

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

**An adaption of the NutriSTEP screening tool to be suitable
for nutrition risk factor identification in New Zealand
preschool children aged two to five years old; adaptation of
NutriSTEP as a parent administered questionnaire.**

A thesis presented in partial fulfilment of requirements for the
degree of

Master of Science
in
Nutrition and Dietetics

At Massey University, Albany,
New Zealand

Breanna Jade Edge

2019

Abstract

Background: Risk factors of poor nutrition status in childhood may continue into adulthood and determine development of chronic disease. To reduce likelihood of chronic disease in adulthood, nutrition risk factors should be identified in childhood. Nutrition screening tools (NSTs) have been developed to identify increased nutrition risk and guide appropriate nutrition intervention. There is currently no reliable paediatric NST for use in the community setting in New Zealand (NZ). However, NutriSTEP, a validated parent-administered NST developed in Canada has been shown to identify preschool aged children at increased nutrition risk.

Aim: To adapt the Canadian NutriSTEP to be suitable for use in the NZ setting, and to test its reliability, as a means to identify nutrition risk in preschool children aged between two and five years, as a parent administered questionnaire.

Methods: New Zealand Registered Dietitians (NZRDs) (n=3) reviewed the wording of the Canadian NutriSTEP and suggested adaptations suitable for the NZ setting. Intercept interviews with parents of preschoolers (n=26) provided non-expert reviews of the Canadian NutriSTEP. NZRDs participated in a second review to evaluate suggested wording adaptations from the parent intercept interviews. Appropriate wording amendments were confirmed and the adapted NutriSTEP was finalised for online reliability testing. Parents of preschoolers (n=79) completed online administrations of the Canadian NutriSTEP and the adapted NutriSTEP four weeks apart in a blinded manner. Intraclass Correlation Coefficient (ICC) was then used to verify test-retest reliability between administrations of the NutriSTEP. Individual questionnaire items were verified for reliability between administrations through Cohen's Kappa statistic (κ), Pearson's chi-square value and Fisher's exact test. Descriptive statistics identified preschoolers at increased (medium to high) nutrition risk and individual questionnaire items with the highest percentage of nutritional risk.

Results: The Canadian NutriSTEP and adapted NutriSTEP were reliable between online administrations (ICC=0.91; 95% confidence interval 0.86, 0.94; $F=11.4$; $P<0.000$). Most (13 out of 17) questionnaire items had adequate ($\kappa>0.5$) agreement between administrations, one item had excellent agreement ($\kappa>0.75$). All individual questionnaire items had a p-value $p<0.05$ indicating a significant relationship between administrations. The Canadian NutriSTEP identified that 20.3% of preschoolers were

at increased nutrition risk, whereas the adapted NutriSTEP identified that 31.6% were at increased nutrition risk. Individual questionnaire items with the highest percentage of nutritional risk included; low intake of breads and cereals (58.2%), milk and milk products (51.9%), meat and meat alternatives (40.5%), child sometimes not controlling the amount consumed (35.4%) and low vegetable intake (34.2%).

Conclusions: The Canadian NutriSTEP and the adapted NutriSTEP were reliable between online administrations when verified for test-retest reliability in the NZ community setting. The adapted NutriSTEP identified more preschoolers at increased nutrition risk than the Canadian NutriSTEP. This demonstrates the adapted NutriSTEP has increased sensitivity in the NZ setting in comparison to the Canadian NutriSTEP. To identify increased nutrition risk in NZ preschoolers and reduce likelihood of chronic disease, the adapted NutriSTEP should be considered for future use in the community setting and to guide appropriate nutrition intervention by a NZRD.

Acknowledgements

There are many people that I would like to thank for their involvement and support throughout writing my thesis.

Firstly, I would like to thank Dr. Carol Wham and Dr. Rozanne Kruger for their endless support, suggestions and help during the process of writing this thesis. Your guidance has pushed and encouraged me to complete this thesis to the absolute best of my ability and to a standard that I am so very proud of. I thank you for your patience and consistent feedback right throughout.

To my Mum, Tony, and partner Charlie, your love has been my biggest support throughout these past two years and I completely attribute each of you to me completing my thesis knowing that I always have encouragement and support each and every day. Also, to my Nana, Grandad, Sharsh and Ryan for always showing interest in my studies and being there to relax with at our special place Pataua for a family holiday. I love you all so very much.

I would like to thank each and every preschool centre manager that participated in this research, their encouraging words and interest in my thesis helped so much in making this research impactful and a monument to be proud of.

Finally, to Darrio Penetito-Hemara from Toi Tangata, without your whanau and hoa, the participation of Māori in my thesis would not have been possible. I give you endless thanks for your help and am so proud to know that there was a significant participation of Māori. Whakawhetai ki a koe.

Table of contents

Abstract.....	i
Acknowledgements	iii
Table of contents	iv
List of tables	vi
List of figures.....	vii
List of appendices.....	viii
Abbreviations.....	ix
Chapter 1: Introduction	1
1.1 Background and justification of this study	1
1.2 Problem statement.....	2
1.3 Aim of this study.....	2
1.3.1 Specific objectives.....	2
1.3.2 Hypothesis	3
1.4 Structure of this thesis.....	3
1.5 Researchers contributions	4
Chapter 2: Literature Review	5
2.1 The health of New Zealand (NZ) Preschoolers	5
2.2 Overweight and obesity	5
2.3 Behavioural and environmental risk factors of poor nutrition in preschool children	6
2.3.1 Eating breakfast.....	7
2.3.2 Parental influences	7
2.3.3 Parental perceptions of a healthy weight.....	8
2.3.4 Socio-economic risk factors	9
2.3.5 Ethnic risk factors.....	9
2.3.6 Sugar sweetened beverage intake.....	10
2.3.7 Excessive screen time and sedentary behaviour.....	11
2.3.8 Physical activity	12
2.4 Dietary risk factors of poor nutrition in preschool children	13

2.4.1 Food group intake.....	13
2.4.2 Breads and cereals	13
2.4.3 Vegetables and fruit	14
2.4.4 Milk and milk products	14
2.4.5 Lean meats, chicken, seafood, eggs, legumes, nuts and seeds	15
2.4.6 Fluid intake.....	16
2.4.7 In summary, unidentified dietary related risk factors	16
2.5 Screening for nutrition risk factors	16
2.5.1 Screening Tools for young children	17
2.5.2 Nutrition Screening Tool for Every Preschooler (NutriSTEP)	30
2.6 Conclusion	31
Chapter 3: Research Study Manuscript	32
3.1 Abstract	32
3.2 Introduction.....	33
3.3 Methods.....	34
3.3.1 Phase 1: Expert review of the original Canadian NutriSTEP	36
3.3.2 Phase 2: Intercept interviews with parents of preschoolers	36
3.3.3 Phase 3 second expert review of the original Canadian NutriSTEP	38
3.3.4 Phase 4 Reliability Testing of the adapted NutriSTEP	38
3.3.5 Statistical Analyses	39
3.4 Results.....	40
3.4.1 Test-retest reliability	44
3.5 Discussion	45
3.6 Conclusion	49
Chapter 4: Conclusions and recommendations	50
4.1 Summary of findings.....	50
4.2 Strengths and limitations.....	53
4.3 Final recommendations	55
5.1 References.....	57
Appendices	64

List of tables

Table 1 Paediatric nutrition screening tools currently used internationally	18
Table 2 Demographic and parent/index child characteristics in the intercept interviews and online reliability testing of NutriSTEP	41
Table 3 Proportion of preschoolers at risk for items in the Canadian versus adapted NutriSTEP tools.....	43

List of figures

Figure 1 Phases in the development of the adapted NutriSTEP	35
---	----

List of appendices

Appendix A supplementary methods	64
Table 4 List of Auckland Preschool Centres which consented to participate in this study.....	64
Statistical methods used for testing reliability of the adapted NutriSTEP	66
 Appendix B supplementary results	68
Table 5 Adaptions to the Canadian NutriSTEP after Phase one and Phase three expert reviews: adaption Phase three represents final adapted NutriSTEP.	68
Table 6 Parent adaption suggestions to the Canadian NutriSTEP collected at intercept interviews according to geographical location	71
Table 7 Frequency and percentage of responses for individual questionnaire items after completion of Canadian NutriSTEP; responses from Phase four online reliability testing.....	86
Table 8 Frequency and percentage of responses for individual questionnaire items after completion of Adapted NutriSTEP; responses from Phase four online reliability testing.....	89
Table 9 Demographic characteristics of parents participating in Phase two intercept interviews.....	92
Table 10 Demographic characteristics of parents participating in Phase four online reliability testing	94
Statistical methods for reliability testing between administrations for each index item	98
 Appendix C materials used	100
Letter to request permission to recruit at a preschool facility	100
Consent form to recruit at a preschool facility	101
Information sheet for preschool facilities	102
Recruitment poster.....	105
Information sheet for intercept interviews.....	107
Consent form to participate in intercept interviews.....	110
Consent form to release audio transcript recorded at intercept interviews.....	111
Demographic questionnaire used in intercept interviews and online reliability testing	112
Intercept interview guide developed by the University of Guelph, Canada.....	114

Information sheet for online reliability testing	124
Consent form to participate in online reliability testing	127
Original Canadian NutriSTEP	128
Adapted NutriSTEP	132

Abbreviations

Acronym	Full form
BMI	Body Mass Index (kg/m ²)
DALY	Disability Adjusted Life Years
DM	Diabetes Mellitus
EHC	Eating for Healthy Children 2-12 years guidelines, 2017
FNGHYC	Food and Nutrition Guidelines for Healthy Children and Young People 2-18 years, 2012
GuiNZ	Growing up in New Zealand
DPNZEPC	Dietary patterns of New Zealand European preschool children report, 2006
MoH	Ministry of Health
NCNS	National Children's Nutrition Survey, 2002
NST	Nutrition Screening Tool
NutriSTEP	Nutrition Screening Tool for Every Preschooler
NZ	New Zealand
NZE	New Zealand European
NZHS	New Zealand Health Survey
NZRD	New Zealand Registered Dietitian
RD	Registered Dietitian
RDI	Recommended Daily Intake
SSB	Sugar Sweetened Beverage

T2DM	Type Two Diabetes Mellitus
WHO	World Health Organisation

Chapter 1: Introduction

1.1 Background and justification of this study

Non-communicable diseases such as hypertension, coronary heart disease and type 2 diabetes mellitus (T2DM) are prevalent in NZ and may result from overweight and obesity. These chronic diseases are both a burden to individuals and may impact quality of life and burden the health system. It is estimated between NZ\$722 million and NZ\$849 million are annually spent on the treatment of these chronic diseases (Lal, Moodie, Ashton, Siahpush, & Swinburn, 2012). Results from the 2016/17 NZ Health Survey (NZHS) show that 66.6% of adults were overweight and/or obese and of children, aged two to 14 years old 21% were overweight and 12% obese (Ministry of Health, 2017). Obesity in childhood is likely to continue into adulthood (WHO, 2003).

The risk of being affected by chronic illnesses in the long term can, in part, be prevented by consuming a healthier diet during childhood (Nishida, Uauy, Kumanyika, & Shetty, 2004). Dietary habits are most likely established in the family environment during infancy and childhood (WHO, 2003). A nutritionally inadequate diet can also result in nutritional risk. Nutrition risk can be defined as the presence of characteristics or risk factors that can lead to impaired nutritional status (American Dietetic Association, 1994). It is imperative that nutritional risk in children is identified as early as possible to identify inadequate dietary behaviours that may contribute to NZ's high rates of chronic diseases in adulthood (Ministry of Health, 2016) and to intervene to improve nutritional intakes.

Nutrition screening tools (NSTs) can be used to help identify risk factors which can place individuals at nutritional risk (Skipper, Ferguson, Thompson, Castellanos, & Porcari, 2012). By use of a validated questionnaire, NSTs are non-invasive, cost effective, and are an easy means for health professionals to identify nutrition risk and then plan and implement an effective dietetic intervention.

The Nutrition Screening Tool For Every Preschooler (NutriSTEP) is a validated, Canadian developed NST (Simpson, Keller, Rysdale, & Beyers, 2008) which aims to identify preschool aged children between the ages of three to five years that are at nutritional risk. The tool comprises 17 questionnaire items, of which each considers

potential risk factors that have been deemed to place preschool children at an increased nutritional risk (Simpson et al., 2008). The tool was developed as a parent-administered tool, to be used in the community setting in Canada, as there was no valid or reliable NST available specifically for preschool children in the community setting that did not require health professional administration.

The NutriSTEP tool has consistently been shown to be a reliable, valid, acceptable and easy to use tool by parents in the community setting (Simpson et al., 2008). In addition, it also increases nutrition awareness and nutrition knowledge of parents (J. R. Simpson, H. Keller, L. Rysdale, & J. Beyers, 2010), and is reliable when completed either on paper or an online/onscreen format (Carducci et al., 2015). To date, NZ has no reliable preschool NST that can be completed in the community setting by a parent or primary caregiver.

1.2 Problem statement

Nutrition related obesity is increasing in NZ in adults, children and younger children of the preschooler age. It is therefore imperative that children that are at increased nutrition risk, are identified early in all settings, including the community, to prevent a compromised or poor nutritional status continuing into adulthood (WHO, 2003). In NZ there is currently no NST for preschool children available, that can be completed in a community setting. Therefore, a validated and reliable community-based NST that can identify young children at nutritional risk is required for use in NZ.

1.3 Aim of this study

The aim of this study is to adapt the Canadian NutriSTEP to be suitable for use in the NZ setting, and to test its reliability, as a means to identify nutrition risk in preschool children aged between two and five years, as a parent administered questionnaire.

1.3.1 Specific objectives

- To conduct an expert review of the wording of the NutriSTEP and its applicability to the NZ setting.
- To conduct intercept interviews with parents of preschool children to assess wording and comprehension of the existing Canadian NutriSTEP tool in order to adapt the NutriSTEP tool for use in NZ.
- To test the reliability of the adapted NutriSTEP tool compared to the Canadian NutriSTEP tool.

- To determine the prevalence of increased nutritional risk using the adapted NutriSTEP tool in preschool aged children (aged two to five years old).

1.3.2 Hypothesis

There will be no difference in reliability between the Canadian NutriSTEP NST and the NutriSTEP tool adapted to a NZ setting.

1.4 Structure of this thesis

This thesis is structured into four chapters. The first chapter is an introduction in which the importance of adequate childhood nutrition is discussed as well as justification for this research study. The second chapter is a literature review which focuses on behavioural and environmental risk factors of a child's nutritional status. This chapter provides a critical review of current knowledge and findings on preschool obesity, dietary risk factors for pre-schoolers, followed by a summary of available paediatric nutrition screening tools that may help to identify children with poor nutritional status internationally. Chapter three comprises the research study and includes an abstract, introduction, methodology, results, discussion and conclusion. This chapter discusses the aim of this research; adaptation of the NutriSTEP screening tool to be reliable in a NZ setting for the identification of nutrition risk in preschoolers aged, two to five years. The fourth chapter is an overall conclusion and final recommendations. It discusses how the aim of this research and each objective were achieved. In addition, strengths and limitations of the study and final recommendations will be discussed.

1.5 Researchers contributions

Name	Contribution to the thesis and research
Breanna Jade Edge	Main author and researcher of this thesis, preparation of ethics application, created all visual materials for research, created all information sheets and consent forms for research, visited all preschool centres for recruitment, conducted all expert reviews and intercept interviews, distributed all emails and online questionnaire links, data entry into SPSS, data analysis in SPSS, interpretation of results.
Dr. Carol Wham	Main academic supervisor, preparation of ethics application, development of study strategy and design, participant of expert review, thesis review.
Dr. Rozanne Kruger	Academic co-supervisor, development of study strategy and design, participant of expert review, thesis review.
Dr. Janis Randall Simpson, University of Guelph	Original developer of the NutriSTEP, supplied all NutriSTEP tools and materials for use in NZ, provided copyright license.

Chapter 2: Literature Review

2.1 The health of New Zealand (NZ) Preschoolers

The importance of adequate health in childhood and addressing the factors that may influence otherwise optimal health is a key part of the New Zealand Health Strategy (Minister of Health, 2016). Risk factors developed in early childhood, including obesity (WHO, 2003) need to be addressed, as poor health status is increasing with 12% of NZ children currently categorized as obese (Ministry of Health, 2016, 2018). Obesity is a chronic disease with significant associated co-morbidities (Armstrong, Harskamp, & Armstrong, 2012) including cardiovascular disease, stroke, hypertension and insulin resistance (Khaodhiar, McCowen, & Blackburn, 1999; Swinburn et al., 1997; Tobias, 2016; WHO, 2003).

Dietary risks are the leading cause of health loss in NZ; a high body mass index (BMI) or obesity is the second ranked risk factor after diet for disability-adjusted-life-years (DALYs) in NZ (Ministry of Health, 2017d). Unhealthy dietary habits tend to be developed in early childhood (Birch, Savage, & Ventura, 2007) and increase the likelihood of chronic disease in adulthood (Schwartz, Scholtens, Lalanne, Weenen, & Nicklaus, 2011; WHO, 2003). Therefore it is essential to intervene to address nutrition risk factors that may contribute to NZ's high rates of obesity (Ministry of Health, 2016).

Dietary, behavioural and environmental risk factors can determine a preschool child's nutritional status. Dietary risk factors may include inadequate food group intake (breads and cereals; vegetables and fruit; milk and milk products; and lean meats, chicken, seafood, eggs, legumes, nuts and seeds), eating irregularly and eating too little/too much (Moreno et al., 2008). Behavioural risk factors may include inadequate physical activity and increased sedentary behaviour (Anderson et al., 2017; Hills, King, & Armstrong, 2007) and environmental risk factors may include parental perceptions of child body weight and size (White et al., 2014).

2.2 Overweight and obesity

Obesity contributes to chronic disease including type two diabetes mellitus (T2DM), cardiovascular disease and some cancers (Ministry of Health, 2017d; Swinburn et al., 1997; Tobias, 2016). Annually, these chronic diseases cost NZ between NZ\$722 million and NZ\$849 million in health care costs and lost productivity (Lal et al., 2012). Obesity in NZ children has been increasing in recent years, with Māori, Pacific

and children living in the most deprived areas of NZ most likely to be obese or at risk of obesity (Ministry of Health, 2017b). Of the two to 14 year old children that participated in the 2006/07 New Zealand Health Survey (NZHS), 21% were overweight and 8.3% were obese (Ministry of Health, 2008). The most recent overweight and obesity statistics from the 2016/17 NZHS found 21% of children aged two to 14 were overweight and 12% were obese (Ministry of Health, 2017a).

According to World Health Organisation (WHO) (2011), 90% of individuals that develop T2DM have excess body weight; a significant contributing factor in development of the disease alongside genetic predisposition (Yanling Wu, Ding, Tanaka, & Zhang, 2014). In 2014 there was an estimated 240,000 NZ adults and children diagnosed with (mostly T2DM) diabetes (Ministry of Health, 2014). A prospective study of Diabetes Mellitus (DM) in NZ children aged up to 14 years of age showed the incidence of T2DM considerably increased from 1994 to 2004 (Campbell-Stokes & Taylor, 2005). In 2011, the Starship database found 31 new cases of T2DM in children under 15 years of age (Starship Child Health, 2017). A retrospective analysis from the Auckland Starship Children's Hospital showed that within 21 years (1995-2015) the incidence of T2DM in children younger than 15 years had increased by five percent per year with the highest increases seen in overweight Māori (33%) and Pacific (46%) children (Sjardin et al., 2018). In children with T2DM attending the Adolescent Auckland Diabetes Centre (1996-2002) the average age of diagnosis was 15 years old and the average BMI was 34.6 kg/m² (class II obesity). Of these children, 85% also had dyslipidaemia, 58% had increased albumin excretion rates and 28% had systolic hypertension (Hotu, Carter, Watson, Cutfield, & Cundy, 2004). These findings show a clear correlation between being overweight/ obese and the progression to chronic disease. Therefore, it is imperative that overweight and obesity in children is intervened early to reduce obesity related chronic disease in adulthood.

2.3 Behavioural and environmental risk factors of poor nutrition in preschool children

Each following subheading explores the literature on behavioural and environmental risk factors of poor nutrition. The following nutrition related risk factors (Randall Simpson, Keller, Rysdale, & Beyers, 2008) can result in a poor health status in preschool children.

2.3.1 Eating breakfast

It is vital that young children eat breakfast everyday as it is a meal opportunity where children can consume essential nutrients and develop regular eating patterns and healthy eating behaviours (Rampersaud, Pereira, Girard, Adams, & Metzl, 2005; Utter, Scragg, Mhurchu, & Schaaf, 2007). Breakfast eating is associated with increased satiety, reduced snacking and reduced consumption of excessive calories throughout the rest of the day (Billon et al., 2002; Utter et al., 2007), meaning children who eat breakfast daily are less likely to be overweight or obese. Of children aged between two and 14 years old in the 2015/16 NZHS, 85.2% ate breakfast every day at home, a behaviour which supports a nutritious diet and regular meal patterns (Ministry of Health, 2016). Children aged between five and 14 years in the 2002 National Children's Nutrition Survey (NCNS) who did not eat breakfast were more likely to consume excessive snack/junk foods and also be overweight or obese (Parnell, Scragg, Wilson, Schaaf, & Fitzgerald, 2003).

