Do Primary Schools in New Zealand Promote a Positive Food Environment? A Menu Analysis of Primary Schools Participating in the Healthy Active Learning Initiative

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Abstract

Background: Childhood nutrition is key to developing positive health outcomes that persist into adulthood. The school food environment represents an important setting to direct public health interventions. There is limited data on how New Zealand (NZ) primary school menus contribute to the availability of healthy food to improve the school food environment. This study seeks to fill this knowledge gap by examining the alignment of primary school menus with current Ministry of Health (MoH) guidelines.

Aim: This study aims to assess the alignment of NZ primary school menus to the MoH Healthy Food and Drink Guidance and explore their contribution to healthy food availability within primary schools in Aotearoa, NZ.

Methods: Quantitative assessment of primary school menus using a quick menu analysis to determine alignment with the MoH guidelines and exploring associations with seven school characteristics (school type, decile, equity index, size, area, region, and deprivation level). In the context of this research, a menu is defined as all foods available for purchase by students at a school on a regular basis.

Results: School menus (n=133) had a low alignment to guidelines with 12.8% 'green', 41% 'amber' and 40% 'red' items. Wellington and Auckland had higher percentages of 'green' items compared to other regions (Auckland against Northland (p=0.046), Bay of Plenty (p=0.002) and South Island (p=0.026), Wellington against Bay of Plenty (p=0.043)). Wellington had the lowest percentage of 'red' items compared to Auckland (p=0.037), Bay of Plenty (p=0.048) and South Island (p=0.041). Schools in urban areas had a higher alignment than rural, 36.9% and 50% of 'red' items, respectively (p<0.001) and a higher percentage of 'green' items (p=0.006). Small schools had less 'green' items and more 'red' items than medium (p=0.002, p<0.001) and large schools (p<0.001, p=0.020). Socioeconomic measures were related to a lower percentage of 'green' menu items in schools with low decile compared to high decile p=0.011), a high and medium equity index compared to low (p=0.02 and p<0.001), respectively and medium and high deprivation compared to low, p=0.046 and p<0.007, respectively.

Conclusion: Primary schools in NZ do not align with MoH guidelines, with rural schools facing greater challenges. Public health interventions could drive change by engaging schools and food suppliers to limit 'red' items and increase 'green' items. This study shows the need for strategies to reduce the availability of 'red' menu items in primary schools, as this poses an increased risk for unhealthy eating in children.

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List of Abbreviations

Abbreviation or Symbol	Definition
BMI	Body mass index
FMI	Fat mass index
Food-EPI	Healthy Food Environment Policy Index
HAL	Healthy Active Learning
HCA	Health Coalition Aotearoa
HPA	Health Promotion Agency
HPS	Health Promoting Schools
HSR	Health Star Rating
INFORMAS	International Network for Food and Obesity/NCD Research, Monitoring and Action Support
MetS	Metabolic Syndrome
NAG	National Administration Guideline
NCD	Non-communicable disease
NGO	Non-government organisations
NZ	New Zealand
PEM	Protein-energy malnutrition
SSB	Sugar sweetened beverage
T2DM	Type 2 Diabetes Mellitus
UNICEF	United Nations International Children's Emergency Fund
UPF	Ultra-processed food
WHO	World Health Organisation
%	Percentage
~	Approximately

Chapter 1: Introduction

1.1. Background

Providing opportunities for children to reach their full nutritional potential is essential to wellbeing and productivity. Children experience rapid periods of growth during childhood, undergoing changes to physical, cognitive and emotional domains of health (Ministry of Health, 2015) it is widely understood that poor nutrition has an effect on each of these domains (Baker-Henningham & Grantham-McGregor, 2004). In addition, childhood nutrition is key for positive health outcomes later in life, as dietary habits formed are likely to persist into adulthood (Frech, 2012). Poor dietary habits are the leading risk factor for non-communicable diseases NCDs, causing more deaths than any other lifestyle factor in adults aged 25 and older (Afshin et al., 2019).

Primary school-aged children in Aotearoa NZ have poor diets, leading to over- and under-nutrition. The 2020/21 annual health survey showed that 32.8% of five to nine-year-olds consumed the recommended servings of vegetables (three or more daily) and 57.3% ate takeaways at least once weekly (Ministry of Health, 2021). Aotearoa NZ was reported as second only to the United States in child obesity rates (UNICEF, 2019). Furthermore, obesity rate are indicated to have increased by 4.7% in five to nine-year-olds since the previous annual health survey (from 2019/2020 to 2020/2021 survey) in Aotearoa NZ (Ministry of Health, 2021). Managing rates of childhood obesity is a key factor in preventing the prevalence of NCD (Kelishadi & Heidari-Beni, 2019). In Aotearoa NZ, 20% of under fifteen year olds living in the most-deprived neighbourhoods experience obesity compared with 5.5% of those living in the least-deprived areas (Mackay et al., 2020).

The school food environment provides a key role for children to foster good dietary habits. Food environments in school are shown to have a strong influence on children's dietary behaviours (He et al., 2012; Lake & Townshend, 2006) and positive food environments are essential in reducing rates of child obesity (Swinburn et al., 2015; Swinburn et al., 2019). Children eat up to half of their daily intake at school, emphasising the value of generating healthy food environments in this setting (O'Halloran et al., 2020). Food environments are complex systems defined as "the physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food" (High Level Panel of Experts [HLPE], 2017). A school menu can be considered as an internal, and therein, controllable factor of school food environment (Cupertino et al., 2021). A school menu is defined as the food items available for purchase on a regular basis. Food available for purchase can be provided in-house (school canteen) or by an outside provider and offered at different regularities (daily, fortnight, once a school term). Therefore, school menus

provide primary school children with a context of what food is available, or acceptable, as purchasable food items. When school menus are offered everyday, these menu items can contribute significantly to what children learn to be everyday foods.

Currently, there are relatively few studies that have assessed the type of food available in primary school food environments in Aotearoa NZ. Findings from 2002 (Ministry of Health, 2003) and 2007-2008 (Regan et al., 2008; Utter et al., 2007) indicate that the majority of foods available in schools were defined by high-sugar and high-fat options. More recent research, conducted in 2016, found similar findings, whereby food available for purchase was dominated by unhealthy options (D'Souza et al., 2022). The school food environment either works to support or create barriers to children establishing healthy habits. Understanding how primary school children experience these environments provides an insight to their influence on dietary habits (Lake & Townshend, 2006). The lack of robust and current data on the nutritional contribution of primary school menus leaves a gap in the literature. To describe how a menu influences food availability, an appropriate menu analysis should be conducted. The primary focus of menu evaluations around the world is commonly on nutritional adequacy (Cupertino et al., 2021; De Silva-Sanigorski et al., 2011; Myers et al., 2019). However, menu design encapsulates many different considerations including cultural, sensory, hygiene and food safety, allergies, seasonality, and sustainability (Cupertino et al., 2021; O'Halloran et al., 2020).

Despite the importance of providing primary school children with a positive food environment, there are no government requirements for what type of food schools offer. Currently, the only nutrition-related government requirement in schools is under the National Administration Guideline (NAG) 5(b) (Ministry of Education, 2020), which states that schools must promote healthy food and nutrition for all students. A complex political environment surrounding the government requirements for schools, suggests it is unlikely that stricter requirements will be placed on schools in the near future. Ministry of Health (MoH) guidelines implemented in 2020 categorise food items as 'green', 'amber', and 'red' based on their nutritional value (Ministry of Health, 2020). These guidelines indicate that school menus should contain at least 75% 'green' menu items and that 'red' menu items should not be available for students (Ministry of Health, 2020). This provides primary schools with an essential tool to navigate what type of food should be available. Nevertheless, the overall absence of requirements generates a shortcoming in how the school food environment is controlled, amplifying the importance of having public health interventions in place.

Effective public health interventions require community leadership, workforce skills, mobilisation of resources and partnership (Swinburn, Vandevijvere, et al., 2013). Monitoring and evaluation ensure

success is in public health interventions are sustained. In Aotearoa NZ, the MoH and Ministry of Education (MoE) are the primary government bodies that work to improve the health of primary school children, with other organisations (e.g., Sport NZ) also involved. Collaboration between these groups increases success and impact. Since 2000, there have been several public health interventions implemented to reduce poor health outcomes in children in Aotearoa NZ. Interventions include HEART START Toitoi Manawa, Healthy Families NZ, Fuelled4life, Ka Ora Ka Ako: Free Healthy School Lunches, Fruit in Schools, KickStart Breakfast and Project Energize (Pillay et al., 2022).

Ka Ora, Ka Ako and Healthy Active Learning (HAL) are current public health initiatives striving to improve the school food environment in primary schools in Aotearoa NZ. Ka Ora, Ka Ako provides free lunches, which has resulted in improved mental health (14%), quality of life (16% physical, 20% school, and 9-12% emotional and social functioning) for children in the country (Peirce; et al., 2022). HAL, launched in 2020, is a nationwide collaboration between Sport NZ, MoH and MoE. This multi-agency approach offers a strong coordinated approach to a public health intervention. HAL targets schools and kura, providing a workforce that creates healthy and active learning environments (Ministry of Education, 2022b). One component of HAL is providing toolkits and a health promotion workforce to support healthy food and water-only policies in schools. As a part of the overall HAL evaluation, a range of baseline data has been collected, including menus in primary schools. This provides an opportunity to assess how primary school menus contribute to the school environment.

1.2. Purpose of the study

The purpose of this study is to explore what contribution school menus have on the type of food available in primary schools in Aotearoa NZ. To assess this, school menus will be nutritionally analysed for their alignment to the MoH guidelines. Additionally, this study will examine school characteristics including size, type, area, region, deprivation level, decile, and equity index to assess any positively or negatively influence on the alignment to MoH guidelines.

Good nutrition during childhood lays the foundation for healthy habits in adulthood, and the type of food available in the school setting provides a positive environment for children to develop healthy dietary habits outside of the home. Currently, there is limited data in Aotearoa NZ to what type of food school menus offer. To the researcher's knowledge, this is the first menu analysis to assess school menus in their alignment with the current MoH guidelines. Therefore, this research will help to determine the type of food available in schools as part of an understanding of the wider school food environment.

1.3. Aim

This study aims to assess the alignment of NZ primary school menus to the MoH Healthy Food and Drink Guidance and explore their contribution to healthy food availability within primary schools in Aotearoa, NZ.

1.3.1. Objectives

1. Define menu items of primary schools as green, amber, and 'red' items as defined in Healthy Food and Drink Guidance (Ministry of Health).
2. Assess the alignment of primary school menus to Healthy Food and Drink Guidance (Ministry of Health) by the percentage of 'green', 'amber', and 'red' menu items.
3. Describe how primary school menus contribute to healthy food availability in schools.
4. Explore the association of menu quality ('green', 'amber', and 'red' items) to school characteristics: type, size, area, region deprivation level, decile rating and equity index.
5. Assess menu items in defined 'foods group' categories as 'green' 'amber' and 'red' items to explore the opportunity for increased alignment to Healthy Food and Drink Guidance (Ministry of Health) in the food offered in primary school menus.

1.1 Thesis Structure

This thesis is structured into four chapters. Chapter One presents the background and purpose of the study, including the aims, objectives, and researchers' contributions. Chapter Two reviews the most applicable and up-to-date literature in the field of the school food environment and public health nutrition in Aotearoa NZ. Chapter Three is the research manuscript which covers the abstract, background, methods, results, and discussion of findings. Chapter Four assesses whether the aims and objectives have been met, outlines the strengths and limitations of this study, and provides recommendations for further research and public health actions based on the findings of this study. The appendices include supplementary results and methods, detailing methodology development and provides the full menu analyses toolkit.

1.2 Researcher Contributions

Table 1.1. Summary of Researcher's Contributions

Author	Contribution to Thesis
Marsha Piddington MSc Nutrition and Dietetic Candidate	Primary author contributing to all aspects of the thesis, collaborated with the research team to develop menu analysis methodology and database, conducted, literature review, menu analysis, statistical analysis, and interpretation of results.
Professor Carol Wham Primary Academic Supervisor	Academic supervisor contributed expertise to advise direction throughout thesis. Developed study design, revised, and approved all thesis chapters.
Professor Ajmol Ali Co-Supervisor	Co-supervisor contributed expertise to advise direction throughout thesis. Developed study design, applied for ethics, advised about data analysis, revised thesis chapters.
Danika Pillay NZRD, PhD Candidate	Research team member collaborated on menu analysis methodology and database development. Co-conducted primary school menu analysis including statistical analysis.
Olivia Hall MSc Nutrition and Dietetic Candidate	Research team member, collaborated on menu analysis methodology and database development.
Shannon Green MSc Nutrition and Dietetic Candidate	Research team member, collaborated on menu analysis methodology and database development.
Dr Hajar Mazahery School of Health Sciences	Advised on statistical analysis and presentation of results.
Owen Mugridge School of Sport, Exercise and Nutrition	HAL evaluation project co-coordinator, involved in data collection, provided contact to the wider HAL team.
Sophie Turner NZRD, Research Assistant	HAL evaluation project, involved in data collection.
Kai Hong Tan Heart Foundation	Advised on menu analysis methodology development.

Chapter 2: Literature Review

2.0 Introduction

This chapter reviews the evidence related to primary school menus in child health and nutrition, the school food environment, food policies and guidelines, and public health interventions. The focus is on the food environment in primary schools in Aotearoa New Zealand (NZ).

2.1 Child Health and Nutrition

2.1.1. Childhood Behaviours and Health

It is well-known that childhood nutrition is an essential part of developing positive health outcomes. Children experience rapid periods of growth during childhood, undergoing changes to physical, cognitive and emotional domains of health (Ministry of Health, 2015) and it has been well documented in the literature the impact that poor nutrition has on each of these domains (Baker-Henningham & Grantham-McGregor, 2004). Moreover, habits established in childhood can persist into adulthood, evolving into positive or negative dietary habits (Frech, 2012). This continuation of habits into adulthood demonstrates the critical nature of good childhood nutrition as poor dietary habits have a significant impact on wellbeing and mortality. Poor nutrition, in terms of either under- or over-nutrition, has an impact on individual wellbeing placing an economic burden in Aotearoa NZ and globally (Alderman et al., 2014; Tzioumis & Adair, 2014). Globally, poor dietary habits contribute the greatest risk factor to non-communicable disease (NCD) development and are responsible for more deaths than any other identified lifestyle risk factor in adults 25 years and older (Afshin et al., 2019). Further, NCDs pose a high health and economic burden on populations (Alderman et al., 2014; Lewarne, 2022)**.** These findings highlight the importance of preventing the long-term burden of poor childhood nutrition. Managing rates of childhood obesity is a key factor in preventing the prevalence of NCD (Kelishadi & Heidari-Beni, 2019) and providing opportunities for children to reach their full potential from a nutrition perspective is essential to wellbeing and productivity in Aotearoa NZ.

2.1.2. Child Population Dietary Habits

Surveys show that primary school-aged children in Aotearoa NZ do not eat the recommended servings of fruit and vegetables daily (Ministry of Health, 2021). Fruit and vegetables are nutrient-dense foods; adhering to the national guidelines of two servings of fruit and at least three servings of vegetables

each day supports growth, development, and wellbeing. Additionally an inverse association between childhood vegetable consumption and adult metabolic syndrome (MetS), with increased blood pressure and triglyceride values related to low intake during childhood, has been reported correcting for low intake during adulthood, demographic characteristics and common MetS risk factors (Jääskeläinen et al., 2012). The 2020/21 Annual Health Survey in Aotearoa NZ showed only 32.8% of children aged five to nine years old consumed the recommended three or more servings of vegetables daily and 74.3% consumed two or more servings of fruit daily (Ministry of Health, 2021). The consumption of energy-dense, nutritionally poor foods is also a concern among NZ children aged five to nine years old. In this age group, consumption of fizzy drinks and takeaways at least once weekly was 28% and 57.3%, respectively (Ministry of Health, 2021). These foods have little or no nutritional value and are key drivers of childhood obesity (Anderson & Butcher, 2006).

Overnutrition is a form of malnutrition and occurs from excessive intake of nutrients, which has negative health implications. Overnutrition causes excess adipose tissue, leading to obesity among children. Short-term consequences of overnutrition include obstructive sleep apnoea, musculoskeletal problems, asthma, and psychological problems (Sahoo et al., 2015). Persistent overnutrition can lead to conditions later in a child's life including NCD, Type 2 Diabetes Mellitus (T2DM), heart disease, dementia, cancers, mental illness, and chronic pain (Ministry of Health, 2017). Research in Aotearoa NZ found in children aged five to fourteen years old that when overnutrition is coupled with physical inactivity it amplifies these negative consequences (Rush et al., 2003). A report from the United Nations International Children's Emergency Fund (UNICEF) (2019) ranked Aotearoa NZ second only to the United States for obesity rates of children in developed countries. In the 2020/21 Annual Health Survey in Aotearoa NZ the rate of obesity among children aged five to nine years old had increased by 4.7% to 15% since the last survey in the years prior (2019/2020) (Ministry of Health, 2021).

It is a widely held view that calorie-dense foods, sugar-sweetened beverages (SSB), and ultra-processed foods (UPF) contribute to the prevalence of overnutrition and obesity (Parvez et al., 2020). Intake of calorie-dense foods can generate a positive energy imbalance leading to weight gain in people (Anderson & Butcher, 2006; Sahoo et al., 2015). UPF are increasingly available in place of minimally processed or freshly prepared foods and have been demonstrated to cause poor outcomes globally for human health (Monteiro et al., 2018). Additionally, high intake of UPF may contribute to insulin resistance due to levels of fructose and sucrose in these food items (Ha et al., 2009). Research from Brazil found that an increased intake of UPF by 100 g in total contribution to daily intake was associated with a gain of 0.14kg/m2 in fat mass index (FMI) in the same time period in children ages six to eleven years old (Costa et al., 2021). Interestingly, this effect was shown after adjustment for

increased caloric intake, indicating the possibility of mechanisms other than caloric imbalance is responsible for the relationship between increased FMI and UPF intake. Additionally, studies have found an association between the intake of SSB and increased body mass index (BMI) in school children (Masse et al., 2014). Other research, however, reported no significant link between SSB intake and BMI (Vanderlee et al., 2014), although this research used self-reported measures for the intake of SSB, weight and height which may explain conflicting outcomes of research, the association of SSB and obesity has been long reported in the literature (Anderson & Butcher, 2006).

2.1.3. Food Insecurity

The question of health outcomes often becomes one of inequity when reviewing the problem in Aotearoa NZ. Recent research noted that 20% of children under 15 years of age living in the most socioeconomically deprived areas have obesity, compared with only 5.5 % in the least deprived areas (Mackay et al., 2020). Children from the most-deprived neighbourhoods are more likely to consume SSB and takeaways, less likely to meet their recommended fruit and vegetable intake, and do not have breakfast every day (Ministry of Health, 2019). More than a third of children living in the most deprived neighbourhoods experienced moderate-to-severe food insecurity (Ministry of Health, 2019). There are high rates, 19.9%, of children who live in homes where food runs out because of money, with 4-5% of children experiencing this often (Duncanson et al., 2021). There are a disproportionate representation of Māori and Pacifica people in areas of deprivation. A recent study found that 45% and 30% of Pacifica and Māori children, respectively, lived in homes that experienced food insecurity, compared to only 16% of NZ European children (Duncanson et al., 2021). Putting this into perspective, at the time of the last census in Aotearoa NZ, Pacifica and Māori represented 8.1% and 16.5% of the New Zealand population, respectively, while NZ Europeans were 70.2% of the population (Stats NZ, 2020).

For children living in food-insecure homes, undernutrition plays a key risk in poor health outcomes. Undernutrition represents a poor-quality diet where total energy, food groups or nutrients are not adequate to meet requirements. During childhood, undernutrition can have lasting effects on overall development. In cases of chronic protein-energy malnutrition (PEM) a child can experience stunting and wasting, and may result in long-lasting cognitive impairments (Kar et al., 2008). While PEM is not a common outcome of undernutrition in Aotearoa NZ, evidence suggests there is an acute effect on the cognitive ability of children on school days when they consume an inadequate amount of food (Kristjansson et al., 2007; Sorhaindo & Feinstein, 2006). Beyond cognitive and physical impacts, undernutrition has been associated with mental, emotional, and behavioural issues which develop

into adolescence (Jacka et al., 2010; Kulkarni et al., 2015; Weng et al., 2012). Cognitive improvement in well-fed children is shown in medium-term outcomes, demonstrated in better school test performance indicators following improved nutrition (Belot & James, 2011; Kar et al., 2008; Nansel et al., 2010).

