neighbourhood socioeconomic deprivation, type ('chain' versus 'independent' services) or menu length ('full' versus 'partial' menus).

The low percentage of 'green' and high percentage of 'amber' and 'red' items in this sample of ELS menus compared with the Health NZ guidance suggests that children's healthy eating exposures at ELS are lacking, while exposure to energy dense, nutrient-poor foods and drinks (high in fat, salt and/or sugar) exceeds recommendations. The negative relationship between %green and %high-choking-risk in this sample of ELS menus indicates that ELS who provide more healthy foods and beverages also provide less high-choking-risk foods and may be more health conscious and/or aware of nutritional guidelines.

Under-2s menus were further from meeting the guidance of providing only green menu items in our cohort, despite containing (on average) more green items than over-2s menus. Plain breads/crackers and full fat milk, rated green for under-2s but amber for over-2s, were widespread on menus, which may explain some of the variation. The assumption that unspecified 'breads/

crackers' were plain, and 'milk' was full fat may have also contributed to this difference.

Some positive trends from the present study can be reported. For example, SSB provision was relatively low (16.6% of menus) compared with nearly half of childcare services serving these beverages in a New South Wales (NSW, Australia) study [31]. In a North Carolina study, over 75% of meat consumed was high fat or deep fried [32], but here no ELS served deep fried meat and only 8.5% served high fat cuts. On the contrary, it appears to hold true that vegetables [31, 33] and meat/meat alternatives [16, 34] are not provided in sufficient quantities at ELS, both overseas and in NZ. These foods are rich in nutrients important for cognition and growth [35].

Evidence suggests that exposure to a food, even one that was initially disliked, is an effective strategy to increase a young child's preference for it [36]. Humans have a weak ability to down-regulate their food intake in response to consuming energy-dense foods and drinks [37]. Providing children with foods and drinks that are rich in nutrients relative to their energy content (e.g., vegetables) helps them to develop healthy eating habits and an ability to self-regulate energy intake, helping to protect against overweight and obesity [38]. On the contrary, being exposed to unhealthy, energy-dense foods and drinks too often may contribute to ingraining eating habits that promote excess weight and lead to poorer health outcomes in later life [39, 40].

Of the seven (4.7%) ELS menus that achieved alignment with the guidance based on their overall menu score, six were 'partial' menus which only captured a small portion of food availability at ELS. This highlights the lack of complete guidance alignment, with only one full menu achieving this alignment. This is lower than the 5% of services that met nutritional guidelines

**TABLE 3** | Comparison of menu characteristics by service characteristics and age group.

Menu characteristic	Group	Subgroup	Count	Over-2s		Under-2s		
				Mean (SD)	<i>p</i> -value	Count	Mean (SD)	<i>p</i> -value
Overall menu score	Full sample <sup>a</sup>	—	148	3.09 (1.20)	<0.01 <sup>b</sup>	123	2.37 (1.23)	<0.01 <sup>b</sup>
	Chain or Independent	Chain <sup>c</sup>	57	3.00 (1.17)	0.451	49	2.29 (1.17)	0.520
		Independent	91	3.15 (1.23)		74	2.43 (1.27)	
	Location	Major city <sup>d</sup>	115	3.15 (1.23)	0.317	96	2.47 (1.29)	0.108
		Provincial <sup>e</sup>	33	2.91 (1.10)		27	2.04 (0.94)	
		Deprivation <sup>f</sup>	Low	34	3.41 (1.02)	0.118	30	2.23 (1.07)
		Medium	62	2.89 (1.27)		54	2.41 (1.38)	
		High	52	3.13 (1.21)		39	2.44 (1.14)	
	Menu length	Full <sup>g</sup>	109	3.04 (0.98)	0.445	101	2.36 (1.12)	0.796
		Partial	39	3.26 (1.68)		22	2.45 (1.68)	
Healthy Heart Award	Awarded	25	3.40 (0.87)	0.165	20	2.75 (2.75)	0.136	
	Not awarded	123	3.03 (1.25)		103	2.30 (1.27)		
% green items	Full sample <sup>a</sup>	—	148	55.5 (16.0)	<0.01 <sup>b</sup>	123	61.7 (13.8)	<0.01 <sup>b</sup>
	Healthy Heart Award	Awarded	25	61.5 (11.4)	0.04 <sup>b</sup>	20	66.9 (8.12)	0.01 <sup>b</sup>
		Not awarded	123	54.3 (16.5)		103	60.7 (14.5)	
% red items	Full sample <sup>a</sup>	—	148	15.3 (9.89)	0.928	123	15.2 (9.42)	0.928
	Healthy Heart Award	Awarded	25	12.5 (6.60)	0.04 <sup>b</sup>	20	11.9 (6.73)	0.081
		Not awarded	123	15.9 (10.4)		123	15.9 (9.76)	
% high-choking-risk items	Full sample <sup>a</sup>	—	148	5.10 [2.30, 10.9] <sup>h</sup>	0.214	123	4.90 [1.80, 10.0] <sup>h</sup>	0.214

<sup>a</sup>Singular *p*-value from the independent *t* test displayed twice.