2.3.2 Parental influences

Parents may be a significant determinant of their children's eating choices, eating patterns and eating behaviours (Savage, Fisher, & Birch, 2007; Scaglioni, Salvioni, & Galimberti, 2008). Parents have the opportunity to role model healthy dietary eating behaviours including eating breakfast daily, appropriate portion sizes, limiting takeaway foods as homemade meal replacements, and adopting a well-balanced and varied diet (Birch et al., 2007). Unhealthy dietary behaviours may lead to an inadequate intake of nutritious foods. Eating regularly at restaurants and takeaway shops (\geq three times a week) increases energy intakes and portion sizes (Moreno et al., 2008) in comparison to a home cooked meal (Ministry of Health, 2012a; Ministry of Social Development, 2008). Many fast foods are void of essential nutrients, promote weight gain (Ludwig, Peterson, & Gortmaker, 2001) are mostly high in saturated fat and sugar, are energy-dense, and come in large portion sizes (Bowman, Gortmaker, Ebbeling, Pereira, & Ludwig, 2004). Therefore, when fast food is regularly eaten instead of healthful meals, it places young children at risk of becoming overweight or obese. In parents of children aged zero to 14 that participated in the 2011/12 NZHS, 7% replaced their child's homemade meal or snack three times a week with a fast food snack, whilst preschool children aged between two and four ate fast food at least once a week (Ministry of Health, 2012b). Families in NZ who ate home prepared meals instead of regular takeaways were more likely to decrease television viewing, and improve nutrient profiles including less

poor-quality fats, less fried foods, increased fibre, less sugar sweetened beverages (SSB's) and more fruits and vegetables (Ministry of Social Development, 2008).

Availability, variety and repeated exposure are key predictors of food consumption in children, whether this be healthful options including fruit and vegetables, or less nutritious options including takeaways and junk foods (Nicklas et al., 2001).

Children's intake of fruits, vegetables, and milk increased after observing parental consumption, whilst parents who had inadequate dietary related behaviours influenced their children to develop the same habits (Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008). In 280 Australian preschool children, physical attributes of the home environment (yard size, parental physical activity, and play equipment) and parental behaviours around nutrition (restricting children's access to fruit juice, cordial/carbonated drinks, and high fat/sugar snacks; reminding the child to 'eat up' and offering food rewards to eat main meal) were significantly associated with preschool children's physical activity, sedentary behaviour and dietary patterns (Spurrier et al., 2008). Inadequate intake of the four main food groups was significantly associated with the parent telling the child to 'eat up', offering food rewards to eat their main meal, giving foods as 'treats/rewards' and unavailability of fruit and vegetables in the home environment. Restricting access to fruit juice and high fat/sugar snacks was significantly associated with adequate intake of fruit and vegetables.

2.3.3 Parental perceptions of a healthy weight

Parent's perceptions of their child's body size is a likely determinant in whether the child is overweight or obese (White et al., 2014). Many NZ parents (98%) that participated in the 2011/12 NZHS (Ministry of Health, 2012b) perceived that their children 14 years and younger were in "good health". Similarly, in the 2016/17 NZHS, 98% of parents also perceived that their child had "good health" (Ministry of Health, 2017a). However, no definition of "good health" was provided, therefore it is unknown whether parents considered nutritional intake, weight and body size in their response.

In the Growing up in New Zealand Study (GuiNZ) (Morton et al., 2017), 73% of obese/overweight four year old children were incorrectly perceived as being of a normal weight by their mothers. This indicates that many parents believe their child is at a healthy weight and body size based on their own beliefs and opinions around

healthy body weight (Baughcum et al., 2001). Parents may only become concerned about their child's weight if emotional distress (being bullied or teased about their weight by other children) arises (Baughcum, Chamberlin, Deeks, Powers, & Whitaker, 2000). In a qualitative study involving 115 parents of American preschool children, parents reported that if their child could participate in activities, looked and felt good, had good relationships with their peers, that they weren't considered obese, even if they fell within the obesity criteria (Garrett-Wright, 2010).

Findings from these studies show that parents may use appearance and behaviours as a marker for health status. They are likely to underestimate their child's weight, may lack skills when identifying health risks in children such as an increased BMI and be influenced by their own personal beliefs and customs when rating their child's health status.

2.3.4 Socio-economic risk factors

Dietary intake is strongly determined by socio-economic factors including household income and the option to buy healthful foods (Pechey & Monsivais, 2016), as well as the physical access to healthful foods (Pearce, Blakely, Witten, & Bartie, 2007; Pearce, Day, & Witten, 2008). Fifty percent of all extremely obese children live in the most deprived areas of NZ (Ministry of Health, 2016). Children living in lower compared to higher socioeconomic areas, are more likely to be overweight or obese due to plentiful access of takeaway foods and receive less education involving healthy dietary practices (Ministry of Health, 2012b). Obesity risk increases when there is greater availability and more invasive marketing of highly refined fast foods and sugar sweetened beverages (Ministry of Health, 2017b). In NZ, neighbourhood deprivation is significantly correlated with increased accessibility to less nutritious foods and obesity rates are twice as high in these areas (Pearce et al., 2008). The distance travelled to access the nearest fast food outlets was significantly less ($p < 0.001$) in the more deprived urban settings of NZ (decile nine and 10) in comparison to the least socially deprived areas (Pearce et al., 2007; Pearce et al., 2008; Pearce, Witten, Hiscock, & Blakely, 2006).

2.3.5 Ethnic risk factors

The Treaty of Waitangi was signed in 1840 in protection of Māori as the indigenous peoples of NZ. Today, the Ministry of Health (MoH) requires that all health initiatives aim to improve and achieve health equity for Māori. However, Māori are less likely to receive equal healthcare due to socioeconomic factors, availability and

cost of health care, and discrimination in comparison to non-Māori (Ellison-Loschmann & Pearce, 2006). Among Māori adults, 38% experienced problems in obtaining health care in their local area and were almost twice as likely as non-Māori (18%) to have gone without health care in the past year because of the cost (Schoen & Doty, 2004). The 2011/12 NZHS showed that 20% of children (all ethnicities) and 25% of Māori children had an unmet need for primary health care due to the unavailability of an appointment (14%), the associated cost (5%), lack of transport (3%) and lack of child care (2%) (Ministry of Health, 2012b).

In comparison to New Zealand European (NZE) and Asian children, Māori and Pacific children aged zero to 14 years in the 2011/12 NZHS were more likely to be obese (17% and 23% respectively), skip breakfast daily (18% and 17% respectively), have SSB's three or more times weekly and eat fast food two or more times weekly (twice as likely and three times as likely respectively). Māori and Pacific children were also more likely to watch more than two hours of television daily (62% and 59% respectively), have poorer parent-rated health (1.8 times more likely for Māori), and have experienced an unmet need for primary health care in comparison to other ethnicities, and live in the most deprived area (quintile five) of NZ (Ministry of Health, 2012b).

2.3.6 Sugar sweetened beverage intake

Sugar sweetened beverages (SSB's) are beverages that contains free sugars or other caloric sweeteners, and include energy drinks, fizzy carbonated drinks (cola, lemonade), soft drinks (including sachet mixes), cordials, sweetened fruit juices, flavoured milks and energy drinks (New Zealand Beverage Guidance Panel, 2017). They are the leading source of sugar in NZ children's diets (Parnell et al., 2003), and may lead to an excessive daily energy intake void of important nutrients. Regular intake of SSB's may provide satiating effects (Taylor, Scragg & Quigley, 2005) in the small stomachs of children and may replace healthful meals and snacks crucial for nutrition and adequate development. The Eating for Healthy Children two to 12 years (EHC) guidelines recommend that children be given soft drinks less than once a week (Ministry of Health, 2017c).

Drinking SSB's are consistently linked to poor diet quality, weight gain, and tooth decay (Bleich & Vercammen, 2018; Taylor, Scragg, & Quigley, 2005) Scragg, Wilson, Schaaf, Fitzgerald, & Utter (2004) found that children participating in the

2002 NCNS who consumed carbonated soft drinks more than once a day had a significantly higher mean BMI (19.7 kg/m^2 versus 18.8 kg/m^2) than children drinking them less than once a week. An American longitudinal study found that after 19 months of SSB consumption (soda, fruit drinks and iced tea), children's BMI increased significantly (0.18 units) (Ludwig et al., 2001). Following adjustment for age, sex, ethnicity, television viewing, physical activity and energy intake, obesity risk increased by 60% for every serve of SSB consumed (Ludwig et al., 2001). It is therefore essential that excessive SSB intake in children is identified and interventions should reduce weight gain and increasing BMI that is associated with excessive SSB consumption.

2.3.7 Excessive screen time and sedentary behaviour

Sedentary behaviour and a lack of physical activity are risk factors of overweight and obesity. The Sit Less, Move More, Sleep Well: Active play guidelines for under-fives recommend that preschool children have less than one hour of screen time daily (Ministry of Health, 2017e), including the use of; television, mobile phones, laptops, iPad's, gaming consoles etc. Preschool children must have limited screen time as sitting for prolonged periods contributes to displacement of physical activity, poor muscle development and stamina, excessive calorie intake, and consequently overweight and obesity (Ministry of Health, 2017b; Ministry of Social Development, 2008; Sigman, 2015). Four year old overweight or obese children in the GuiNZ study had 3.5 hours of screen exposure daily, exceeding the screen time recommendation (Morton et al., 2017) and putting them at risk of increased sedentary behaviour.

Excessive screen time (moderate $1 \geq 3$ hours; long $3 \geq 5$ hours and prolonged ≥ 5 hours) in five to 18 year old NZ and international children was strongly correlated with an increased BMI (females; 0.24 kg/m^2 , 0.34 kg/m^2 and 0.36 kg/m^2 respectively and males; 0.19 kg/m^2 , 0.32 kg/m^2 and 0.36 kg/m^2 respectively), sedentary behaviours, exposure to fast food advertisements and calorie intake whilst watching television (Braithwaite et al., 2013). A NZ study found that sedentary behaviour is correlated with excessive consumption of energy-dense food and drinks due to the unmindful and inattentive nature of media engrossment and snacking whilst engaging in ≥ 2 hours of screen time (Utter, Scragg, & Schaaf, 2006). Despite the evidence that shows excessive screen time and sedentary behaviour is associated with increased BMI and

weight gain in children, literature specifically on preschool children and the effects of excessive screen time is currently limited.

2.3.8 Physical activity

Regular physical activity for children under five is associated with better short term health outcomes including good quality sleep, and long term health outcomes including lower risk of overweight and obesity, the ability to learn properly and good mental wellbeing (Ali, Pigou, Clarke, & McLachlan, 2017; Ministry of Health, 2017e; Oliver, Schluter, & Schofield, 2012; Yanhui Wu, Gong, Zou, Li, & Zhang, 2017).

The Food and Nutrition Guidelines for Healthy Children and Young People aged two to 18 years (FNGHYC) recommend that preschool children should have at least three hours of fun active play daily with at least one hour being energetic play i.e. running, riding a bike, or bouncing on a trampoline (Ministry of Health, 2012a). NZ specific literature on preschool children's physical activity levels is limited as both the annual NZHS and the NCNS only considered five to 14 year old children's physical activity levels (Parnell et al., 2003).

However, the GuiNZ study found that most children aged four years participated in the following activities on a daily basis; riding a bike or a scooter (24.4%), playing with a ball (27%), climbing a tree (34%), playing with a ball (27%) and dancing around the house or playing chasing or running games (80%) (Morton et al., 2017). A literature review of exercise levels in preschool children found that NZ children aged between zero and five years physical activity levels have significantly declined over the last 20-30 years alongside the steady increase of obesity rates (Ali et al., 2017). The decline in activity is likely to be due to the increased use of mechanical transport and that many hours of the day are spent sitting at preschools or in front of a screen device (WHO, 2003).

Many NZ preschool children are not receiving adequate physical activity daily and this may be a significant cause of overweight and obesity issues. However, it is essential to note that changes in family eating patterns, and the increased consumption of fast foods, convenience meals and SSBs has also occurred over the past 30 years (WHO, 2003).

2.4 Dietary risk factors of poor nutrition in preschool children

2.4.1 Food group intake

The FNGHYC recommend the daily consumption of foods from the four main food groups; fruits and vegetables, breads and cereals, milk and milk products, and lean meats, chicken, seafood, eggs, legumes, nuts and seeds (Ministry of Health, 2012a). More specifically this includes: at least two fruits and two vegetables; at least two to four servings of breads and cereals; at least two to three servings of milk and milk products and at least one serving of lean meats or pulses.

Adequate intake of these four food groups aims to ensure a balanced and variable diet and to reduce the risk of nutrient deficiencies (Ministry of Health, 2012a). When children do not meet these dietary recommendations, their risk of deficiencies in essential nutrients and vitamins increases and long term may result in developmental problems including lower cognitive functioning and poor growth (Theodore, Thompson, Wall, & Becroft, 2006).

The NZ Dietary Patterns of New Zealand European Preschool Children (DPNZEPC) report found that an unsatisfactory number of NZE preschool children were not meeting the recommended nutrition guidelines for consumption of the four main food groups (Theodore et al., 2006). However, 85% did receive a “treat food” (chips, candy bars, muesli bars, biscuits, and cakes) at least once daily and 12% received “treat foods” more than three times daily. This is contrary to the FNGHYC guidelines which recommend consumption of high sugar, salt and fat foods less than once a week (Ministry of Health, 2012). Although the guidelines recommend refined sugars (found in muesli bars, lollies, potato chips, chocolates, sweet biscuits, takeaways and soft drinks) contribute no more than 10% of a child’s daily calorie intake, refined sugars provided 30.3% of the daily energy intake in NZ Pacific children aged two to three years old and 25.9% in four to five years old (A. M. Grant, Ferguson, Toafa, Henry, & Guthrie, 2004).

2.4.2 Breads and cereals

The FNGHYC recommend that for preschool children, at least four servings of breads and cereals should be eaten each day (Ministry of Health, 2012a). This food group contains the macronutrient carbohydrate, fibre, folate and iodine and is the best source of energy for the body (Ministry of Health, 2012a, 2017c). Only seven percent of

NZE preschool children met the guidelines in consuming at least four servings of breads and cereals daily (Theodore et al., 2006).

2.4.3 Vegetables and fruit

Preschool children aged between two and five years are recommended to eat at least two servings each of vegetables and fruit each day (Ministry of Health, 2012a, 2017c). Vegetables and fruit provide carbohydrates, fibre, vitamins, minerals and are low in fat. They should be eaten in a variety of colours and provided in most meals and snacks (Ministry of Health, 2012a, 2017c).

Data from the GuiNZ study found that just over half of the cohort children (54%) were meeting these guidelines. More preschoolers consumed fruit (84%) than vegetables (60%) (Morton et al., 2017). The DPNZEPC report found that 27% of NZE preschool children did not eat two or more servings each of vegetables or fruit per day (Theodore et al., 2006). However, 30% of the preschoolers consumed fruit juice and 36% consumed cordial daily (Theodore et al., 2006).

The replacement of whole fruits and vegetables with fruit juices and cordials may be a contributing factor to preschool children not meeting their daily fruit and vegetable recommendations. Many fruit drinks are cleverly marketed as a good source of vitamin C and fruit drinks contribute to 37% of the vitamin C intake in NZ children (Taylor et al., 2005). Fruit drinks and cordials contain large amounts of refined sugars and contribute 16% of sucrose to the diets of NZ children, this likely contributing to the increasing rates of obesity in NZ children (Parnell et al., 2003; Taylor et al., 2005). High in water and fibre providing a satiating effect yet low in calories, whole fruits and vegetable are protective of obesity meaning adequate intake is essential (Ledoux, Hingle, & Baranowski, 2011).

2.4.4 Milk and milk products

The FNGHYC recommend that preschool children should consume at least two to three servings of milk and milk products daily (Ministry of Health, 2012a, 2017c). This food group provides protein and calcium, both of which are essential for preschoolers to develop strong bones and teeth (Mazahery et al., 2018).

International studies have shown that adequate milk and milk product intake contributes to good nutritional status in children. Cow's milk intake had the most consistent associations with a reduced BMI in two to four year old White, Black, and Mexican American preschool children (Wiley, 2010). The recommended daily

intake (RDI) of calcium for one to eight year old children is 500mg-700mg/day, and according to the 2002 NCNS, 87.8% of boys and 81.8% of girls met these requirements mainly through the consumption of cow's milk (Parnell et al., 2003). In White American preschool children, a higher intake of calcium (mean female: 808mg/day; mean male: 968mg/day) sourced from milk products was associated with lower body fat ($P=0.0001$) (Carruth & Skinner, 2001). NZ children aged three to 10 years with long term avoidance of cow's milk in their diets, were shorter, had smaller skeletons, a lower total body-bone mineral content, and lower z scores ($P < 0.05$) for areal bone mineral density at the femoral neck, hip trochanter, lumbar spine, and ultra-distal radius, compared with children that consumed adequate amounts of cow's milk (Black, Williams, Jones, & Goulding, 2002).

2.4.5 Lean meats, chicken, seafood, eggs, legumes, nuts and seeds

The FNGHYC recommend that preschool children should eat at least one serving of lean meats, chicken, seafood, eggs, legumes, nuts and seeds daily (Ministry of Health, 2012a, 2017c). This food group is essential for providing protein, fat and iron, all of which are vital for growth, producing and maintaining blood supply and brain development (Grantham-McGregor & Ani, 2001; Ministry of Health, 2012a, 2017c). Haem sources of iron (meat and seafood) are more bioavailable than non-haem sources and are recommended for children to obtain optimum iron stores. (Hunt, 2003; Soh, Ferguson, McKenzie, Homs, & Gibson, 2004).

In 1963, research in NZ found that Māori children under five years of age in both rural and urban areas were at an increased risk of iron deficiency anaemia, and was a cause of the high morbidity and mortality rates in Māori (Neave, Prior, & Toms, 1963). At the time, this was due to overcrowded houses, infection, and inadequate animal protein intakes of meat, cheese, fish and eggs. In a more recent study among 398 NZ children aged between six and 23 months, iron deficiency was present in 14% (C. C. Grant, Wall, Brunt, Crengle, & Scragg, 2007). Furthermore, nearly a third (29%) of six to 24 month old NZ infants ($n=263$) living in the Christchurch, Dunedin and Invercargill regions had suboptimal iron status including iron deficiency anaemia, iron deficiency without anaemia, and depleted iron stores (Soh et al., 2004). Data from three day weighed food records showed that 60% of the dietary iron was sourced from infant formula, 31% from cereals, whereas meat only contributed between two and 10% of dietary iron intake (Soh et al., 2004).

2.4.6 Fluid intake

The EHC guidelines recommend that children should consume enough fluid daily to prevent dehydration (Ministry of Health, 2017c). The predominant sources of fluid should be either water or milk due to its nutrient density which may help young children reach their daily nutrition requirements (Hagg, Jacobson, Nordlund, & Rossner, 1998; Ministry of Health, 2017c). Fruit juice and SSB's are advised to be limited (fruit juice is recommended only when a whole fruit option is unavailable). Tea, coffee and energy drinks are advised to be completely avoided due to the caffeine and sugar present which may possibly affect sleeping patterns and hydration (Ministry of Health, 2012a, 2017c).

Only 34% of five year old children participating in the 2002 NCNS drank milk as a drink once a week (Taylor et al., 2005), a minor increase from the 30% of NZE preschool children consuming fruit juice daily and the 36% consuming cordial daily (Theodore et al., 2006). Food frequency information was collected from parents of 549 NZE children that were enrolled in the Auckland Birthweight Collaborative (ABC) study (Blair et al., 2007). In this study, 82% of NZE preschool children (aged three and a half years) drank water daily, however this figure does not consider if an adequate amount was consumed (Theodore et al., 2006). Six percent of children's dietary energy was sourced from non-water beverages including tea, coffee, coffee substitutes, sugar sweetened beverages, cordials, powdered fruit drinks, sports drinks and energy drinks in the 2002 NCNS (Taylor et al., 2005). These fluid options have poor nutritional composition and excess calories, and when substituted for water and milk, are contributing factors to the concerning rates of childhood obesity in NZ (Taylor et al., 2005).

2.4.7 In summary, unidentified dietary related risk factors

The increase of obesity rates in NZ preschoolers and young children is likely due to unidentified nutrition related risk factors. These risk factors must be identified as early as possible in preschool aged children to ensure adequate diet quality, the development of healthy nutrition habits into childhood and adulthood and the future prevention of dietary related chronic disease.

2.5 Screening for nutrition risk factors

A nutrition screening tool (NST) considers nutritional risk factors which can place individuals at nutritional risk. In dietetic practice, using NSTs are vital as the first line process to identify an at risk/ malnourished client/patient. The screening process can

also be used to identify and initiate a referral to a registered dietitian for a more comprehensive nutritional assessment and intervention (Skipper et al., 2012). It is imperative that nutrition risk is quickly identified and intervened to improve nutritional status and physical health in vulnerable children (Randall Simpson et al., 2008). The NST can be invaluable when identifying the severity of nutrition risk in an individual, and also help to guide the appropriate nutritional intervention. Nutritional screening can predict the possibility of a better or worse outcome due to nutritional factors, and if nutritional treatment may improve the outcome (Kondrup, Allison, Elia, Vellas, & Plauth, 2003).

2.5.1 Screening Tools for young children

Children under the age of five years admitted to hospital with poor nutrition have been shown to have increased risk of poor immune function, physical and cognitive development, and clinical outcomes alongside increased risk of weight loss, recovery time and length of hospital stay (Moeeni, Walls, & Day, 2013, 2014; White et al., 2016). Therefore, often when NSTs are developed, an acute setting is considered due to the serious nature of hospital admissions. There are not many NSTs that consider identification of children with poor nutrition status in the community setting.

Paediatric NSTs are not currently implemented in either NZ hospitals or in the community. In NZ, identification of nutritional risk is reliant on anthropometric data and clinical judgment of a paediatrician or registered dietitian (Hartman, Shamir, Hecht, & Koletzko, 2012). Existing barriers that may be preventing the use of paediatric NSTs in NZ include the lack of simplicity and requirements for secondary validation. For a paediatric NST to be successful in identifying nutrition risk it must be: simple, quick, inexpensive, non-invasive, have a high degree of sensitivity; specificity, validity and reliability, be easy to use without user need for training, and specific for paediatric populations (White et al., 2016).