2.2 School Food Environment

The school food environment influences the food choices, and therein dietary habits, of children in Aotearoa NZ. A food environment is defined as "the physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food" (High Level Panel of Experts [HLPE], 2017). More simply, a food environment can be considered the availability, opportunities, and influences on food choice in a defined setting. In the context of a primary school in Aotearoa NZ the school food environment, and specific aspects of the food environment are depicted in Figure 2.1. Access to food in primary schools includes brought in lunches, Ka Ora Ka Ako (Healthy Lunches in Schools), school canteen food, order-in food (local food stores, chain food providers, school-specific providers), in-school fundraisers, shared lunches and school events, free breakfast programmes (KickStart) and school gardens. The opportunities that impact the choices within these available foods for primary school students are food prices, socioeconomic status, and types of local food retailers available. The overarching influences in this food environment are government guidelines (Ministry of Health (MoH) Healthy Eating Guidelines and National Administrative Guidelines), school food policies, food marketing, nutrition education in schools and staff role modelling. Understanding how primary school children experience these environments provides a background to the influence on it has on dietary habits

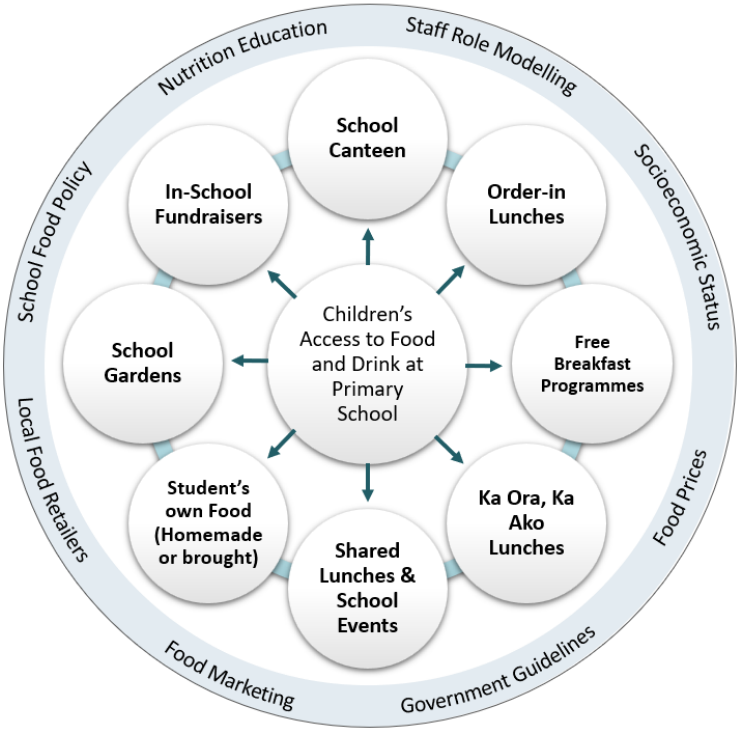

Figure 2.1.
Food Environment of Primary Schools in Aotearoa, NZ

in children (Lake & Townshend, 2006). The school food environment either works to support or create barriers to children establishing healthy habits.

Establishing positive food environments has been recommended as an essential action to reduce child poverty by World Health Organisation (WHO) and The Lancet Commission on Obesity (Swinburn et al., 2015; Swinburn et al., 2019). Ensuring that the school food environment supports children in making positive dietary decisions is key to improving the health of primary school children in Aotearoa NZ. Research has shown a link to positive outcomes both in education and BMI among children when food environments support healthy habits (Driessen et al., 2014). Barriers to positive school food environments have been reported as the promotion and sale of UPF and SSB, and the limited availability of healthy options. (Lundborg et al., 2022). Research in Aotearoa NZ that describes the eating habits of children aged five to fourteen years found that up to a third of their overall energy intake is consumed at school (Regan et al., 2008). This study, however, did not include whether children accessed breakfast at schools. KickStart is a free breakfast programme available to primary school children of Aotearoa NZ established in 2009 (Ministry of Social Development, 2017). KickStart now delivers to over 1,000 schools and 30,000 children (Cronin, 2019), indicating that for some children, more than a third of their overall energy is consumed at school, emphasising the importance of generating positive food environments in primary schools.

2.2.1 Quality of the School Food Environment in Aotearoa NZ

In Aotearoa NZ, the food environment is monitored using the government Healthy Food Environment Policy Index (Food-EPI) monitoring tool. The Food-EPI tool fits within the monitoring framework of the International Network for Food and Obesity/NCD Research, Monitoring and Action Support (INFORMAS). INFORMAS involves the collaboration of over 60 countries with a mission to improve food environments globally (Swinburn, Sacks, et al., 2013). INFORMAS has three current reports on the status of the food environment in Aotearoa NZ, conducted in 2014, 2017 and most recently 2020. The most recent INFORMAS report indicates that New Zealand's food environments overall are characterised by highly accessible and heavily promoted energy-dense, often nutrient-poor food and drinks, that contain high levels of salt, saturated fats and sugars (Mackay et al., 2021). Consistently, the INFORMAS reports have noted that the school food environment lacks mandatory food policies ensuring the promotion and availability of healthy food (Mackay et al., 2021). Therein, key recommendations for the improvement of school food environments are a requirement to have a school food policy and that government support is provided to bolster this implementation (Mackay et al., 2020).

Relatively few studies have assessed the type of food available and therein the primary school food environment in Aotearoa NZ. Previous studies that have assessed the food available in schools found these items were predominantly unhealthy, characterised by high-sugar and high-fat foods (Regan et al., 2008; Utter et al., 2007). The data in these studies is now over 20 years old, from the last national children's nutrition survey conducted in Aotearoa NZ in 2002 (Ministry of Health, 2003). More recent research, conducted in 2016, found similar findings noting that food available for purchase was dominated by unhealthy options (D'Souza et al., 2022). This indicates a longstanding trend of undesirable food choices available in primary schools. It is important to note that none of these studies assessed food items available against the current MoH Healthy Food and Drink in Schools Guidance. Further research has investigated the other aspects of the school food environment, a summary of these studies is detailed in Table 1. From this research, it appears that the number of primary schools with an existing school food policy has increased from 16% to 38.5% from 2003 to 2016 (Carter, 2004; D'Souza et al., 2022). Although, the data from these studies included non-identical samples of primary schools in Aotearoa NZ, 200 schools in 2003 and 647 schools in 2016, therefore these figures may not represent a true increase in school food policies as INFORMAS reports note no significant changes from 2017 to 2020 (Mackay et al., 2021). From an evaluation of these studies and INFORMAS data, it can be said that the school food environment in Aotearoa NZ lends itself to generating more barriers than support for allowing primary school children to make healthy food choices.

Table 2.1. Summary of Studies Assessing the School Food Environment in Aotearoa New Zealand.

Study	Aim	Method	Sample	Aspect of the School Food Environment	Results
(Carter, 2004)	Identify and measure the obesogenic elements of the school environment.	Self-comparison questionnaire.	200 Primary schools.	School food policy and school canteens.	It was found that 16% of schools had a food policy. Most commonly available food was pies (79%). Less healthy foods were 9.3 times more available than healthy options.
(Regan et al., 2008)	Describe the dietary habits of New Zealand school children during school hours.	24-hour food recall, 2002 National Children Survey data.	2,247 Children aged 5-14 years.	All food accessed at during school hours.	The most consumed foods were snack foods, fruit and biscuits at morning tea, and sandwiches and fruit at lunch.
(Utter et al., 2007)	Describe the demographic characteristics and food choices of school canteen/tuckshop users.	2002 National Children Survey data.	3,275 Children aged 5-14 years.	School canteens.	Reported that 58% of children brought most or some of their food and drink from school. Canteen use was associated with consumption of high-sugar, high-fat foods.
(Vandevijvere et al., 2016)	Conduct spatial analysis of retail food environments around varying socioeconomically deprived schools in New Zealand.	Validated geocoding.	Data from 66 city and district councils.	Local food retailers.	A convenience store was located within 800 m of up to 68.5% of schools. A fast food or takeaway outlet was located within 800m of up to 62% of schools. Access to unhealthy foods was significantly higher in least deprived urban schools.
(Huang et al., 2020)	Explore the proportion of bus stop advertisements promoting non-core food and beverages within walking distance of schools.	Quantification of outdoor advertising around schools.	573 Schools, all schools in Auckland.	Food marketing.	Within 500 m of schools, 50.2% of food advertisements were for non-core foods. 12.8% of all bus stop advertisements promoted non-core dietary items.
(D'Souza et al., 2022)	Evaluate the healthiness of New Zealand school food environments.	Cross-sectional questionnaire, Wellness School Assessment Tool, and Menu analysis.	819 Schools, 647 of which were primary schools.	School food policy, Nutrition education, Food marketing, Food available for purchase.	It was shown that only 40% of schools has a food policy. Foods sold were dominated by 'unhealthy' items, notably in school fundraisers where 90% of foods sold were 'unhealthy'. Positively, 80% had school gardens, 90% offered nutrition education, 91% did not have commercial advertising on school grounds.

2.2.2. School Menus and Food Availability

In the context of this thesis, a school menu is defined as the food items available for purchase on a regular basis for lunch or morning tea breaks. School menus may be available every day, weekly, monthly, or once a term. Food available from the menus may be provided in-house (school canteen) or by an outside provider (i.e., order-in lunches described in Figure 2.1). Considering this, school menus provide primary school children with a context of what food is available, or acceptable, as purchasable food items. In the case that these menu items are available every day it may be considered that these foods contribute significantly to what child learns to be everyday foods. Furthermore, it should be considered that every aspect of a primary school lends itself to providing a learning opportunity for children, therefore, even if menus are only offered once a term, food items available should be healthy options.

School menus do not cover all food available in Primary Schools in Aotearoa NZ. Additional food can be available through food-based school fundraisers; Shared lunches; Ka Ora Ka Ako lunches; Fruit in Schools; and KickStart as discussed prior. School menus, alongside food-based school fundraisers and shared lunches, are managed by the schools themselves and may be governed by the individual school's food policy. Ka Ora, Ka Ako lunches are provided for free to school children by the government and are dictated by the MoH guidelines (discussed further in section 3.3). Similarly, Fruit in Schools is led by MoH, providing free fruit to schools in high-deprivation areas. Kickstart is a joint initiative through Sanitarium, Fonterra, and MSD (Ministry of Social Development), providing Weetbix and milk to schools every day. In the assessment of primary school menus, this thesis provides a meaningful analysis as to what type of food is available in schools which is within a primary school's ability to enact changes to improve the healthiness of these food items.

2.2.3. School Menu Analysis

To describe how primary school menus are influenced by food systems, an appropriate menu analysis should be conducted. The primary focus of menu evaluations around the world is commonly on nutritional adequacy (Cupertino et al., 2021; De Silva-Sanigorski et al., 2011; Myers et al., 2019). The focus of this thesis is similarly on nutritional adequacy, however, It is important to note that the design of most school menus encapsulates many different considerations: cultural, sensory, hygiene and food safety, allergies, seasonality and sustainability (O'Halloran et al., 2020). An Australian study reviewing the validity of different menu assessments found that a quick menu analysis was the most reliable method available (Reilly et al., 2016). The study looked into four different methods, including two

styles of self-reports, a comprehensive menu analysis and a quick menu analysis, finding that a quick menu analysis required less financial and time input while generating the highest agreement for the audit (kappa = 0.68; (Reilly et al., 2016). This research supports the validity of employing a quick menu analysis in the assessment of school menus.

2.3. Food Policy and Guidelines

A food policy defines actions within a given environment to positively impact the nutritional status of a given population (Helsing, 1997). School food policies provide the opportunity to positively influence the type of food available at schools. It has been well documented that food policies aid in improving the healthfulness of food available in schools (Micha et al., 2018). By establishing a clear intent to support healthy habits, schools can rely on a food policy to guide staff, students, and parents to create a beneficial environment. Research has further highlighted the success of school food policy in creating improved outcomes for children. A review of research conducted in high-income countries found interventions that focused on the school environment, over a community or home setting, were the most successful in preventing childhood obesity (Bleich et al., 2018). Additional research, assessing 115 intervention studies in the primary school setting, found moderate to strong evidence for the effectiveness of school-based interventions in preventing childhood obesity (Wang et al., 2015). Although this research was based on studies conducted predominantly in America, further reviews with a global lens support the effectiveness of school-based interventions on dietary habits (O'Brien et al., 2021). The NOURISHING Framework provides a benchmark for comprehensive food policies that promote healthy eating, outlining 10 specific policy areas in relation to the food environment, food system and behaviour change communication (Hawkes et al., 2013). This framework can be used as a tool by policymakers to assess and strengthen current policies.

2.3.1. School Food Policy in Aotearoa NZ

For Primary Schools in Aotearoa NZ there is minimal national governance over school food policies and availability. Currently, the only government requirement in schools is under the National Administration Guideline (NAG) 5(b) (Ministry of Education, 2020). NAG 5(b) states that schools must promote healthy food and nutrition for all students, however, there is no restriction on the type of food available in schools. This was not always the case, in 2007 two clauses were added to NAG 5, one of which is the existing NAG 5(b), the second clause, NAG 5 (iii), stipulated where food and beverages are sold on school premises, to make only healthy options available (Education Review Office, 2008).

In effect NAG 5(iii) allowed for interventions to take place to improve the quality of food sold in schools. However, this clause was short-lived, coming into effect on the 1st of June 2008 and on the 19th of November 2008 NAG 5(iii) was removed because of a change in government. The newly appointed National government stated an aim to reduce compliance costs for schools and generate a 'high trust' environment (Education and Science Committee, 2008). Despite petitions, NAG 5 (iii) was not reinstated and only NAG 5(b) remained. Looking at the present day, NAG 5(b) was due to end in January 2023, prompting action to be taken to strengthen the guideline. A proposal was made to replace the existing regulation with a duty on schools to promote healthy food and supply only healthy drinks (water and milk). Nevertheless, proposals were unsuccessful, with the caucus requiring more agreement from secondary schools before any such guideline was to be added, despite support from primary schools (Ministry of Education, 2022c). Currently, NAG 5(b), as it was originally written, is the only government policy influencing the school food environment. Considering the political environment surrounding the government requirements for schools, it is unlikely stricter requirements will be placed on schools in the near future.

2.3.2. School Food Policy Implementation

Australia offers a case study for the development and implementation of food policies in schools. Since 2005 Australian states have implemented school food services policies that support beneficial food environments through increasing the availability of healthy foods. For example, the Victoria government introduced a policy in 2006 stipulating the banning of SSB and confectionery and outlined a traffic light system for categorising food items (De Silva-Sanigorski et al., 2011). Initial reviewal of the success of these policies found that schools were not aligned with the healthy food policy (De Silva-Sanigorski et al., 2011). This research in Victoria concluded that increased investment to implement change is needed to create school environments that reflect the school policy. Similar results were found in a 2014 national assessment of school food policy compliance, where Western Australia had the highest adherence to guidelines with 62% of schools (Woods et al., 2014). However, with continued government support to implement guidelines, more recent studies have shown a greater rate of compliance of school menus with school food policy (Clinton-Mcharg et al., 2018; Myers et al., 2019). This shows that for a food policy to be successful in improving the food environment the input of resources is essential, and that time may be a factor in observing success.

2.3.3. Ministry of Health Guidelines

In 2020, the Ministry of Health introduced Healthy Food and Drink Guidance for Schools in an effort to help schools to develop a policy to improve access to healthy food and drinks (Ministry of Education, 2022c). The main element of the guidelines is the traffic-light categorisation of food and drinks as 'green,' 'amber,' and 'red' indicating their nutritional value and consequentially what their availability should be in school canteens. Green menu items are everyday foods and include foods such as fruit, vegetables, whole grains, lean proteins, low-fat plain dairy, and legumes. 'Amber' menu items are occasional foods that have some nutritional value but can contribute to negative outcomes if intake is consumed in high portions, e.g., snack foods with a health star rating (HSR) of at least 3.5. 'Red' menu items are foods that should be avoided with poor nutritional value and include food items such as SSB, UPF and deep-fried items. The guidelines indicate that school menus should have at least 75% 'green' food items and that 'red' food items should not be available for students (Ministry of Education, 2022c). The guidelines currently on offer provide primary schools with an essential tool to navigate what type of food should be available.

2.4. Addressing the School Food Environment in Aotearoa NZ

2.4.1 Public Health Interventions

Public health intervention become meaningful when they generate change within a population. It is important then to understand what makes for successful interventions in public health. Community leadership, workforce skills, mobilisation of resources and establishing partnerships are the bones of delivering a successful intervention (Swinburn, Vandevijvere, et al., 2013). Further, the long-term success of an intervention is achieved through the monitoring and evaluation of intervention outcomes. It is through these measures that continued adjustment, improvement and resources can be delivered. A common flaw in the effectiveness of public health intervention is poor implementation (Swinburn et al., 2019). From this research, it can be determined that for Aotearoa NZ to deliver successful interventions to improve the nutrition of children it must employ a coordinated effort among community groups alongside appropriate monitoring and evaluation.

In Aotearoa NZ, the MoH and the Ministry of Education (MoE) are the primary bodies that support the health needs of children at primary school. However, there are many organisations that support the health outcomes of children. Other main organisations include Sport New Zealand (Sport NZ) which oversees sports implementation and sponsorship; Health Coalition Aotearoa (HCA) which coordinates non-government organisations (NGO), healthcare and academic sectors to achieve health equity and

prevent harm from unhealthy food; Te Hiringa Hauora, Health Promotion Agency (HPA), operating as an evidenced-based agency; and The Office of the Child's Commissioner who provide advocacy for young people at a policy level. Collaboration between groups creates a higher opportunity for success and impact of interventions. The public health issue and related consequences of obesity and food insecurity is recognised in Aotearoa NZ, and globally, yet slow and insufficient action is persisting. In New Zealand, the Food-EPI committee effectively monitors aspects of the food environment. This committee noted from 2014 to 2020 no measurable improvements have been made (Mackay et al., 2021). This may be the case, but not through a lack of effort from the government and community bodies involved in the care of primary school-aged children.

The government of Aotearoa NZ has implemented several public health interventions aimed to reduce poor health outcomes in children over the past two decades since the year 2000. These include HEART START Toitoi Manawa, Healthy Families NZ, Fuelled4life, Ka Ora Ka Ako: Free Healthy School Lunches, Fruit in Schools, KickStart Breakfast and Project Energize (Pillay et al., 2022). Of note is Project Energize, which initially ran from 2004 to 2006 in 124 primary schools in the Waikato region (Rush et al., 2012). Schools were put into intervention and control groups, where school intervention groups were provided with an 'energizer.' The energizer helped schools achieve goals in physical activity and healthier eating. Project Energize expanded to be delivered to all schools (n=242) in the Waikato region by 2012, including 70 primary schools in other regions. In a two-year follow-up, the intervention was associated with reduced accumulation of body fat among young children (Rush et al., 2012). More recent evaluations have continued to show the programme's success, citing a sustainable, effective, inclusive, and cost-efficient health programme (Rush et al., 2016; Rush & Yan, 2017). Specifically, in the 10-year review the programme outcomes found lower rates of obesity and increased physical activity at $45 per child per year positively impacted on one health-related cost quality-adjusted life year (Rush et al., 2016). Despite its reported success, Project Energize did not expand to a national level and is currently operating in only Wellington and Northland regions.

The Childhood Obesity Plan represents an overarching strategy that encompasses different initiatives to target the rates of childhood obesity in Aotearoa NZ. This plan was developed by the MoH in 2015 and includes 22 different approaches across the food industry, health sector actions, physical activity (sports and education), and public information (Ministry of Health, 2017). Among the 22 approaches included are Health Promoting Schools (HPS), Play.Sport, and the Health Star Rating (HSR) system. HPS and Play.Sport provide schools with a workforce and resources to improve health, wellness, and physical activity in schools. While Play.Sport has since developed into Healthy Active Learning. meaningful outcomes were shown in learning, reading performance and attendance in HPS schools (Leeson, 2017). The HSR, which assigns food items with a rating out of 5, falls into more controversy

when discussing its success. While the intent of the rating is praised for its ability to inform healthy choices for consumers (Hawkes et al., 2013), the system itself is often criticised for creating a 'health halo' assigning cereals with more than 25% sugar a 4-star rating (Consumer NZ, 2016). Another targeted initiative by the Childhood Obesity Plan is the Before School Check. The Before School Check is a referral system that identifies four-year-olds who are obese (above the 98th percentile) and refers them to a health professional for assessment. However, this check does not include a wider plan to support the children who are referred, and this has the possibility of contributing to inequitable health outcomes through unbalanced access to care. The childhood obesity plan still has an overarching role in public health intervention in Aotearoa NZ and provides a backing for interventions seen today.