<sup>b</sup>*p* < 0.05.

<sup>c</sup>Part of a group of services operating under the same name and/or Education group.

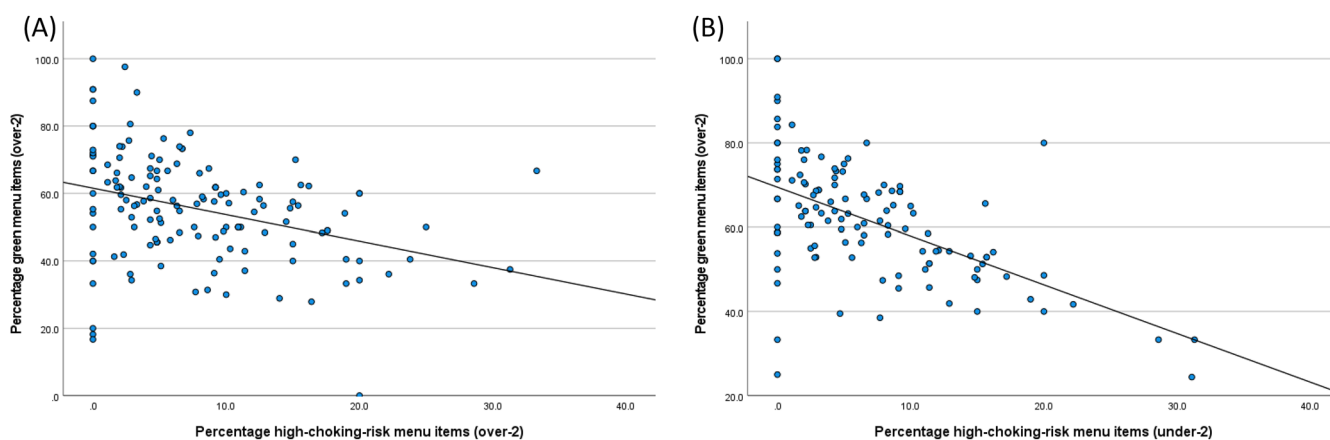
<sup>d</sup>Auckland or Wellington.

<sup>e</sup>Bay of Plenty, Canterbury, Gisborne, Northland or Southland.

<sup>f</sup>Derived from NZDep decile scores and collapsed into low (1–3), medium (4–7) and high (8–10) deprivation.

<sup>g</sup>Minimum of one meal and two snacks provided daily.

<sup>h</sup>Median [IQR].

**FIGURE 3** | Correlation between green items and high-choking-risk items on over-2s (A) and under-2s (B) menus.

based on menu-scoring in the 2014 *Kai Time in ECE* survey [16], and less than the 4/10 services in a recent NZ study which utilised the guidance [28].

A possible reason for this low guidance adherence is lack of awareness of the national nutritional guidelines. Early childhood centres in Columbia ( $n = 1343$ ) were less prepared for guidance implementation when awareness of guidance was low or non-existent [41]. It may also reflect the lack of nutrition teaching and professional development opportunities for ECE educators in NZ [42], where educators lack the baseline knowledge to implement the guidance even if they are aware of it. A nutrition knowledge survey of 386 ECE teachers in NZ found that nutrition knowledge was lacking and limited by lack of staff training, confidence and resources [43]. Of the 80 ELS cooks surveyed by Gerritsen et al. [16], only two (12.5%) had nutrition training and 12 (15%) had attended a menu development course run by the Heart Foundation.

Barriers to promoting healthy food to children may also be responsible for ELS low alignment with nutrition guidelines in the current study. Lack of support from whānau (families) is the most common barrier experienced by 20.6% [15] to 30% [28] of ELS in NZ-based studies. Other barriers reported across Australia, Canada and the United States are the perceived cost of healthier options and lack of resources and understanding of how to apply dietary guidelines [44–46]. Therefore, consideration of how to empower staff to operationalise nutritional guidance whilst communicating and collaborating with whānau appears crucial.