The variety of paediatric NSTs currently used internationally are presented in Table 1

Table 1 Paediatric nutrition screening tools currently used internationally

	Details	Population	Reference of validation	Screening parameters	Scoring	Results
Screening Tool for Risk on Nutritional status and Growth (STRONGkids) (Hulst, Zwart, Hop, & Joosten, 2010) Netherlands, 2010	Four areas 1) subjective global assessment 2) high risk disease 3) nutritional intake and losses weight loss or poor appetite 4) weight increase	44 Dutch hospitals (37 general, 7 academic) Child >1 month of age that was admitted to paediatric ward >one day 424 children in total, mean age 3.5 years	Nursing staff or attending physicians took weight measurements at admission and discharge (digital scales) Supine length or standing height assessed at admission only (stadiometer)	1) Is there an underlying illness with risk for malnutrition or expected major surgery? (0-2) 2) Is the patient in a poor nutritional status judged with subjective clinical assessment: loss of subcutaneous fat and/or loss of muscle mass and/or hollow face? 3) Is one of the following items present? Excessive diarrhoea ≥ 5 /day or vomit >3 times/day during the last 1-3 days, reduced food intake last 1-3 days, pre-existing nutrition intervention (ONS or tube feeding), inability to consume adequate	Each item gives score of 1–2 points with a maximum total score of 5 points 0 points = low risk, no intervention necessary 1-3 points = medium risk, consult doctor for full diagnosis, consider dietitian	STRONGKIDS had higher validity in comparison to STAMP in terms of validity. STRONKIDS correlated more closely to anthropometric assessment of nutritional status(Ling, Hedges, & Sullivan, 2011) STRONGkids was able to detect the highest number of under-nourished patients

Details	Population	Reference of validation	Screening parameters	Scoring	Results
			nutritional intake because of pain (0-1) 4) Is there weight loss (all ages) and/or no increase in weight/height (infants <1 year) during the last few week-months? (0-1)	4-5 points = High risk, consult doctor and dietitian First 2 items assessed by a paediatrician Second 2 items discussed with parents or caregivers	compared to the PYMS and the STAMP (Moeeni et al., 2013)
Paediatric Yorkhill Malnutrition Score (PYMS) (Gerasimidis, Keane, Macleod, Flynn,	Based on guidelines of the European Society of Clinical Nutrition and Metabolism	Four paediatric wards (three medical, one surgical) at the Royal Hospital for Sick Children,	Accuracy tested by comparing PYMS completed by ward nursing staff to full dietetic assessment (full dietetic assessment, anthropometry and	1) Is the BMI below the cut off value in the table overleaf? (0-2) 2) Has the child lost weight recently? (0-1) 3) Has the child had a reduced intake including feeds for at least the past week? (0-2)	Each “step” gives a score of up to 2 and the total score reflects the degree of the nutrition risk of the patient. Showed moderate agreement with the full assessment (k = 0.46) and interrater Reliability

	Details	Population	Reference of validation	Screening parameters	Scoring	Results
& Wright, 2010)	for nutritional screening Four “steps”	Yorkhill, Glasgow	body composition measures) by two research dietitians	4) Will the child’s nutrition be affected by the recent admission /condition for at least the next week? (0-2)	0) = repeat score weekly 1) = medium risk, must be on a fluid and food chart, score again in 3 days	(k = 0.53) with the research dietitians
Yorkhill, Glasgow, 2010	1) BMI 2) History of recent weight loss 3) Changes in nutritional intake 4) Predicted effect of the current medical condition on the nutritional status of the patient.	General paediatric ward of district general hospital Paediatric patients 1-16 years old admitted over a 4-month period 160 nursing staff to complete PYMS 247 children	Also compared to validated malnutrition tools, in a large tertiary hospital and a district general hospital	5) Calculate total score	2) or above = high risk, dietetic review must be made. Showed moderate agreement with the full assessment (k = 0.46) and interrater reliability (k = 0.53) with the	

Details	Population	Reference of validation	Screening parameters	Scoring	Results
Screening Tool for Assessment of Malnutrition in Paediatrics (STAMP) (McCarthy, Dixon, Crabtree, Eaton-Evans, & McNulty, 2012) United Kingdom, 2012	3 steps 1) Diagnosis 2) Nutritional intake 3) Weight and height Children's division of Central Manchester and Manchester Children's Hospitals University NHS Trust. Children 2-17 years old admitted to medical and surgical wards 238 children	Reliability, sensitivity and specificity were estimated by comparing nutrition risk score with a full nutritional assessment by a registered dietitian	1) Does the child have a diagnosis that has any nutritional implications? (0-3) 2) What is the child's nutritional intake? (0-3) 3) Use a growth chart or the centile quick reference tables to determine the child's measurements (0-3) 4) Receive a score 5) Devise a care plan	research dietitians. Each step has a maximum score of 3 0-1 = low risk, continue clinical care, repeat STAMP weekly whilst inpatient 2-3 = medium risk, monitor nutritional intake for 3 days, repeat STAMP after 3 days	Fair to moderate reliability in identifying nutrition risk compared to the nutrition risk classification determined by a registered dietitian (k = 0.541; 95% confidence interval = 0.461–0.621). Sensitivity and specificity were estimated at 70% (51–84%) and

Details		Population	Reference of validation	Screening parameters	Scoring	Results
Simple paediatric nutritional risk score (PNRS)	3 questions	Children admitted to medical ward (gastroenterology, cardiology, pulmonology, haematology, or general paediatrics) or a surgical ward (visceral surgery) at Necker Enfants Malades Hospital.	Same investigator performed assessments on each child and interviewed the parents, nursing staff and, when possible, the patient.	1) Food intake <50% (Yes/No) 2) Pain (Yes/No) 3) Pathology (Grade 1,2 or 3) 4) Receive a score (5 maximum)	≥4 = high risk, refer to Dietitian, monitor plan weekly	91% (86–94%), respectively.
		Children >1 month of age			0 = low risk of nutritional depletion 1-2 = moderate risk of nutritional depletion, weight surveillance, report intake, consider dietetic consult (Huysentruyt et al., 2015)	Identified as valid alongside STAMP, PYMS, and STRONGkids in the systematic literature review by (Huysentruyt et al., 2015)

Details		Population	Reference of validation	Screening parameters	Scoring	Results
		296 children			≥ 3 = high risk of nutritional depletion, nutritional assessment, monitor intake, consider nutritional intervention (Huysentruyt et al., 2015)	
Paediatric Nutrition Screening Tool (PNST) (White et al., 2016)	4 questions	2 tertiary paediatric hospitals and 1 regional hospital in Australia	Used alongside the paediatric Subjective Global Nutrition Assessment (SGNA) and anthropometric measures	1) Has child unintentionally lost weight lately? (yes/no) 2) Has child had poor weight gain over the last few months? (yes/no) 3) Has child been eating/feeding less in the last few weeks? (yes/no)	Yes or no response SGNA is compared with PNST and anthropometry	PNST identified 37.6% of children at nutrition risk, the SGNA identified 34.2%. The sensitivity and specificity of

Details	Population	Reference of validation	Screening parameters	Scoring	Results
Australia, 2014	Term age to 16 years old 295 children	(calibrated scales and stadiometers)	4) Is child obviously underweight/significantly overweight? (yes/no)	A patient with an overall SGNA rating of moderate or severe was considered at nutrition risk.	PNST compared to SGNA were 77.8% and 82.1%, respectively. The sensitivity of the PNST at detecting patients with a BMI z score of less than -2 (indicated malnutrition, wasting, and stunting) was 89.3%, and the specificity was 66.2%. Both PNST and SGNA were

Details	Population	Reference of validation	Screening parameters	Scoring	Results
					relatively poor at detecting patients who were stunted or overweight, with the sensitivity and specificity being less than 69%.
Nutrition Screening Tool for Every Preschooler (NutriSTEP) (Randall Simpson et al., 2008) Canada, 2008	17 item questionnaire completed by parents of children aged 3 to 5 years in the community setting	Test-retest reliability assessed with 140 parents of preschoolers Validity scores tested by 269 parents of preschoolers completing the NutriSTEP questionnaire	Tested for validity against a comprehensive nutritional assessment by a registered dietitian (based on medical and nutritional history, 3 days of dietary recall and anthropometric measurements) who then rated	1) My child usually eats grain products 2) My child usually has milk products 3) My child usually eats fruit 4) My child usually eats vegetables 5) My child usually eats meat, fish, poultry or alternatives 6) My child usually eats ‘fast food’ Each item gives a score between 0-4 with a maximum score of 68 < 20 = low risk >20 and ≤25 = moderate risk ≥25 = high risk	Scores on NutriSTEP and the registered dietitian rating were correlated (r=0.48, P=0.01). Area under the ROC curve for the high-risk registered dietitian rating (score 8+) and the

Details	Population	Reference of validation	Screening parameters	Scoring	Results
		their nutritional risk (1 (low) to 10 (high risk))	7) I have difficulty buying food to feed my child because food is expensive 8) My child has problems chewing, swallowing, gagging or choking when eating 9) My child is not hungry at mealtimes because he/she drinks all day 10) My child usually eats (number of times per day) 11) I let my child decide how much to eat 12) My child eats meals while watching TV 13) My child usually takes supplements: 14) My child (gets enough/needs more physical activity)		moderate risk rating (score 5+) were 81.5 and 73.8%, respectively. The NutriSTEP score was reliable between administrations (ICC=0.89, F=16.7, P=0.001). Most items on the questionnaire had adequate (k=0.5) or excellent (k=0.75) agreement.

	Details	Population	Reference of validation	Screening parameters	Scoring	Results
				15) My child usually watches TV, uses the computer, and plays video games: 16) I am comfortable with how my child is growing: 17) My child: (weighs too little/much)		
Toddler NutriSTEP (J. Randall Simpson et al., 2015) Canada, 2015	17 item questionnaire completed by parents of children aged 18–35 month in the community setting	Test–retest reliability assessed with 133 parents of toddlers Validity assessed scores on the Toddler NutriSTEP to a comprehensive nutritional assessment of 200 toddlers	Tested for validity against a comprehensive nutritional assessment (calibrated scale weigh, height measure with stadiometer >24 months, length measure for <24 months, weight for length (<2 years), body mass index	1) My child usually eats grain products 2) My child usually has milk products 3) My child usually eats vegetables and fruit 4) My child usually eats meat, fish, poultry or alternatives 5) My child usually eats restaurant or take-out “fast foods” 6) My child usually drinks juice or flavoured beverages	Each item gives a score between 0-4 with a maximum score of 68 < 20 = low risk >20 and ≤25 = moderate risk ≥25 = high risk	Reliable between 2 administrations (ICC = 0.951, F=20.53, p<0.001) Most questions had moderate (≥0.6) or excellent (≥0.8) agreement. Scores on the RD nutrition risk

Details	Population	Reference of validation	Screening parameters	Scoring	Results
		for age (≥ 2 years), 3-day food record) completed by a registered dietitian who then rated their nutritional risk (1 (low) to 10 (high risk))	7) I have difficulty buying food to feed my child because food is expensive 8) My child has problems chewing, swallowing, gagging or choking when eating 9) My child feeds his/her self at meals and snacks 10) My child drinks from a baby bottle with a nipple 11) My child is hungry at mealtimes 12) My child usually eats meals and snacks 13) I let my child decide how much to eat 14) My child eats meals or snacks while watching while watching TV, or being read to, or playing with toys		rating and the Toddler NutriSTEP were correlated ($r = 0.67$, $p < 0.000$) The area under the ROC curve for moderate and high RD risk ratings were 84.6% and 82.7%, respectively. Cut points of ≥ 21 (sensitivity 86%; specificity 61%) (moderate risk) and ≥ 26 (sensitivity 95%; specificity 63%)

Details	Population	Reference of validation	Screening parameters	Scoring	Results
			15) My child usually watches TV, or uses the computer, or plays video games 16) I am comfortable with how my child is growing 17) My child (weighs too little/much)		(high risk) were determined.

2.5.2 Nutrition Screening Tool for Every Preschooler (NutriSTEP)

Nutrition Screening Tool for Every Preschooler (NutriSTEP) was developed in Canada as there was no valid and reliable screening tool that could be readily completed by parents in the community setting. To test reliability and validation of the tool, the NutriSTEP screening tool was first validated against registered dietitian assessment (medical and nutritional history, three day food diary and anthropometric measurements) (Randall Simpson et al., 2008). Reliability between the NutriSTEP and the registered dietitian rating were correlated ($r=0.48$, $P=0.01$) (Randall Simpson et al., 2008). Secondly, 140 parents of preschoolers completed the NutriSTEP on two different occasions, then reliability was assessed by testing Intraclass correlation (ICC) and Kappa statistic (κ). Analysis showed that the NutriSTEP score was reliable between the two occasions (ICC=0.89, $F=16.7$, $P=0.001$) and that most questions on the questionnaire had adequate ($\kappa=0.5$) or excellent ($\kappa=0.75$) agreement. The tool was then completed by 499 diverse Canadian parents in the community setting to test acceptability and feasibility of the NutriSTEP. The study found that the tool increased knowledge and awareness about preschooler nutrition habits and behaviour (J. R. Simpson et al., 2010). Parents ($n=412$) attending preschool immunization clinics in Canada, were asked to complete the NutriSTEP. In addition, parents, staff, and physicians were also asked personal opinions on the feasibility of implementing the NutriSTEP. Parents found the NutriSTEP easy to complete and that the tool was helpful in identifying areas of nutritional concern for their child. Parents and physicians also stated that the community health setting was the most ideal environment for them to complete the NutriSTEP. In contrast, nurses and physicians found that the completion of the tool noticeably contributed to their workload (Watson-Jarvis, McNeil, Fenton, & Campbell, 2011). Canadian health workers later suggested that online versions of NutriSTEP be available for parents as this provided ease and further opportunity to complete the tool in the community setting. An online version of NutriSTEP increases the opportunity for identifying larger numbers of children at risk of poor nutrition (Watson-Jarvis et al., 2011). A group of 73 parents completed an online version of NutriSTEP versus 98 completing the paper version of NutriSTEP (Carducci et al., 2015). Results showed that parents obtained the same/similar results whether completing an online or paper version of the NutriSTEP.

2.6 Conclusion

In conclusion, many NZ preschool children present risk factors that may increase the risk of poor nutritional status. International development of paediatric NSTs has shown that tools are both valid and reliable at identifying children at increased risk in the acute hospital setting which can prompt appropriate dietetic intervention. The Canadian developed NutriSTEP identifies preschoolers in the community setting at risk, providing an opportunity to nutritionally intervene to address unhealthy dietary habits and prevent adverse health effects. The NutriSTEP tool also has the advantage of being parent administered and can identify a range of risk factors related to inadequate nutritional status. NZ currently has no NST available to identify risk among preschoolers in the community, therefore this study aims to adapt a validated tool for reliability and use in the NZ setting.

Chapter 3: Research Study Manuscript

3.1 Abstract

Objectives: New Zealand Registered Dietitians (NZRDs) (n=3) reviewed the wording of the Canadian NutriSTEP and suggested adaptations suitable for the NZ setting. Intercept interviews with parents of preschoolers (n=26) provided non-expert reviews of the Canadian NutriSTEP. NZRDs participated in a second review to evaluate suggested wording adaptations from the first expert review and parent intercept interviews. Appropriate wording amendments were confirmed and the adapted NutriSTEP was finalised for online reliability testing.

Design: In Phase one, NZRDs reviewed the wording of the Canadian NutriSTEP and suggested adaptations for suitability in the NZ setting. In Phase two, intercept interviews were undertaken with a diverse group of parents of preschoolers (n=26) to collect non-expert reviews of the Canadian NutriSTEP. Phase three comprised a second expert review by the NZRDs who were re-engaged to assess the appropriateness of all suggested adaptations from Phase one and two and finalise the adapted NutriSTEP for online reliability testing. In Phase four, 79 parents of preschoolers completed online administrations of the Canadian NutriSTEP and the adapted NutriSTEP four weeks apart in a blinded manner. Intraclass Correlation Coefficient (ICC) was then used to verify test-retest reliability between administrations of the NutriSTEP. Individual questionnaire items were verified for reliability between administrations through Cohen's Kappa statistic (κ), Pearson's chi-square value and Fisher's exact test. Descriptive statistics identified preschoolers at increased (medium to high) nutrition risk and individual questionnaire items with the highest percentage of nutritional risk.

Setting: Auckland, New Zealand.

Subjects: Parents of NZ preschoolers aged two to five years.

Results: The overall score between online administrations of the original Canadian NutriSTEP and the adapted NutriSTEP was determined to be reliable (ICC = 0.91; 95% confidence interval 0.86, 0.94; $F = 11.4$; $P < 0.000$). Between NutriSTEP administrations, 13 out of 17 individual questionnaire items had adequate ($\kappa > 0.5$) agreement, one item had excellent agreement ($\kappa > 0.75$). All individual questionnaire

items had a p-value $p < 0.05$ indicating a significant relationship between administrations. The Canadian NutriSTEP identified that 20.3% of preschoolers were at increased nutrition risk, whereas the adapted NutriSTEP identified 31.6% at nutrition risk. Individual questionnaire items with the highest percentage of nutritional risk included; low intake of breads and cereals (58.2%), milk and milk products (51.9%), meat and meat alternatives (40.5%), child sometimes controlling the amount consumed (35.4%) and low vegetable intake (34.2%).

Conclusions: The Canadian NutriSTEP and the adapted NutriSTEP were reliable between online administrations when completed by NZ parents in the community setting. The adapted NutriSTEP identified an additional nine preschoolers at increased nutrition risk, demonstrating increased sensitivity in comparison to the Canadian NutriSTEP. Nutrition risk can be identified in early childhood to prevent the development of chronic disease. The adapted NutriSTEP should be considered for future use to identify preschoolers at increased nutrition risk and guide appropriate nutrition intervention.

3.2 Introduction

It is well established that good nutrition in childhood is essential for optimal growth, development, and health status (Randall Simpson et al., 2008). Dietary, behavioural and environmental risk factors can impair good nutrition. Risk factors may include inadequate intake of essential food groups, eating irregularly (too much or too little), inadequate levels of physical activity and parental misperceptions towards their child's body weight which may contribute to obesity.

Nutrition risk is defined as “the presence of characteristics or risk factors that can lead to impaired nutritional status” (American Dietetic Association, 1994) which results from “the relationship between nutrient intake and requirements and the body's ability to digest, absorb and use nutrients” (FAO, 2007). A poor nutritional status may lead to improper growth (small stature, low or high BMI, irregular growth patterns and stunted growth) and weight concerns (malnourishment, muscle wasting, overweight and obesity) (Mahan & Raymond, 2016). Nutrition risk screening can identify those at increased nutrition risk and provides an opportunity to intervene before adverse nutrition status occurs. Currently, reliable paediatric NSTs are not available for use in New Zealand (NZ).

NutriSTEP is a Canadian developed, community-based, parent-administered NST developed to assess nutrition risk in preschool aged children. The 17 item questionnaire was developed to assess risk factors for nutrition risk, and was validated for content by both parents and health professionals in the Canadian setting (Randall Simpson et al., 2008). The 17 items address risk factors of poor nutrition status including; food group intake, food security, fluid intake, eating patterns (not hungry at meals due to drinking fluid, eating frequency, child controlling the amount consumed), sedentary behaviours, and parental perception of adequate growth, weight and physical activity. Each questionnaire item has between two and five responses which are scored between zero (no risk) and four (high risk). Responses are summed to provide a total score (maximum 68) where an increased score (greater than 25) indicates a high nutritional risk.

Canadian studies have consistently found the NutriSTEP tool to be valid against RD assessment, quick and easy to complete, easy to interpret, and reliable in identifying preschool children at increased nutrition risk (Randall Simpson et al., 2008; Simpson, Keller, Rysdale, & Beyers, 2010). Similarly, NutriSTEP could be a valuable tool to identify NZ preschool children at increased nutrition risk. Used in the community setting, it may be a useful aid to fast track children in need of RD intervention as a preventive measure. Therefore, the aim of this study was to adapt the Canadian NutriSTEP to be suitable for use in the NZ setting, and to test its reliability, as a means to identify nutrition risk in preschool children aged between two and five years, as a parent administered questionnaire.

3.3 Methods

This study was approved by the Massey University Human Ethics Committee (Southern A) –SOA 18/17

The reliability testing of the adapted NutriSTEP was undertaken in four phases (Figure 1).