2.4.2. Current Public Health Interventions in Schools

Ka Ora, Ka Ako: Healthy School Lunches (Ka Ora, Ka Ako) and Health Active learning (HAL) are current public health interventions that aim to improve the school food environment of primary schools in Aotearoa NZ. Ka Ora, Ka Ako is an initiative that provides free lunches in schools, started in 2019 as a two-year initiative, delivered to 120 schools in the most deprived areas of Aotearoa NZ (Ministry of Education, 2023a). The programme has grown, delivering lunches to 974 school and kura (as of January 2023), partly in response to growing food insecurity during the Covid-19 Pandemic. The aim of this intervention is to target the negative impact on health that children living in food-insecure houses experience, need is assessed using the 2019 equity index (Ministry of Education, 2023a). Ka Ora, Ka Ako allows schools to source or internally provide lunches, however, meals must align with specified nutrition standards. These standards were implemented from Term 1 in 2023 and have been adapted from the current MoH Healthy Food and Drink Guidelines for schools. Where the guidelines generated some problems, the new nutrition standards hope to address some of the issues that this programme has faced in students' acceptance of lunches (Ministry of Education, 2023b). During 2021 and 2022 increased food waste was reported as a result of uneaten Ka Ora, Ka Ako lunches, examples of up to 450 lunches going to waste daily in the Hamilton area (Food Waste, 2022; Hall, 2021). Setting aside this criticism, Ka Ora, Ka Ako lunches resulted in better outcomes for students in areas of mental health (14% advantage) and quality of life (16% physical, 20% school, and 9-12% emotional and social functioning advantage). These outcomes demonstrate a meaningful impact on the overall wellbeing of children in Aotearoa NZ.

HAL is a nationwide intervention implemented in January 2020 in early learning services, schools and kura throughout Aotearoa NZ. In 2019 the Child and Youth Wellbeing Strategy was developed, providing the government with several strategies to target health disparities currently facing Aotearoa

NZ. One defined outcome is 'Children and Youth are happy and healthy' and to achieve this outcome, HAL was identified as a key intervention (Department of the Priminister and Cabinet [DPMC], 2019). Developed off the back of Play.Sport, HAL is an initiative that brings together three government agencies: Sports NZ, MoH and MoE. It is a $47 million project that, with the utilisation of multiple government agencies, offers a strong coordinated approach to a public health intervention. HAL targets schools and kura, providing a workforce that creates healthy and active learning environments. Three main components work to improve the value of health and physical education and create healthy food and drink environments (Ministry of Education, 2022b). The first component is the development and implementation of new curriculum resources for hauora, health, and physical education, led by MoE. The second is a physical activity workforce, delivered by Sports NZ to enhance health and physical education in schools. Thirdly, toolkits and a health promotion workforce to support healthy food and water-only policies in schools, led by MoH. The current roadmap for HAL involves implementation in two phases: phase 1 from 2020 to 2022 involving 300 participating primary and intermediate schools; and phase 2 from 2022 to 2024 which involves an additional 800 participating schools. In its early phases, HAL positions itself to be a meaningful school intervention for the future of public health interventions in Aotearoa NZ.

2.5. Summary

The evidence reviewed demonstrates three key concepts: Improving dietary behaviours in children is essential to positive health and economic outcomes; the school environment offers a strong opportunity for implementing change; and successful public health interventions rely on collaboration alongside monitoring and evaluation. With no recent improvements to the rates of poor health outcomes in Aotearoa NZ it is paramount to ensure current public health interventions deliver meaningful results. HAL is a recent intervention that aims to deliver a collaborative and longstanding initiative. This research provides benchmark data to allow for the monitoring and success of HALs implementation. This thesis will provide the first investigation of the quality of New Zealand School menus in comparison to the current MoH guidelines.

Chapter 3: Study Manuscript

Do Primary Schools in New Zealand Promote a Positive Food Environment? A Menu Analysis of Primary Schools Participating in the Healthy Active Learning Initiative.

3.1. Abstract

Background: Childhood nutrition is key to developing positive health outcomes that persist into adulthood. The school food environment represents an important setting to direct public health interventions. There is limited data on how New Zealand (NZ) primary school menus contribute to the availability of healthy food to improve the school food environment. This study seeks to fill this knowledge gap and examine primary school menus' alignment with current Ministry of Health (MoH) guidelines.

Methods: Quantitative assessment of primary school menus using a 'quick menu analysis' to determine their alignment with the MoH guidelines. Menus were explored by seven school characteristics (school type, decile, equity index, size, area, region, and deprivation).

Results: School menus (n=133) had low alignment to guidelines with 12.8% 'green', 41% 'amber' and 40% 'red' menu items. Urban schools had more 'green' items than rural schools (p=0.006) and fewer 'red' items (p<0.001), with rural schools having 50% 'red' items compared to 36.9% in urban schools. Higher levels of socioeconomic deprivation were associated with lower percentages of 'green' items.

Conclusions: Primary schools in NZ struggle to meet MoH guidelines, with rural schools facing greater challenges. Public health interventions could drive change by engaging schools and food suppliers to limit 'red' items and increase 'green' items.

Relevance: This study shows the need for strategies to reduce the availability of 'red' menu items in primary schools, as this poses increased risk for unhealthy eating in school children.

3.2. Background

Childhood nutrition is key for positive health outcomes in adulthood, as established habits tend to persist (Frech, 2012). Poor nutrition, be it under or over-nutrition, affects individual wellbeing and has economic impacts in Aotearoa NZ and globally (Alderman et al., 2014; Tzioumis & Adair, 2014). Poor dietary habits are the leading risk factor for NCDs, causing more deaths than any other lifestyle factor in adults aged 25 and older (Afshin et al., 2019). Thus, providing children with the opportunity to reach their full nutritional potential is vital for Aotearoa NZ's wellbeing, and productivity.

Primary school-aged children in Aotearoa NZ have poor diets, leading to over- and under-nutrition. The 2020/21 Annual Health Survey showed 32.8% of five to nine-year-olds consumed recommended three or more vegetable servings daily and 57.3% ate takeaways at least once weekly (Ministry of Health, 2021). Aotearoa NZ was second only to the US in child obesity rates (UNICEF, 2019). The 2020/21 Annual Health Survey in Aotearoa NZ showed a 4.7% increase in obesity of five to nine-year-olds since 2019/2020 (Ministry of Health, 2021). Middle-income countries have higher child obesity, particularly in at-risk, food-insecure communities (Swinburn et al., 2019). In Aotearoa NZ, 20% of under fifteen year olds in most-deprived neighbourhoods experienced obesity compared with 5.5% in the least-deprived (Mackay et al., 2020). These children are more likely to have high sugar-sweetened beverage (SSB) and takeaway intake, while consuming less fruit and vegetables and no breakfast (Ministry of Health, 2019).

It is a widely held view that calorie-dense foods, sugar-sweetened beverages (SSB), and ultra-processed foods (UPF) contribute to the prevalence of overnutrition and obesity (Parvez et al., 2020). Intake of calorie-dense foods cause weight gain (Anderson & Butcher, 2006; Sahoo et al., 2015). UPF are increasingly available and have been linked to poor health outcomes (Monteiro et al., 2018). High intake of UPF may contribute to insulin resistance due to high levels of fructose and sucrose (Ha et al., 2009). SSB intake has been linked to increased body-mass index (BMI) (Masse et al., 2014) and obesity in children (Anderson & Butcher, 2006).

The school food environment (defined as the availability, opportunities and influences on food choice) affects children's food choices and dietary habits in Aotearoa NZ (Lake & Townshend, 2006). WHO and The Lancet Commission on Obesity suggest positive food environments as essential to reduce child poverty (Swinburn et al., 2015; Swinburn et al., 2019). Influences on the school food environment include Government guidelines (Ministry of Health Healthy Eating Guidelines, National Administrative Guidelines), school food policy, food marketing, nutrition education and staff role modelling. Understanding how primary school children experience these environments informs the influence on dietary habits and these environments can either support or hinder healthy habits.

Schools provide a key setting to promote interventions for lifelong health changes. Food environments in schools can strongly influence children's dietary behaviour (He et al., 2012; Lake & Townshend, 2006). Children eat up to half of their daily intake at school, making healthy school food environments important (O'Halloran et al., 2020). Food environments are complex systems, involving many internal and external factors. School menus and food policies are internal, and therein controllable, factors of school food environments (Cupertino et al., 2021). A school menu is defined as the food items available for purchase on a regular basis. Food available from the menus may be provided in-house

(school canteen) or by an outside provider. Food items offered in school menus can contribute significantly to what children learn to be everyday foods.

Few studies have assessed primary school food environments in Aotearoa NZ, with findings from 2002 (Ministry of Health, 2003) and 2007-2008 (Regan et al., 2008; Utter et al., 2007) indicate the majority of foods available in schools is characterised as being high in sugar and fat. More recent research, conducted in 2016, found similar findings, whereby food available for purchase was dominated by unhealthy options (D'Souza et al., 2022).

School food policies can positively influence the type of food available in schools improving the healthfulness of the school food environment (Micha et al., 2018). For primary schools in Aotearoa NZ there is minimal national governance over school food policies. Currently, the only government requirement in schools came under the National Administration Guideline (NAG) 5(b) (Ministry of Education, 2020). NAG 5(b) states that schools must promote healthy food and nutrition for all students, however, there is no restriction on the type of food available in schools. Considering the political environment for government requirements, it is unlikely strict requirements will be placed on schools in the near future.

In 2020, the MoH introduced Healthy Food and Drink Guidance for Schools which categorises food items as 'green', 'amber', and 'red' based on their nutritional value (Ministry of Health, 2020). Where 'green' menu items are everyday foods 'amber' menu items are occasional foods and 'red' menu items are foods that should be avoided with poor nutritional value. The guidelines indicate that school menus should be up to at least 75% 'green' food items and that 'red' food items should not be available for students (Ministry of Health, 2020). This provides primary schools with an essential tool to navigate what type of food should be available.

Effective public health interventions require community leadership, workforce skills, mobilisation of resources and partnership (Swinburn, Vandevijvere, et al., 2013). Monitoring and evaluation ensure success is sustained, enabling adjustments and improvement in programme delivery. In Aotearoa NZ, the MoH and Ministry of Education (More) are the primary government bodies that address the health of primary school children, with other community organisations (e.g., Sports NZ) also involved. Collaboration between these groups increases success and impact. Since 2000, Aotearoa NZ has implemented several public health interventions to reduce poor health outcomes in children, including HEART START Toitoi Manawa, Healthy Families NZ, Fuelled4life, Ka Ora Ka Ako: Free Healthy School Lunches, Fruit in Schools, KickStart Breakfast and Project Energize (Pillay et al., 2022). The Childhood Obesity Plan represents an overarching strategy that encompasses different initiatives to target the rates of childhood obesity in Aotearoa NZ.

Ka Ora, Ka Ako and Health Active Learning (HAL) are current public health initiatives striving to improve the school food environment in primary schools in Aotearoa NZ. Ka Ora, Ka Ako provides free lunches, which has resulted in improved mental health (14%), quality of life (16% physical, 20% school, and 9-12% emotional and social functioning) for children in the country (Peirce; et al., 2022),. HAL, launched in 2020, is a $47.6 million nationwide collaboration between Sport NZ, Ministry of Health, and Ministry of Education. This multi-agency approach government agencies, offers a strong coordinated approach to a public health intervention. HAL targets schools and kura, providing a workforce that creates healthy and active learning environments (Ministry of Education, 2022b). One component of HAL is providing toolkits and a health promotion workforce to support healthy food and water-only policies in schools.

Providing children with the opportunity to establish healthy dietary habits is essential for health and economic outcomes in Aotearoa NZ. Existing research indicates undesirable food options, particularly in areas of deprivation, can contribute to levels of childhood obesity (Swinburn et al., 2019). Primary schools provide a key setting for developing healthy dietary habits, yet government requirements on schools are minimal. Thus, public health interventions such as HAL are needed to create healthier school food environments. This study fills an existing gap in the current literature by exploring how primary school menus align with current MoH guidelines.

3.2 Methods

3.2.1 Study Design

Quantitative baseline assessment of school menus of primary schools participating in HAL. School menus were assessed for nutritional adequacy in their alignment with the MoH 3-tier Healthy Food and Drink Guidance (Schools) (Ministry of Health, 2020).

3.2.2 Data Collection

Data used in this study was collected for the baseline evaluation of HAL i.e., Pre-HAL food availability. Primary school menus were collected between July 2020 and March 2021. Primary schools were contacted via their email address or valid ‘contact us’ webpage and asked to provide a) menu of the food available to students for purchase and b) respond to a questionnaire to ascertain specific detail (e.g., type of milk used) (see Appendix D for questionnaire). Menus assessed were from contributing (years 1-6) and full (years 1-8) primary schools. A total of 144 menus were collected, 11 of which had

insufficient information and were therefore excluded, therefore, the final number of menus analysed was 133. Ethics approval for the baseline evaluation of HAL evaluation was granted by Massey University Human Ethics Committee (NOR 20/07).

3.2.3 Menu Analysis

The methodology for analysis of school menus was developed by the research team, comprised of four dietetic researchers', two supervising professors and input from stakeholders (MoH, the Heart Foundation). Primary school menu analysis was conducted by two members of the research team. A quick menu analysis was determined to be the most appropriate method as it mitigated differences in detail provided across menus and inter-researcher variability by setting out a defined list of assumptions. The quick menu audit used a defined set of assumptions to assess the quality of menus, compared to a comprehensive menu audit where all recipe and menu item details are obtained from the source (i.e. through contacting schools and suppliers; (Reilly et al., 2016). A quick menu audit has been demonstrated to be a more reliable, cost and time efficient compared to a comprehensive menu analysis (Reilly et al., 2016). A 'menu analysis toolkit' was developed which detailed a food and recipe database, defined assumptions with accompanying justifications and provided analysis templates for single items and mixed meals. The food and recipe database categorised common menu items from suppliers (local- and chain-providers), packaged food items, recipes, and baked items (based on portion sizes) into 'red', 'amber' or 'green' categories. Methods were verified through consensus amongst the primary research team, supervisor review and stakeholders' input. In the context of this study, a menu was defined as all foods available for purchase by students at a school on a regular basis. One menu was counted per school; in cases where schools had more than one menu on offer (e.g., students could purchase sushi on Mondays and items from a bakery on Fridays) offerings were combined as one menu. A menu item was defined as any item listed available for purchase, i.e., a combo was counted as one menu item (assessed as a 'mixed meal'). School menus were analysed through Excel (Microsoft 365, version 2212), using the menu analysis toolkit to categorise each item on school menus. A cross analysis was conducted in 20 randomly selected menus to assess for menu analysis agreement. The full methodology is detailed in Figure 3.1.

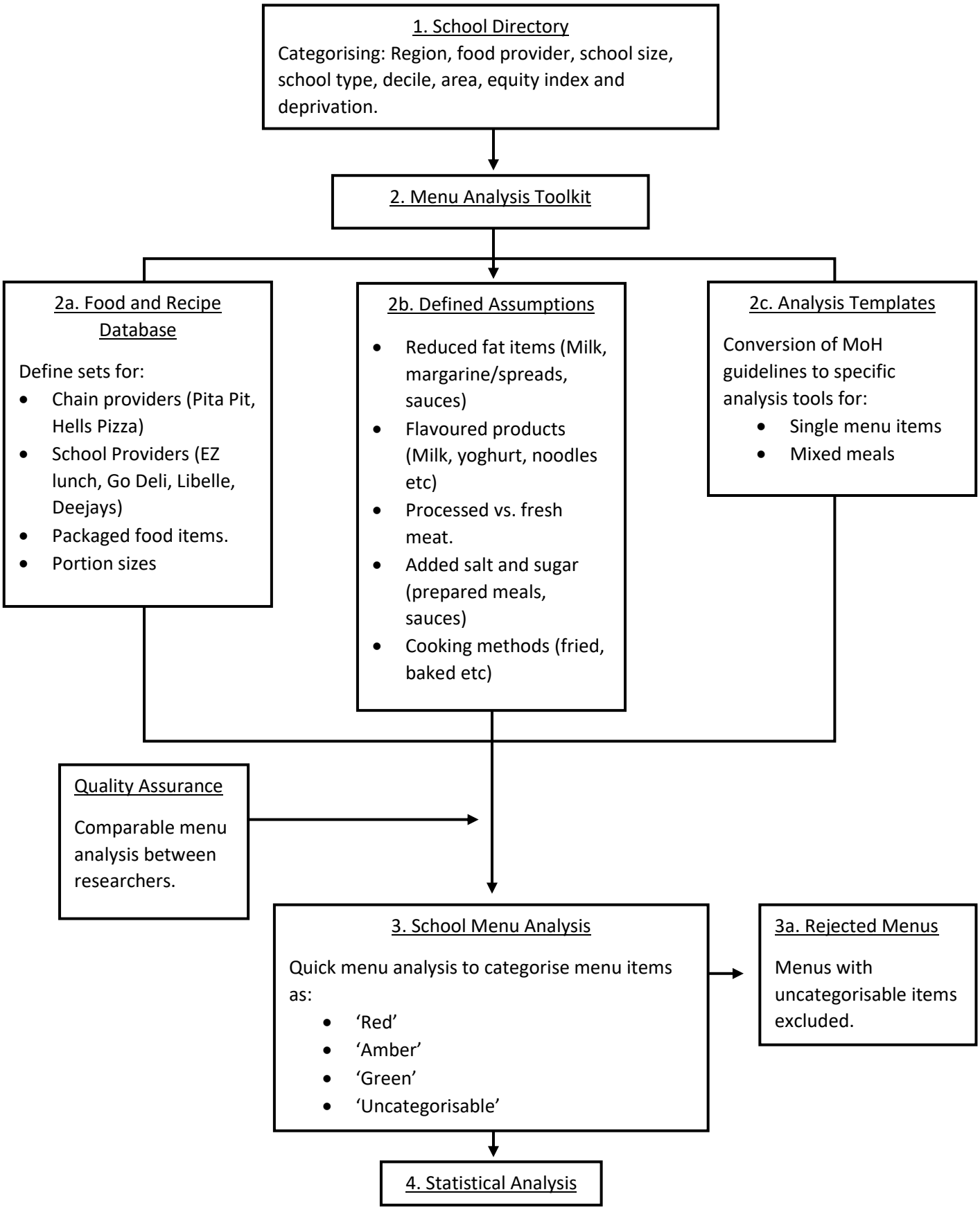

Figure 3.1. Menu Analysis Methodology Overview.

3.2.4 Menu-Scoring Criteria

A menu-scoring criteria was developed to evaluate the overall quality of the menus. School menus that offered at least 75% of food items from the 'green' category and no 'red' menu items were determined to align with MoH guidelines. The menu-scoring criteria was defined in two parts; Part A assessed the proportion of 'green' food items available for purchase, and scores decrease in 25% increments. Part B assessed the proportion of 'red' foods and decreases in 12.5% increments to reflect the lower acceptability of 'red' foods in the guidance, which should be excluded for all children. The total criteria had a maximum score of six, indicating high quality and compliance with the guidance.

3.2.5 Food Group Categorisation

Menu items were categorised into 15 different defined food groups to assess the type of food available in school. By categorising menu items into distinct food groups, the opportunity for increased alignment to MoH guidelines could be explored. A sandwich can meet the guidelines for a 'green' menu item with adjustments (i.e., increased vegetables and wholegrain bread), but a deep-fried hot dog cannot. Defined food groups were assigned a category of 'red', 'amber' or 'green' based on a prior school menu analysis study in Aotearoa NZ (D'Souza et al., 2022), prior MoH guidelines for food in schools, and the current MoH traffic light system. The defined food groups that were categorised as 'red' menu items were 'baked items', 'sausages' (including deep-fried items), 'mixed meal – UPF' (meals including 'red' menu items), 'desserts', 'SSB', 'UPF (savoury)' and 'UPF (sweet)'. The defined food groups that were categorised as 'amber' menu items were 'pizza' (including garlic and pizza bread) and 'condiments'. Lastly, food groups categorised as 'green' menu items were 'sandwiches' (including wraps, rolls etc), 'mixed meals' (ingredients excluded 'red' menu items), 'water' (including plain low-fat milk), 'fruit and vegetables', 'dairy snack food' and 'sushi'.

3.2.6 School Characteristics

The alignment of school menus was assessed by seven categories related to school socioeconomic characteristics, size, and location. Decile rating, deprivation and equity index are measures used in Aotearoa NZ to describe the socioeconomic status of schools and kura (decile rating and equity index), or that of the surrounding area (deprivation). The equity index is a new system currently being brought in to phase out the decile rating system (Ministry of Education, 2022a). Decile rating and deprivation is measured on a 1-10 scale and equity index from 344-569 (Environmental Health Intelligence New Zealand [EHINZ], 2018; Ministry of Education, 2022a, 2022d). Each decile rating, deprivation, and

equity index was categorised into 'low' 'medium' and 'high' where 'low' included 1-3 and 344-399, 'medium' 4-7 and 400-499, 'high' 8-10 and 500-569 for each respective system. School size was defined as small (1-199 students), medium (200-399) and large (400+), where school roles varied from 12 to 785. Area was defined by rural, major urban, minor urban and secondary urban. All 'urban' categories were grouped together creating two defined areas as rural or urban. There were five regions in total, with only one school located in Tairawhiti/Hawkes Bay, this was joined to the Bay of Plenty region as the closest geographical distance. The number of schools from Canterbury and Otago/Southland were 12 and five respectively, therefore, these were combined into one 'South Island' category.