In NZ, despite having two sets of ELS nutritional guidance for over-2s under-2s, there are no practical tips to assist all-ages services with two sets of meal provision. Subsequently, nearly two-thirds (64%) of all-ages services in the present study served the same menu to all children. Furthermore, there is no mandate for the guidelines to stipulate minimum standards for food provision in ELS in NZ and Australia. This contrasts with most states in the United States [41] and Canada [47] where minimum requirements are regulated. Chriqui et al. [41] reported improved nutrition practices in nearly all US-based ELS in their study, and familiarity with the standards over time, but whether the same will occur in NZ and Australia, requires further research.

The findings from the current study are only broadly generalisable to ‘teacher-led’ (education and care services and kindergartens) services, which made up 99.3% of respondents. No services were whānau-led (e.g., te kōhanga reo), and only one was parent-led (playcentre), where food environments are likely to differ due to different teaching philosophies and cultural practices. This respondent skew may be because more teacher-led services provide food and drinks to children and/or follow a set menu, therefore felt that the research related to them. All-ages services (81.8%) were overrepresented, and no services provided care to under-2s only. There was however a reasonable representation of ‘chain’ (40.5%) and ‘independent’ (59.5%) ELS. The proportion of ‘full’ menus in this sample of ELS (73.6%) is comparable to a previous a NZ study (24; 66.3%). Few services (16.9%) incorporated HHA, despite this being a government-funded initiative [18].

Auckland or Wellington-based services made up 41.6% of the ECE sector in 2020 [5], but over 75% of the sample population, with less than 5% of services in rural or low urban accessibility areas. The rest of NZ is more rural, where access to food outlets such as grocery stores may be restricted. The impact this has on ELS food provision in rural versus urban areas has therefore not been explored in the present study. There was a fair representation of New Zealand’s overall population in terms of neighbourhood socioeconomic status.

There was no significant association between any service characteristics (‘chain’ versus ‘independent’, location, deprivation, menu length or HHA status) and the overall menu score, or %high-choking-risk across the weekly menus in this study. This indicates that sociodemographic and geospatial factors may be poor predictors of food availability at ELS.

The *Kai Time in ECE* study found that low and high (but not medium) deprivation services had better menu scores [16]. Lack of observation of this finding in the present study may reflect a greater reach of local food and nutrition assistance programmes (which have historically targeted high deprivation areas), to medium deprivation areas. It may also reflect the wide variation in menus across socioeconomic areas. In NSW Australia, where ECE nutrition environments are similarly unregulated, there was no association observed between dietary guidance alignment and socioeconomic status or locality [33].

Approximately 5% of the menu items in this sample posed a ‘high-choking-risk’. This is a useful benchmark for NZ where, to the best of the authors’ knowledge, no previous data has been reported. However, ‘high-risk-foods to alter’ (e.g., apple) as classified in the guidance for *Reducing Food-Related Choking for Babies and Young Children at Early Learning Services* were not included, so the actual number of ‘choking risk foods’ may be higher.

Worldwide, the foods that cause children to choke vary according to the dietary patterns of the population; for example, fish bones in Finland where fish consumption is widespread [48]. In the current study, hard crackers (69.7%) and dried fruit (31.7%) were the most common high-choking-risk foods served. Recent findings from the NZ Hawkes Bay region found that nearly one-third (28.3%) of services were concerned about food-related choking and perceived this as a barrier to providing healthy food [28]. This indicates that some ELS may not feel confident or able to alter ‘healthy’ high-choking-risk foods (e.g., apple) or find healthy alternatives to inappropriate foods (e.g., wholegrain crackers), reinforcing the need for further education and support with the implementation of choking guidance.

The practice of removing high-choking-risk foods also does not equate to improved ELS choking safety without evidence of other practices such as education and first aid training of parents and caregivers, suggested to be the most important preventative strategy for preventing food-related choking [49].

Prior to the Healthy Active Learning initiative, the HHA scheme was the most comprehensive and widespread voluntary, government-funded nutrition promotion initiative operating in the NZ ELS setting [50] and has previously been associated

with healthier ELS menus [16]. As part of obtaining a HHA, a nutrition advisor from the Heart Foundation provides healthy eating support, such as assisting services to create and operationalise healthy eating policies. The initiative also includes a menu checklist component, which sets serving requirements for food groups based on the HFD guidance. Although we found that having a HHA was not associated with an increased overall menu score (potentially related to sensitivity of the small sample size), it was associated with the provision of more green (healthy) menu items for both age groups, and less red (unhealthy) menu items for under-2s. This is consistent with the HHA menu checklist, which puts greater focus on healthy food inclusion than unhealthy food exclusion. Achieving a HHA does not require the ELS to exclude all high-choking risk foods, or have choking policy in place, and subsequently we observed no association between a HHA and %high-choking-risk. Collaboration between Health NZ and the Heart Foundation to incorporate a 'choking prevention' component would be a useful future direction to ensure consistent healthy messaging to ELS educators.