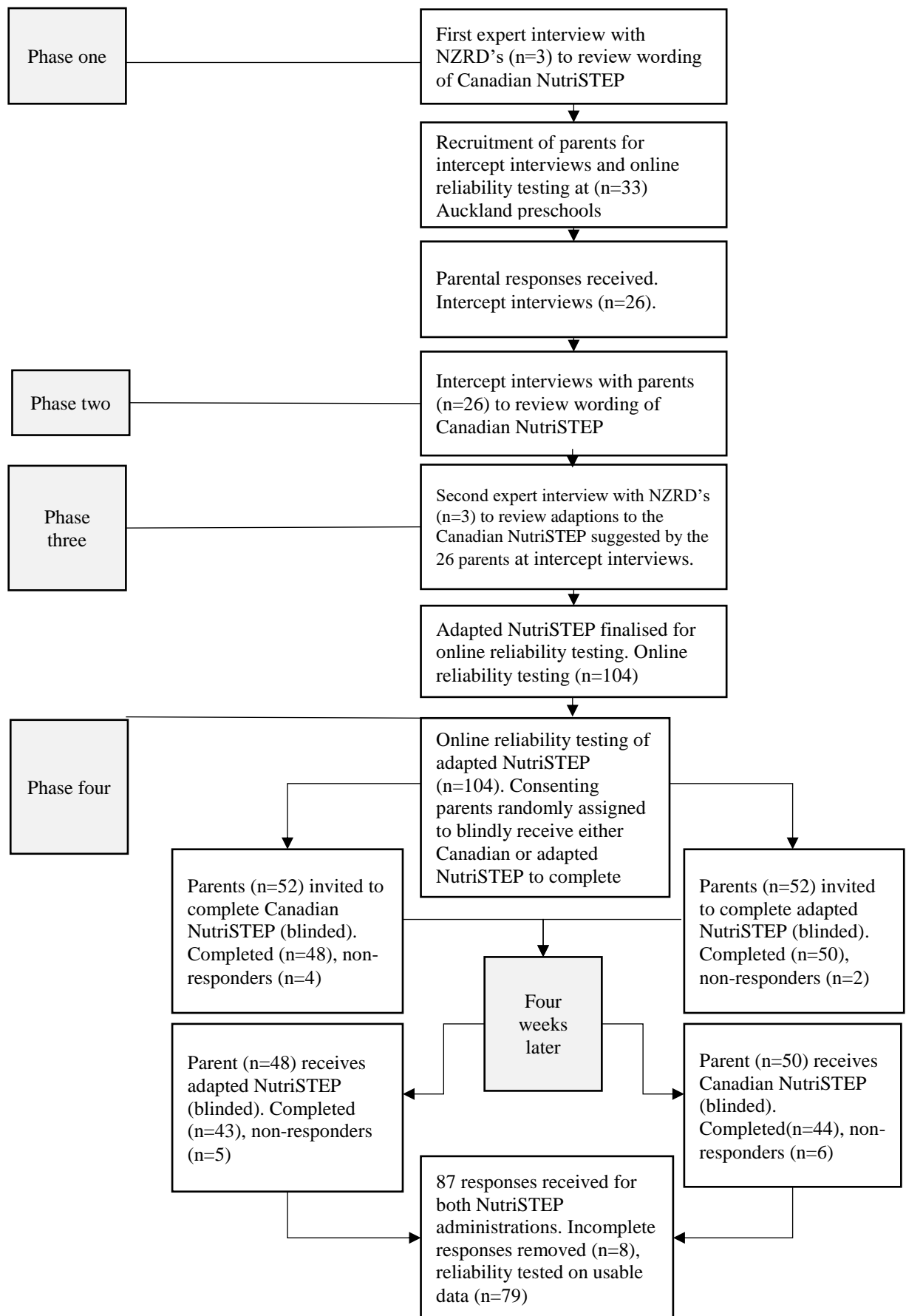


Figure 1 Phases in the development of the adapted NutriSTEP

Firstly, in Phase one, an expert review with NZRD experts was undertaken to adapt the original wording of the Canadian NutriSTEP to be applicable in the NZ setting. In Phase two, intercept interviews were undertaken with a diverse group of parents of preschool children. The aim of the intercept interviews was to collect parent feedback on each of the 17 items in the Canadian NutriSTEP. Phase three comprised a second expert review by the NZRD experts who were re-engaged to assess the appropriateness of the suggested adaptations provided by parents in the intercept interviews. Finally, in Phase four, reliability testing of the adapted NutriSTEP against the original Canadian NutriSTEP was undertaken among a larger group of parents.

The methodology used in each of the four phases include the following:

3.3.1 Phase 1: Expert review of the original Canadian NutriSTEP

An expert review of the wording of the original Canadian NutriSTEP was conducted to assess its applicability for use in the NZ setting. Three RD's with expertise in paediatric nutrition, local food consumption practices and knowledge of current food and nutrition guidelines for young children were invited to conduct the expert review. The age of preschool children was altered for the NZ context where a preschool age is two to five years, distinct from the preschool age of three to five years in Canada. The content of the 17 items in the Canadian NutriSTEP tool were reviewed for clarity and language for suitability in the NZ setting. Foreign wording, food terminology and nomenclature not commonly used in NZ were identified and alternative wording suggestions were made (Appendix B Changes to the Canadian NutriSTEP after each expert review, finalising the adapted NutriSTEP).

3.3.2 Phase 2: Intercept interviews with parents of preschoolers

A range of preschool centres (n=33) in the Auckland region were identified and face to face meetings were arranged by the researcher with preschool centre managers to inform them of the aim and context for the study. Preschool centre managers who agreed to participate provided the researcher with written consent for the recruitment of parents of preschoolers.

Among the consenting preschool centres that agreed to participate (n=28) there were a diversity of ethnic backgrounds and deprivation levels. In NZ, a deprivation level of one is considered least deprived whereas 10 is the most deprived (Atkinson, 2014).

Deprivation level according to area was considered when recruiting preschools to ensure a diverse sample. Higher deprivation areas included; Central Auckland (Mount Roskill, Blockhouse Bay, Wesley), West Auckland (Te Atatu South, Henderson Valley), South Auckland (Mangere, Manukau, Papatoetoe) and North Shore (Beach Haven). Lower deprivation areas included; Central Auckland (Greenlane, Mount Albert, Epsom, Newmarket, Hillsborough, Remuera, Ellerslie), North Shore (Albany, Takapuna), and West Auckland (Te Atatu Peninsula) (Atkinson, Salmond, & Crampton, 2014).

Parents were invited to participate in the study through a variety of recruitment methods. This included leaflets and posters available at the preschool, face to face communication with parents at child pick up times; by email provided by the preschool centre manager, social media and online community group Facebook pages. An incentive to win one of two monetary vouchers was provided to acknowledge parents for their time. Inclusion criteria were outlined in all forms of communication; these included a requirement to be the parent/primary caregiver of a preschool child (aged two to five years), to have lived in NZ for at least the last five years and, to be able to read and write in English. Exclusion criteria included parents of children with a chronic disease. Eligible parents who agreed to participate contacted the researcher by email.

Five separate intercept interviews were then arranged at a time and place convenient for the parent and an information sheet was provided. A total of 26 parents provided written consent to participate in the intercept interviews and to have the discussion recorded on a voice-only device. The University of Guelph intercept interview guide used in the development of the original Canadian NutriSTEP, was used to explore the parent's comprehension, opinions and thoughts on the wording of the 17 questionnaire items (Appendix C Intercept interview guide developed by the University of Guelph, Canada). Each parent completed a hard copy of the Canadian NutriSTEP, then gave feedback for each of the items including alternative wording suggestions where uncommon terminology was identified (Appendix B Parent adaption suggestions to the Canadian NutriSTEP collected at intercept interviews according to geographical location). Finally, parents completed a short questionnaire to ascertain their gender, age, ethnicity, marital status, educational attainment, first

language and the number and age of their children (Appendix C Demographic questionnaire used in intercept interviews and online reliability testing).

3.3.3 Phase 3 second expert review of the original Canadian NutriSTEP

Following Phase two, a second expert review was conducted to further review and integrate all the suggested wording amendments recommended in both Phases one and two, and to finalise the adaptations required for the NutriSTEP tool to be reliable in a NZ setting. The three RD experts that participated in Phase one contributed to the Phase three review. Refinements for the Canadian NutriSTEP tool were based on the Phase one review, suggested changes by the Phase two participants and using guidelines from the FNGHYC (Ministry of Health, 2012) for guidance. Final adaptations were agreed and the adapted NutriSTEP tool was produced (Appendix C Adapted NutriSTEP). Amendments reflected the use of local terminology and more commonly consumed foods within the reference food groups (Appendix B Changes to the Canadian NutriSTEP after each expert review, finalising the adapted NutriSTEP).

3.3.4 Phase 4 Reliability Testing of the adapted NutriSTEP

Phase four involved testing the reliability of the adapted NutriSTEP tool against the original Canadian NutriSTEP tool. A sample size of 120 parents was estimated to be sufficient for test-retest reliability (Jones, 2004; Randall Simpson et al., 2008; Streiner, Norman, & Cairney, 2015). Parents were recruited from the preschool centres used for recruitment in the Phase two intercept interviews. Those who expressed interest (n=104) and who had not participated in Phase two, were invited to email the researcher. They were sent an information sheet and an online consent form to confirm their participation. A unique de-identification number to protect each parent's anonymity was provided. Parents were randomly assigned to blindly receive either the original Canadian NutriSTEP (n=52) or the adapted NutriSTEP (n=52) for completion. Four weeks later, the parents received the crossover version to complete. All online forms and questionnaires were distributed to parents using Google forms which facilitated a fast response. The use of Google Forms eliminated use of paper copies, send-return postal addresses, reduced time and expense, and helped to increase response rates.

3.3.5 Statistical Analyses

All data entry was transferred into SPSS version 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.) for statistical analysis. Descriptive analyses (mean, standard deviation (s.d), frequencies (n) and percentages (%)) for the demographic responses and parental characteristics of the Phase two participants were undertaken for comparative purposes.

Responses from the two completed administrations of the NutriSTEP completed by the parents in Phase four were transferred into SPSS. Where there were missing results and/or where parents had not completed both NutriSTEP administrations, responses were removed from the data set. This resulted in 79 completions for the two questionnaires by the parents in Phase four. Similarly, basic descriptive analyses (mean, standard deviation (s.d), frequencies (n) and percentages (%)) were performed for demographic and parental characteristics for comparison purposes. Intraclass Coefficient (ICC) testing was performed to test the reliability between responses for both the Canadian and adapted NutriSTEP administrations. The Cronbach's alpha, 95% confidence interval and F test were used as measurements of reliability.

Reliability of individual items between administrations were assessed by using Cohen's κ (κ) and p-value (Pearson's Chi-square and Fisher's exact test). Item scores were dichotomized at cut points deemed low or high nutrition risk (Randall Simpson et al., 2008). A K statistic of 0.5 indicates adequate agreement between administrations. Scores greater than 0.75 indicated excellent agreement between administrations (Streiner and Norman 1996; as cited in (Randall Simpson et al., 2008). For items in which κ was indeterminate, the Chi-square was calculated; P -value > 0.05 indicated no significant difference of scores between administrations. When Chi-square values could not be calculated due to violation assumptions, Fisher's exact test was calculated; p-value > 0.05 indicated no significant difference of scores between administrations.

A limitation of the Pearson's chi-square test is that the sampling distribution of the test statistic has an approximate chi-square distribution, where the larger the sample is, the better the approximation (Field, 2013). In a smaller sample such as this research (n=79) the approximation may be inadequate to provide a significant result. To use the Pearson's chi-square test, the expected frequencies in each cell must be > 5 . When expected cell frequencies are < 5 , the sampling distribution of the test statistic is too deviant from a chi-square distribution to be used (Field, 2013). Nine out of 17

items had expected cell frequencies <5 (Appendix B Crosstabulation, Chi-square tests and Kappa statistic results between administrations for each index item). In this case, the Fisher's exact test was used to calculate the exact probability of the chi-square statistic that will be accurate in the small sample size (Field, 2013). A p -value <0.05 indicates significance and that the hypothesis can be accepted that there is no difference between the reliability of the Canadian and adapted NutriSTEP.

3.4 Results

In total 104 parents completed the consent form. The parent sample was halved and each group ($n=52$) receive a blind copy of either the Canadian NutriSTEP or the adapted NutriSTEP. Where the questionnaire was not completed within a one-week time frame, parents were sent a reminder by email. Non-responders were excluded to respect the voluntary nature of the study. Four weeks later, the alternate questionnaire was sent to the parents who had completed the first administration of NutriSTEP, alongside a short questionnaire to ascertain personal characteristics including gender, age, ethnicity, marital status, educational attainment, first language, number and age of children (Appendix C Demographic questionnaire used in intercept interviews and online reliability testing). Where both NutriSTEP administrations were not fully completed ($n=25$) they were withdrawn from the reliability testing and removed from the final data set, resulting in a final sample size of 79 completions by the parents.

The demographic characteristics of parents and the index child that participated in the intercept interviews and online reliability testing of the adapted NutriSTEP are provided in Table 2.

Table 2 Demographic and parent/index child characteristics in the intercept interviews and online reliability testing of NutriSTEP

Characteristics	Phase two intercept interviews (n=26) mean \pm s.d.	Phase four reliability testing of the adapted NutriSTEP (n=79) mean \pm s.d.
<i>Parent age (years)</i>	32 \pm 4	35 \pm 5
<i>People in household (n)</i>	4 \pm 1	4 \pm 2
<i>Adults in household (n)</i>	2 \pm 1	2 \pm 1
<i>Children in household (n)</i>	2 \pm 1	2 \pm 2
	n (%)	n (%)
<i>Gender</i>		
Male	2 (7.7)	8 (10.1)
Female	24 (92.3)	71 (89.9)
<i>Marital Status</i>		
Married/common law	23 (88.5)	69 (87.3)
Separated/divorced/single	3 (11.5)	10 (12.7)
<i>Education</i>		
Primary	5 (19.2)	6 (7.6)
Secondary	4 (15.3)	16 (20.3)
Tertiary	17 (65.4)	57 (72.2)
<i>First language spoken</i>		
<i>Mother</i>		
English	21 (80.8)	62 (78.5)
Te Reo Māori	0 (0.0)	4 (5.1)
*Other	5 (19.2)	13 (16.4)
<i>Father</i>		
English	24 (92.3)	60 (75.9)
Te Reo Māori	0 (0.0)	1 (1.3)
*Other	2 (7.7)	18 (22.8)
<i>Child</i>		
English	25 (96.2)	62 (78.5)
Te Reo Māori	0 (0.0)	4 (5.1)
*Other	1 (3.8)	13 (16.4)
<i>Country of birth</i>		
<i>Mother</i>		
New Zealand	18 (69.2)	53 (67.1)
Other	8 (30.8)	26 (32.9)
<i>Father</i>		
New Zealand	22 (84.6)	49 (62.0)
Other	4 (15.4)	30 (38.0)
<i>Child</i>		
New Zealand	24 (92.3)	74 (93.7)
Other	2 (7.7)	5 (6.3)

<i>Ethnicity</i>		
<i>Mother</i>		
New Zealand European	13 (50.0)	40 (50.6)
Māori	3 (11.5)	6 (7.6)
Māori/New Zealand European	0 (0.0)	6 (7.6)
Other	10 (38.5)	27 (34.2)
<i>Father</i>		
New Zealand European	14 (53.8)	37 (46.8)
Māori	2 (7.7)	4 (5.1)
Māori/New Zealand European	2 (7.7)	5 (6.3)
Other	8 (30.8)	33 (41.8)
<i>Child</i>		
New Zealand European	12 (46.2)	42 (53.2)
Māori	0 (0.0)	4 (5.1)
Māori/New Zealand European	6 (23.1)	6 (7.6)
Other	8 (30.7)	27 (34.1)
<i>Age of child(years)</i>		
2	6 (23.1)	17 (21.5)
3	11 (42.3)	30 (38.0)
4	6 (23.1)	29 (36.7)
5	3 (11.5)	3 (3.8)
<i>Gender of child</i>		
Male	14 (53.8)	39 (49.4)
Female	12 (46.2)	40 (50.6)
<i>Ease of completion</i>		
<i>(Canadian NutriSTEP only)</i>		
Easy	23 (88.5)	
Hard	3 (11.5)	

* Values are means \pm s.d or n (%)

* First Language Other (e.g. Afrikaans, Hindi, German, Chinese, Hebrew)

In both Phases, most parents were in their early to mid-30s, married, had a tertiary education, used English as a first language and identified as New Zealand European. Most index children were aged between three and four years. Most parents (n=23; 88.5%) in the intercept interviews agreed that the NutriSTEP was easy to complete.

Table 3 provides Phase four parental responses for the 17 NutriSTEP items for both the Canadian NutriSTEP and adapted NutriSTEP, a percentage of “at risk” for each questionnaire item.

Table 3 Proportion of preschoolers at risk for items in the Canadian versus adapted NutriSTEP tools

NutriSTEP item	Canadian NutriSTEP n (%)	Adapted NutriSTEP n (%)	Test re-test reliability	
			Cohens Kappa (K)	P- value
<i>Breads and cereals</i>				
>3 x per day	23 (29.1)	33 (41.8)	0.57	.000
≤ 3 x per day	56 (70.9)	46 (58.2)		
<i>Milk and milk products</i>				
>3 x per day	36 (45.6)	38 (48.1)	0.54	.000
≤2 x per day	43 (54.4)	41 (51.9)		
<i>Fruit</i>				
> 2 x per day	71 (89.9)	70 (88.6)	0.54	*.000
≤ 2 x per day	8 (10.1)	9 (11.4)		
<i>Vegetables</i>				
> 1 x per day	54 (68.4)	52 (65.8)	0.54	.000
≤ 1 x per day	25 (31.6)	27 (34.2)		
<i>Meat and meat alternatives</i>				
> 1 x per day	54 (68.4)	47 (59.5)	0.43	.000
≤ 1 x per day	25 (31.6)	32 (40.5)		
<i>Fast food</i>				
< 2 x per week	72 (91.1)	70 (88.6)	0.72	*.000
≥ 2 x per week	7 (8.9)	9 (11.4)		
<i>Food is expensive</i>				
Never to rarely	57 (72.2)	57 (72.2)	0.62	.000
Sometimes to always	22 (27.8)	22 (27.8)		
<i>Chewing/swallowing difficulty</i>				
Never to rarely	79 (100)	77 (97.5)	*Indeterminate	
Sometimes to always	0 (0.0)	2 (2.5)		
<i>Not hungry at meal times due to drinking</i>				
Never to rarely	62 (78.5)	59 (74.7)	0.40	*.001
Sometimes to always	17 (21.5)	20 (25.3)		
<i>Eating frequency</i>				
> 3 x per day	78 (98.7)	78 (98.7)	1.00	*.013
≤ 2 x per day	1 (1.3)	1 (1.3)		
<i>Child controls amount consumed</i>				
Always/most of the time	49 (62.0)	51 (64.6)	0.73	.000
Sometimes to never	30 (38.0)	28 (35.4)		

NutriSTEP item	Canadian NutriSTEP n (%)	Adapted NutriSTEP n (%)	Test re-test reliability	
			Cohens Kappa (K)	<i>P</i> - value
<i>Watches television at meals</i>				
Never to sometimes	74 (93.7)	73 (92.4)	0.71	*.000
Most of the time to always	5 (6.3)	6 (7.6)		
<i>Uses vitamin/mineral supplements</i>				
Never to sometimes	69 (87.3)	67 (84.8)	0.69	*.000
Most of the time to always	10 (12.7)	12 (15.2)		
<i>Physically active</i>				
Enough	76 (96.2)	76 (96.2)	0.65	*.003
Needs more	3 (3.8)	3 (3.8)		
<i>Sedentary activity during the day</i>				
< 3 hours	70 (88.6)	71 (89.9)	0.67	*.000
> 3 hours	9 (11.4)	8 (10.1)		
<i>Growth adequate</i>				
Yes	78 (98.7)	79 (100)	*Indeterminate	
No	1 (1.3)	0 (0.0)		
<i>Weight</i>				
Appropriate	73 (92.4)	72 (91.1)	0.59	*.000
Too much/little	6 (7.6)	7 (8.9)		

Test-retest reliability of items between administrations of the NutriSTEP was determined using the following:

*Indeterminate = kappa is indeterminate due to results falling completely in one of the binary categories

*P-value is Pearson's Chi Square unless * is present. * indicates that Fisher's exact test has been used.

Items were considered "high risk" when 30% or more of the sample was determined at risk for an index item (Randall Simpson et al., 2008). Items at high risk in both Phases two and four included; Grain products (≤ 3 servings per day), milk and substitute products (≤ 2 servings per day), vegetables (≤ 1 serve per day), and child did not control amount consumed (sometimes to never).

3.4.1 Test-retest reliability

The overall score between administrations of the original Canadian NutriSTEP and the adapted NutriSTEP was determined to be reliable (ICC = 0.91; 95% confidence interval 0.86, 0.94; $F = 11.4$; $P < 0.000$). Table 3 outlines the Cohen's Kappa (K) statistics for the dichotomized index items. $\kappa > 0.5$ suggests adequate agreement between items and $\kappa > 0.75$ suggests excellent agreement. There was inadequate

agreement for the item “Not hungry at meal times due to drinking and meat and alternatives”. Adequate agreement between administrations was determined for the following items; grains, milk/substitute products, fruit, vegetables, fast food, food is expensive, child controls amount consumed, child watches television at meal times, uses vitamin/mineral supplements, physically active, and weight. Excellent agreement between administrations was determined for how frequently the preschooler ate.

Pearson’s chi-square value or Fisher’s exact test were used to indicate if there was a significant relationship between the two administrations for each of the 17 items. A p-value <0.05 indicates a significant relationship between the two administrations.

3.5 Discussion

This study has established that the adapted NutriSTEP tool has been shown to be a reliable nutrition risk screening tool that can be completed by parents of preschool children in NZ.

To the best of our knowledge, this study is the first to adapt the Canadian NutriSTEP (Randall Simpson et al., 2008) for use in NZ. We have used well accepted procedures (Randall Simpson et al., 2008) to refine the Canadian tool using four phases of development; an expert review, intercept interviews with parents, a further expert review and then testing the reliability of the adapted tool against the Canadian tool in parent groups.

The original validation testing of the Canadian NutriSTEP identified among 269 preschoolers, 33.2% were at medium and 13.9% at high nutrition risk (Randall Simpson et al., 2008). These NutriSTEP scores were reflective of a standardized nutrition risk rating given by a RD after completion of a dietetic assessment including a three-day food record, weight and height, and a brief clinical assessment identifying any signs of malnutrition (weight, anaemia, failure to thrive). The original test-retest reliability testing of the Canadian NutriSTEP identified 23.5% at medium and 6.3% at high nutrition risk in a sample of 140 preschoolers (Randall Simpson et al., 2008).