3.2.7 Data Analysis

Statistical analyses were conducted using SPSS (IBM Statistics version 27, IBM Corp; Armonk, NY, USA), the percentage of 'red', 'amber' and 'green' menu items were calculated by school type (contributing/full), decile rating, equity index, school size, area, region, and deprivation level. Kolmogorov-Smirnov and Shapiro-Wilks tests were performed to test for normality among each variable, where normality was not reached the geometric mean (% 'red' menu items) and median (% 'green' menu items and menu score) was used for further analysis. For ease of reading, each variable has been reported using median (25^{th}, 75^{th} percentiles). Where sample variable had normal distribution (%amber menu items and transformed % 'red' menu items) parametric testing, independent one-way ANOVA, was used to assess the relationship to each demographic; except for area and school type, where independent T-tests were used. Levene's tests were caried out to test homogeneity of variance among each variable. Where variables were not normally distributed (% 'green' menu items and menu score) nonparametric Kruskal-Wallis testing was used to assess the relationship to each demographic, again in all except area and school typed were independent T-tests were used. Where significant group effects were found, Tukey and Mann-Whitney U tests were used for post-hoc analyses for normally and non-normally variables, respectively. A significance level of $p<0.05$ was set for all statistical tests.

3.4. Results

The sample of primary schools included in this study (n=133) represent 7% of primary schools in Aotearoa NZ. The characteristics of the sample of primary schools partially aligned to those of all primary schools (Table 3.1). Regions differed with a high representation of the Bay of Plenty (23%) and

Northland (13%) regions compared to all primary schools (14% and 6% respectively). There was a low representation of 'small' sized (28%) and 'low' decile (17%) primary schools in the sample when compared with all primary schools (54% and 31%) in Aotearoa NZ.

Overall, school menus offered 12.8% green, 41% 'amber' and 40% 'red' menu items. The overall menu score was 0, out of a maximum of 6 indicating a low level of alignment to the MoH guidelines. Significant relationships were found between school characteristics and the percentage of 'red', 'amber', 'green' menu items and menu score in all characteristics excluding school type, these are discussed further below. School menus varied in level of detail, number of menus items (<10 - >100 items) and frequency (daily - once a term) see Appendix C for example of analysed menus.

Table 3.1. Study Sample Characteristics

School Characteristic		Sample	All NZ Primary Schools*
Number of Primary Schools		133 (7%)	1,829 (100%)
School type	Contributing (year 1-6)	77 (58%)	771 (42%)
	Full (year 1-8)	56 (42%)	1,058 (58%)
Deciles	Low (1-4)	23 (17%)	569 (31%)
	Medium (5-7)	49 (37%)	548 (30%)
	High (8-10)	61 (46%)	698 (38%)
Equity Index	Low (300-399)	39 (29%)	-
	Medium (400-499)	79 (59%)	-
	High (500+)	15 (11%)	-
School size	Small (1-199)	37 (28%)	990 (54%)
	Medium (200-399)	51 (38%)	506 (28%)
	Large (400+)	45 (34%)	333 (18%)
Area	Rural	30 (23%)	605 (33%)
	Urban (main, minor, and secondary)	103 (77%)	1223 (67%)
Region	Northland	17 (13%)	105 (6%)
	Auckland	44 (33%)	383 (21%)
	Bay of Plenty (including Hawkes Bay)	30 (23%)	250 (14%)
	Wellington	23 (17%)	207 (11%)
	South Island (Canterbury and Otago/Southland)	19 (15%)	391 (21%)
Deprivation	Low (1-3)	38 (29%)	-
	Medium (4-7)	64 (48%)	-
	High (8-10)	31 (23%)	-
Providers†	Chain Providers	69 (52%)	-
	Local Providers	71 (53%)	-
	In-House	26 (20%)	-
	School Provider	24 (18%)	-

**All Primary school characteristics obtained September 2022 (Education Counts, 2022)*
†Total percentage of providers does not equate to 100% as some schools use more than one provider

Table 3.2. Percentage of 'green', 'amber' and 'red' Menu Items and Overall Menu Score of Primary Schools

		% Green	% Amber	% Red	Menu Score†
All Schools		12.8 (5.2, 24.0)	41.0 (23.6, 54.7)	40.0 (25.7, 57.9)	0 (0, 1)
School type	Contributing	13.0 (4.1, 24.2)	40.0 (24.4, 54.4)	40.5 (28.9, 54.6)	0 (0, 1)
	Full	12.5 (6.2, 23.1)	41.5 (21.8, 56.5)	40.0 (20.4, 62.2)	0 (0, 1)
Deciles	Low	8.6 (0.0, 20.2) *	38.5 (21.1, 50.0)	48.3 (40.0, 67.9) *	0 (0, 0)
	Medium	11.1 (4.9, 24.3)	33.3 (19.1, 54.4)	47.7 (24.8, 69.5)	0 (0, 1)
	High	15.8 (9.7, 25.4) *	45.2 (25.8, 60.0)	35.8 (20.3, 47.3) *	0 (0, 1)
Equity Index	Low	22.2 (12.9, 26.7) *	42.5 (25.0, 54.8)	35.8 (25.8, 47.7)	0 (0, 1)
	Medium	12.1 (3.2, 21.2) *	41.6 (18.2, 56.5)	40.0 (22.5, 61.3)	0 (0, 1)
	High	6.7 (0.0, 11.1) *	36.4 (20.0, 46.7)	50.0 (41.2, 80.0)	0 (0, 0)
School size	Small	7.1 (0.0, 14.0) *	25.0 (14.6, 43.5)	61.3 (34.9, 84.5) *	0 (0, 0)
	Medium	13.5 (5.6, 26.7) *	46.2 (32.7, 61.4)	31.6 (19.1, 46.2) *	1 (0, 1)
	Large	16.7 (10.4, 24.7) *	40.0 (24.4, 50.0)	39.8 (30.7, 52.5) *	0 (0, 1)
Area	Rural	9.7 (0.0, 12.8) *	28.0 (12.0, 44.6)	50.0 (38.1, 84.4) *	0 (0, 0)
	Urban	15.1 (7.0, 25.0) *	43.0 (25.0, 56.5)	36.9 (22.5, 52.0) *	0 (0, 1)
Region	Northland	11.1 (0.0, 19.9) *	33.3 (25.0, 48.8)	50.0 (29.5, 68.1)	0 (0, 1.5)
	Auckland	20.4 (9.2, 27.1) *	32.6 (22.9, 46.7) *	44.8 (32.8, 51.8)	0 (0, 1)
	Bay of Plenty	10.4 (3.0, 13.3) *	42.2 (20.8, 60.8)	41.2 (25.7, 60.2) *	0 (0, 1)
	Wellington	20.2 (7.0, 28.1) *	46.2 (43.9, 64.2) *	25.8 (15.8, 35.8) *	1 (0, 1)
	South Island	12.5 (0.0, 19.6) *	32.7 (20.0, 50.0)	46.9 (25.6, 72.0) *	0 (0, 1)
Deprivation	Low	14.2 (10.4, 25.8) *	45.0 (26.1, 70.8)	34.3 (19.2, 48.1)	0 (0, 1)
	Medium	13.0 (5.3, 26.2) *	38.6 (18.7, 47.3)	41.3 (24.3, 64.1)	0 (0, 1)
	High	8.6 (0.0, 16.7) *	38.5 (25.0, 60.0)	46.7 (32.6, 60.9)	0 (0, 1)

All figures are reported as median (25th percentile, 75th percentile)
**Statistically significant differences found among school characteristics*
†Overall menu score to indicate alignment to MoH guidelines, ranked 0-6, with 6 representing the highest alignment to MoH guidelines

3.4.1. Regions

Wellington and Auckland had a higher percentage of 'green' menu items, approximately double that of other regions. This result was found to be statistically significant when comparing Auckland to Northland (p=0.046), Bay of Plenty (p=0.002) and South Island (p=0.026) and comparing Wellington to Bay of Plenty (p=0.043). The percentage of 'amber' menu items did not vary significantly among regions except for Wellington and Auckland, where Wellington had a higher percentage compared to

Auckland (46.2% and 32.6% respectively, p=0.015). Further, Wellington had the lowest percentage of 'red' menu items (25.8% compared to 41-50%), this was significant in comparison to Auckland (p=0.037), Bay of Plenty (p=0.048) and South Island (p=0.041).

3.4.2. Area

Urban areas had a higher alignment to the MoH guidelines, with a significantly higher percentage of 'green' menu items (p=0.006) and lower percentage of 'red' menu items (p<0.001). The largest difference was seen in the percentage of 'red' menu items where rural schools had 50% of 'red' menu items, compared to 36.9% in urban schools. This trend was represented in the menu score as well, where a statistically significant difference was noted (p=0.008). However, due to the overall low compliance of menu scores, the difference found here is with the 75th percentile where the urban menu score was 1 compared to the rural 0, that median score was 0 for both.

3.4.3. School Size

A small school size was found to have lower compliance to the MoH guidelines in comparison to medium and large size primary schools. Schools that were small had about half the percentage of 'green' menu items compared to medium (p=0.002) and large (p<0.001) and large sized schools. Similarly, there was a significantly higher percentage of 'red' menu items in small sized schools compared to medium (p<0.001) and large (p=0.020) sized schools. The median menu score was found to be significantly different in small sized schools (0) compared to medium sized schools (1; p=0.006).

3.4.4. Socioeconomic Characteristics

Socioeconomic measures overall were found to have a statistically significant impact on the percentage of 'green' menu items. A low equity index was related to a larger percentage of 'green' menu items (22.2%) compared to both medium (12.1% p=0.02) and high (6.7% p<0.001) index schools. Differences were shown in levels of deprivation with lower percentage of 'green' menu items in high deprivation schools compared to both medium (p=0.046) and low (p<0.007) deprivation levels. Following this trend, low decile schools had a significantly lower percentage of 'green' menu items compared to high decile schools (p=0.011). The decile rating of school also had a significant difference for the percentage of 'red' menu items, with a higher percentage in low decile schools compared to high decile (p=0.036).

3.4.5. Food Group Categorisation

This analysis indicated there were a higher percentage of 'green' menu items based on the defined food groups. The food group analysis was representative of 59.1% 'green' menu items, compared to the current 16.2%. This was reflective of a change in the number of 'amber' menu items, from 39.8% to 2.7% when assessing defined food groups. There was not a large difference in the percentage of red menu items, 44% when individually analysed to a representative 38.2% when using food groups (Figure 3.2).

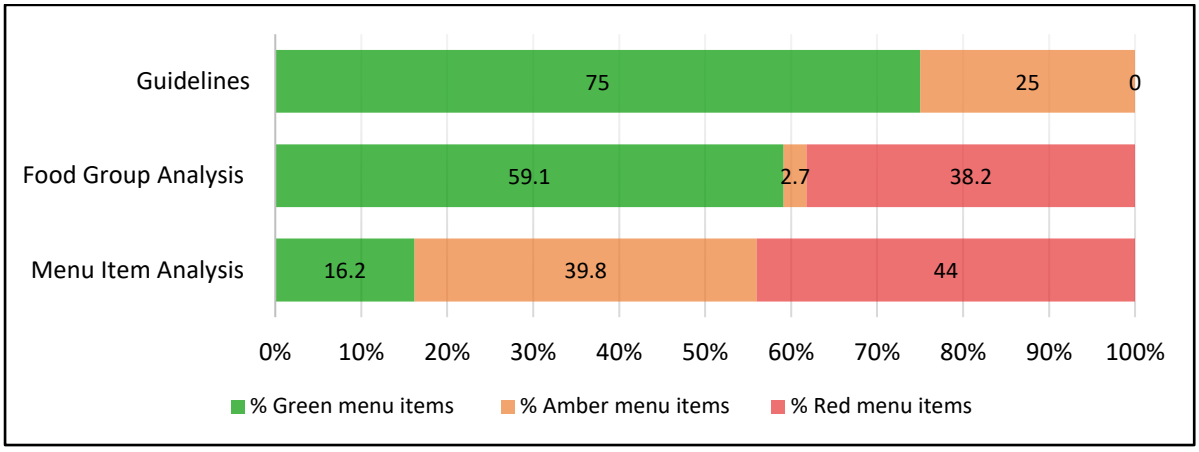

Figure 3.2. The Alignment of Primary School Menus to Ministry of Health Guidelines, Comparison of Food Group Categorisation, and Individual Menu Item Analysis.

3.5. Discussion

3.5.1. Alignment to MoH Healthy Food and Drink Guidance

This study has highlighted how far primary schools and kura in Aotearoa NZ must go to meet the current MoH guidelines. The average menu score was zero out of six, only five schools (3.8%) had a score of three or more, with the highest score being four. No school in this sample of 133 menus met the overall MoH guidelines. Only two schools (1.5%) provided at least 75% of 'green' menu items and just one school (0.75%) had 0% 'red' menu items. This indicates a low level of compliance with MoH guidelines.

3.5.2. Contribution to Food Availability

The findings indicate school menus in this study represent increased access to undesirable food choices in primary schools in Aotearoa NZ. School menus are dominated by 'amber' and 'red' menu items that can be characterised as foods which have poor-nutrient density, UPF items, deep-fried

items and SSB. The findings reported here demonstrate that school menus may increase the availability of undesirable food choices in primary schools, this can negatively influence a child's perceptions of healthy food.

Further understanding is required to determine the overall weight that school menus have in influencing a child's food choice. Primary school menus were provided everyday, once a week or once a term, therefore, caution should be applied when interpreting the findings of this study as menu choices were not available all the time for students. Considering the many different elements involved in a school food environment, the importance of a school menu that is only offered once a term may be outweighed by the other influences in the school food environment. A previous investigation has shown that 80% of NZ schools (primary and secondary) had school gardens, and 90% included nutrition education in the curriculum (D'Souza et al., 2022). Therefore, children may change their attitudes towards healthy eating because of these school activities in the absence of healthy foods available from the school menu. Alternatively, the disconnect between what is being promoted through school gardens, the curriculum, and the lack of healthy food available may undermine the importance of healthy eating. This analysis provides a base understanding as to the contribution of school menus to the type of school food available in primary schools, however, further research would provide a greater context to how this influences the school food environment.

3.5.3 Influence of School Characteristics

We found that schools located in rural settings were associated with a lower alignment to MoH guidelines. A lower alignment (higher percentage of 'red' menu items, lower percentage of 'green' menu items) was found in rural areas compared to urban, in smaller sized schools, and regions outside of Auckland and Wellington. These characteristics were representative of schools located outside of metropolitan areas and in less densely populated settings. These findings may be explained from the geographical make up of Aotearoa NZ and access to food suppliers. Primary schools do not offer an in-house cafeteria in the same capacity as early childhood services or secondary schools. Only 20% of the schools included in this study had food provided from an inhouse service (Table 3.1). Predominantly, primary schools utilise external food providers for school menus. Therefore, the type of food provided in these menus is, in part, dictated by what food suppliers are available to that school. Where a primary school in Auckland could access multiple chain provider (e.g., sushi, sandwiches, or school-specific providers), a small regional school may only have access to the local bakery or dairy. The location of a school may therefore determine access to suitable suppliers, therein the ability to provide a school menu that aligns with the MoH guidelines. These findings bring into question, what

expectations can be placed on schools to offer foods in alignment with the guidelines when they are limited by their access to suitable suppliers based on their location.

Findings from this study suggest that children living in higher areas of social deprivation have a lower access to 'green' menu items. The percentage of 'green' menu items was approximately double in areas of low deprivation vs high deprivation. 'Red' menu items were higher in schools with high deprivation, high equity index and low decile rating although this was only statistically significant in the high equity index group. Findings highlight the need for public health interventions such as HAL to target schools with lower socioeconomic status.

3.5.4. Food Group Comparison

The food group comparison provided a different context for assessing the nutritional adequacy of primary school menus. This analysis found 38.2% of school menus were made up of food groups that represented 'red' menu item which contribute the most to unfavourable health outcomes. This was not very different compared to 44% in the menu item analysis. There was a higher percentage of 'green' menu items, 59.1% from food groups compared to 16.2% from menu items. The shift in the 'green' menu items was reflected by a reduction in the number of 'amber' menu items (from 39.8% from food groups to 2.7% from menu items) and is an indication that there is a key opportunity to improve the school menus to be closer to the recommended 75% in MoH guidelines. 'Amber' menu items may provide an opportunity to shift to a 'green' menu item, for example, a sandwich made on white bread with no vegetables can be adjusted to be on brown bread, with the addition of two vegetables.

Alternatively, these findings may question the applicability of the MoH guidelines. The governments Ka Ora, Ka Ako lunches used these same guidelines to deliver and audit school lunches. However, adjustments were required and implemented at the start of 2023 (Ministry of Education, 2023b) in order to make requirements more achievable, and reportedly, to make meals more acceptable to school children.

3.5.5. Interpretation

This study shows the amount of 'red' menu items available does not support healthy eating habits for primary school-aged children. In an environment where school menus reflect the social norm of foods available in Aotearoa NZ, alongside a historical understanding of the inability to impose regulations to remove the sale of 'red' menu items in schools – the focus returns to what a public health programme,

such as HAL, can do to generate change in primary schools. Targeting the reduction in sales and availability of these items requires the greatest focus for strategies to improve the school food environment. Further research will help to understand the importance of school menus in the greater context of the school food environment of primary schools in Aotearoa NZ.

The findings from this study highlight the need to place more resources into primary schools to generate change in school menus to improve the food environment. However, the complex picture around food providers should be taken into consideration. Primary schools face unique challenges, the inequitable access to suppliers reflect the need to work with primary schools on an individual level. For a programme such as HAL, when working with primary schools to improve their school menus, a 'working with suppliers' toolkit may need to be considered as a low percentage of primary schools provide their menus from in-house cafeterias.

3.6. Conclusion

In conclusion findings from this study indicate that primary schools' menus in Aotearoa NZ are not aligned to the MoH guidelines, not a single school in this study met the guidelines. The issue is more persistent in rural schools with small roll sizes, indicating inequitable outcomes in relation to access to food suppliers in comparison to metropolitan areas. 'Red' menu items represent a persistent portion (~40%) of primary school menus, comparatively, there is an opportunity to improve the percentage of 'green' menu items by an adjustment of menu items, MoH guidelines, or both.

To generate meaningful change, focus needs to be placed on supporting schools who have more vulnerable populations, where socioeconomic pressures are higher, and in rural isolated towns where food choices are limited. Additional focus should be on limiting 'red' menu items first, to minimise the health risk that these foods have, then address the changes to include more 'green' menu items.

Public health interventions such as HAL provide the best opportunity to drive change, their efforts should focus not only on the encouragement of schools to create change, but to facilitate conversations with food suppliers to limit their offering of 'red' menu items. The feasibility of MoH guidelines should be addressed to help support schools and kura into meeting achievable goals for healthy food availability for children.

Chapter 4 Conclusion and Recommendations

4.1 Achievement of Aims and Objectives

This thesis aimed to assess alignment of primary school menus to the MoH Healthy Food and Drink Guidance, therein exploring their contribution to healthy food availability of primary schools participating in Healthy Active Learning (HAL). The following objectives were set out to achieve this aim: 1) define menu items of primary schools as 'green', 'amber', and 'red' items as defined in Healthy Food and Drink Guidance (Ministry of Health); 2) assess the alignment of primary school menus to Healthy Food and Drink Guidance (Ministry of Health) by the percentage of 'green', 'amber', and 'red' menu items; 3) describe how primary school menus contribute to healthy food availability in schools; 4) explore the association of menu quality ('green', 'amber', and 'red' items) to school characteristics: type, size, area, region deprivation level, decile rating and equity index; 5) assess menu items in defined 'foods groups' categories as 'green' 'amber' and 'red' items to explore the opportunity for increased alignment to Healthy Food and Drink Guidance (Ministry of Health) in the food offered in primary school menus.

Objective one posed the greatest challenges regarding this menu analysis, as the guidelines were developed as recommendations, and not as a tool for analyses. To address this, the research team developed a menu analysis database to serve as a comprehensive toolkit for menu analysis. This was the first study of its kind in Aotearoa NZ and has the potential to be utilised in future research, providing a basis for comparative studies and the assessment of the impact of the HAL on school menus.

In assessing objective two, the alignment of the primary school menus, it was found that there is, currently, very low adherence to MoH guidelines. None of the schools in this study met the overall guidelines, while only two met the recommended 75% of 'green' menu items and one met the criteria for no 'red' menu items. On average, 16.2% of the menu consisted of 'green' items, 39.8% of 'amber' items, and 44% of 'red' items, indicating a need for improvement.