The moderate (over-2s) to strong (under-2s) correlation between providing more green menu items and providing less high-choking-risk menu items in this study indicates that as ELS include more highly nutritious items on their menus, the availability of less nutritious high-choking-risk foods declines. This may reflect greater health literacy of services with nutritious menus—that they are also aware of and strive to minimise choking hazards. This would indicate that the Health NZ guidelines are being utilised to some degree in menu planning, even if they are not being properly implemented. This finding is promising, as it points to the guidelines being somewhat useful for ELS, but implementation seems to be the limiting factor to improving menu quality and safety.

#### 4.1 | Strengths and Limitations

This is the first NZ study to evaluate the application of the 2020 Health NZ HFD guidance and choking criteria to ELS menus, providing a unique insight into the nutritional quality and safety of foods provided. The study also identifies the prevalence of high-choking-risk foods in childcare environments, an area with limited international research but significant importance due to the role of food in choking incidents [51]. Our study minimised potential reporting errors by collecting and analysing raw data from menus instead of participant questionnaires. Verification with agencies such as Health NZ and the Heart Foundation ensured accuracy in categorising menu items. Participant burden was low compared to menu evaluation studies [16, 32, 33], with remote completion of tasks taking under 15 min, and there was no need for on-site verification. The analysis covered 1 week of food and drink provision, longer than the typical 1–2 days in similar studies [4, 33, 34]. The sample also included services from diverse socioeconomic areas in NZ.

The primary limitations of the study included the quick menu audit, lack of recipe details available and no onsite observation of meal preparations. Many menus lacked precision details like exact portion sizes and criteria to determine milk fat content, impacting comparisons with nutrition recommendations. The choking risk analysis was limited to identifying high-risk foods

but did not offer preparation guidance. The study relied on a convenience sample, potentially biased towards ELS more interested in nutrition, with an urban focus on Auckland. The sample also lacked diversity, not including Māori immersion services (te kōhanga reo). Self-reported data by service managers without verification posed another limitation, as previous studies show discrepancies between menus and actual serving sizes [52]. Foods brought from home were not examined, though previous studies suggest their nutritional quality is often low [53, 54] but can be improved with caregiver education, highlighting the role of both caregivers and childcare providers in enhancing children's food environments.

#### 4.2 | Implications for Policy and Practice and Future Directions

This study found that children in both major cities and provincial areas, regardless of socioeconomic status, are equally vulnerable to poor food availability. Public health interventions should target all sub-groups. Participation in HHA had a small but positive impact on healthy food availability within ELS and thus maximising the reach of HHA, including teacher training, could enhance nutrition knowledge and menu planning. Effective interventions include staff training, resources and follow-up support. Structural and policy changes are needed as current ELS menus often misalign with HEALTH NZ guidelines. More nutrition-focused professional learning, practical implementation resources and stringent monitoring are necessary to support healthy food environments in ELS.

Further research is needed to evaluate the choking safety of ELS food environments. Besides removing high-risk foods from menus, choking prevention also involves creating a safe physical environment and ensuring educators are trained in first aid. Despite 'variety' being a key nutrition concept described within NZ ECE regulations, it is not included in the guidance. Future studies on ELS food availability should consider 'variety', as a range of food choices can promote biodiversity of gut microbiome, which has been linked to obesity and diabetes. In this study, we evaluated ELS menus but children's acceptability of foods and what they consume in childcare may be more important to consider. Moreover, future studies should explore other important aspects of the food environment including existence of healthy eating policies, food available on special occasions and fundraising events, how food is sourced and prepared and involvement with other health and nutrition promotion initiatives.

#### 5 | So What?

The present study has shown that most of the ELS menus reviewed in this study do not meet NZ Health NZ guidelines for providing healthy menus and reducing food-related choking in children. Children tend to be exposed to unhealthy food items too frequently, which is concerning for ensuring proper growth, development and obesity prevention. Extending the reach of Healthy Active Learning and the Heart Foundation's HHA could assist more services to provide nutrient-rich foods at ELS, through practical implementation of national nutritional

guidance. Establishing what barriers ELS faces in creating healthy food environments is an important direction for future research, which can be used to inform further public health interventions. Interventions in the ELS setting should be prioritised, as ELS provide access to large numbers of children at a highly dependent life period.

### Conflicts of Interest

The authors declare no conflicts of interest.

### Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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