As part of the reliability testing, we assessed the nutrition risk status of preschool children aged two to five years using the adapted NutriSTEP against the Canadian NutriSTEP. In a convenience sample of 79 preschoolers, nearly a third (31.6%) were at medium to high risk of inadequate nutrition status when using the adapted NutriSTEP tool. In contrast, scores from the Canadian NutriSTEP identified one fifth of the preschoolers (20.3%) to be at medium to high nutrition risk. The adapted

NutriSTEP tool identified an additional nine children at increased nutrition risk that were not identified by the Canadian NutriSTEP. These results clearly show that the adapted NutriSTEP has a higher degree of sensitivity than the Canadian NutriSTEP in the NZ setting. For example, risk factors for consumption of breads and cereals and meat and meat alternatives were better identified in the adapted NutriSTEP due to misconceptions of the Canadian NutriSTEP wording.

Further, the overall score between administrations of the original Canadian NutriSTEP and the adapted NutriSTEP was determined to be reliable (ICC=0.91; 95% confidence interval 0.86, 0.94; $F = 11.4$; $P < 0.000$). The original test-retest reliability testing of the Canadian NutriSTEP had similar reliability between administrations (ICC= 0.89) (Randall Simpson et al., 2008). Previous reliability testing using ICC found the Canadian NutriSTEP to also have a high degree of reliability when using internet and onscreen versions (0.94 and 0.91 respectively) (Carducci et al., 2015).

Use of the adapted NutriSTEP identified important nutrition risk factors among NZ preschoolers.

Among major food groups, more than half did not consume the recommended serves of bread and cereals (>3 serves per day) (58.2%) and milk and milk products (>3 serves per day) (51.9%). Breads and cereals are NZ preschoolers main source of carbohydrate, fibre, and iodine (Ministry of Health, 2012a, 2017c; Theodore et al., 2006). The original reliability testing of the Canadian NutriSTEP found that 50% of preschoolers were not consuming >3 serves of breads and cereals daily, whereas 15% were not consuming >3 milk and milk products daily (Randall Simpson et al., 2008). The 2002 NCNS found that only 38% of children consumed cow's milk daily (Parnell et al., 2003), whereas 86% of NZE preschool children were consuming an adequate amount of milk and milk products (Theodore et al., 2006). Children who are not meeting daily recommendations may not be receiving adequate amounts of these nutrients including protein and calcium to maintain good health. When young children do not meet guidelines for milk and milk products, this places them at risk of inadequate growth and bone development, and a smaller stature (Mazahery et al., 2018).

A small proportion of preschoolers consumed less than two serves of fruit (11.4%) and more than a third (34.2%) ate less than one serving of vegetables a day, similar to

other NZ studies indicating that fruit is more likely to be eaten than vegetables (Morton et al., 2017). As the FNGHYC recommend that preschoolers eat at least three serves of vegetables daily, our findings show many of the index preschoolers were not meeting these recommendations by consuming only one vegetable serving. In the reliability testing of the Canadian NutriSTEP it was found 53.7% of preschoolers ate less than two serves of fruit and similar to our findings, 34.3% ate less than one serve of vegetables daily (Randall Simpson et al., 2008). These children may have a compromised intake of essential vitamins and fibre found in these foods, important for good nutrition status (Ministry of Health, 2012a).

Forty percent of preschoolers were not meeting daily recommendations (>1 x per day) of meat and meat alternatives. Reliability testing of the Canadian NutriSTEP found that 22.1% of preschoolers also had inadequate intake of this food group (Randall Simpson et al., 2008). Although one serving daily may provide sufficient protein, iron intake from this food group maybe compromised. Iron intake is especially important in preschoolers and previous reports indicate some form of iron deficiency is prevalent in this age group (Grant, Wall, Brunt, Crengle, & Scragg, 2007; Soh, Ferguson, McKenzie, Homs, & Gibson, 2004). As the protein source (meat vs plant protein) and biochemical markers of iron status were not assessed in this study, the adequacy of iron intake could not be determined. Preschoolers who do not consume a highly bioavailable iron source on a regular basis may be at increased risk of iron deficiency anaemia secondary to inadequate iron intake (Soh et al., 2004).

We found that fast food was eaten more than twice a week by 11.4% of preschoolers. Some young NZ children (seven percent) that participated in the NZHS ate as much as three times the recommended amount of takeaways on a weekly basis (Ministry of Health, 2012b), therefore, it is likely that these results may not represent the excessive fast food intake of many NZ preschoolers in previous studies. Fast food may be energy dense and low in essential nutrients. When consumed in excess of the guidelines, preschoolers may learn to prefer these choices placing them at increased risk for overweight and obesity.

About a third (27.8%) of parents responded that food was “sometimes” expensive which may indicate that less nutritious foods are available in the household due to cost. In the 2008/09 NZHS it was estimated that 41% of NZ households were never fully food secure (having access to adequate, safe, affordable and acceptable food)

and found that there was an inadequate amount of food to eat on a daily basis (Parnell, Wilson, Thomson, Mackay, & Stefanogiannis, 2011). Similarly, 17.1% of parents responded ‘sometimes to always’ for experiencing food insecurity in the reliability testing of the Canadian NutriSTEP (Randall Simpson et al., 2008).

Inexpensive and less nutritious convenience foods significantly contribute to obesity (Rush, Puniani, Snowling, & Paterson, 2007) and may increase the risk of poor nutrition status when replacing nutritious foods such as fruit and vegetables.

More than a fifth (25.3%) of preschoolers were “sometimes” not hungry at meal times due to drinking too much fluid. The Canadian NutriSTEP found that 22.1% of preschoolers were also “sometimes to always” not hungry at meal times due to excess drinking (Randall Simpson et al., 2008). These preschoolers may therefore be missing out on essential nutrients from food sources, especially if these fluids are mainly composed of refined sugars (Taylor et al., 2005).

More than a third (35.4%) of preschoolers “sometimes to never” controlled the amount of food eaten. The Canadian NutriSTEP identified that 31.4% of preschoolers “sometimes to never” controlled the amount of food eaten (Randall Simpson et al., 2008). This can hinder the child’s internal regulation of energy intake and alter responsiveness to internal cues of hunger and satiety, resulting in children eating more than necessary at each meal (Birch & Fisher, 1998). If foods consumed in excess are energy dense and high in sugar, the potential for weight gain is high (Birch & Fisher, 1998).

Finally, 10% of preschoolers exceeded three hours of sedentary behaviour on a daily basis versus 21.4% of preschoolers that were sedentary for more than three hours daily in the original Canadian NutriSTEP reliability testing (Randall Simpson et al., 2008). Physical activity rates are inadequate in many NZ preschoolers (Ali, Pigou, Clarke, & McLachlan, 2017) and an unsatisfactory percentage of preschoolers in the GuiNZ study were physically active daily (Morton et al., 2017). With excessive sedentary behaviour significantly associated with weight gain, these preschoolers may be at increased risk of overweight and obesity (Ministry of Health, 2017b; Ministry of Social Development, 2008; Morton et al., 2017; Sigman, 2015).

3.6 Conclusion

This study provides evidence that the Canadian and adapted NutriSTEP were reliable between administrations when completed by diverse parent groups in a community setting in Auckland, NZ.

To the best of our knowledge, this research is the first to adapt the validated NutriSTEP (Randall Simpson et al., 2008) to a NZ setting and to test the reliability in parent groups to identify preschool children aged two to five years old at increased nutrition risk.

The adapted NutriSTEP has found that some NZ preschool children; are not meeting daily nutrient requirements, have inadequate food group intake and present increased sedentary behaviours. Therefore, it is crucial that a tool demonstrated to be reliable in a NZ setting is considered for future use to identify preschoolers with increased nutrition risk.

Overall, 13 out of 17 items had adequate reliability between separate administrations of the Canadian NutriSTEP and the adapted NutriSTEP. One item (eating frequency) had excellent reliability (1.00) between the two administrations. For two of the items (chewing/swallowing difficulty and adequate growth) there was an indeterminate reliability.

Scores from the Canadian NutriSTEP found 63 preschoolers were at low nutritional risk (79.7%), 11 at medium nutritional risk (14%) and five at high nutritional risk (6.3%). Scores from the adapted NutriSTEP found 54 preschoolers were at low nutritional risk (68.4%), 21 were at medium risk (26.6%) and four were at high nutritional risk (5%).

Conclusively, the Canadian NutriSTEP versus the adapted NutriSTEP identified that 20.3% versus 31.6% of NZ preschoolers respectively were at medium-high nutritional risk. Items with the highest percentage of nutritional risk included; low intake of breads and cereals (58.2%), milk and milk products (51.9%), meat and meat alternatives (40.5%); child controlling the amount consumed (35.4%) and low vegetable intake (34.2%). It would therefore be important for a RD to focus on these particular items when assessing an at-risk child for dietetic intervention.

These results show that the adapted NutriSTEP has the potential to identify NZ preschoolers at increased nutritional risk and can provide information to guide nutritional interventions for those identified as at nutritional risk.

Chapter 4: Conclusions and recommendations

4.1 Summary of findings

This test-retest reliability study was conducted in the community setting with 79 parents of preschoolers living in diverse areas of Auckland, NZ. The aim was to adapt the Canadian NutriSTEP to be suitable for use in a NZ setting.

Reliability of the adapted NutriSTEP was tested online against the Canadian NutriSTEP. Between administrations of the NutriSTEP, test-retest reliability was assessed by *Intraclass Correlation Coefficient* (ICC). Reliability between administrations of individual questionnaire items was also tested by Cohen's kappa statistic (κ), Pearson's chi-square value or Fisher's exact test. The reliability testing followed a process of adapting the Canadian NutriSTEP tool to the NZ setting. The adaption process included two NZRD expert reviews and intercept interviews with 26 parents of preschoolers from diverse areas in Auckland.

The four study objectives were met as follows:

Objective one: Conduct an expert review of the wording of the NutriSTEP and its applicability to the New Zealand context.

This objective was met by completing phases one and three in the study. The wording of the adapted NutriSTEP was reviewed by conducting two expert reviews by NZRDs. The first review occurred prior to and the second post the parent intercept interviews. For both reviews the same panel of NZRD experts were used for consistency. The two expert reviews of the Canadian NutriSTEP firstly allowed NZRDs with knowledge and experience in paediatrics to provide terminology and food choices that would be appropriate and recognisable for NZ parents. Secondly, the expert review conducted post parent intercept interviews provided an opportunity for the RD experts to accept or reject suggested adaptations to be suitable in a NZ

setting, to adapt their initial review if appropriate and to consolidate the adaptations to comply with FNGHYC guidelines and recommendations (Ministry of Health, 2012a). Both these reviews proved to be very valuable in finalising the adapted NutriSTEP tool for use in NZ, achieving a higher identification rate of increased nutrition risk than using only the Canadian NutriSTEP tool (see objective three). Outcomes of these Phases were firstly, NZRDs identifying terminology in the Canadian NutriSTEP uncommon in NZ and then providing adaptations that would be better comprehended by NZ parents. The panel of NZRDs each had career experience in educating NZ parents about nutrition. Therefore, their wording suggestions would be considered more appropriate and familiar to NZ parents in comparison to terminology used in the Canadian tool. Secondly, a second expert review allowed the NZRDs to consider wording suggestions made by parents in Phase two that did not have expertise in the paediatric dietetic setting. This allowed the NZRDs to gauge whether the expert suggestions from phase one were appropriate and similar to parent suggested adaptations.

Secondly, in Phase two,

Objective two: Conduct intercept interviews with parents of preschool children to assess wording and comprehension of the existing Canadian NutriSTEP tool in order to adapt the NutriSTEP tool for use in NZ.

Conducting intercept interviews with parents of preschoolers in diverse areas of Auckland successfully identified uncommon food and nomenclature used in the Canadian NutriSTEP that was deemed unsuitable in an NZ setting. Adaptions to the Canadian NutriSTEP were suggested by the parent group (Appendix B Parent adaption suggestions to the Canadian NutriSTEP collected at intercept interviews according to geographical location) with parents providing reasons as to why the Canadian wording was misunderstood. This was very beneficial feedback to return to the NZRD expert panel during the second expert review, as parent answers provided a lay perspective and understanding of the tool.

Ultimately, some parent adaptations were rejected by the NZRD panel. Examples of rejected suggestions; inclusion of grain alternatives seen in trend diets (quinoa, amaranth, buckwheat); specifying if fast foods only included “unhealthier” options

(burgers, hot chips, and hot dogs); difficulty buying food should only consider if “healthier” options were too expensive; and considering fresh versus frozen fruits and vegetables. Such suggestions were agreed by the NZRD panel to be unnecessary in identifying poor nutritional status.

Adaptions that were accepted complied with the FNGHYC. Examples of accepted suggestions included: adding wraps and crackers to bread and cereal examples; excluding almond, rice and coconut milks in the milk and milk products category; and to consider all digital devices watched during meal times; not just the television. Independently, the NZRD experts added seafood to meat and meat alternatives as a source of protein.

Collectively, two expert reviews and the intercept interviews produced the adapted NutriSTEP, in which the terminology had been thoroughly reviewed by both parents and experts. The final recommendations were integrated to formulate the adapted NutriSTEP tool successfully used in this study and tested for reliability against the original Canadian tool.

Thirdly in Phase four,

Objective three: The reliability of the adapted NutriSTEP tool compared to the Canadian NutriSTEP tool was tested.

Test-retest reliability was tested by Intraclass Correlation Coefficient (ICC) in SPSS. The adapted NutriSTEP was reliable in a NZ setting and had great reliability (ICC = 0.91; 95% confidence interval 0.86, 0.94; $F = 11.4$; $P < 0.000$) with the Canadian NutriSTEP in between administrations. Furthermore, individual risk items were tested for reliability between administrations. Cohen’s Kappa statistic (κ) was tested to indicate if parents gave identical item responses between both administrations of the NutriSTEP. There was adequate agreement ($\kappa > 0.5$) between administrations for the following items; grains, milk/substitute products, fruit, vegetables, fast food, food is expensive, child controls amount consumed, child watches television at meal times, uses vitamin/mineral supplements, physically active, and weight. Two items had indeterminate κ results (chewing/swallowing difficulty, adequate growth). To test reliability between item responses in both administrations, Pearson’s chi-square value

test or Fisher's exact test were tested in SPSS to indicate a p-value (significant relationship). A p-value score $p < 0.05$ indicated that there was a significant relationship between administrations, and that individual items were reliable.

Finally, also in Phase four,

Objective four: To determine the prevalence of low, medium or high nutritional risk using the NutriSTEP tool in preschool aged children (aged two to five years old).

SPSS frequency tables were used to display the percentages of preschool children at low, medium or high nutritional risk in both administrations of the NutriSTEP. Risk categories were based on cut off scores used in the original reliability testing of the Canadian NutriSTEP (< 20 = low risk, > 20 and ≤ 25 = moderate risk, and ≥ 25 = high risk). The adapted NutriSTEP successfully identified 31.6% of preschoolers at medium to high nutrition risk. The adapted NutriSTEP identified an additional nine children at increased nutrition risk (medium to high) that were not identified in the Canadian NutriSTEP (20.3%).

4.2 Strengths and limitations

The strengths of this study were that we were able to use the Canadian NutriSTEP malnutrition screening tool which is a validated nutrition screening tool. The items in the NutriSTEP tool have undergone extensive development and refinement by Canadian RD experts and parents. The tool has been successful in identifying preschool children at increased nutrition risk in previous studies (Carducci et al., 2015; Randall Simpson et al., 2008; Simpson et al., 2010) and since 2014, it's use has been required in all Ontario public health units, an implementation by the Ministry of Health (Ontario, Canada) as part of their Public Health Funding and Accountability Agreement in order to reduce nutrition risk (Ontario Ministry of Health and Long-Term Care, 2008).

NutriSTEP is a quick and easy to use nutrition screening tool for parents. Ease of completion was furthered by administering the tool as an online version. Google Forms was used to administer all forms and questionnaires to parents who consented to participate in the reliability testing of the tool. Google Forms allowed parents to quickly receive and return consent forms and questionnaires once completed. Google

Forms reduced the unsuccessful response rates that can occur when using paper versions due to; misplacement in the post, having to collect personal home addresses to send paper versions, buying returnable envelopes and postage fees, having to visit a post office to post all consent forms and questionnaires, and parents not remembering to return the paper copies once finished. The return rate for both initial administrations was nearly 100%; if the questionnaires were to be administered by paper copy, this response rate would likely be much less. All responses collected from parents that participated were also analysed electronically, reducing likelihood of human error that may have occurred if the researcher had to manually enter data from paper copies.

The diverse nature of parents of preschoolers that participated in this research makes the adapted NutriSTEP suitable and applicable in a NZ wide setting for potential future community setting use. Diverse characteristics included; age, ethnicity, country of birth, geographical residency and education attainment. There were various ethnicities that participated in this study, however most importantly, a high percentage of Māori participation. With Māori more likely to experience health inequities and chronic disease in NZ it was essential that Māori could participate and potentially become aware of risk factors that could influence their preschoolers nutrition status. If Māori could increase awareness of nutritional risk factors in preschoolers from participating in this research and using this tool in the community setting, this may encourage tamariki and whanau to adopt more health protective habits and behaviours in the home environment.

Limitations of this research include that this was a cross-sectional study that did not have randomised inclusion criteria, potentially meaning that the sample had limited ethnic and socioeconomic variation. However, this limitation was overcome by recruiting parents from preschools that ranged in deprivation levels and geographical locations of Auckland. This led to the successful recruitment of a wide range of parents with different ethnic and socioeconomic backgrounds.

It was estimated that a sample size of ~150 parents would be sufficient to test test-retest reliability of the adapted NutriSTEP, a number based on the original reliability testing of the Canadian NutriSTEP where a sample size of 140 parents were recruited

(Randall Simpson et al., 2008). Although 104 parents consented to participating in the reliability testing of the adapted NutriSTEP, the sample size was reduced to 79 after non-respondents (did not complete the first NutriSTEP administration) and incomplete respondents (did not fully complete one/both administrations of NutriSTEP) were removed from the data set.

Parents that did not complete the administrations in full were removed from the data set as the final nutrition risk score could not be summed accurately. In the future, it would be important that the online versions required parents to answer each item before continuing to the next item. Parents who did not complete the initial administration were followed up by email to remind them about participation in the reliability testing. However, parents that did not respond were not further contacted. Parents who wished to remove themselves from the study, were free to do so at any time as explained in the information sheet provided to parents before consenting to participate, therefore this statement was respected. In the future, it would be a recommendation to use a larger sample size to further confirm reliability of the adapted NutriSTEP in an NZ setting.

4.3 Final recommendations

During intercept interviews, item 14 “My child gets enough exercise” was commonly misunderstood by parents as they didn’t know how much exercise for a preschooler was “enough”. Parents fed back that the questionnaire item was too vague and that specific guidelines should be given to ensure accuracy when answering this question. Nearly all parents believed their child was getting “enough” physical activity in both administrations of online reliability testing (96.2%). These results are impressive, yet potentially inaccurate as children have become increasingly sedentary according to NZ literature. This limitation was likely due to a lack of comprehension. If exercise specific guidelines were included in future adaptations “*A child aged 2-4 years needs 3 hours, 1 of these being energetic play*” this may allow parents to better comprehend the questionnaire item and provide a more accurate interpretation of their child’s activity level.

Nearly all parents that participated in this research n=57 (72.2%) had a tertiary education. Further research should aim to include more parents with a variety of education levels to ensure inclusiveness of all education and literacy levels.

NutriSTEP items with the highest percentage of increased nutritional risk included; inadequate intake (≤ 3 x per day) of breads and cereals (58.2%), inadequate intake (≤ 2 x per day of) milk and milk products (51.9%), inadequate intake (≤ 1 x per day) of vegetables (34.2%), inadequate intake (≤ 1 x per day) of meat and meat alternatives (40.5%), and the child sometimes to never controlling the amount consumed (35.4%) It would therefore be a recommendation to RDs to focus on these food groups during their dietetic assessments at the referral stage to prevent deficiencies of nutrients found in these food groups (calcium and iron) which have previously been a concern in NZ preschoolers. In the future, RD education to correct food group inadequacies in the diet could be given at preschool centres as a preventative approach to reduce nutrition risk in preschoolers from eating an inadequate diet.