This analysis revealed that primary school menus were largely composed of foods that are not nutritionally adequate, such as ultra-processed foods, sugary drinks, and baked items. As such, addressing objective three, primary school menus from this study can be contributing to the availability of unhealthy food options for children at school.

With regards to objective four, schools in a rural setting (associated with small school size and regions outside of Auckland and Wellington) had a lower alignment to MoH guidelines. Poor socioeconomic

measures were associated with a lower percentage of 'green' menu items, indicate inequitable access to healthy options among schools with greater levels of deprivation.

From the analysis of primary school menus by food groups, the opportunity for increased alignment to MoH guidelines in school menus was indicated. From objective five, two key aspects of menus were found, there is a clear opportunity to increase the percentage of 'green' menu items from small adjustments, and that 'red' menu items represent a persistent issue in primary school menus. The potential ease to adjust menus to offer more 'green' items pulls an alternative view, whether there is a need to adjust guidelines to make them more achievable. For example, stating that a sandwich can be categorised as green if it is made on wholegrain bread and contains at least one (rather than three) vegetables, defines a more manageable goal for schools and providers.

4.2. Research Impact

This research adds to the knowledge of the types of food available to children in the primary school setting, providing a preliminary understanding of the role of primary school menus in the overall school food environment. It must be noted, however, that these findings must be considered in the context of the wider school food environment to gain a more complete understanding of the implications for child health outcomes. This research provides data for a baseline analysis of HAL outcomes which can be used to measure the effectiveness of the interventions offered as a part of HAL.

4.3. Strengths

To the researcher's knowledge, this is the first study of its size to analyse primary schools on a national level in Aotearoa NZ. In assessing against the MoH school guidelines, this study provides a new knowledge to the impact that primary school menus have on the school food availability, providing a new insight into the type of food that children in New Zealand are provided in school.

This study was particularly strong in its ability to assess primary school menus both by individual menu items and by food group categorisation. This gave a more comprehensive overview of the school menus that went beyond the guidelines, allowing the study outcomes to not only reflect the current state of primary school menus but to also recognise the potential for change. It was evident that there is an opportunity to increase the percentage of 'green' menu items, however, 'red' menu items remain persistent and require more resources from public health interventions to reduce.

The research team, knowledgeable in the field of dietetics, established the first methods for the first menu analysis of its scale in Aotearoa NZ. This was a key strength of the study, as it opens the possibility for similar analyses to be conducted, adding more value to this area of research in Aotearoa NZ. Further, two members of the research team conducted the analyses for primary school menus, allowing for a cross-analysis to be done and minimizing potential research bias in menu categorisation.

4.4. Limitations

This study had several limitations in the distribution of primary schools across the assessed characteristics. To achieve statistical significance, urban areas, 'major', 'minor' and 'secondary' had to be grouped together as one 'urban' variable. Additionally, due to small sample sizes from the Canterbury and Southland regions, these had to be combined into one 'South Island' region. Furthermore, the lack of data from the Gisborne area meant that it had to be combined with Hawkes Bay. Having better representation in these areas could have provided a clearer indication of the results found in this study.

The use of a menu database and assumptions to categorise school menu items has a limitation in terms of accuracy. While a quick menu analysis has been found to be more reliable and cost-effective than a comprehensive analysis (Reilly et al., 2016), the assumptions used can be a source of error. The varying level of detail among primary school menus is also a factor that needs to be considered. For instance, some schools provided full descriptions and images of portion sizes, while others only listed the name of the food item, such as 'chicken sandwich'. This lack of detail made it necessary to employ more assumptions about menus that provided limited detail, which may ultimately produce discrepancies in the results.

There is a limitation in the sample of schools in this study which were participating in HAL. The sample was not chosen randomly and was reliant on the schools' willingness to provide their school menus. The demographic characteristics of the sample schools differ from all primary schools in Aotearoa NZ with an over-representation of the Bay of Plenty and Northland regions. Additionally, there was a low representation of schools who had a 'small' roll size and a 'low' decile rating. This poses a limitation in the interpretation of results to all primary schools in Aotearoa NZ.

The global Covid-19 pandemic had an undeniable impact on this research, as the Ministry of Health had to prioritize managing the pandemic, thus curtailing its involvement. Although some contact was achieved, further collaboration with the Ministry of Health would have improved the outcomes of the

study. Additionally, the number of primary schools involved was cut short, as the data collection was terminated prior to reaching the target of 300 menus, leaving only 146 menus collected.

4.5. Recommendations

- Further research should examine the relationship between school suppliers and alignment to MoH school guidelines. This research should include a more comprehensive menu analysis that considers both the location of the school and the availability of different suppliers/food providers. Such an analysis would enable a better understanding of the extent to which schools are able to provide a school menu that is in line with the MoH guidelines and the factors that may be hindering or facilitating the process. Additionally, the research should identify potential strategies to ensure greater availability and accessibility of healthier food options in schools.
- To ensure meaningful outcomes from interventions that improve the school food environment and provide children with access to nutritious, healthy food choices, a comprehensive resource should be developed to assist schools in working effectively and strategically with food suppliers. This resource should provide guidance on the selection of suppliers and the type of food being offered. It should also include best practices for working with suppliers to ensure that the school food environment is safe, healthy, and equitable.
- It is recommended that interventions to improve the school food environment focus on reducing the number of 'red' menu items on primary school menus. This can be achieved through strengthening targets in public health interventions such as HAL. 'Red' menu items represent a persistent percentage of school menus and have been linked to poor health outcomes and undesirable dietary habits. Strategies to reduce 'red' menu items should be emphasized to improve the overall school food environment.
- The Ministry of Health should consider a revision of the healthy eating guidelines, as similar adjustments were made for the Ka Ora, Ka Ako lunches guidelines. Further research with schools to investigate the opportunity for menus to meet the guidelines and identify any barriers is recommended to establish areas that require revision. This may help to ensure that schools have clear and achievable guidelines to follow, enabling them to comply with the guidelines and reach the desired outcomes.

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Appendices

Appendix A: Supplementary Methods

A.1. Detailed Development of the Menu Analysis Toolkit

A.1.1. Food and Recipe Database

The food and recipe database compiled a list of common food items found on menus, categorising items into 'red', 'amber', or 'green' categories. There were five main categories within this database 1) Packaged food items, 2) Recipes, 3) Chain-suppliers, 4) Local suppliers and 5) Portion sizes of baked items.

Packaged food items were categorised based on their health star rating (HSR), the rating was obtained through supermarket websites (www.countdown.co.nz and www.newworld.co.nz), company websites, or calculated using the MoH HSR calculater excel tool. Where possible, three or more packaged food items were recorded so that an average HSR could be assigned to a food item (e.g. plain rice crackers). Therefore, if a menu did not include the specific brand used, the average HSR could be used to determine if a menu item was 'red', 'amber', or 'green'.

Recipes were obtained for common mixed meals (e.g., butter chicken, spaghetti bolognaise) from local websites (e.g. www.countdown.co.nz). This was used to assign a category to menu items if schools or providers did not provide the full recipe.

Nutrition information was accessed from chain-provider websites (e.g., Subway, Pita Pit). Where menus included a 'build-your-own' element, an 'average' was defined in order to categorise these items. For example, a build-your-own sandwich was assumed to have three vegetables, one sauce, one bread, and one protein. In the case of two main chain providers, the protein option was the variable that changed the categorisation of the menu item, therefore, each protein option was treated as a single menu item based around the 'average' base of other ingredients. This allowed for analysis of these menus when an exponential number of combinations would otherwise be possible.

The most common local providers were bakeries and sushi; menu items were catergorised in accordance with the guidelines. Sandwiches, rolls and wraps were the only items where assumptions had to be made in order to categorise these food items. Among the research team, it was assumed that three salad ingredients would be used (e.g., lettuce, tomato and cucumber), margarine spread, and the protein stated on the menu (e.g., ham, chicken).

A reference ‘portion guide’ was developed to describe the common weight of menu items where the portion size dictated whether the item would be a ‘red’ or ‘amber’ category (mainly baked foods). To determine portions sizes of item (e.g., pies, mufffins) Foodworks (New Zealand and Australia database) analysis was used.

A.1.2. Defined Assumptions

An ‘assumptions’ list was developed to record all assumptions that were made in developing the food and recipe database. These assumptions were also used to guide the analysis of school menus. A specific list of accompanying justifications was included, detailing the rationale behind each defined assumption. The assumptions were defined among the research team, with input from key stakeholders.

A.1.3. Analysis Templates

The analysis of these menus was based upon the MoH Healthy Food and Drink Guidance – Schools; therefore, the guidelines needed to be translated into a tool for menu analysis. A template was set up on Excel defining how to correctly categorise each of the different food groups set out in the guidelines; these groups were vegetables and fruits; breads, cereals and grains; milk and milk products; legumes, nuts, seeds, fish and other seafood, eggs, poultry and red meat; mixed meals/ready-to-eat and ready-to-heat meals; fats, oils, spreads, sauces, dressings and condiments; packaged snack foods; baked items; and drinks (Ministry of Health, 2020).

The menu item template provided the ability to code each menu item from their specific food group into either ‘red’, ‘amber’ and ‘green’ categories. A ‘mixed meal’ template was created separately as percentage of ingredients had to be considered (e.g., required 75% of ‘green’ ingredients).

A.2. Menu Analysis Toolkit

A.2.1. Food and Recipe Database

Table A.1 Packaged Food Rating

Packaged Food				
Food Item	**Brand**	**Rating**	**Justification**	**Guidelines**
Plain Rice Cracker	No Brand	Red	Average HSR of food group	*"Breads and Crackers'" Amber: Refined crackers/crispbread w/ HSR ≥3.5*
	Countdown	Red		
	Fantastic	Red		
	Peckish Thins	Red		
Flavoured Rice Cracker	No Brand	Red	Average HSR of food group	*"Breads and Crackers'" Amber: Refined crackers/crispbread w/ HSR ≥3.5*
	Ceres Organic	Amber		
	Peckish Thins	Red		
Brown Rice Cracker	No Brand	Green	Average HSR of food group	*"Breads and Crackers'" Green: Wholegrain/wholemeal w/ HSR ≥3.5*
	Ceres Organic	Green		
	Countdown	Green		
Whole Grain Cracker	No Brand	Green	Average HSR of food group	*"Breads and Crackers'" Green: Wholegrain/wholemeal w/ HSR ≥3.5*
	Arnott's: Salada	Red		
	Arnott's: Vita Wheat 9 Grain	Green		
	Arnott's: Vita Wheat Original	Green		
	Arnott's: Vita Wheat Sesame	Green		
	Huntly & Palmers: 8 Grains	Green		
	Huntly & Palmers: Sesameal	Red		
	Huntly & Palmers: Sesameal 5 Grain	Red		
	Huntly & Palmers: Sprouted Rye	Green		
Thin & light crackers	No Brand	Green	Average HSR of food group	"Breads and Crackers" Amber: Refined crackers/crispbread w/ HSR ≥3.5
	Arnott's: Cruskits Corn	Red		
	Arnott's: Cruskits Original	Green		
	Ceres Organics: Brown Rice Cakes Original	Green		
	Huntly & Palmers: Litebread Mixed Grain	Red		
	Huntly & Palmers: Litebread Original	Amber		
	Real Foods: Corn Thins	Green		
	Sunrice: Quinoa Thin Rice Cake	Green		
Other Crackers	No Brand	Red	Average HSR of food group	*"Breads and Crackers" Amber: Refined crackers/crispbread w/ HSR ≥3.5*
	Countdown: Garlic Crackers	Red		
	Countdown: Plain Water	Red		
	Griffins: Meal Mates Original	Red		
	Griffins: Snax Original	Red		
	Huntly & Palmers: Cream Cracker	Red		
	Huntly & Palmers: Somerset	Red		
	Nairns: Scottish Oat Cakes	Red		
	Ritz	Red		
	Rutherford & Meyer: Rice Wafer Cracker	Red		

Croutons/ Breadsticks	No Brand	Red	Average HSR of food group	*"Bread and Crackers" Amber: Refined crackers/crispbread w/ HSR ≥3.5*
	Grissini: Bread Sticks	Red		
	Hansells: Bread Croutons Plain	Red		
	Hansells: Soup &Salad Crouton Herb	Red		
Bread Products	No Brand	Amber	Average HSR of food group	*"Breads and Crackers" Green: Other bread products w/ <5 g fibre and ≥ 450 mg sodium/100g*
	Golden Bakery: Crumpets	Amber		
	Quality bakers: Muffin Splits	Amber		
	Tip Top: Oatilicious	Amber		
	United: Bao Steamed Buns	Amber		
Fruit Bread	No Brand	Amber	Average HSR of food group	*"Breads and Crackers" Green: Other bread products w/ <5 g fibre and ≥ 450 mg sodium/100g*
	Vogel's	Amber		
	Tip Top	Amber		
	Burgen	Amber		
	Quality bakers	Amber		
Fruit Products	No Brand	Amber	Average HSR of food group	*"Fruit" Amber: Fruit products with an HSR of ≥ 3.5*
	Fruit Hitz	Amber		
	Countdown Peach cups (in Juice)	Amber		
	Fruit Crush Ups	Amber		
	Countdown: Fruit salad in juice cup	Amber		
	Countdown: Peaches in juice cup	Amber		
	Countdown: Jelly fruit cup	Red		
	Pams: Jelly fruit cup	Red		
	Pure NZ Apple Chips	Amber		
	Annie's Fruit Bars	Amber		
	Wattie's Fruit Squirtz	Amber		
Pastry	No Brand	Amber	Average HSR of food group	*"Breads and Crackers" Green: Other bread products w/ <5 g fibre and ≥ 450 mg sodium/100g*
	Edmonds: Flaky Puff Pastry	Amber		
	Edmonds: Savoury Short Pastry	Amber		
	Timos: Filo Pastry	Green		
Packaged ice blocks / popsicle	No Brand	Red	Average HSR of food group	*"Packaged Snack Foods" Amber: HSR ≥ 3.5 AND kJ ≤ 800*
	Juicies (assorted flavour)	Amber		
	Kiwi Crushies: Wild berry	Amber		
	Twisted: Pink lemon twist plant-based ice block	Amber		
	Streets: Calipo	Red		
	Streets: Cyclone	Red		
	Tiptop: Fruju pineapple crush ice block	Red		
	Tiptop: Lemonade ice block	Red		
Packaged Snack Food	No Brand	Red	Average HSR of food group	*"Packaged Snack Foods" Amber: HSR ≥ 3.5 AND kJ ≤ 800*
	Healtheries: Potato Stix Roast	Red		
	Healtheries: Rice Wheels Sour Cream & Chives	Red		
	Healtheries: Oven baked Twirls	Red		
	Harvest Snaps: Pea Snacks Original Salted	Red		

	Countdown: Salted pretzel twists	Red		
	Le Snack: Cracks N Dip Cheese	Red		
	Frooze balls: Snack Balls Fugetastic	Red		
	Tom & Luke: Snackaballs Peanut Butter	Red		
	Mexicano Corn Chips: Unflavoured	Red		
	Mexicano Corn Chips: Flavoured	Red		
	Go nuts: Corn chips Tasty Cheese/salsa	Amber		
	Go nuts: Corn chips all flavour 150g packet	Red		
	Doritos: Cheese supreme 45g	Red		
	Countdown: Cassava vegetable crisps original	Red		
	Arnott's: Shapes 70g (assorted flavour)	Red		
	Sunny Hill: Kumara chips (original) 40g	Red		
	Pringles, single serve, 53g	Red		
	Pita Crisps	Red		
	Mother Earth Fruit Sticks	Amber		
	Fresher: Chip packet (assorted flavour)	Red		
Popcorn	No Brand	Amber	Average HSR of food group	*"Packaged Snack Foods" Amber: HSR ≥ 3.5 AND kJ ≤ 800*
	Countdown Light Butter Popcorn	Green		
	Serious Popcorn Sea Salt	Red		
	Countdown Popcorn lightly salted	Green		
	Pop'n'Good: Light and buttery popcorn 25g	Red		
	NZ Kettle Korn: Sweet and Salted Popcorn	Red		
	Sweet as Popcorn: Sea Salt	Amber		
	NZ Kettle Korn: Sea Salt Popcorn	Amber		
Seaweed	Ceres	Green		
	Nishin: Sweet seaweed	Red		
Muesli Bars	No Brand	Red	Average HSR of food group	*"Baked Items" Amber: Muesli bars w/ a HSR ≥3.5*
	Countdown: Yoghurt Muesli Bars	Amber		
	Countdown: Chewy muesli	Amber		
	Countdown: Nut bar	Red		
	Countdown: Oven baked fruit filled bars	Red		
	Countdown: Oaty Slice Chocolate Chip	Red		
	Fibre one: Muesli bar	Red		
	Flemings: Chewy muesli			
	Kellogg's: Nutrigrain cereal bar	Red		
	Kellogg's: LCM cereal bar	Red		
	Mother Earth: Wellbeing sustain muesli bar	Amber		
	Mother Earth: Baked Oaty Slice	Red		
	Mother Earth: Fruit sticks/vege fruit sticks	Amber		
	Nature Valley: Crunchy oats and honey	Red		
	Nestle: Cereal bar	Red		
	Nice & Natural: Protein nut bar	Red		
	Tasti: Snack logs	Red		
	Tasti: Milkies muffin bar	Amber		
	Tasti: Protein bar muesli bar	Red		
	Tasti: Mega nuts	Red		

	Tasti: Frutsies	Red		
	Tasti: Made Simple muesli bar	Amber		
Muesli	No Brand	Amber	Average HSR of food group	*"Breakfast Cereals" Green: Wholegrain cereal and porridge w/ HSR ≥3.5 and ≤15g sugar/100g Amber HSR ≥3.5*
	Ceres Organics: Blueberry/LSA bircher muesli	Green		
	Ceres Organics: Cacao Almond Macadamia Bircher	Amber		
	Ceres Organics: Original Bircher	Green		
	Chantal organics: Swiss Bircher muesli	Amber		
	Countdown: Natural Muesli	Amber		
	Countdown: Toasted Muesli	Amber		
	Macro organic: Natural Muesli	Green		
	Moore Wilson's: Highland Muesli toasted	Amber		
	Sanitarium: Cluster crisp	Amber		
	Sanitarium: Light n tasty	Amber		
Corn Flakes	No Brand	Red	Average HSR of food group	*"Breakfast Cereals" Amber: HSR ≥3.5 Red: Cereals w/ HSR <3.5*
	Countdown: Cornflakes	Amber		
	Hubbard's: Cornflakes	Red		
	Kellogg's: Cornflakes	Red		
	Pams: Cornflakes	Red		
	Skippys: Cornflakes	Amber		
Rice Pops	No Brand	Red	Average HSR of food group	*"Breakfast Cereals" Red: Cereals w/ HSR <3.5*
	Countdown: Rice pops	Red		
	Hubbard's: Rice pops	Red		
	Sanitarium: Ricies	Red		
Cereals	No Brand	Red	Average HSR of food group	*"Breakfast Cereals" Red: Cereals w/ HSR <3.5*
	Kellogg's: Coco pops	Red		
	Kellogg's: Fruit Loops	Red		
	Kellogg's: Nutri Grain	Red		
	Kellogg's: Sultana Bran	Red		
	Nestle: Milo cereal	Red		
Fries, Wedges, Hashbrowns	No Brand	Amber	Average HSR of food group	*"Vegetables" Amber: Vegetable products w/ HSR ≥3.5*
	Birds eye: Golden crunch crinkle fries	Amber		
	Birds eye: Seasoned fries	Amber		
	McCain: Beer batter Fries Steak Cut	Amber		
	McCain: Beer batter wedges	Amber		
	McCain: Pub style wedges	Amber		
	McCain: Shoestring fries	Amber		
	Super oven golden chips	Amber		
	Wattie's: Original wedges	Amber		
	Wattie's: Tempura wedges	Amber		
	McCain Hashbrowns Golden	Amber		
	McCain Quick Cook Hashbrowns	Amber		
	Wattie's Classic Hashbrowns	Amber		
Creamed Corn	No Brand	Amber	Average HSR of food group	