5.1 References

- Ali, A., Pigou, D., Clarke, L., & McLachlan, C. (2017). Literature review on motor skill and physical activity in preschool children in New Zealand.
- American Dietetic Association. (1994). Identifying patients at risk: ADA's definitions for nutrition screening and nutrition assessment. *J Am Diet Assoc*(94), 838-839.
- Anderson, Y. C., Wynter, L. E., Grant, C. C., Stewart, J. M., Cave, T. L., Wild, C. E., . . . Hofman, P. L. (2017). Physical activity is low in obese New Zealand children and adolescents. *Scientific reports*, 7, 41822.
- Armstrong, A., Harskamp, C., & Armstrong, E. (2012). The association between psoriasis and obesity: a systematic review and meta-analysis of observational studies. *Nutrition & diabetes*, 2(12), e54.
- Atkinson, J., Salmond, C., & Crampton, P. (2014). NZDep2013 index of deprivation. *Wellington: Department of Public Health, University of Otago*
- Baughcum, A. E., Chamberlin, L. A., Deeks, C. M., Powers, S. W., & Whitaker, R. C. (2000). Maternal perceptions of overweight preschool children. *Pediatrics*, 106(6), 1380-1386.
- Baughcum, A. E., Powers, S. W., Johnson, S. B., Chamberlin, L. A., Deeks, C. M., Jain, A., & Whitaker, R. C. (2001). Maternal feeding practices and beliefs and their relationships to overweight in early childhood. *Journal of Developmental & Behavioral Pediatrics*, 22(6), 391-408.
- Billon, S., Lluch, A., Gueguen, R., Berthier, A., Siest, G., & Herbeth, B. (2002). Family resemblance in breakfast energy intake: the Stanislas Family Study. *European Journal of Clinical Nutrition*, 56(10), 1011.
- Birch, L., Savage, J. S., & Ventura, A. (2007). Influences on the development of children's eating behaviours: from infancy to adolescence. *Canadian journal of dietetic practice and research: a publication of Dietitians of Canada= Revue canadienne de la pratique et de la recherche en dietetique: une publication des Dietetistes du Canada*, 68(1), s1.
- Black, R. E., Williams, S. M., Jones, I. E., & Goulding, A. (2002). Children who avoid drinking cow milk have low dietary calcium intakes and poor bone health. *The American journal of clinical nutrition*, 76(3), 675-680.
- Blair, N. J., Thompson, J. M., Black, P., Becroft, D., Clark, P., Han, D. Y., . . . Mitchell, E. A. (2007). Risk factors for obesity in 7 year old European children: The Auckland birthweight collaborative Study. *Archives of disease in childhood*
- Bleich, S. N., & Vercammen, K. A. (2018). The negative impact of sugar-sweetened beverages on children's health: an update of the literature. *BMC obesity*, 5(1), 6.
- Bowman, S. A., Gortmaker, S. L., Ebbeling, C. B., Pereira, M. A., & Ludwig, D. S. (2004). Effects of fast-food consumption on energy intake and diet quality among children in a national household survey. *Pediatrics*, 113(1), 112-118.
- Braithwaite, I., Stewart, A. W., Hancox, R. J., Beasley, R., Murphy, R., Mitchell, E. A., & Group, I. P. T. S. (2013). The worldwide association between television

- viewing and obesity in children and adolescents: cross sectional study. *PloS one*, 8(9), e74263.
- Campbell-Stokes, P., & Taylor, B. (2005). Prospective incidence study of diabetes mellitus in New Zealand children aged 0 to 14 years. *Diabetologia*, 48(4), 643-648.
- Carducci, B., Reesor, M., Haresign, H., Rysdale, L., Keller, H., Beyers, J., . . . Simpson, J. R. (2015). NutriSTEP® is Reliable for Internet and Onscreen Use. *Canadian Journal of Dietetic Practice and Research*, 76(1), 9-14.
- Carruth, B., & Skinner, J. (2001). The role of dietary calcium and other nutrients in moderating body fat in preschool children. *International Journal of Obesity*, 25(4), 559.
- Ellison-Loschmann, L., & Pearce, N. (2006). Improving access to health care among New Zealand's Maori population. *American journal of public health*, 96(4), 612-617.
- Field, A. (2013). *Discovering statistics using IBM SPSS statistics*: sage.
- Garrett-Wright, D. (2010). Parental perceptions of healthy body weight in preschool children. *Southern Online Journal of Nursing Research*.
- Gerasimidis, K., Keane, O., Macleod, I., Flynn, D. M., & Wright, C. M. (2010). A four-stage evaluation of the Paediatric Yorkhill Malnutrition Score in a tertiary paediatric hospital and a district general hospital. *British Journal of Nutrition*, 104(5), 751-756.
- Grant, A. M., Ferguson, E. L., Toafa, V., Henry, T. E., & Guthrie, B. E. (2004). Dietary factors are not associated with high levels of obesity in New Zealand Pacific preschool children. *The Journal of nutrition*, 134(10), 2561-2565.
- Grant, C. C., Wall, C. R., Brunt, D., Crengle, S., & Scragg, R. (2007). Population prevalence and risk factors for iron deficiency in Auckland, New Zealand. *Journal of paediatrics and child health*, 43(7-8), 532-538.
- Grantham-McGregor, S., & Ani, C. (2001). A review of studies on the effect of iron deficiency on cognitive development in children. *The Journal of nutrition*, 131(2), 649S-668S.
- Hagg, A., Jacobson, T., Nordlund, G., & Rossner, S. (1998). Effects of milk or water on lunch intake in preschool children. *Appetite*, 31(1), 83-92.
- Hartman, C., Shamir, R., Hecht, C., & Koletzko, B. (2012). Malnutrition screening tools for hospitalized children. *Current Opinion in Clinical Nutrition & Metabolic Care*, 15(3), 303-309.
- Hills, A. P., King, N. A., & Armstrong, T. P. (2007). The contribution of physical activity and sedentary behaviours to the growth and development of children and adolescents. *Sports medicine*, 37(6), 533-545.
- Hotu, S., Carter, B., Watson, P., Cutfield, W., & Cundy, T. (2004). Increasing prevalence of type 2 diabetes in adolescents. *Journal of paediatrics and child health*, 40(4), 201-204.
- Hulst, J. M., Zwart, H., Hop, W. C., & Joosten, K. F. (2010). Dutch national survey to test the STRONGkids nutritional risk screening tool in hospitalized children. *Clinical nutrition*, 29(1), 106-111.
- Hunt, J. R. (2003). Bioavailability of iron, zinc, and other trace minerals from vegetarian diets. *The American journal of clinical nutrition*, 78(3), 633S-639S.
- Huysentruyt, K., Devreker, T., Dejonckheere, J., De Schepper, J., Vandenplas, Y., & Cools, F. (2015). Accuracy of nutritional screening tools in assessing the risk of undernutrition in hospitalized children. *Journal of pediatric gastroenterology and nutrition*, 61(2), 159-166.

- Jones, J. M. (2004). Reliability of nutritional screening and assessment tools. *Nutrition*, 20(3), 307-311.
- Khaodhiar, L., McCowen, K. C., & Blackburn, G. L. (1999). Obesity and its comorbid conditions. *Clinical cornerstone*, 2(3), 17-31.
- Kondrup, J., Allison, S. P., Elia, M., Vellas, B., & Plauth, M. (2003). ESPEN guidelines for nutrition screening 2002. *Clinical nutrition*, 22(4), 415-421.
- Lal, A., Moodie, M., Ashton, T., Siahpush, M., & Swinburn, B. (2012). Health care and lost productivity costs of overweight and obesity in New Zealand. *Australian and New Zealand journal of public health*, 36(6), 550-556.
- Ledoux, T., Hingle, M., & Baranowski, T. (2011). Relationship of fruit and vegetable intake with adiposity: a systematic review. *Obesity Reviews*, 12(5), e143-e150.
- Ling, R. E., Hedges, V., & Sullivan, P. B. (2011). Nutritional risk in hospitalised children: an assessment of two instruments. *e-SPEN, the European e-Journal of Clinical Nutrition and Metabolism*, 6(3), e153-e157.
- Ludwig, D. S., Peterson, K. E., & Gortmaker, S. L. (2001). Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *The Lancet*, 357(9255), 505-508.
- Mahan, L. K., & Raymond, J. L. (2016). *Krause's food & the nutrition care process-e-book*: Elsevier Health Sciences.
- Mazahery, H., Cairncross, C., Conlon, C., Houghton, L., Coad, J., Camargo Jr, C., . . . von Hurst, P. (2018). Type of cows' milk consumption and relationship to health predictors in New Zealand preschool children. *The New Zealand medical journal*, 131(1468), 54-68.
- McCarthy, H., Dixon, M., Crabtree, I., Eaton-Evans, M., & McNulty, H. (2012). The development and evaluation of the Screening Tool for the Assessment of Malnutrition in Paediatrics (STAMP©) for use by healthcare staff. *Journal of Human Nutrition and Dietetics*, 25(4), 311-318.
- Minister of Health. (2016). *New Zealand Health Strategy: Future direction*. Wellington: Ministry of Health.
- Ministry of Health. (2008). *A Portrait of Health. Key Results of the 2006/07 New Zealand Health Survey*. Wellington: Ministry of Health.
- Ministry of Health. (2012a). *Food and Nutrition Guidelines for Healthy Children and Young People (Aged 2–18 years): A background paper*. Wellington: Ministry of Health.
- Ministry of Health. (2012b). *The Health of New Zealand Children 2011/12: Key findings of the New Zealand Health Survey*. Wellington: Ministry of Health.
- Ministry of Health. (2014). About Diabetes. Retrieved from <https://www.health.govt.nz/our-work/diseases-and-conditions/diabetes/about-diabetes>
- Ministry of Health. (2016). *Annual Update of Key Results 2015/16: New Zealand Health Survey*. Wellington: Ministry of Health.
- Ministry of Health. (2017a). Annual Data Explorer 2016/17: New Zealand Health Survey [Data File]. <https://minhealthnz.shinyapps.io/nz-health-survey-2016-17-annual-update>
- Ministry of Health. (2017b). *Children and Young People Living Well and Staying Well: New Zealand Childhood Obesity Programme Baseline Report 2016/17*. Wellington: Ministry of Health.
- Ministry of Health. (2017c). Eating for Healthy Children aged 2 to 12/Ngā Kai Tōtika mō te Hunga Kōhungahunga. In. Ministry of Health: Wellington.
- Ministry of Health. (2017d). *National Expectations for the Prevention and Management of Long Term Conditions* Wellington.

- Ministry of Health. (2017e). *Sit Less, Move More, Sleep Well: Active play guidelines for under-fives*. Wellington: Ministry of Health.
- Ministry of Health. (2018). Annual Data Explorer 2017/18: New Zealand Health Survey. Retrieved 23/11/2018 <https://minhealthnz.shinyapps.io/nz-health-survey-2017-18-annual-data-explorer/>
- Ministry of Social Development. (2008). *Children and Young People: Indicators of Wellbeing in New Zealand 2008*. Wellington: Ministry of Social Development.
- Moeeni, V., Walls, T., & Day, A. S. (2013). Nutritional status and nutrition risk screening in hospitalized children in New Zealand. *Acta Paediatrica*, 102(9), e419-e423.
- Moeeni, V., Walls, T., & Day, A. S. (2014). The STRONG kids nutritional risk screening tool can be used by paediatric nurses to identify hospitalised children at risk. *Acta Paediatrica*, 103(12), e528-e531.
- Moreno, L. A., Ochoa, M. C., Wärnberg, J., Marti, A., Martínez, J. A., & Marcos, A. (2008). Treatment of obesity in children and adolescents. How nutrition can work? *International Journal of Pediatric Obesity*, 3(sup1), 72-77.
- Morton, S., Grant, C., Berry, S. D., Walker, C., Corkin, M., Ly, K., . . . Mohal, J. (2017). Now we are four: Describing the preschool years.
- Neave, M., Prior, I., & Toms, V. (1963). The prevalence of anaemia in two Maori rural communities. *New Zealand Medical Journal*, 62, 20-28.
- New Zealand Beverage Guidance Panel. (2017). *Policy Brief: A sugary drink tax for New Zealand*.
- Nicklas, T. A., Baranowski, T., Baranowski, J. C., Cullen, K., Rittenberry, L., & Olvera, N. (2001). Family and child-care provider influences on preschool children's fruit, juice, and vegetable consumption. *Nutrition reviews*, 59(7), 224-235.
- Nishida, C., Uauy, R., Kumanyika, S., & Shetty, P. (2004). The joint WHO/FAO expert consultation on diet, nutrition and the prevention of chronic diseases: process, product and policy implications. *Public health nutrition*, 7(1a), 245-250.
- Oliver, M., Schluter, P. J., & Schofield, G. M. (2012). Body size, physical activity, and exposure to television in preschoolers.
- Ontario Ministry of Health and Long-Term Care. (2008). *Ontario public health standards 2008*. Retrieved from http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/ophs_2008.pdf
- Parnell, W., Scragg, R., Wilson, N., Schaaf, D., & Fitzgerald, E. (2003). NZ food NZ children. *Key Results of the 2002 National Children's Nutrition Survey*
- Pearce, J., Blakely, T., Witten, K., & Bartie, P. (2007). Neighborhood deprivation and access to fast-food retailing: a national study. *American journal of preventive medicine*, 32(5), 375-382.
- Pearce, J., Day, P., & Witten, K. (2008). Neighbourhood provision of food and alcohol retailing and social deprivation in urban New Zealand. *Urban Policy and Research*, 26(2), 213-227.
- Pearce, J., Witten, K., Hiscock, R., & Blakely, T. (2006). Are socially disadvantaged neighbourhoods deprived of health-related community resources? *International journal of epidemiology*, 36(2), 348-355.
- Pechey, R., & Monsivais, P. (2016). Socioeconomic inequalities in the healthiness of food choices: exploring the contributions of food expenditures. *Preventive medicine*, 88, 203-209.

- Rampersaud, G. C., Pereira, M. A., Girard, B. L., Adams, J., & Metzl, J. D. (2005). Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *Journal of the American Dietetic Association*, 105(5), 743-760.
- Randall Simpson, Keller, Rysdale, & Beyers. (2008). Nutrition screening tool for every preschooler (NutriSTEP™): validation and test–retest reliability of a parent-administered questionnaire assessing nutrition risk of preschoolers. *European Journal of Clinical Nutrition*, 62(6), 770.
- Randall Simpson, J., Gumbley, J., Whyte, K., Lac, J., Morra, C., Rysdale, L., . . . Keller, H. (2015). Development, reliability, and validity testing of Toddler NutriSTEP: a nutrition risk screening questionnaire for children 18–35 months of age. *Applied Physiology, Nutrition, and Metabolism*, 40(9), 877-886.
- Rush, E., Puniani, N., Snowling, N., & Paterson, J. (2007). Food security, selection, and healthy eating in a Pacific Community in Auckland New Zealand. *Asia Pacific Journal of Clinical Nutrition*, 16(3), 448-454.
- Savage, J. S., Fisher, J. O., & Birch, L. L. (2007). Parental influence on eating behavior: conception to adolescence. *The Journal of Law, Medicine & Ethics*, 35(1), 22-34.
- Scaglioni, S., Salvioni, M., & Galimberti, C. (2008). Influence of parental attitudes in the development of children eating behaviour. *British Journal of Nutrition*, 99(S1), S22-S25.
- Schoen, C., & Doty, M. M. (2004). Inequities in access to medical care in five countries: findings from the 2001 Commonwealth Fund International Health Policy Survey. *Health Policy*, 67(3), 309-322.
- Schwartz, C., Scholtens, P. A., Lalanne, A., Weenen, H., & Nicklaus, S. (2011). Development of healthy eating habits early in life. Review of recent evidence and selected guidelines. *Appetite*, 57(3), 796-807.
- Sermet-Gaudelus, I., Poisson-Salomon, A.-S., Colomb, V., Brusset, M.-C., Mosser, F., Berrier, F., & Ricour, C. (2000). Simple pediatric nutritional risk score to identify children at risk of malnutrition. *The American journal of clinical nutrition*, 72(1), 64-70.
- Sigman, A. (2015). *Screen time in New Zealand: Report to Family First New Zealand 2015*. Auckland, New Zealand.
- Simpson, Keller, Rysdale, & Beyers. (2010). Preschool Nutrition Risk Screening Using NutriSTEP® Is Acceptable, Is Feasible, Increases Nutrition Knowledge, and Changes Nutrition Behavior in Ontario, Canada. *Journal of Nutrition Education and Behavior*, 42(4), S86.
- Simpson, J. R., Keller, H., Rysdale, L., & Beyers, J. (2008). Nutrition screening tool for every preschooler (NutriSTEP™): validation and test–retest reliability of a parent-administered questionnaire assessing nutrition risk of preschoolers. *European Journal of Clinical Nutrition*, 62(6), 770.
- Simpson, J. R., Keller, H., Rysdale, L., & Beyers, J. (2010). Preschool Nutrition Risk Screening Using NutriSTEP® Is Acceptable, Is Feasible, Increases Nutrition Knowledge, and Changes Nutrition Behavior in Ontario, Canada. *Journal of Nutrition Education and Behavior*, 42(4), S86.
- Sjardin, N., Reed, P., Albert, B., Mouat, F., Carter, P. J., Hofman, P., . . . Jefferies, C. (2018). Increasing incidence of type 2 diabetes in New Zealand children < 15 years of age in a regional-based diabetes service, Auckland, New Zealand. *Journal of paediatrics and child health*

- Skipper, A., Ferguson, M., Thompson, K., Castellanos, V. H., & Porcari, J. (2012). Nutrition screening tools: an analysis of the evidence. *Journal of Parenteral and Enteral Nutrition*, 36(3), 292-298.
- Soh, P., Ferguson, E., McKenzie, J., Homs, M., & Gibson, R. (2004). Iron deficiency and risk factors for lower iron stores in 6–24-month-old New Zealanders. *European Journal of Clinical Nutrition*, 58(1), 71.
- Spurrier, N. J., Magarey, A. A., Golley, R., Curnow, F., & Sawyer, M. G. (2008). Relationships between the home environment and physical activity and dietary patterns of preschool children: a cross-sectional study. *International Journal of Behavioral Nutrition and Physical Activity*, 5(1), 31.
- Starship Child Health. (2017). NZ Register of Children and Youth with Diabetes. Retrieved 23/11/2018 from <https://www.starship.org.nz/for-health-professionals/new-zealand-child-and-youth-clinical-networks/clinical-network-for-children-and-young-people-with-diabetes/nz-register-of-children-and-youth-with-diabetes/>
- Streiner, D. L., Norman, G. R., & Cairney, J. (2015). *Health measurement scales: a practical guide to their development and use*: Oxford University Press, USA.
- Swinburn, B., Ashton, T., Gillespie, J., Cox, B., Menon, A., Simmons, D., & Birkbeck, J. (1997). Health care costs of obesity in New Zealand. *International Journal of Obesity*, 21(10), 891.
- Taylor, R., Scragg, R., & Quigley, R. (2005). Do sugary drinks contribute to obesity in children. *Agencies for Nutrition Action*
- Theodore, R., Thompson, J., Wall, C., & Becroft, D. (2006). Dietary patterns of New Zealand European preschool children. *Special Series*
- Tobias, M. (2016). *Health Loss in New Zealand 1990-2013: A Report from the New Zealand Burden of Diseases, Injuries and Risk Factors Study*: Ministry of Health.
- Utter, J., Scragg, R., Mhurchu, C. N., & Schaaf, D. (2007). At-home breakfast consumption among New Zealand children: associations with body mass index and related nutrition behaviors. *Journal of the American Dietetic Association*, 107(4), 570-576.
- Utter, J., Scragg, R., & Schaaf, D. (2006). Associations between television viewing and consumption of commonly advertised foods among New Zealand children and young adolescents. *Public health nutrition*, 9(5), 606-612.
- Watson-Jarvis, K., McNeil, D., Fenton, T. R., & Campbell, K. (2011). Implementing the Nutrition Screening Tool For Every Preschooler (NutriSTEP®): In Community Health Centres. *Canadian Journal of Dietetic Practice and Research*, 72(2), 96-98.
- White, Burrello, Rofey, Kriska, Venditti, Gibbs, . . . Jakicic. (2014). Expressing Concern For Child Weight: The Influence On Parental Perception Of Child Weight And Parent Concern For Future Obesity In Children. *Medicine & Science in Sports & Exercise*, 46(5S), 515.
- White, Lawson, Ramsey, Dennis, Hutchinson, Soh, . . . Elliott. (2016). Simple nutrition screening tool for pediatric inpatients. *Journal of Parenteral and Enteral Nutrition*, 40(3), 392-398.
- WHO. (2003). Diet, nutrition and the prevention of chronic diseases: report of a joint WH.
- Wiley, A. S. (2010). Dairy and milk consumption and child growth: Is BMI involved? An analysis of NHANES 1999–2004. *American Journal of Human Biology: The Official Journal of the Human Biology Association*, 22(4), 517-525.

- Wu, Y., Ding, Y., Tanaka, Y., & Zhang, W. (2014). Risk factors contributing to type 2 diabetes and recent advances in the treatment and prevention. *International journal of medical sciences*, 11(11), 1185.
- Wu, Y., Gong, Q., Zou, Z., Li, H., & Zhang, X. (2017). Short sleep duration and obesity among children: A systematic review and meta-analysis of prospective studies. *Obesity research & clinical practice*, 11(2), 140-150.

Appendices

Appendix A supplementary methods

Table 4 List of Auckland Preschool Centres which consented to participate in this study

Preschool Centre	Suburb	Region
ABC Gillies Ave	Epsom	Central Auckland
Active Explorers	Blockhouse Bay	Central Auckland
Albany Community Preschool	Albany	North Shore
Aro Arataki Children's Centre	Greenlane	Central Auckland
Bizzykids Childcare	Mangere Bridge	South Auckland
Child's Play Limited	Blockhouse Bay	Central Auckland
Edukids Manukau	Manukau	South Auckland
Freyberg Preschool	Te Atatu South	West Auckland
Henderson Valley Playcentre	Henderson Valley	West Auckland
Hillsborough Playcentre	Hillsborough	Central Auckland
Kids Cove Early Learning Centre	Newmarket	Central Auckland
Kindercare Learning Centre	Mount Eden	Central Auckland
Kindercare Papatoetoe	Papatoetoe	South Auckland
Little Scholars	Mount Roskill	Central Auckland
Lollipops Airport	Manukau	South Auckland
Lollipops Albany	Albany	North Shore
Lollipops Greenlane	Greenlane	Central Auckland
Lollipops Takapuna	Takapuna	North Shore
Massey University Auckland ELC	Albany	North Shore
Molly's Preschool	Mount Albert	Central Auckland

Natural Steps Ellerslie Village	Ellerslie	Central Auckland
Nursery Dale Childcare	Beach Haven	North Shore
Pohutukawa Kindergarten	Ellerslie	Central Auckland
Royal Oak Learning Centre	Royal Oak	Central Auckland
Saint Kentigern Preschool	Remuera	Auckland Central
Sunnynook Preschool	Sunnynook	North Shore
Te Atatu Village Preschool	Te Atatu Peninsula	West Auckland
Wesley Kindergarten	Mount Roskill	Central Auckland

Statistical methods used for testing reliability of the adapted NutriSTEP

SPSS version 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.) was used to ensure accurate analysis of all results.