	Countdown: Creamed corn	Amber		*"Vegetables"* *Amber: Vegetable products w/ HSR ≥3.5*
	Edgell: Creamed corn	Amber		
	Wattie's: Creamed corn	Amber		
Pickled Vegetables	No Brand	Red	Average HSR of food group	*"Vegetables"* *Amber: Vegetable products w/ HSR ≥3.5*
	Countdown: Sundried tomatoes	Red		
	Countdown: Gherkin	Red		
	Delmaine: Olives pitted green	Red		
Yoghurt Individual Pottles/Pouches	No Brand	Green	Average HSR of food group	*"Milk Products"* *Green: Low/Reduced Fat w/ HSR ≥3.5* *Amber: Full fat w/ HSR ≥3.5* *Red: HSR <3.5*
	Anchor: Calci yum yoghurt range	Green		
	Anchor: Uno yoghurt range	Green		
	EasiYo: Natural Yoghurt	Amber		
	Fresh n Fruity: Flavoured yoghurt range	Green		
	Meadow Fresh: Creamy berries yoghurt	Green		
	Moogurt: Suckies yoghurt kids range	Green		
	The Collective: 'Suckies' yoghurt range	Green		
	Yoplait: Viguer classic chocolate yoghurt	Red		
Yoghurt Tubs	No Brand	Green	Average HSR of food group	*"Milk Products"* *Green: Low/Reduced Fat w/ HSR ≥3.5* *Amber: Full fat w/ HSR ≥3.5* *Red: HSR <3.5*
	Yoplait: real fruit range	Amber		
	Yoplait: lemon	Green		
	Yoplait: natural sweetened	Green		
Cheese	No Brand	Amber	Assumption '31' Type of cheese blend	*"Milk Products"* *Green: Low/Reduced Fat w/ HSR ≥3.5* *Amber: Full fat w/ HSR ≥3.5* *Red: HSR <3.5*
	Countdown: Colby	Amber		
	Countdown: Mild	Amber		
	Mainland: Crumbly Feta	Amber		
	Mainland: Tasty	Red		
	Mainland: Parmesan	Green		
	Mainland: Mozzarella	Green		
	Smart Choice: Cheese Cafe bakery blend grated (Bidfood)	Green		
	Ornelle: Camembert	Red		
	Thomas dux: Brie	Red		
	Galaxy: Creamy feta	amber		
	Southern Range: Cheese pizza blend grated (Bidfood)	amber		
Custards	No Brand	Amber	Average HSR of food group	*"Milk Products"* *Green: Low/Reduced Fat w/ HSR ≥3.5* *Amber: Full fat w/ HSR ≥3.5* *Red: HSR <3.5*
	Meadow Fresh: Custard vanilla	Amber		
	Anchor: Custard Vanilla Thick & Creamy	Amber		
	Alpro: Soya Custard Vanilla Dairy Free	Amber		
Iced Milk Product	No Brand	Red	Average HSR of food group	*"Milk Products"* *Green: Low/Reduced Fat w/ HSR ≥3.5* *Amber: Full fat w/ HSR ≥3.5* *Red: HSR <3.5, Frozen desserts.*
	Moosie	Red		
	Twisted: Licks ice block (Mango)	Red		
	Twisted: Frozen yoghurt minis (chocolate + vanilla)	Amber		
	Twisted: Frozen yoghurt minis (assorted flavour)	Red		
Fish Cakes	No Brand	Green	Average HSR of food group	*"Fish and Other Seafood"* *Green: Processed fish with*

	Leaderbrand: Fish cakes	Green		*HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Birdseye: Salmon cakes	Green		
	United: Fish cake hoki hash	Green		
Fish Fingers	No Brand	Green	Average HSR of food group	*"Fish and Other Seafood"* *Green: Processed fish with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Sealord: Fish fingers	Green		
	Birdseye: Fish fingers	Green		
	Shore Mariner: Fish fingers	Green		
	Sealord: fish bites classic crumb	Green		
	Captains choice: Fish fingers	Green		
Smoked Fish	No Brand	Green	Average HSR of food group	*"Fish and Other Seafood"* *Green: Processed fish with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal* "
	Sealord: Fish fillet chunk style smoked	Green		
	Countdown: Tuna smoked	Green		
	John West: Tempers Tuna Naturally smoked	Green		
	Sealord: Sensations Salmon Smoked Flavour	Green		
	Countdown: Salmon naturally smoked	Green		
	United: Hoki cold smoked	Amber		
	Smokey: Kawahi smoked	Green		
Smoked Chicken	No Brand	Green	Average HSR of food group	*"Poultry"* *Green: Processed poultry with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Countdown: Smoked chicken breast	Green		
	Brinks: Smoked chicken breast	Green		
Chicken Nuggets	No Brand	Green	Average HSR of food group	*"Poultry"* *Green: Processed poultry with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Leader: Chicken nugget battered	Green		
	Leader: Chicken nugget tempura battered	Green		
	Southern range: Chicken nugget battered	Amber		
	Tegel: Chicken nugget battered	Green		
Chicken Luncheon	No Brand	Amber	Average HSR of food group	*"Poultry"* *Green: Processed poultry with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Huttons: Ham & Chicken luncheon	Amber		
	Southern range: Luncheon roll chicken	Green		
	Tegel: Chicken luncheon	Amber		
Chicken Pattie	No Brand	Amber	Average HSR of food group	*"Poultry"* *Green: Processed poultry with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Leader: Chicken patties coat Southern Style	Amber		
	Southern range: Chicken burger patties	Amber		
	Tegel: Chicken patties crunchy	Green		
	Tegel: Chicken patties grilled	Green		
	Tonys: Southern style chicken burger patties	Amber		
Chicken Tenders	Tegel: Take outs Southern style chicken tenders	Green	Average HSR of food group	*"Poultry"* *Green: Processed poultry with HSR ≥3.5*
	Tegel: crispy crumbed tenders	Green		

	Tegel: Tandoori chicken tenders	Green		*Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Rangitikei: Thai style tenderloins	Green		
	Waitoa: Original free range chicken tenders	Green		
Chicken Schnitzel	No Brand	Green	Average HSR of food group	*"Poultry"* *Green: Processed poultry with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Smart Choice: Chicken schnitzel	Green		
	Tegel: Chicken schnitzel	Green		
	Tonys: Chicken schnitzel	Green		
	Wattie's: Chicken schnitzel	Green		
Shaved Red Meat	No Brand	Amber	Average HSR of food group	*"Red Meat"* *Green: Processed meat with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Countdown: Shaved ham	Amber		
	Hellers: Shaved champagne ham	Amber		
	Hellers: Shaved pork	Amber		
	Southern range: Ham Shaved Leg	Green		
Meatballs	No Brand	Amber	Average HSR of food group	*"Red Meat"* *Green: Processed meat with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Angel Bay: Gourmet meatballs	Amber		
	Angel Bay: Meat balls beef part cooked	Amber		
	Countdown: Beef & pork meatballs	Green		
	Hellers: Pork meatballs	Amber		
	Leader: Meatballs beef cocktail flame grilled	Amber		
	Leader: Meatballs beef premium school	Green		
Burger Patties	No Brand	Amber	Average HSR of food group	*"Red Meat"* *Green: Processed meat with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Angel bay: Beef burger 100g part cooked halal	Amber		
	Countdown: Prime NZ Beef burger patties	Amber		
	Hellers: Burger Patties Angus	Amber		
	Leader: Hamburger patties fast cook	Green		
	Pacific Gold: Beef burger patties raw	Amber		
	Rocket: Beef Burger Patties NZ	Green		
Misc. Red Meat Products	No Brand	Amber	Average HSR of food group	*"Red Meat"* *Green: Processed meat with HSR ≥3.5* *Amber: HSR of <3.5, ≤ 50 g in sandwiches, rolls, wraps or salads, ≤ 120 g as a meal*
	Countdown: Corned beef	Amber		
	Tonys: BBQ pork ribblet	Amber		
Falafel	No Brand	Amber	Average HSR of food group	*"Legumes"* *All legumes 'green';* *Defined guideline: processed legume products defined as 'green' if 75% or more. 'Amber' if HSR ≥3.5*
	Danny's	Red		
	The cool gardener	Amber		
	Turkish kitchen	Red		
	Lisa's: Middle Eastern mix	Amber		
	Lissa: Mediterranean mix	Amber		
	Wild chef	Amber		
Meat Alternative Patties	No Brand	Amber	Average HSR of food group	*Defined guideline:* *'Meat Alternative'* *Amber if HSR ≥ 3.5*
	Bean supreme: Vegetarian burger patties	Amber		
	Beyond meat: Beyond burger patties	Amber		

	Leader: Burger patties vegetarian precooked	Red		
	Linda McCartney's: Vegetarian patties	Amber		
	Plan*t: Smoky Chipotle burger patties	Red		
	Polaris: Pattie Vege Burger	Amber		
	The Alternative meat co: Burger patties veggie	Amber		
	Vegie delights: Smoky BBQ burger patties	Amber		
Chicken Alternatives	No Brand	Amber	Average HSR of food group	*Defined guideline: 'Meat Alternative' Amber if HSR ≥ 3.5*
	Frys: Vegetarian burgers meat free chicken style	Amber		
	Plan*t: Chicken burger patties plant based	Red		
	Quorn: Vegetarian meal meat free soy pieces	Amber		
	Sunfed: Chicken free chicken original	Amber		
Mince Alternatives	No Brand	Amber	Average HSR of food group	*Defined guideline: 'Meat Alternative' Amber if HSR ≥ 3.5*
	Bean Supreme: Whole Food Mince	Amber		
	Bean supreme: Wholefood mince	Amber		
	Plan*t: Ground mince plant based	Red		
	Quorn: Vegetarian meal meat & soy free mince	Amber		
	Sunfed: Bull free beef	Amber		
	Vegie Delights: Casserole Mince Vegetarian	Amber		
	Vegie Delights: Meat alternative Nutmeat	Amber		
Vegetarian Sausages	No Brand	Amber	Average HSR of food group	*Defined guideline: 'Meat Alternative' Amber if HSR ≥ 3.5*
	Bean Supreme: Vegetarian sausages	Amber		
	Linda McCartney's: Vegetarian sausages	Amber		
	The Alternative Meat Co: Vegetarian sausages	Amber		
	Tonzu: Vegan sausages	Amber		
	Vegie Delights: Vegetarian hot dogs	Amber		
Hummus	No Brand	Amber	Average HSR of food group	*"Legumes" All legumes 'green';* *Defined guideline: processed legume products defined as 'green' if 75% or more. 'Amber' if HSR ≥3.5*
	Countdown: Original Hummus	Amber		
	Greater Hummus: Roasted Garlic Hummus	Amber		
	Just Hummus: Garlic & Lemon	Amber		
	Lisa's: Original Hummus	Amber		
	Obela: Hummus Smooth Classic	Green		
	Turkish Kitchen: Hummus Traditional	Amber		
Guacamole	No Brand	Green	Average HSR of food group	*Defined guideline: "Dips" defined as 'green' if 75% or more dairy/FVNL. 'Amber' if HSR ≥3.5*
	Countdown: Creamy guacamole dip	Amber		
	Obela: Guacamole	Green		
Dips	No Brand	Red	Average HSR of food group	*Defined guideline: "Dips" defined as 'green' if 75% or*
	Lisa's: Feta & Spinach	Red		
	Obela: Tzatziki	Red		

	Turkish Kitchen: Fresh spinach & feta	Red		*more dairy/FVNL. 'Amber' if HSR ≥3.5*

Table A.2 Common Recipes Rating

Common Recipes		
Menu Item	**Rating**	**Guidelines**
Bean burger patties	Amber	*"Mixed Meals"* *Green ≥ 75% 'green' ingredients* *Amber No 'red' ingredients* *Red Contains 'red' ingredients OR does not contain any fruit or vegetables*
Beef Nachos (no sour cream)	Red	
Berry Fluff / Ambrosia	Red	
Butter Chicken	Red	
Casserole/stew	Amber	
Cheese (Bechamel) sauce	Amber	
Chicken Kebab on Rice	Amber	
Chicken fried rice	Amber	
Chicken Thai fried noodle	Green	
Chicken chilli (curry)	Amber	
Chicken afridatta on rice	Green	
Chicken curry	Red	
Chicken and avocado wraps	Amber	
Chicken and vegetable pie	Amber	
Chicken noodle soup with corn	Green	
Chop suey	Green	
Coconut chia pot	Amber	
Corn fritters	Amber	
Cottage pie	Amber	
Dumplings: Pork and prawn (fat visible)	Red	
Dumplings: Chicken and vegetable	Green	
Feta and spinach roll	Amber	
Fish pie (mashed potato top)	Green	
Fried rice (Vegetarian)	Green	
Frittata	Amber	
Homemade ham pizza	Amber	
Jacket/Baked potato	Green	
Japanese Curry (Beef or Chicken)	Red	
Lasagne	Amber	
Macaroni cheese (Amber only if vegetables included)	Amber	
Mashed potato	Amber	
Meat loaf	Amber	
Mexican burrito bowl	Green	
Mouse trap	Red (no vegetable)	
Mushroom and Spinach fettucine	Red	
Pasta salad	Amber	
Onigiri (Teriyaki/Tuna)	Red	
Pesto and tomato pasta salad	Amber	
Pizza bread	Amber	
Pizza scrolls	Amber	
Pizza: Mushroom	Amber	

Pizza: Chicken	Amber	
Pizza: Hawaiian	Amber	
Pizza: Meat lovers Pizza	Red	
Pork fried rice	Amber	
Pork bun	Red (fat visible meat)	
Rice Ball (Plain)	Red	
Roast (Chicken)	Green	
Savoury mince	Amber	
Seaweed Inari	Red	
Smoked chicken and spinach fettucine	Red	
Spaghetti Bolognese	Green	
Spring rolls (spring roll)	Red	
Stir-fry (Chicken)	Green	
Soup: Pumpkin and kumara	Green	
Soup: Pumpkin	Red	
Soup Leek and Potato (no cream)	Amber	
Soup: Chicken and vegetable	Green	
Soup: Tomato (no cream)	Amber	
Teriyaki Chicken Donburi	Amber	
Teriyaki Chicken Rice Ball	Red	
Thai Beef Salad	Amber	
Thai chicken noodle salad	Green	
Toasted sandwich (Cheese)	Amber	
Tuna pasta bake	Amber	
Vegetable Noodle Salad	Green	
Vegetarian stir fry noodles	Amber	
Vegetable lasagne	Amber	
Vegetable soup with pasta	Green	
Vegetarian quiche	Amber	
Vietnamese spring rolls	Amber	

Table A.3 Chain Providers Menu Ratings

Chain Providers				
Chain	**Menu Item**	**Rating**	**Justification**	**Guideline**
Hells Pizza	Black Pizza	Red		*"Mixed Meals"* *Green ≥ 75% 'green' ingredients* *Amber No 'red' ingredients* *Red Contains 'red' ingredients OR does not contain any fruit or vegetables*
	Blue Pizza	Red		
	Chicken Tenders W/ Garlic Mayo Dip	Red		
	Green Pizza	Amber		
	Red Pizza	Red		
	Slaw Salad + balsamic dressing	Green		
	Slaw salad + Caesar dressing	Green		
	Wedges w/ Sour Cream	Red		
	Yellow Pizza	Amber		
Jesters Pie	All	Red	All exceed portion guide for pies	*"Baked Items"* *Red: Exceeds portion guide, Pies ≤ 140g*
Bakers Delight	Apple & Custard Scroll	Red		*"Baked Items"* *Amber: Contains wholemeal flour, grains/fruit or vegetables.* *Red: Exceeds portion guide, has confectionary or icing*
	BBQ Pizza	Red		
	Berry Scroll	Red		
	Cheese & Bacon Savoury Rolls	Red		
	Cheesymite Scroll	Red		
	Chocolate Croissant	Red		
	Finger Bun: Hundreds & Thousands	Red		
	Finger Bun: Raspberry Icing	Red		
	Ham, Salami, Caramelised Onion Pockets	Red		
	Hawaiian Pizza	Amber		
	Mediterranean Pizza	Red		
	Spinach, Feta, Pesto (Vege) Pockets	Amber		
Subway	Vegetarian	Amber	6 INC 'Choose Your Own - Bread & GF Wrap (Based off 'average' Subway w/ 3 salad options, cheese & sauce)	*"Sandwiches and Wraps"* *Green: Prepared w/ only 'green' ingredients* *Amber: Prepared w/ green and amber ingredients.* *Red: Contains red ingredients* *Meat servings are based upon processed meat with a HSR <3.5, Must not exceed 50g. All bread is amber, 3x veg, 1 x protein listed, 1 x spread/condiment, 1 x cheese. Serving of meat based on https://www.subway.com/~/media/New_Zealand/Documents/Nutritionals/NZ-Nutritional-Summary.pdf*
	Tuna & Mayo	Amber		
	Buffalo Chicken	Red		
	Chicken and Bacon Ranch Melt	Red		
	Chicken Classic	Red		
	Chicken Strips	Amber		
	Chicken Teriyaki	Amber		
	Three Pepper Chicken	Amber		
	Turkey, Sliced	Amber		
	Bacon, Streaky	Amber		
	Leg, Ham	Amber		
	Meatball Marinara	Red		
	Italian BMT	Red		
	Pepperoni	Red		
	Pizza Melt	Red		
	Pork Riblet	Red		
	Pulled Pork	Red		
	Roast Beef	Amber		
	Salami	Red		
	Steak, Diced	Red		

	Omelette	Amber		
	Veggie Patty	Amber		
	Falafel	Amber		
	Vegetarian	Amber	FOOT LONG Choose Your Own - Bread & GF Wrap (Based off 'average' Subway w/ 3 salad options, cheese & sauce).	
	Tuna & Mayo	Amber		
	Buffalo Chicken	Red		
	Chicken and Bacon Ranch Melt	Red		
	Chicken Classic	Red		
	Chicken Strips	Amber		
	Chicken Teriyaki	Amber		
	Three Pepper Chicken	Amber		
	Turkey, Sliced	Amber		
	Bacon, Streaky	Amber		
	Leg, Ham	Red		
	Meatball Marinara	Red		
	Italian BMT	Red		
	Pepperoni	Red		
	Pizza Melt	Red		
	Pork Riblet	Red		
	Pulled Pork	Red		
	Roast Beef	Amber		
	Salami	Red		
	Steak, Diced	Red		
	Omelette	Amber		
	Veggie Patty	Amber		
	Falafel	Amber		
	Vegetarian	Amber	WRAP Choose Your Own - Wrap (Based off 'average' Subway w/ 3 salad options, cheese & sauce)	
	Tuna & Mayo	Amber		
	Buffalo Chicken	Red		
	Chicken and Bacon Ranch Melt	Red		
	Chicken Classic	Red		
	Chicken Strips	Amber		
	Chicken Teriyaki	Amber		
	Three Pepper Chicken	Amber		
	Turkey, Sliced	Amber		
	Bacon, Streaky	Amber		
	Leg, Ham	Amber		
	Meatball Marinara	Red		
	Italian BMT	Red		
	Pepperoni	Red		
	Pizza Melt	Red		
	Pork Riblet	Red		
	Pulled Pork	Red		
	Roast Beef	Amber		
	Salami	Red		
	Steak, Diced	Red		
	Omelette	Amber		
	Veggie Patty	Amber		
	Falafel	Amber		
	Vegetarian	Amber		

	Turkey, Sliced	Amber	MINI Choose Your Own - (Based off 'average' Subway w/ 3 salad options, cheese & sauce)	
	Leg, Ham	Amber		
	Roast Beef	Amber		
	Chicken Strips	Amber	Salad bowl (Based off average salad w/ 4 veg options (green), sauce (amber), and protein (amber)) = mixed meal average 66% green items	
	Ham	Amber		
	Salami	Red		
	Beef strips	Amber		
	Tuna & Mayo	Amber		
	Vegetarian	Green		
	Apple & Custard Danish	Red		*"Baked Items"* *Amber: Contains wholemeal flour, grains/fruit or vegetables.* *Red: Exceeds portion guide, has confectionary or icing*
	Apricot & Custard Danish	Red		
	Boysenberry & Custard Danish	Red		
	Chocolate Chip Cookie	Red		
	Chocolate Chip Cookie w/ MnM's	Red		
	Double Chocolate Chip Cookie	Red		
	Oatmeal Raisin Cookie	Red		
	White Chip Macadamia	Red		
	Ultimate Cheesy Garlic Bread Toastie	Red		*"Mixed Meals"* *Green ≥ 75% 'green' ingredients* *Amber No 'red' ingredients* *Red Contains 'red' ingredients OR does not contain any fruit or vegetables*
	Ultimate Chicken & Pepperoni Cheesy Garlic Bread	Red		
Pita Pit	Black Bean Pattie	Amber	PETITA (Wholemeal, Plain + GF) 'Choose Your Own (Based Off a 'Regular' Pita Pit w/ 4 Veg, Sauce & Cheese)	*"Sandwiches and Wraps"* *Green: Prepared w/ only green ingredients* *Amber: Prepared w/ green and amber ingredients.* *Red: Contains red ingredients* *"Red Meat + Poultry"* *Green = Meat w/ fat remove, Mince w/ drained fat, Fresh or Frozen Poultry w/ fat removed OR Processed w/ a HSR >/= 3.5* *Amber = Processed w/ a HSR of <3.5 and </= 50g in a sandwich* *Red: Meat where fat is not removed, processed meat that does not meet Amber criteria*
	Feta & Quinoa Rosti	Amber		
	Garden Vege			
	Kumara & Lentil Rosti	Amber		
	Falafel	Amber		
	Ham	Amber		
	Pulled Pork	Amber		
	Roast Beef	Amber		
	Grilled steak	Amber		
	Bacon (fat visible)	Red		
	Grilled Lamb	Amber		
	Cabanossi Sausage	Amber		
	Eggs	Amber		
	Prawns	Amber		
	Chicken	Amber		
	Chicken - Teriyaki	Amber		
	Chicken Tenders	Amber		
	Marmite	Amber		
	Vegemite	Amber		
	Black Bean Pattie	Amber	REGULAR (Wholemeal, Plain + GF)	
	Feta & Quinoa Rosti	Amber		
	Kumara & Lentil Rosti	Amber		