Firstly, data was cleaned by removing parents from the data set that did not complete all three required questionnaires after returning the consent form; the Canadian NutriSTEP, adapted NutriSTEP and the demographic questionnaire. After removing parents that had not completed both versions of the NutriSTEP and the demographic questionnaire, complete and usable data was available for 79 parents to test reliability of the adapted NutriSTEP. Outliers and skewed data were prevented by allowing one answer only option for each questionnaire item in all three questionnaires.

Secondly, demographics were analysed to compare characteristics of parents and index children that participated in intercept interviews and online reliability testing. Demographic and parent/index child characteristics were statistically analysed to provide mean, standard deviation (s.d), frequencies (n) and percentages (%) presented in Table 1. Parent age (years), number of people in household, number of adults in household and number of children in household were reported as a mean \pm standard deviation. Parent gender, marital status, education, first language spoken, country of birth, age of child, and gender of child were reported as the frequency (n) and percentage (%).

Thirdly questionnaire items were tested for reliability between administrations. Total NutriSTEP scores for Canadian NutriSTEP and adapted NutriSTEP were assessed for reliability between administrations using intraclass correlation coefficient (ICC). Cronbach's alpha, 95% confidence interval and F test were also used as measurements of reliability. Reliability of individual questionnaire items between administrations were assessed by using Cohen's kappa and P value (Pearson's Chi-square and Fisher's exact test). Item scores were dichotomized at cut points deemed low or high nutrition risk (originally determined in (Simpson et al., 2008)). Kappa statistic of 0.5 indicates adequate agreement between administrations. Scores greater than 0.75 indicates excellent agreement between administrations (Streiner and Norman 1996; as cited in (Simpson et al., 2008)). Items in which kappa was indeterminate, chi-square was calculated. A chi-square *p*-value >0.05 indicates that

there is no significant difference of scores between administrations. When chi-square values could not be calculated due to violation assumption, Fisher's exact test was calculated. A Fisher's exact test result of $p>0.05$ indicates that there is no significant difference of scores between administrations.

Appendix B supplementary results

Table 5 Adaptions to the Canadian NutriSTEP after Phase one and Phase three expert reviews: adaption phase three represents final adapted NutriSTEP.

Question Number	Original Canadian NutriSTEP	Adaption Phase one	Adaption Phase three
Instructions	<p>Below are questions about your preschool child's (3-5 years old) eating and other habits.</p> <p>Please complete the questions yourself or with the help of others who take care of your child.</p> <p>Check (✓) only one answer for each question.</p> <p>Think about your child's usual habits when answering each question.</p>	<p>Below are questions about your preschool child's <u>(2-5 years old)</u> eating and other habits.</p> <p>Please complete the questions yourself or with the help of others who take care of your child.</p> <p><u>Tick</u> (✓) only one answer for each question.</p> <p>Think about your child's usual habits when answering each question.</p>	<p>Below are questions about your preschool child's (2-5 years old) eating and other habits.</p> <p>Please complete the questions yourself or with the help of others who take care of your child.</p> <p>Tick (✓) only one answer for each question.</p> <p>Think about your child's usual habits when answering each question.</p> <p><u>The word "times" in the response section refers to at least a half standard serving of food offered at a single eating occasion"</u></p>
Question 1	<p>My child usually eats grain products. Examples are bread, bagel, bun, cereal, pasta, rice, roti and tortillas.</p>	<p>My child usually eats <u>bread, cereals and grain products.</u> Examples are bread, <u>buns,</u> <u>wraps, porridge,</u> cereal, pasta, rice, and roti.</p>	<p>My child usually eats <u>bread, cereals and grain products.</u> Examples are <u>bread, buns,</u> <u>breakfast cereals (e.g. Weetbix, porridge),</u> <u>pasta, rice, roti, wraps and crackers.</u></p>

Question Number	Original Canadian NutriSTEP	Adaption Phase one	Adaption Phase three
Question 2	My child usually has milk products. Examples are white or chocolate milk, cheese, yogurt, milk puddings or milk substitutes such as fortified soy beverages.	My child usually has <u>milk and milk products</u> . Examples are <u>plain milk, flavoured milk, cheese, yoghurt, custard and dairy food and fortified soy milk</u> . <u>This does not include rice milks, almond milk, other plant milk, soy yoghurt and ice cream.</u>	My child usually has <u>milk and dairy products</u> . Examples are <u>cow's milk, flavoured milk (i.e. chocolate), cheese, yoghurt, custard, dairy foods and fortified soy milk</u> . <u>This excludes almond, rice and coconut milks and products.</u>
Question 3	My child usually eats fruit.	My child usually eats fruit.	My child usually eats <u>fresh</u> fruit.
Question 4	My child usually eats vegetables.	My child usually eats vegetables.	My child usually eats vegetables.
Question 5	My child usually eats meat, fish, poultry or alternatives. Alternatives can be eggs, peanut butter, tofu, nuts or dried beans, peas and lentils.	My child usually eats meat, fish, <u>seafood</u> , poultry or alternatives. Alternatives can be eggs, peanut butter, tofu, nuts or dried beans, peas and lentils.	My child usually eats meat, fish, <u>seafood</u> , poultry or alternatives. Alternatives can be eggs, peanut butter, tofu, nuts or dried beans, peas and lentils.
Question 6	My child usually eats “fast food”.	My child usually eats “fast food”.	My child usually eats “fast food”.
Question 7	I have difficulty buying food to feed my child because food is expensive.	I have difficulty buying food to feed my child because food is expensive.	I have difficulty buying food to feed my child because food is expensive.
Question 8	My child has problems chewing, swallowing, gagging or choking when eating.	My child has problems chewing, swallowing, gagging or choking when eating.	My child has problems chewing, swallowing, gagging or choking when eating.
Question 9	My child is not hungry at mealtimes because	My child is not hungry at mealtimes because	My child is not hungry at mealtimes because

	he/she drinks all day.	he/she drinks all day.	he/she drinks all day.
Question Number	Original Canadian NutriSTEP	Adaption Phase one	Adaption Phase three
Question 10	My child usually eats (number of times per day).	My child usually eats (number of times per day).	My child usually eats (number of times per day).
Question 11	I let my child decide how much to eat.	I let my child decide how much to eat.	I let my child decide how much to eat.
Question 12	My child eats meals while watching TV.	My child eats meals while watching TV.	My child eats meals while watching TV <u>or other digital devices.</u>
Question 13	My child usually takes supplements. Examples are multivitamins, iron drops, cod liver oil.	My child usually takes supplements. Examples are multivitamins, iron drops, cod liver oil.	My child usually takes supplements. Examples are <u>multivitamins, iron drops, fish oil.</u>
Question 14	My child (gets enough/needs more physical activity)	My child (gets enough/needs more physical activity).	My child (gets enough/needs more physical activity).
Question 15	My child usually watches TV, uses the computer, and plays video games.	My child usually watches TV, uses the computer, and plays video games.	My child usually watches TV, uses the <u>computer/other devices</u> , and plays video games.
Question 16	I am comfortable with how my child is growing.	I am comfortable with how my child is growing.	I am comfortable with how my child is growing.
Question 17	My child (weighs too little/much)	My child (weighs too little/much).	My child (weighs too little/much).

Table 6 Parent adaption suggestions to the Canadian NutriSTEP collected at intercept interviews according to geographical location

West Auckland (Te Atatua, Auckland)

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
1. My child usually eats grain products.			
2. My child usually has milk products.	Would change to "dairy products", needs to state that this doesn't include milk substitutes, thought that white milk meant white chocolate milk, have "milk or flavoured milk, take out milk puddings and have dairy food.	Does this mean complete servings, or just how many times/bites/sips?	Have milk substitutes or alternatives instead of fortified soy beverages.
3. My child usually eats fruit.		Times vs servings	
4. My child usually eats vegetables.	Does this mean starchy or green vegetables, does it include salads?	Times vs servings	This needs to be clarified on what this does not include; chips etc
5. My child usually eats meat, fish, poultry, or alternatives.	Change to alternative proteins. Does this include tinned beans and what kind of peas? Split peas. Take Peanut Butter out. Specify chickpeas (common) and red kidney beans.		
6. My child usually eats "fast food".	Change to fast food/takeaways, specify high fat, high sugar, need to	Split and have a separate 2 or 3 option	

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
	<p>specify this does not include healthy alternatives, needs to specify as a meal replacement</p>		
7. I have difficulty buying food to feed my child because food is expensive.	<p>Make less economic: "The price of healthy foods affects my decision to buy it for my child"</p> <p>Needs to specify if this means healthy food</p>	<p>Could have an option that says "dietary requirements affect the expense"</p>	
8. My child has problems chewing, swallowing, gagging, or choking when eating.			
9. My child is not hungry at mealtimes because he/she drinks all day.	<p>Drink needs to be specified, does this include water?</p> <p>Drinks should be underlined.</p>		
10. My child usually eats (number of times per day).	<p>Should state meals and snacks</p>		
11. I let my child decide how much to eat.	<p>Does this mean stop when they say they have had enough or how much the parent would serve up</p>		
12. My child eats meals while watching TV	<p>Change to "any digital screen"</p>		
13. My child usually takes supplements.	<p>Would take out cod liver oil, would change to "takes a supplement or</p>		

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
	supplements once a day"		
14. My child (gets enough/needs more physical activity).	It should specify the guidelines as this is so broad. Guidelines: A child aged 2-4 years needs 3 hours, 1 of these being energetic play		Change to sedentary, moderate, heavy etc
15. My child usually watches TV, uses the computer, and plays video games.	Maybe this should be on an average day as the weekends differ, you need to include the same examples as the screen time question	Maybe change to hours per week average?	
16. I am comfortable with how my child is growing.	Does this mean physically growing or mentally developing?		
17. I think my child (weighs too little/much).	Maybe change this to "In my opinion, I think my child should..."		
Overall would you say that the questionnaire was:			
a) Easy to complete		7	
b) hard to complete			
c) you don't have an opinion about this			
d) you don't know			
Is there anything missing that you think should be in the tool?			
It didn't talk about junk food; chocolate, chips, biscuits, baking, treats			

East Auckland (Howick, Auckland)

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
1. My child usually eats grain products.	Should include crackers. Should say brown or white bread if that was important		
2. My child usually has milk products.	Change to dairy products and specify what this includes		
3. My child usually eats fruit.	Should specify if it includes fruit juice		
4. My child usually eats vegetables.			
5. My child usually eats meat, fish, poultry, or alternatives.			
6. My child usually eats "fast food".	Specify what this does and doesn't include	Add in a never option	
7. I have difficulty buying food to feed my child because food is expensive.	Change to healthy foods. Does this include organic - want this but can't afford it.		
8. My child has problems chewing, swallowing, gagging, or choking when eating.			
9. My child is not hungry at mealtimes because he/she drinks all day.	How are we supposed to know if they have been drinking all day or not?		Specify the drinks; juice, etc does it exclude water?

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
10. My child usually eats (number of times per day).	Needs more detail - specify "meals and snacks"		
11. I let my child decide how much to eat.	This was decided to mean " stop when they say they are finished". Does this mean at meals or snacks?		Comments: "I find this question very confusing"
12. My child eats meals while watching TV			
13. My child usually takes supplements.	Include supplements like Vitamin D, Spirulina		
14. My child (gets enough/needs more physical activity).	The guidelines need to be included as we don't know this		
15. My child usually watches TV, uses the computer, and plays video games.			
16. I am comfortable with how my child is growing.		Add in a maybe/unsure option	
17. I think my child (weighs too little/ much).		Add in a maybe/unsure option	
Overall would you say that the questionnaire was:			
a) Easy to complete b) hard to complete		3	

Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
c) you don't have an opinion about this d) you don't know		
Is there anything missing that you think should be in the tool:		
There should be a question on treat foods/packaged foods. There should be a question on SSB.		

North Shore (Takapuna, Auckland)

Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
1. My child usually eats grain products.	Should include crackers, weetbix, wraps instead of tortillas	
2. My child usually has milk products.	Specify what this means (milk puddings - is this a calci-yum?), does this include fortified plant milks, change white milk to cow's milk, change to question to dairy products.	Why are the responses so different in each category? - later explained that the responses were based on guideline recommendations.
3. My child usually eats fruit.		Need a less than once a day option
4. My child usually eats vegetables.	Specify what this includes; fresh, frozen, does it include oven chips?	Need a less than once a day option
5. My child usually eats meat,	Could divide into 2 separate alternatives as I	Needs a 1-2 a day option

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
fish, poultry, or alternatives.		feel meat and peanut butter are very different; meat vs alternatives	
6. My child usually eats "fast food".		Specify what this means - what it excludes or define what it does include	
7. I have difficulty buying food to feed my child because food is expensive.			
8. My child has problems chewing, swallowing, gagging, or choking when eating.			
9. My child is not hungry at mealtimes because he/she drinks all day.			
10. My child usually eats (number of times per day).			
11. I let my child decide how much to eat.		I think this means I let them stop eating when they want to, but it needs to be specified what it means	
12. My child eats meals while watching TV		Does this include other screens? Specify meals - breakfast, lunch and dinner. You could write this excludes snacks	

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
13. My child usually takes supplements.	Should change to dietary supplements daily. Exclude cod liver oil and use more popular NZ ones; gummy multivitamins etc		
14. My child (gets enough/needs more physical activity).	Should specify the guidelines		
15. My child usually watches TV, uses the computer, and plays video games.	Include tablets and phones	Should say 1-2, 2-3 etc	
16. I am comfortable with how my child is growing.			
17. I think my child (weighs too little/ much).			
Overall would you say that the questionnaire was:			
a) Easy to complete		4	
b) hard to complete			
c) you don't have an opinion about this			
d) you don't know			
Is there anything missing that you think should be in the tool?			
Should be a question on sleep. Should be a question on SSB. Should be a question on processed foods/treat foods; pies, nuggets, chips etc			

Central Auckland (Hillsborough, Auckland)

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
1. My child usually eats grain products.	Does this include grain alternatives? Quinoa, buckwheat etc		Maybe there could be less examples
2. My child usually has milk products.	Should change this to dairy products, does this include formula? Should specify what substitutes.		Do we get told what the recommendations are? Portion sizes or recommended serves would be helpful
3. My child usually eats fruit.	This should state full or whole pieces of fruit.	Should say 3 full pieces, 2 full pieces	
4. My child usually eats vegetables.	Does this mean a variety of vegetables? Not just one vegetable that the child may like	Should say 3 full pieces, 2 full pieces	
5. My child usually eats meat, fish, poultry, or alternatives.			
6. My child usually eats "fast food".	"I think everyone knows what fast food is" - specify what it doesn't include		
7. I have difficulty buying food to feed my child because food is expensive.	Needs to be changed to healthy foods		
8. My child has problems chewing, swallowing, gagging, or choking when eating.			
9. My child is not hungry at mealtimes because	Specify the drinks, include formula		

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
he/she drinks all day.			
10. My child usually eats (number of times per day).	Does this mean snacks and main meals?		
11. I let my child decide how much to eat.	"I take this as how big the portions would be served up" "I think this means they stop eating when they are full"		I think that this should include does the child decide what they eat. Is variety key?
12. My child eats meals while watching TV	State breakfast, lunch and dinner	Should have usually as an option	
13. My child usually takes supplements.	Does this include medications	Should have a "seasonally" option - most said their child would only take Vitamin C or a multivitamin in winter	
14. My child (gets enough/needs more physical activity).			
15. My child usually watches TV, uses the computer, and plays video games.			
16. I am comfortable with how my child is growing.		Should have an option under "no" to specify - weight, height etc	
17. I think my child (weighs too little/much).			
Overall would you say that the questionnaire was:			
a) Easy to complete		5	

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
b) hard to complete c) you don't have an opinion about this d) you don't know			
	Is there anything missing that you think should be in the tool? It should include a question on variety and willingness to try new things. Also, maybe a question on "My food preferences hinder my child's diet"		

West Auckland (Henderson Valley, Auckland)

	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
1. My child usually eats grain products.	Should include crackers, is tortillas necessary? Does this mean part of meals or snacks?		Should say some examples are instead of just examples
2. My child usually has milk products.	Should say dairy foods instead of milk products, should say just milk or flavoured milk, should say milk substitutes instead of FSB, needs to say specifically what is included.	Maybe use 1-2, 2-3 as responses instead.	
3. My child usually eats fruit.	Does this include dried, canned in syrup? It should say how many pieces of fruit? What is a serving size of fruit?	Change to how many pieces of fruit are eaten throughout the day? 1 or 2 etc	
4. My child usually eats vegetables.	The same approach as the fruit question	Same approach as the fruit question	
5. My child usually eats meat, fish, poultry, or alternatives.	I think PB should be taken out as it is not healthy, maybe an alternative like nut butters? Specify fresh or crumbed fish is it the same nutritionally?	Portions rather than times eaten	
6. My child usually eats "fast food".	Needs examples, does this include healthy ones like sushi?	Should have a daily option as this is most likely for many, there could be an option for other processed foods	

7. I have difficulty buying food to feed my child because food is expensive.	Needs to specifically say healthy foods rather than just food		
	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
8. My child has problems chewing, swallowing, gagging, or choking when eating.			Why would they need to know this? What does it have to do with a healthy diet?
9. My child is not hungry at mealtimes because he/she drinks all day.	Drinks what? Fizzy drink, water, formula, juice? Does this mean what are they filling up on?		
10. My child usually eats (number of times per day).	Needs to say meals and snacks		
11. I let my child decide how much to eat.	I think this means until they are full, but it changes for snacks as they aren't allowed to eat as much as they want then.	Would be more relevant if the question was more detailed and made sense	
12. My child eats meals while watching TV	I only thought this meant TV. Maybe should include a statement that says all screens. People would probably lie about this as they don't want people to know	Change to specific times	You could maybe change it to "The TV is on when my child eats"
13. My child usually takes supplements.	Exclude cod liver oil. State whether it is prescribed vs optional	I think there should be a seasonal option	
14. My child (gets enough/needs	What does this include? Would be helpful to have		

more physical activity).	types of exercise that is recommended, the guidelines are needed.		
	Question Do you have any comments about the first part of the question? If so, please specify:	Response Do you have any comments about the responses to the question? If so, please specify:	Comment Do you have any other comments? If so, please describe:
15. My child usually watches TV, uses the computer, and plays video games.	Should include screens, phones etc	This is too specific - should have 1-2, 2-3 etc and also a "none" option as some children aren't allowed to watch tv everyday	
16. I am comfortable with how my child is growing.	Does this mean physical development? How are we meant to know that they are growing properly?	Should be a "mostly but I have some concerns" option. If no, should have a space to say why not i.e. weight, height etc.	
17. I think my child (weighs too little/much).	Needs to say, "I think" Does this mean in comparison to other children?		
Overall would you say that the questionnaire was:			
a) Easy to complete	All: "It is easy to fill out, but it isn't representative, and I don't think you would get very good information from it as many of the questions don't mean much to us" It is confusing. 4		
b) hard to complete			
c) you don't have an opinion about this			
d) you don't know			
Is there anything missing that you think should be in the tool?			

Question on processed foods. Question on snacks and treats. Question on SSB. A section for "Do you have any other comments about your child"

Table 7 Frequency and percentage of responses for individual questionnaire items in the Canadian NutriSTEP: responses from Phase four online reliability testing.