	Falafel	Amber	'Choose Your Own (Based Off a 'Regular' Pita Pit w/ 4 Veg, Sauce & Cheese)	
	Ham	Red		
	Pulled Pork	Amber		
	Roast Beef	Amber		
	Grilled steak	Amber		
	Bacon	Red		
	Grilled Lamb	Amber		
	Cabanossi Sausage	Red		
	Eggs	Amber		
	Prawns	Amber		
	Chicken	Amber		
	Chicken - Teriyaki	Red		
	Chicken Tenders	Red		
	Marmite	Amber		
	Vegemite	Amber		
	Black Bean Pattie	Green	SALAD BOWL Salad Bowl Based off 'regular' bowl, mixed meal w/ 4 Veg (Green), 1 Sauce (Amber), 1 Toppings (Green) + Protein	
	Feta & Quinoa Rosti	Green		
	Kumara & Lentil Rosti	Green		
	Falafel	Green		
	Ham	Amber		
	Pulled Pork	Amber		
	Roast Beef	Amber		
	Grilled steak	Amber		
	Bacon	Red		
	Grilled Lamb	Amber		
	Cabanossi Sausage	Amber		
	Eggs	Green		
	Prawns	Green		
	Chicken	Green		
	Chicken - Teriyaki	Amber		
	Chicken Tenders	Amber		
	Brownie	Red		*"Baked Items"* *Amber: Contains wholemeal flour, grains/fruit or vegetables.* *Red: Exceeds portion guide, has confectionary or icing*
	Cookie	Red		
	Cookie Baked Choc Candy	Red		
	Ginger Crunch	Red		
	Grilled Wedges	Red		*"Deep fried foods"* *All Red*
	Loaded Pita Chips: Chicken	Red		*"Mixed Meals"* *Green ≥ 75% 'green' ingredients* *Amber No 'red' ingredients* *Red Contains 'red' ingredients OR does not contain any fruit or vegetables*
	Loaded Pita Chips: Falafel	Red		
	Loaded Wedges	Red		
	Pita Chips w/ Aioli Dipping sauce	Red		

Table A.4. Local Providers Menu Ratings

Local Providers				
Store	**Menu Item**	**Rating**	**Justification**	**Guidelines**
Sushi (Onigiri + Sushi Roll)	Chicken	Green		*"Sushi"* *Green: Prepared w/ mostly green ingredients.* *Amber: Other Sushi* *Red: contains deep-fried ingredients*
	Chicken & Avocado	Green		
	Tuna	Green		
	Tuna & Avocado	Green		
	Avocado	Green		
	Teriyaki Chicken	Amber		
	Teriyaki Chicken & Avocado	Green		
	Cream cheese + pineapple	Amber		
	Chicken Katsu	Red		
Bakery/Cafe	White Sandwich: Chicken & Vegetable	Amber		*"Sandwiches and Wraps"* *Green: Prepared w/ only green ingredients* *Amber: Prepared w/ green and amber ingredients.* *Red: Contains red ingredients*
	White Sandwich: Chicken	Amber		
	White Sandwich: Ham & Vegetable	Amber		
	White Sandwich: Ham	Amber		
	White Sandwich: Vegetable	Amber		
	Wholegrain/Brown Sandwich: Chicken & Vegetable	Amber		
	Wholegrain/Brown Sandwich: Ham & Vegetable	Amber		
	Filled Roll: Chicken & Vegetable	Amber		
	Filled Roll: Ham + Veg	Amber		
	Pie: Mince & Cheese	Red		*"Baked Items"* *Amber: Contains wholemeal flour, grains/fruit or vegetables.* *Red: Exceeds portion guide, has confectionary or icing*
	Pie: Mince	Red		
	Pie: Steak & Cheese	Red		
	Pie: Steak	Red		
	Pie: Bacon & Egg	Red		
	Pie: Mini Mince	Red		
	Sausage Roll	Red		
	Spinach Quiche	Amber		
	Gingerbread man	Red		
	Raspberry Lamington	Red		
	Chocolate Lamington	Red		
	Creamed Donut	Red		
	Hot Chips	Red		*"Deep fried foods"* *All Red*
	Battered Hot Dog	Red		
	Chicken Nuggets	Red		

Table A.5. Portion Guide for Baked Items

Baked Items - Commercial			
Food Item	Guidelines for amber category	Average Serving	Category
Scones	≤ 100g	65-85g	Amber
Cake	≤ 100g	113g	Red
Loaf	≤ 100g	101g	Red
Muffin	≤ 100g	163g	Red
Waffle	<100g	90g	Amber
Pancake	≤ 100g	1 (68g)	Amber
Crumble	≤ 100g	100g	Amber
Banana bread	≤ 100g	110g-140g	Red
Slices (14)	≤ 80g	80g	Amber
Slice with filling (e.g., caramel)	≤ 80g	90g	Red
Pikelet	≤ 40g	1 (25g)	Amber
Biscuit (plain sweet)	≤ 40g	≤ 3 (34g)	Amber
Custard Square	<80g	115g	Red
Biscuit flavoured (shortbread, fruit filled, choc chip, Anzac)	≤ 40g	≤ 2 (34g)	Amber
Small Pastries	≤ 60g	45g	Amber
Pie	≤ 140g	171g	Red
Quiche	≤ 140g	135g	Amber
Baked Items - Homemade			
Muffin	≤ 100g	Regular: 163g, Small: 110g	Red
Shortbread biscuit	≤ 40g	Regular: 39g, Small: 12g	Amber
Plain uniced biscuit	≤ 40g	Regular: 15g, Small: 7.5g	Amber
Brownie	≤ 100g	Regular: 98g	Amber

A.2.1. Defined Assumptions

Table A.5. Defined Assumptions and Justifications

	Assumptions	Justification
	Vegetables	
1	Where percentage of vegetable in a vegetable product not available, percentage is equal to the most similarly labelled product on the countdown website with this information available	Ingredient quantities likely to be similar. Countdown is a common supermarket, used for other justifications (consistency).
2	Mixed vegetable', 'roasted vegetable', 'vegetable platter' and 'salad' are all equivalent to 3 vegetables (i.e., 3 ingredients)	Commonality e.g., carrot, peas and corn for mixed vegetables, lettuce, tomato cucumber for a salad
3	All creamed corn has an HSR ≥ 3.5	See food database (average HSR)
4	Potato wedges and fries, oven baked from frozen, have a HSR ≥ 3.5	See food database (average HSR)
	Fruit	
5	Where percentage of fruit in a vegetable product not available, the percentage is equal to the most similarly labelled product on the countdown website with this information available	Ingredient quantities likely to be similar. Countdown is a common supermarket, used for other justifications (consistency).
6	Canned fruit, when used as an ingredient in meals, is in natural juice that has been drained	Dietetic judgement
7	Fruit salads and fruit platter contain three fruits where not otherwise salad	Commonality
	Breads and Crackers	
8	All bread (including pizza bases, pitas and wraps) is plain (white) unless stated otherwise	2002 NZ National Children's Nutrition survey "white bread was the most common bread type eaten by New Zealand children (79%)
9	Plain bread is defined as containing less than 25% wholemeal flour/wholegrains and no dried fruit	Dietetic judgement
10	Plain, wholemeal, wholegrain, wholewheat, wheatmeal and multigrain breads are served with a standard spread	Dietetic judgement
11	Fruit bread is served with margarine	Dietetic judgement
12	All wholemeal, wholegrain, wholewheat and wheatmeal breads have ≥ 5g fibre and < 450mg sodium per 100g as per Foodworks analysis (27/04/22)	Foodworks analysis (27/04/22) of these products in the NZ Market
13	White pita bread is amber for schools based on Foodworks analysis (27/04/22)	Foodworks analysis (27/04/22) of this product in the NZ Market
14	Multigrain bread and crackers without a brand/recipe stated contain the following whole grains: kibbled rye and wheat (no pumpkin or sunflower seeds)	Tip Top multigrain bread ingredients as of 06/05: https://www.countdown.co.nz/shop/productdetailsstockcode=275523&name=tip-top-super-soft-toast-bread-multi-grain add crackers
15	Pastry has a HSR of ≤ 3.5 (unless stated to be filo pastry which has a HSR of ≥ 3.5)	See food database
16	All fruit toast meets the amber category	See food database
	Breakfast Cereals	
17	Weetabix and Porridge have a HSR ≥ 3.5 and ≤ 15g sugar per 100g based on Foodworks analysis (27/04/22)	Foodworks analysis (27/04/22) of these products in the NZ Market
18	All muesli (including bircher) has HSR of ≥ 3.5	See food database (average HSR)
19	All muesli (including bircher) contains dried fruit and/or nuts and/or seeds	See food database
20	Are served with milk unless otherwise stated	Commonality
	Other grains	
21	Rice is white unless otherwise stated	Commonality
22	Grains are plain and unflavoured unless otherwise stated	Most often used as ingredient in meals where other flavouring is being added
	Milk	
23	Milk is full fat (dark blue top) and unsweetened unless otherwise stated	2002 NZ National Children's Nutrition survey, "three quarters of children most frequently drank standard milk".

24	Plant milks (soy, rice, almond and oat) are fortified with added calcium and B12	Soy milk most commonly used and most commonly fortified
25	Coconut milk without a brand stated is unfortified	Dietetic judgement, often canned
Milk Products		
26	Are full fat unless stated otherwise, with the exception of yoghurt (excluding Greek) which is assumed to be reduced fat	Commonality
27	Are unflavoured unless stated otherwise	Dietetic judgement
28	All yoghurts (reduced fat and regular) have a HSR ≥ 3.5	See food database
29	School aged+ children are served 1 pottle of yoghurt (125g) where not otherwise stated	Ease of service from school canteen and dietetic judgement
30	All custard products have a HSR ≥ 3.5	See food database
31	Cheese is bakery blend where cheese type is not stated (category amber not considering portion sizes)	Reported by Heart Foundation Nutrition Advisor to be commonly used
32	Cheese is 'pizza blend grated' where cheese type is not stated (category amber not considering portion sizes)	Reported by Heart Foundation Nutrition Advisor to be commonly used
33	Feta is the 'creamy' not 'crumbly' type where not otherwise stated	Commonality
34	The amount of cheese in sandwiches and meals does not exceed 40 g for schools	Verified with judgement of Heart Foundation Nutrition Advisor due to cost of cheese
35	A serving of ice cream is one scoop (68g)	A serving of ice cream is one scoop (68g)
36	All ice cream products have a HSR < 3.5	See food database
Fish and seafood		
37	Tuna is canned and unflavoured unless otherwise stated	Most often used as ingredient in meals where other flavouring is being added
38	All frozen fish (including crumbed) has a HSR ≥ 3.5	See food database
39	All canned fish (including flavoured) has a HSR ≥ 3.5	See food database
Poultry (chicken and turkey)		
40	Fresh or frozen poultry with the fat removed is used in meals/sandwiches unless otherwise stated	Dietetic judgement
41	All fresh and frozen poultry (including chicken nuggets and schnitzel) has a HSR ≥ 3.5	See food database
42	All smoked, shredded and roasted poultry has a HSR ≥ 3.5	See food database
43	All luncheon has a HSR < 3.5	See food database
Red meat (beef, lamb, pork)		
44	The fat has not been removed from meat if item is from a chain or community provider (otherwise it has)	Dietetic judgement
45	The fat has not been drained from mince if item is from a chain or community provider (otherwise it has)	Dietetic judgement
46	All processed/dried meat products meet amber based on nutrition assessment of Jack Links 600kj/packet (50g) or <300kj/stick (12g) and Biltong 550kJ *	Foodworks analysis (27/04/22) of these products in the NZ Market
47	All shaved ham & pork has a HSR < 3.5	See food database (based on average HSR)
48	All pork ribblet has a HSR < 3.5	See food database (based on average HSR)
49	All meatballs have a HSR of < 3.5	See food database (based on average HSR)
50	All burger paddies have a HSR of < 3.5	See food database (based on average HSR)
51	Red meat schnitzel has a HSR ≥ 3.5	Similar in nutritional composition to poultry schnitzel
52	All salami and bacon products have 'visible fat'	Production knowledge; blended with fat
53	The average portion size of red meat in a school meal is ≤ 120g	Verified with judgement of Heart Foundation Nutrition Advisor
54	The average portion size of red meat in a school sandwich is ≤ 50g	Verified with judgement of Heart Foundation Nutrition Advisor
Eggs		

55	Eggs prepared any style (scrambled, poached, fried, boiled) are green	Dietetic judgement
	Mixed meals	
56	Additional items including Salt, Stock, Raising agents, Herbs, Spices, Zest, Cornflour, Vinegar are not counted as ingredients in mixed meals	We do not have full recipes and these details are optional/suggestions on the guidelines
57	Salads are served without dressing in ELS (exception of coleslaw, assumed to be made up with mayonnaise)	Dietetic judgement
58	Burgers contain 1 protein (Amber), 1 condiment (Amber), 1 x plain bun (Amber), 3 x vegetable items (Green): Considered amber unless stated as 'fried' or no vegetables included in description	Commonality
59	Lunch boxes or 'Munch boxes' contain one red menu item (backed good, packaged snack food, or juice) where not defined therefor classified as red	Commonality
60	Dumplings are steamed unless otherwise stated	Commonality
61	Nachos' contain corn chips unless otherwise stated	Commonality
	Sandwiches and wraps	
62	Contain a single serve of vegetable oil spread unless another spread/sauce is stated. Falls under amber category, except for items where no main protein or salad is included. I.e., Cheese & Mayo, Marmite & Cheese	Dietetic judgement
63	Contain three vegetables if made by the school/ELS and two vegetables if made by children	Dietetic judgement
	Sushi	
64	Sushi includes sushi rolls and onigiri	Dietetic judgement
65	Katsu/crumbed items are deep fried	Dietetic judgement
66	Sweet Seaweed is a sweetened packaged snack item classified as Red	Green sushi is made of mostly green ingredients, all other sushi is amber (i.e., processed meat, cream cheese). Sushi that is deep fried will be red as this is in line with the guidance
67	Green sushi is made of mostly green ingredients, all other sushi is amber (i.e., processed meat, cream cheese). Sushi containing deep-fried products is red	Dietetic jugement
	Fats, oils and spreads	
68	Vegetable oil has been used as an ingredient in mixed meals with the exception of baked or air fried meals	Verified with judgement of Heart Foundation Nutrition Advisor
69	≤ 10g of spread is used in sandwiches and meals	Dietetic judgement
70	Spreads are vegetable oil based unless stated otherwise	2002 National Children's Nutrition Survey "Margarine or margarine blend was more frequently spread on bread by New Zealand children (about half) than Butter (one in five)".
	Sauces and dressings	
71	Are not reduced fat, salt or sugar unless stated otherwise	Commonality
72	Are served on the side (exception: chains e.g., pita and subway)	Dietetic judgement
73	Include gravy	Likely made from powder not fat
	Sweet condiments	
74	Are served in portions less than ≤ 1 tablespoon (15g)	Dietetic judgement
75	Include honey and sugar	Dietetic judgment of most suitable category
	Packaged snack foods	
76	HSR and kJ per packet content are as defined by the packaged snack food database	See food database
77	If brand name is not stated, the product falls into the common category (≤ 50%) for that snack item in the snack foods database	Dietetic judgement
	Confectionary	
78	Includes jelly	Dietetic judgement

Baked Items		
79	Portion sizes of baked items are as defined by the portion size database unless portion size is provided	Dietetic judgement
80	Wholemeal flour and wholegrains are not contained in baked items unless stated otherwise	Commonality
81	Fruit or vegetables are not contained in baked items unless stated otherwise	Commonality
82	The following baked items contain icing: buns, cakes, cupcakes, doughnuts, Afghan cookies, slices (exception: oat-based slice/muesli slice), lamingtons	Commonality
83	Family sized' pies baked inhouse with a protein source and vegetables are treated as mixed meal instead of baked item. These are assumed to be made with pastry unless stated to be Potato top, Shepherds, Cottage or Fish pie.	Portioning unknown, baked items category more suitable for individual items
84	All muesli bars and slices contain either dried fruit and/or whole nuts or seeds and/or are hard to chew	Commonality
85	All savoury scones contain at least one vegetable	Commonality
86	All bliss balls contain over 30g of dried fruit	Commonality
87	Anzac biscuits contain coconut which is a fruit	Commonality

Table A.6. Defined Rules for Primary School Menu Analysis

Rules	
1	If multiple flavours stated, count as individual items. If no flavour specified, count as one. For example: moosies (= 1 item), choc/banana/strawberry milk (= 3 item)
2	Combo meals are included as an overall item (treat as mixed meal). If the menu specifies that the items are also sold separately, classify the items as combo and individual items. If the menu does not specify the combo items being sold separately, only include the classification of the combo meal.
3	Count all verities of a food group (e.g., four bean mix counted as four legumes) in a mixed meal
4	If multiple sizes are stated, count them as individual items (e.g., 'small' and 'large', or 'half wrap' and 'whole wrap'
5	Vegetables are assessed as their culinary categorisation rather than botanical, i.e., a tomato is a vegetable.

A.2.2. Analysis Templates

The following templates have been extrapolated from Excel and do not function in Excel. Functioning templates assign menu category as tables are filled out. Functioning Excel Spreadsheets are available upon request.

Table A.7. Menu Item Categorisation Template

Menu Item Categorisation					
Category	Questions				
Vegetables	Fresh, Frozen or Canned	Vegetable Product HSR ≥3.5	Category		
1					
Fruit	Fresh, Frozen or Canned	Canned w/ Fruit juice AND drained	Dried fruit ≥30 g	Fruit Product HSR ≥3.5	Category
1					
Bread and crackers	Wholegrain, Wholemeal or Wheatmeal	Pita bread (	Refined Cracker/Crispbread HSR ≥3.5	Category	
1					
Breakfasts cereals	Weetabix, Porridge	Wholegrain cereal HSR ≥ 3.5 and ≤ 15 g sugar per 100g	Other cereal HSR ≥ 3.5	Category	
1					
Other grains	Wholegrain	No flavouring	Category		
1					
Milk	Low fat	Plant milk fortified	Unsweetened	Category	
1					
Milk Products	Low fat	Coconut cream, sour cream, cream cheese - low fat	Yoghurt, Custard ≤150g	Cheese ≤40g	Category
1					
Legumes	All green				Category
1					
Nuts and Seeds	ELS - Any nuts & seeds	No Added Salt	No Added Sugar	Salted Items, Nut mix w/ dried fruit ≤30g	Category
1					
Fish and other seafood	Fresh (if Y - No other Q's required)	Frozen or Canned HSR ≥3.5 (if Y - No other Q's required)	≤50g in a Sandwich	≤120g in a Meal	Category
1					
Poultry	Fresh (if Y - No other Q's required)	Processed w/ HSR ≥3.5* (if Y - No other Q's required)	≤50g in a Sandwich	≤120g in a Meal	Category
1					

Red meat	Meat/Mince w/ fat removed (if Y - No other Q's required)	Processed Meat (11) HSR ≥3.5* (if Y - No other Q's required)	≤50g in a Sandwich	≤120g in a Meal	Category	
1						
Eggs	All green					Category
1						
Mixed Meals (see separate table)	% Of Green items	% Of Amber items	% Of Red items	Contains Fruit or Vegetables	Category	
1						
Sandwiches and wraps	% Of Green items	% Of Amber items	% Of Red items	Contains Fruit or Vegetables	Category	
1						
Sushi	Uses mostly green items	Deep Fried Items	Category			
1						
Fats, oils and spreads	No Added Salt (Spreads)	Vegetable oil used (N = Saturated fats)	Butter ≤10g Portion	Category		
1						
Sauces and dressings	Reduced Fat	Reduced Sugar	Reduced Salt	Category		
1						
Sweet Condiment	Reduced Sugar	Category				
1						
Deep Fried Food	All Red					Category
1						
Packaged Snack Food	HSR ≥3.5 and ≤ 800 kJ per packet	Category				
1						
Confectionary	All Red (Includes: 'confectionary' includes boiled sweets, toffees, and caramels, fudge, fondants, gums (including sugar-free gums), pastilles and jellies, chocolate, fruit leathers, yoghurt-covered items, candied fruit and nuts, and compound chocolate)					Category
1						
Baked items	Contains wholemeal/wholegrain OR fruit (13) OR vegetable	Contains confectionary	No Icing	Muesli bars HSR ≥3.5	Portion Size (See Guide)	Sausage Roll	Category
1							
Drinks	Plain Water: Green		Milk - Use milk section to determine amber/green		All other drinks and smoothies: Red		Category
1							

Table A.8. Mixed Meal Categorisation Template

Mixed Meal Template						
Mixed Meal	% Of Green items	% Of Amber items	% Of Red items	Contains Fruit or Vegetables	Category	Ingredients

Table A.9. Menu Analysis Template

Menu Analysis Template									
School	**Food Provider**	**Menu Category**	**Menu Item**	**Category**	**Food Group**	**Assumptions made**	**Statistics**	**#**	%
	**Merge as required*	**Merge as Required*					Menu Items:	0	0.0
							Red:	0	#DIV/0!
							Amber:	0	#DIV/0!
							Green:	0	#DIV/0!
							?:	0	#DIV/0!
							Time to assess:		
							Menu quality:		
							Comments: **Merge as required*		

A.3. Food Categories

Table A.9. Food Category Definitions

Food Categories	**Reference Name**	**MoH Category**
Sandwiches, filled rolls, wraps, pitas, panini, bagels	Sandwiches	Green
Baked foods and foods with pastry (pies, sausage rolls, bakery items - savoury and sweet scrolls, muffins etc.)	Baked	Red
Sausage sizzle, hot dogs, and deep-fried items (singular - fries, hashbrown, chicken nuggets)	Sausage	Red
Pizza and garlic bread (including pizza bread)	Pizza	Amber
Mixed meals containing cheese, cream, UPF (nachos) and/or deep-fried items	MM - UPF	Red
Mixed meals other (stir-fry, fried rice, lasagne, teriyaki chicken on rice, donburi)	MM - Other	Green
Water and low-fat milk (plain, unflavoured)	Water	Green
Ice creams, ice blocks, juicies (frozen juice), jellies and dessert items	Desserts	Red
Sugar-sweetened beverages (flavoured milk/juice/fizzy drink/flavoured water)	SSB	Red
Dairy snack foods (yoghurt, cheese)	Dairy Snack	Green
Fresh, frozen, canned fruit & vegetables (incl. hummus)	F&V	Green
UPF - savoury - chips, crackers, savoury snacks, instant noodles	UPF - Savoury	Red
UPF - sweet (biscuits, chocolate, bars)	UPF - Sweet	Red
Sushi (sushi rolls, panda sushi, onigiri)	Sushi	Green
Condiments (soy sauce, tomato sauce, wasabi - not hummus)	Condiments	Amber

**Ultra-processed foods (UPF)*

A.4. Menu Scoring Criteria

Table A.9. Food Category Definitions

Part A: Availability of healthy food and beverages ('green' items)		
Quality level	*Proportion of menu*	*Score*
High (alignment with guidance)	75-100%	3
Medium	50-74.9%	2
Low	25-49.9%	1
Very Low	0-24.9%	0
Part B: Exclusion of unhealthy food and beverages ('red' items)		
Quality level	*Proportion of menu*	*Score*
High (alignment with guidance)	0	3
Medium	1-.12.5%	2
Low	12.6-25%	1
Very Low	25.1-100%	0
Total score		/6

Appendix B: Supplementary Results

Table B.1. Results Reported in Individual Statistical Form

		% Green‡	% Amber	% Red†	Menu Score‡
All Schools		12.80 (5.20, 23.95)	39.75 ±22.44	40.37 [36.31-44.66]	0 (0, 1)
School type	Contributing (year 1-6)	13.00 (4.05, 24.20)	39.86 ±2.52	40.53 [35.22-46.21]	0 (0, 1)
	Full (year 1-8)	12.50 (6.23, 23.13)	36.60 ±3.07	40.16 [33.80-47.07]	0 (0, 1)
Deciles	Low	8.60 (0.00, 20.20)	37.84 ±4.54	47.84 [36.68-60.48]	0 (0, 0)
	Medium	11.10 (4.85, 24.25)	36.14 ±3.25	44.18 [36.73-52.32]	0 (0, 1)
	High	15.80 (9.70, 25.40)	43.38 ±2.85	34.89 [29.93-40.23]	0 (0, 1)
Equity Index	Low	22.20 (12.90, 26.70)	42.52 ±2.83	35.33 [30.20-40.87]	0 (0, 1)
	Medium	12.10 (3.20, 21.20)	39.20 ±2.71	40.88 [35.31-46.85]	0 (0, 1)
	High	6.70 (0.00, 11.10)	35.44 ±6.47	52.03 [34.92-72.53]	0 (0, 0)
School size	Small	7.10 (0.00, 13.95)	31.69 ±4.28	54.40 [43.91-66.00]	0 (0, 0)
	Medium	13.50 (5.60, 26.70)	46.83 ±2.98	32.17 [27.01-37.71]	1 (0, 1)
	Large	16.70 (10.40, 24.70)	38.35 ±2.70	39.53 [34.00-45.48]	0 (0, 1)
Area	Rural	9.65 (0.00, 12.78)	29.99 ±3.82	54.11 [44.24-64.97]	0 (0, 0)
	Urban	15.10 (7.00, 25.00)	45.59 ±2.18	36.75 [32.54-41.22]	0 (0, 1)
Region	Northland	11.10 (0.00, 19.90)	38.33 ±6.19	43.15 [27.68-62.04]	0 (0, 1.5)
	Auckland	20.40 (9.18, 27.08)	34.11 ±2.58	42.75 [37.23-48.65]	0 (0, 1)
	Bay of Plenty *(and Gisborne)*	10.40 (2.95, 13.30)	41.18 ±4.52	43.48 [33.49-53.42]	0 (0, 1)
	Wellington	20.20 (7.00, 28.05)	52.13 ±3.60	26.62 [19.87-34.36]	1 (0, 1)
	South Island *(Otago/Southland and Canterbury)*	12.50 (0.00, 19.60)	36.84 ±6.41	46.27 [32.95-61.85]	0 (0, 1)
Deprivation	Low (1-3)	14.15 (10.38, 25.80)	41.03 ±3.47	35.42 [29.31-42.12]	0 (0, 1)
	Medium (4-7)	12.95 (5.33, 26.28)	37.29 ±2.98	41.55 [35.00-48.65]	0 (0, 1)
	High (8-10)	8.60 (0.00, 16.70)	40.81 ±3.75	44.33 [36.16-53.34]	0 (0, 1)

*Values are mean ± SD

† Mean [95% CI, lower-upper]

‡ Median (25^{th}, 75^{th} quartiles)

Appendix C: Example School Menus

School	Food Provider	Menu Category	Menu Item	Category	Food Groups	Assumptions made	Statistics	#	%
OB School	*Unknown*	*Hot Food*	Pie	Red	Baked		Menu Items:	6	100
			Pizza	Amber	MM - UPF		Red:	5	83.3
			Sausage Roll	Red	Baked		Amber:	1	16.7
			Butter Chicken Wrap	Red	MM - UPF		Green:	0	0.0
		Muffin	Chocolate	Red	Baked		Part A:Part B	0	0
			Blueberry	Red	Baked		**Score**		0

School	Food Provider	Menu Category	Menu Item	Category	Food Groups	Assumptions made	Statistics	#	%
RB School	*Go Deli*	*Hot Food*	Pork & Cabbage Bun	Red	MM - Other	Fat on pork	Menu Items:	87	100
			Fried Dumpling Combo	Red	MM - UPF		Red:	28	32.2
			Chicken Corn Soup w/ Cheesy Toast	Amber	MM - UPF		Amber:	11	12.6
			Mince Pie	Red	Baked		Green:	48	55.2
			Mince & Cheese Pie	Red	Baked		Part A:Part B	1	0
			Large Butter Chicken & Rice	Red	MM - UPF		**Score**		1
			Small Butter Chicken & Rice	Red	MM - UPF		*Comments:*		
			Large Spaghetti Bolognaise	Green	MM - Other	No cheese			
			Small Spaghetti Bolognaise	Green	MM - Other	No cheese			
			Vege Fried Rice	Green	MM - Other				
			Panini - Ham & Cheese	Amber	Sandwiches				
			Panini - Chicken & Spinach	Amber	Sandwiches				
			GF Toasted Cheese Sandwich	Red	Sandwiches				
			Toasted Sandwich - Cheese	Red	Sandwiches				
			Toasted Sandwich - Cheese & Ham	Red	Sandwiches				
			Hot Dog	Red	Sausage				
			Beef Nachos (Large)	Red	MM - UPF				
			Mashed Potato	Amber	F&V				
			Mini Sausage Roll	Red	Baked				
			Mince Savoury	Red	Baked				
			Tomato Sauce	Amber	Condiments				
		Snacks & Dessert	Banana & Chocolate Yum Yum Balls	Red	UPF - Sweet				
			Chocolate Yum Yum Balls	Red	UPF - Sweet				
			After School Combo 1	Red	MM - UPF				
			After School Combo 2	Red	MM - UPF				
			Popcorn	Amber	UPF - Savoury				
			Brownie - Chocolate	Red	Baked				
			Chocolate Muffin	Red	Baked				
			Chocolate Cookie	Red	Baked				
			Yoghurt	Green	Dairy				
			Fresh Fruit Salad	Green	F&V				
			Carrot Sticks	Green	F&V				
			Grapes	Green	F&V				
			Pineapple	Green	F&V				
			Sweet Seaweed	Red	UPF - Sweet				
			Organic Seaweed - 2g	Green	UPF - Savoury				

		Drinks	Chocolate Milk - WDOM 250ml	Red	SSB		
			Milk - Full Cream 250ml	Amber	Dairy		
			Water - 320ml	Green	Water		
	Sushi 4 U	*Sushi Roll*	Teriyaki Chicken - Mini	Green	MM - Other		
			Popcorn Chicken & Salad	Red	MM - UPF	Deep fried	
			Popcorn Shrimp & Salad	Red	MM - UPF	Deep fried	
			Teriyaki Chicken	Green	Sushi		
			Tuna Veg - Mini	Green	Sushi		
			Tuna Veg	Green	Sushi		
			Salmon - Mini	Green	Sushi		
			Salmon	Green	Sushi		
			Salmon Avo - Mini	Green	Sushi		
			Salmon Avo	Green	Sushi		
			Avocado - Mini	Green	Sushi		
			Avocado	Green	Sushi		
		Sushi Pieces (no.)	GF Teriyaki Chicken (5)	Green	Sushi		
			Vegetarian (5)	Green	Sushi		
			Teriyaki Chicken (3)	Green	Sushi		
			Teriyaki Chicken (5)	Green	Sushi		
			Teriyaki Chicken (6)	Green	Sushi		
			Teriyaki Chicken (7)	Green	Sushi		
			Tuna & Vege (3)	Green	Sushi		
			Tuna & Vege (5)	Green	Sushi		
			Tuna & Vege (6)	Green	Sushi		
			Tuna & Vege (7)	Green	Sushi		
			Fresh Salmon (3)	Green	Sushi		
			Fresh Salmon (5)	Green	Sushi		
			Mixed Sushi (3)	Green	Sushi		
			Mixed Sushi (5)	Green	Sushi		
			Salmon & Avocado (5)	Green	Sushi		
			Salmon & Avocado (6)	Green	Sushi		
			Salmon & Avocado (7)	Green	Sushi		
			Avocado (3)	Green	Sushi		
		Panda Pack	Plain (no fillings)	Amber	MM - Other		
			Plain Chicken	Amber	MM - Other		
			Chicken Katsu	Red	MM - UPF		
			GF Teriyaki Chicken	Green	MM - Other		
			Vegetarian	Green	MM - Other		
			Teriyaki Chicken	Green	MM - Other		
			Tuna & Veg	Green	MM - Other		
			Salmon	Green	MM - Other		
			Avocado	Green	MM - Other		
		On Rice	Chicken Katsu (Regular)	Red	MM - UPF		

			Chicken Katsu (Medium)	Red	MM - UPF		
			Chicken Katsu & Teriyaki Chicken Combo	Red	MM - UPF		
			Teriyaki Chicken (Regular)	Amber	MM - Other		
			Teriyaki Chicken (Medium)	Amber	MM - Other		
			Teriyaki Chicken (Medium) w/ Salad	Green	MM - Other		
			Prawn & Fresh Salmon w/ Salad	Green	MM - Other		
		Rice Burger	Chicken	Green	Sushi		
			Salmon Avocado	Green	Sushi		

School	**Food Provider**	**Menu Category**	**Menu Item**	**Category**	**Food Groups**	**Assumptions made**	**Statistics**	**#**	%
PC School	*Pita Pit*	*Plain*	Free Range Chicken	Amber	Sandwiches		Menu Items:	115	100
			Free Farmed Ham	Red	Sandwiches		Red:	33	28.7
			Roast Beef	Amber	Sandwiches		Amber:	54	47.0
			Falafel	Amber	Sandwiches		Green:	28	24.3
			Garden Veggie	Amber	Sandwiches		Part A:Part B	0	0
			Marmite	Amber	Sandwiches		**Score**		0
			Vegemite	Amber	Sandwiches		*Comments:*		
		Wholemeal	Free Range Chicken	Amber	Sandwiches		*Pictures available on Menu*		
			Free Farmed Ham	Red	Sandwiches				
			Roast Beef	Amber	Sandwiches				
			Falafel	Amber	Sandwiches				
			Garden Veggie	Amber	Sandwiches				
			Marmite	Amber	Sandwiches				
			Vegemite	Amber	Sandwiches				
		Gluten Free	Free Range Chicken	Amber	Sandwiches				
			Free Farmed Ham	Amber	Sandwiches				
			Roast Beef	Amber	Sandwiches				
			Garden Veggie	Amber	Sandwiches				
		Salad Box	Free Range Chicken	Green	MM - Other				
			Free Farmed Ham	Amber	MM - Other				
			Roast Beef	Green	MM - Other				
			Falafel	Green	MM - Other				
			Garden Veggie	Green	MM - Other				

		Sides	Chocolate Chip Cookie	Red	Baked		
			Brownie Chocolate Fudge	Red	Baked		
			Pita Chips with Aioli Dipping Sauce (large)	Red	UPF - Savoury		
			Candy Choc Chip Cookie	Red	Baked		
	Brunch n Lunch	*Warm Mains*	VEGAN Spaghetti Bolognese	Amber	MM - Other		
			VEGAN Chickpeas curry with Rice	Amber	MM - Other		
			Macaroni Cheese with ham	Red	MM - UPF	No Vegetables	
			Spaghetti Bolognese	Green	MM - Other	No cheese	
			Beef Lasagne	Amber	MM - UPF		
			Butter Chicken on rice	Red	MM - UPF		
			GF Spaghetti Bolognese	Green	MM - Other	No cheese	
			Egg Fried Rice	Green	MM - Other		
			Vege Noodles	Amber	MM - Other		
			Chicken noodles	Amber	MM - Other		
			Mild Mince and Chilli Bean Nachos	Red	MM - UPF		
			Chicken kebab on Rice	Amber	MM - Other		
			Baked Spring Rolls 6 pieces	Amber	MM - Other		
			Sausage Roll	Red	Baked		
			Vegetarian Sausage Roll	Red	Baked		
			Burger	Amber	MM - Other		
			Vegetarian Burger	Amber	MM - Other		
			Cheese Pizza	Amber	Pizza		
			Vegan Pizza 9 inch	Amber	Pizza		
			Cheese & Olives Pizza	Amber	Pizza		
			Mushroom Pizza	Amber	Pizza		
			Ham & cheese Pizza	Amber	Pizza		
			Chicken Pizza	Amber	Pizza		
			Cheesy Garlic Pizza	Amber	Pizza		

			GF Pizza Large 9 inch	Amber	Pizza	
		Jesters Pie	Mince	Red	Baked	
			Billy T (mince & cheese pie)	Red	Baked	
			Stockman (steak pie)	Red	Baked	
			Jesters stockman (steak pie)	Red	Baked	
			Maharaja (butter chicken pie)	Red	Baked	
		Sandwiches	Cheese Toastie	Red	Sandwiches	
			Ham & Cheese Toastie	Red	Sandwiches	
			Ham, Cheese & Tomato Toastie	Amber	Sandwiches	
			Chicken & Cheese Toastie	Red	Sandwiches	
			Panini (your choice of fillings)	Amber	Sandwiches	Incudes Vegetable
			Panini (Beef & your choice of fillings)	Amber	Sandwiches	Incudes Vegetable
			Panini (Chicken & your choice of fillings)	Amber	Sandwiches	Incudes Vegetable
			Panini (Ham & your choice of fillings)	Amber	Sandwiches	Incudes Vegetable
			Wrap (Small)	Amber	Sandwiches	Average wrap/sandwich category
			Vegetarian Wrap (Small)	Amber	Sandwiches	
			GF Wrap (Large)	Amber	Sandwiches	
			Wrap (Large)	Amber	Sandwiches	
			Vegetarian Wrap (Large)	Amber	Sandwiches	
			Design a sandwich (Ham)	Amber	Sandwiches	
			Design a sandwich (Chicken)	Amber	Sandwiches	
			Design a sandwich (Beef)	Amber	Sandwiches	
			Design a sandwich (Vege)	Amber	Sandwiches	
			Baguette - Chicken, brie, salad and cranberry sauce	Amber	Sandwiches	

			Baguette - Ham, brie, salad and mustard sauce	Amber	Sandwiches	
		Cold Mains	Fresh Salad - Chicken	Green	MM - Other	
			Fresh Salad - Ham	Green	MM - Other	
			Fresh Salad - Cheese	Green	MM - Other	
			Bean Salad	Green	MM - Other	
			Bread and Hummus	Amber	MM - Other	
		After School Lunch Bag	Lunch bag/box: 1 Sandwich, 1 muffin, 1 strawberry yoghurt, 1 oat slice	Red	MM - Other	Sandwiches, Dairy, Baked
			Lunch box: 3 sushi pieces, 1 water bottle, 1 bag carrot sticks, 1 fruit, 1 oat slice, 1 muffin	Red	MM - Other	Sushi, Water, F&V, Baked
		Sushi	Sushi Baked Chicken (3 Pieces)	Green	Sushi	
			Sushi Baked Chicken (6 Pieces)	Green	Sushi	
			Sushi Prawn Chicken (6 Pieces)	Green	Sushi	
			Sushi Teriyaki Chicken, Avocado & Mayo (3 pieces)	Green	Sushi	
			Sushi Teriyaki Chicken, Avocado & Mayo (6 pieces)	Green	Sushi	
			Sushi Salmon Avocado (3 pieces)	Green	Sushi	
			Sushi Salmon Avocado (6 pieces)	Green	Sushi	
			Sushi Tuna Avocado Mayo (6 pieces)	Green	Sushi	
			Sushi Vegetarian (6 pieces)	Green	Sushi	
			Teriyaki Chicken on Rice - Small	Amber	MM - Other	
			Teriyaki Chicken on Rice - Large	Amber	MM - Other	

		Snacks & Desserts	Strawberry yoghurt	Green	Dairy	
			Fresh Fruit Salad	Green	F&V	
			Fresh sliced pineapple	Green	F&V	
			Apple	Green	F&V	
			Banana	Green	F&V	
			Orange	Green	F&V	
			Carrot Sticks	Green	F&V	
			Grapes	Green	F&V	
			Chocolate Chip Cookie (Small)	Red	Baked	
			Chocolate Muffin	Red	Baked	
			Oat Slice	Red	Baked	
			Scone	Red	Baked	No fruit
			Vegemite & Cheese Scroll	Red	Baked	
			Popcorn	Amber	UPF - Savoury	
			Rice Wafer	Red	UPF - Savoury	
			Oven Baked Twirls	Red	UPF - Savoury	
			Carrot Cake Slice	Red	Baked	
			Banana Cake Slice	Red	Baked	
			Chocolate Brownie	Red	Baked	
			GF Chocolate Brownie	Red	Baked	
			Freshly Baked Cookie	Red	Baked	

Appendix D: School Questionnaire

The following questions were emailed out to schools to obtain menu data and menus:

- What type of bread do you use? (e.g., white, wholemeal, wheatmeal, multigrain, wholegrain) If available please give the brand.
- What type of milk do you use most? (e.g., light blue top, green top, yellow top, dark blue top, primo, calciyum).
- Do you use low fat or reduced fat dairy products (e.g., reduced, or low-fat yoghurt, reduced fat cheese such as Edam)
- Do you sell any deep-fried foods?
- If you sell sushi, does this include deep-fried ingredients?
- Do you sell confectionery (e.g., boiled sweets, toffees and caramels, fudge, fondants, gums (including sugar-free gums), pastilles and jellies, chocolate, fruit leathers, yoghurt-covered items, candied fruits and nuts, and compound chocolate)?
- Do you add vegetables to any of the following? (Please specify) (burgers/wraps/hot foods/sandwiches/sushi)
- Do you sell packaged snack foods? What types? (List or take photos)
- Is your lunch order system available daily?
- If you have a menu, are we able to have a copy?