	Frequency (n)	Percent (%)
<i>Breads and cereals</i>		
2-3 times a day	49	62.0
4-5 times a day	22	27.8
Less than 2 times a day	7	8.9
More than 5 times a day	1	1.3
<i>Milk and milk substitutes</i>		
2 times a day	33	41.8
3 times a day	22	27.8
More than 3 times a day	14	17.7
Once a day or less	10	12.7
<i>Fruit</i>		
2 times a day	25	31.6
3 times a day	29	36.7
More than 3 times a day	17	21.5
Not at all	1	1.3
Once a day	7	8.9
<i>Vegetables</i>		
2 times a day	29	36.7
More than 2 times a day	25	31.6
Not at all	3	3.8
Once a day	22	27.8
<i>Meat and meat alternatives</i>		
2 times a day	36	45.6
A few times a week	5	6.3
More than 2 times a day	18	22.8
Not at all	2	2.5
Once a day	18	22.8
<i>Fast food</i>		
2-3 times a week	7	8.9
A few times a month	21	26.6
Once a month or less	22	27.8
Once a week	29	36.7
<i>Food is expensive</i>		
Most of the time	2	2.5
Never	39	49.4
Rarely	18	22.8
Sometimes	20	25.3

<i>Chewing/swallowing difficulty</i>		
Never	65	82.3
Rarely	14	17.7
<i>Not hungry at meal times due to drinking</i>		
Always	1	1.3
Most of the time	2	2.5
Never	30	38.0
Rarely	32	40.5
Sometimes	14	17.7
<i>Eating frequency</i>		
2 times a day	1	1.3
3 to 4 times a day	27	34.2
5 times a day	43	54.4
More than 5 times a day	8	10.1
<i>Child controls amount consumed</i>		
Always	16	20.3
Most of the time	33	41.8
Rarely	6	7.6
Sometimes	24	30.4
<i>Watches television at meals</i>		
Always	1	1.3
Most of the time	4	5.1
Never	21	26.6
Rarely	24	30.4
Sometimes	29	36.7
<i>Uses vitamin/mineral supplements</i>		
Always	5	6.3
Most of the time	5	6.3
Never	40	50.6
Rarely	12	15.2
Sometimes	17	21.5
<i>Physical activity</i>		
Gets enough physical activity	76	96.2
Needs more physical activity	3	3.8
<i>Sedentary activity during day</i>		
1 hour a day or less	44	55.7
2 hours a day	26	32.9
3 hours a day	5	6.3
4 hours a day	4	5.1
<i>Growth adequate</i>		
No	1	1.3
Yes	78	98.7
<i>Weight</i>		

Is about the right weight	73	92.4
Should weigh less	2	2.5
Should weigh more	4	5.1

Table 8 Frequency and percentage of responses for individual questionnaire items for the Adapted NutriSTEP; responses from Phase four online reliability testing

	Frequency (n)	Percent (%)
<i>Breads and cereals</i>		
2-3 times a day	38	48.1
4-5 times a day	31	39.2
Less than 2 times a day	8	10.1
More than 5 times a day	2	2.5
<i>Milk and milk substitutes</i>		
2 times a day	31	39.2
3 times a day	32	40.5
More than 3 times a day	6	7.6
Once a day or less	10	12.7
<i>Fruit</i>		
2 times a day	21	26.6
3 times a day	29	36.7
More than 3 times a day	20	25.3
Not at all	1	1.3
Once a day	8	10.1
<i>Vegetables</i>		
2 times a day	32	40.5
More than 2 times a day	20	25.3
Not at all	5	6.3
Once a day	22	27.8
<i>Meat and meat alternatives</i>		
2 times a day	32	40.5
A few times a week	4	5.1
More than 2 times a day	15	19.0
Not at all	0	0
Once a day	28	35.4
<i>Fast food</i>		
2-3 times a week	9	11.4
A few times a month	26	32.9
Once a month or less	23	29.1
Once a week	21	26.6
<i>Food is expensive</i>		
Always	1	1.3
Most of the time	2	2.5
Never	40	50.6
Rarely	17	21.5
Sometimes	19	24.1

<i>Chewing/swallowing difficulty</i>		
Never	62	78.5
Rarely	15	19.0
Sometimes	2	2.5
<i>Not hungry at meal times due to drinking</i>		
Always	0	0
Most of the time	3	3.8
Never	31	39.2
Rarely	28	35.4
Sometimes	17	21.5
<i>Eating frequency</i>		
2 times a day	1	1.3
3 to 4 times a day	27	34.2
5 times a day	41	51.9
More than 5 times a day	10	12.7
<i>Child controls amount consumed</i>		
Always	12	15.2
Most of the time	39	49.4
Rarely	4	5.1
Sometimes	24	30.4
<i>Watches television at meals</i>		
Most of the time	6	7.6
Never	20	25.3
Rarely	26	32.9
Sometimes	27	34.2
<i>Uses vitamin/mineral supplements</i>		
Always	6	7.6
Most of the time	6	7.6
Never	41	51.9
Rarely	9	11.4
Sometimes	17	21.5
<i>Physical activity</i>		
Gets enough physical activity	76	96.2
Needs more physical activity	3	3.8
<i>Sedentary activity during day</i>		
1 hour a day or less	42	53.2
2 hours a day	29	36.7
3 hours a day	7	8.9
4 hours a day	1	1.3
<i>Growth adequate</i>		
Yes	79	100
<i>Weight</i>		
Is about the right weight	72	91.1

Should weigh less	3	3.8
Should weigh more	4	5.1

Table 9 Demographic characteristics of parents participating in intercept interviews.

	Frequency (n)	Percent (%)
<i>Preschooler Age</i>		
2 Years	6	23.1
3 Years	11	42.3
4 Years	6	23.1
5 Years	3	11.5
<i>Preschooler Gender</i>		
Female	12	46.2
Male	14	53.8
<i>First Language Mother</i>		
English	21	80.8
Dutch	1	3.8
German	1	3.8
Chinese	1	3.8
Hebrew	1	3.8
Hebrew	1	3.8
<i>Country Born Mother</i>		
New Zealand	18	69.2
Australia	1	3.8
Israel	1	3.8
Japan	1	3.8
China	1	3.8
Kenya	1	3.8
England	2	7.7
Germany	1	3.8
<i>Ethnicity Mother</i>		
New Zealand European	13	50.0
Māori	3	11.5
Australian	1	3.8
British	2	7.7
Dutch	1	3.8
Israeli	1	3.8
Japanese	1	3.8
Chinese	1	3.8
German	2	7.7
Croatian	1	3.8
<i>First Language Father</i>		
English	24	92.3
Chinese	1	3.8
Russian	1	3.8

<i>Country Born Father</i>		
New Zealand	22	84.6
China	1	3.8
Belarus	1	3.8
USA	1	3.8
South Africa	1	3.8
<i>Ethnicity Father</i>		
New Zealand European	14	53.8
Māori	2	7.7
Chinese	1	3.8
Belarusian	1	3.8
Samoan/Chinese	1	3.8
Samoan	2	7.7
Irish/German	1	3.8
Samoan/Māori	1	3.8
Māori/New Zealand European	2	7.7
South African	1	3.8
<i>First Language Child</i>		
English	25	96.2
Hebrew	1	3.8
<i>Country Born Child</i>		
New Zealand	24	92.3
China	1	3.8
Vietnam	1	3.8
<i>Ethnicity Child</i>		
New Zealand European	12	46.2
Chinese	1	3.8
Māori/New Zealand European	6	23.1
Israeli/Belarusian	1	3.8
Japanese/New Zealand European	1	3.8
Māori/Samoan/Chinese	1	3.8
German/New Zealand European	2	7.7
Samoan/New Zealand European	2	7.7

Table 10 Demographic characteristics of parents participating in Phase four online reliability testing.

	Frequency (n)	Percent (%)
<i>Preschooler Age</i>		
2 Years	17	21.5
3 Years	30	38.0
4 Years	29	36.7
5 Years	3	3.8
<i>Preschooler Gender</i>		
Female	40	50.6
Male	39	49.4
<i>First Language Mother</i>		
Afrikaans	2	2.5
Chinese	1	1.3
English	62	78.5
Filipino	1	1.3
German	1	1.3
Hindi	3	3.8
Malayalam	1	1.3
Mandarin	1	1.3
Māori	4	5.1
Punjabi	1	1.3
Spanish	1	1.3
Taiwanese	1	1.3
<i>Country Born Mother</i>		
Australia	2	2.5
Chile	1	1.3
China	1	1.3
England	5	6.3
Fiji	3	3.8
France	1	1.3
India	4	5.1
Kenya	1	1.3
New Zealand	53	67.1
Philippines	1	1.3
South Africa	4	5.1
Switzerland	1	1.3
Taiwan	2	2.5
<i>Ethnicity Mother</i>		
Asian	1	1.3
Australian	2	2.5
British	5	6.3

Chinese	1	1.3
Fijian Indian	2	2.5
Filipino	1	1.3
Hindu	2	2.5
Indian	3	3.8
Māori	6	7.6
Māori/New Zealand European	6	7.6
New Zealand European	40	50.6
Samoan/New Zealand European	1	1.3
South African	4	5.1
South American	1	1.3
Swiss	1	1.3
Taiwanese	2	2.5
Tongan/Niuean	1	1.3
<i>First Language Father</i>		
Afrikaans	3	3.8
Arabic	1	1.3
Bengali	1	1.3
Chinese	1	1.3
Cook Island	1	1.3
Dutch	1	1.3
English	60	75.9
Filipino	1	1.3
French	1	1.3
German	1	1.3
Hindi	3	3.8
Malayalam	1	1.3
Mandarin	1	1.3
Māori	1	1.3
Punjabi	1	1.3
Taiwanese	1	1.3
<i>Country Born Father</i>		
Australia	1	1.3
Bangladesh	1	1.3
China	1	1.3
Cook Island	1	1.3
Egypt	1	1.3
England	6	7.6
Fiji	4	5.1
France	1	1.3
India	4	5.1
New Zealand	49	62.0
Philippines	1	1.3

Scotland	1	1.3
Singapore	2	2.5
South Africa	3	3.8
Taiwan	2	2.5
Netherlands	1	1.3
<i>Ethnicity Father</i>		
Asian	1	1.3
Australian	1	1.3
Bangladeshi	1	1.3
British	4	5.1
Chinese	1	1.3
Cook Island	2	2.5
Dutch	1	1.3
Egyptian	1	1.3
Fijian Indian	2	2.5
Filipino	1	1.3
French	1	1.3
German/Chinese	1	1.3
Hindu	3	3.8
Indian	4	5.1
Māori	4	5.1
Māori/Cook Island	1	1.3
Māori/New Zealand European	5	6.3
New Zealand European	37	46.8
Samoan	2	2.5
Samoan/Chinese	1	1.3
South African	3	3.8
Taiwanese	2	2.5
<i>Country Born Child</i>		
Australia	1	1.3
China	1	1.3
England	1	1.3
New Zealand	74	93.7
South Africa	1	1.3
United Kingdom	1	1.3
<i>Ethnicity Child</i>		
Asian	1	1.3
Bangladeshi/New Zealand European	1	1.3
Chinese	1	1.3
Dutch/Māori/New Zealand European	1	1.3
Egyptian/New Zealand European	1	1.3
Fijian Indian	1	1.3
German/Chinese/New Zealand European	1	1.3

Hindu	1	1.3
Indian	4	5.1
Indian/New Zealand European	3	3.8
Māori	4	5.1
Māori/Chinese/New Zealand European	1	1.3
Māori/Cook Island	3	3.8
Māori/New Zealand European	6	7.6
Māori/Samoan/Chinese	1	1.3
New Zealand European	42	53.2
Samoan/New Zealand European	1	1.3
South African	2	2.5
Swiss/New Zealand European	1	1.3
Taiwanese	1	1.3
Taiwanese/New Zealand European	1	1.3
Tongan/Samoan	1	1.3

Statistical methods for reliability testing between online administrations for each index item.

For breads and cereals, the K reliability was considered adequate (0.57) and the Pearson's chi-square test p-value was significant at <0.05 (0.000).

For fruit, the K reliability was considered adequate (0.54) and the Fisher's exact test p-value was significant at <0.05 (0.000) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For vegetables, the K reliability was considered adequate (0.54) and a Pearson's chi-square test p-value was significant at <0.05 (0.000) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For meat and meat alternatives, the K reliability was considered inadequate (0.43). The Pearson's chi-square test p-value was significant at <0.05 (0.000) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For fast food, the K reliability was considered adequate (0.72) and a Fisher's exact test p-value was significant at <0.05 (0.000) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For food expense, the K reliability was considered adequate (0.62) and a Pearson's chi-square test p-value was significant at <0.05 (0.000) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For chewing/swallowing difficulty, the K reliability was indeterminate. An indeterminate result is due to results falling completely in one of the binary categories, in this case 100% of parents answered that their preschooler never to rarely has any difficulty chewing/swallowing.

For not hungry at meal times due to drinking, the Cohens K reliability was considered the least inadequate (0.40) of all items. The Fisher's exact test p-value was significant at <0.05 (0.001) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For eating frequency of the preschooler, K reliability for this item was the most reliable of all items (1.00) and a Fisher's exact test p-value was significant at <0.05

(0.013) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For parental control over feeding, this item had adequate reliability between administrations (0.73) and a Pearson's Chi Square value was significant at <0.05 (0.000) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For television watching at meal times, this item had adequate reliability between administrations (0.71) and a Fisher's exact value was significant at <0.05 (0.000) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For the use of vitamin and mineral supplements, this item had adequate reliability between administrations (0.69) and a Fisher's exact test value was significant at <0.05 (0.000) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For preschooler was getting "enough" physical activity, this item had adequate reliability between administrations (0.65) and a Fisher's exact test value was significant at <0.05 (0.003) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For sedentary behaviours, this item had adequate reliability (0.67) between administrations and a Fisher's exact test value p-value was significant at <0.05 (0.000) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

For appropriate weight, this item had adequate reliability (0.59) between administrations and a Fisher's exact test p-value was significant at <0.05 (0.000) indicating a significant relationship between the two administrations meaning the hypothesis can be accepted.

Appendix C materials used

Letter to request permission to recruit at a preschool facility

Letter to Request Permission

To Whom it may concern,

I am a Master of Science student completing my MSc in Nutrition and Dietetics at Massey University, Albany and for my thesis are seeking your help to adapt a nutrition screening tool to identify healthy eating habits among preschool children. The nutrition screening tool was developed in Canada and needs to be adapted for the New Zealand setting.

I aim to recruit parents of preschool children from different areas of Auckland to complete the New Zealand adapted nutrition screening tool to assess its reliability. This involves completing a 17-item questionnaire regarding the eating habits and behaviours of your preschool aged child. For example, whether your child consumes sweetened beverages or how often they are physically active etc. Firstly, I aim to recruit around five groups of six parents or caregivers for an “intercept interview” to check whether the adapted nutrition screening tool is easily understood. Secondly, we are needing to recruit a large sample of parents to complete both the original Canadian tool and the adapted New Zealand tool online. A short questionnaire to identify demographic characteristics will also need to be completed online. All personal information provided by parents will be strictly confidential. To comply with ethical study procedures, parents who volunteer to participate will be provided with an information sheet and will need to provide written informed consent before the study begins.

This research may potentially benefit both parents and children. A reliable nutrition screening tool for use in New Zealand can be used by health professionals and parents to identify eating habits that are consequential to good health. We are seeking approval for your preschool to participate in this research. We would greatly appreciate your support and help to recruit parents to engage in this project

Kind regards and many thanks

Breanna Edge

Student Dietitian

02102477083

bedge@massey.ac.nz

Consent form to recruit at a preschool facility



School of Sport, Exercise and Nutrition
Massey University
Private Bag 102904
North Shore City
Auckland
0754
New Zealand

Reliability of an adapted Nutri-Step nutrition risk screening tool for preschool aged children 2-5 years old in a New Zealand setting.

CONSENT TO RECRUIT AT A PRESCHOOL FACILITY

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree for the preschool _____ to participate in this study under the conditions set out in the Information Sheet.

I agree that the researcher may recruit parents for this research project at this preschool.

Signature:

Date:

Full Name - printed

Information sheet for preschool facilities



School of Sport, Exercise and Nutrition
Massey University
Private Bag 102904
North Shore City
Auckland
0754
New Zealand

Reliability of an adapted Nutri-Step nutrition risk screening tool for preschool aged children 2-5 years old in a New Zealand setting.

INFORMATION SHEET FOR PRESCHOOLS

Researcher Introduction

This project is being undertaken by Breanna Edge for her thesis to complete a Master of Science in Human Nutrition and Dietetics. The project will be supervised by Associate Professors Carol Wham and Rozanne Kruger from the School of Sport, Exercise and Nutrition. The project aims to adapt a nutrition screening tool called Nutri-Step that has been developed in Canada for use in New Zealand to identify the adequacy of eating habits of pre-school children.

Project Description and Invitation

Children aged two to five years old may be vulnerable to poor nutrition or risk factors that can impair healthy eating. A nutrition screening tool provides an opportunity to identify nutritional risk factors specific to New Zealand children such as excessive sugar intake, high fat intake, low vegetable and fruit intake, limited physical activity and long periods of screen time. Delayed intervention and inadequate management of poor nutritional status can have health consequences in preschool children including poor growth and overweight and obesity.

NutriSTEP is a validated nutrition screening tool specific for preschool aged children aged two to five years old that has shown significant success in identifying young children with low, medium or high nutritional risk.

In New Zealand there is no nutrition screening tool specific for children that is used in the community setting. Therefore, this study will test the reliability of the Canadian NutriSTEP when adapted to a New Zealand setting. The aim of research is to produce a reliable adaptation of the Canadian NutriSTEP tool, appropriate for use by parents and health care professionals in a community setting to identify preschool aged children at low, medium or high nutrition risk.

Participant Identification and Recruitment

Parents/primary caregivers of preschool aged children will be invited to participate by recruitment through preschools that their child attends. Recruitment phone calls will be made to preschool centers Auckland wide asking for interest of involvement. Preschools that show interest will be emailed or visited by myself to discuss the involvement of parents that wish to partake in this research project and

supplied with an information sheet and consent form. Parents that show interest in participation will receive an information sheet about the study before giving written consent to participate.

Participant names will not be necessary. Participants will be instead given an ID number to identify with to ensure privacy and personal information are kept confidential.

Selection criteria

- Being a parent/primary caregiver of a preschool child (two to five years old)
- Having lived in New Zealand for the last 5 years
- Be able to read and write in English.
- Have email and internet access (online questionnaire section only)

This research project is aiming for the recruitment of around 30 parents for the intercept interview phase and 120 parents for the online questionnaire phase. This number is to ensure all ethnicities, groups and cultures living in New Zealand are represented as equally as possible.

Exclusion Criteria

- Not be able to read and write in English
- Have lived in New Zealand for less than 5 years
- Involvement of a child that is below the age of two or above the age of five
- Involvement of a child with a chronic disease

Project Procedures

Parents who consent to be involved in the intercept interviews are invited to:

Participate in a group discussion with the student researcher to discuss the comprehension/understanding of the questions that are asked in the NutriSTEP tool. Feedback given will be used to change the NutriSTEP to be more suitable for a NZ setting.

Secondly parents who consent to participate in completing online questionnaires will be required to:

- 1) Complete an online version of the original Canadian NutriSTEP tool,
- 2) Complete an online version of the adapted NutriSTEP tool 4 weeks after completing the original Canadian NutriSTEP tool
- 3) Complete a questionnaire online which will involve questions about your: gender, ethnicity, age, number of children, marital status, income, education and language that you mostly speak.

Time involved.

1) Group Interviews

Group Interviews will be a maximum time of one hour. This hour will involve completion of the questionnaire in your own amount of time and then a group discussion about how easy the questionnaire was to complete.

2) Online Questionnaires

- a) A maximum of 20 minutes for the completion of the online version of the original Canadian NutriSTEP tool. This is completed on a personal device of the participants, at a time that suits the participant.
- b) A maximum of 20 minutes for the completion of the online version of the NutriSTEP tool 4 weeks after completing the original Canadian NutriSTEP tool. This is completed on a personal device of the participants, at a time that suits the participant.
- c) A maximum of 20 minutes for the completion of the demographic questionnaire online via the survey link SurveyMonkey. This is completed on a personal device of the participants, at a time that suits the participant.
- d) This results in a total of 60 minutes for participation in this research project.

Incentives

Group Interviews: A chance to win a \$100 voucher via a prize draw, refreshments during the interviews

Online Questionnaire Respondents: A chance to win one of two \$100 vouchers via a prize draw

Project Contacts

Please contact the researcher at any time if you have any questions about this research project

Breanna Edge
Student Dietitian, Massey University Albany
Phone: 02102477083
Email: b.edge@massey.ac.nz

Carol Wham
Associate Professor School of Sport, Exercise and Nutrition
+64 (09) 414 0800 ext. 43644
C.A.Wham@massey.ac.nz

Rozanne Kruger
Associate Professor in Dietetics and Human Nutrition School of Sport, Exercise and Nutrition
+64 (09) 414 0800 ext. 43661
R.Kruger@massey.ac.nz

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern A, Application 18/17. If you have any concerns about the conduct of this research, please contact Dr Lesley Batten, Chair, Massey University Human Ethics Committee: Southern A, telephone 06 356 9099 x 85094, email humanethicsoutha@massey.ac.nz.



Do you have a child between the age of 2 and 5 years?

We are recruiting parents/primary caregivers of children between the ages of 2 and 5 years to take part in this exciting study in which we will be assessing a nutrition screening tool which may help identify nutritional risk factors specific to New Zealand children.



Reliability of an adapted Nutri-Step nutrition risk screening tool for preschool aged children 2-5 years old in a New Zealand setting.

What you would need to do:

- Answer one short questionnaire online
- Answer another two short questionnaires online, 4 weeks later

What you will gain from taking part:

- Go into a prize draw to win one of two \$100 vouchers
- Receive a summary sheet of the final research findings regarding nutritional risk factors in preschool children

....Interested?

Please See Further Instructions Below to Participate!

Hi there,

Thank you so much for your interest in participating in this research study "*Identifying Eating Habits in Preschool Aged Children*"

Your input is greatly appreciated.

Please read the information sheet below which explains what you will need to do if you decide to participate in this research:

<https://drive.google.com/open?id=1bZx1Voe91szQaIQVoOs-nluTwKGDDvzP>

Once you have read the information sheet, please complete and submit the consent form below, which will mean that you agree to participate in this research:

https://drive.google.com/open?id=12-fikoOHnPTyFqQNfjfnW7v5Lp_KNZQ1f05_SRyaNaU

Once you have completed and submitted this consent form, the first questionnaire will be sent to you through a link via email, along with an **ID number** that you will use during this research.

Please don't hesitate to contact me at any time.

Many Thanks and Kind Regards

Breanna Edge
Student Dietitian
02102477083

Information sheet for intercept interviews



MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

School of Sport, Exercise and Nutrition
Massey University
Private Bag 102904
North Shore City
Auckland
0754
New Zealand

Reliability of an adapted Nutri-Step nutrition risk screening tool for preschool aged children 2-5 years old in a New Zealand setting.

INFORMATION SHEET FOR INTERCEPT INTERVIEWS

Researcher Introduction

This project is being undertaken by Breanna Edge for her thesis to complete a Master of Science in Human Nutrition and Dietetics. The project will be supervised by Associate Professors Carol Wham and Rozanne Kruger from the School of Sport, Exercise and Nutrition. The project aims to adapt a nutrition screening tool called Nutri-Step that has been developed in Canada for use in New Zealand to identify the adequacy of eating habits of pre-school children.

Project Description and Invitation

Children aged two to five years old may be vulnerable to poor nutrition or risk factors that can impair healthy eating. A nutrition screening tool provides an opportunity to identify nutritional risk factors specific to New Zealand children such as excessive sugar intake, high fat intake, low vegetable and fruit intake, limited physical activity and long periods of screen time. Delayed intervention and inadequate management of poor nutritional status can have health consequences in preschool children including poor growth and overweight and obesity.

NutriSTEP is a validated nutrition screening tool specific for preschool aged children aged two to five years old that has shown significant success in identifying young children with low, medium or high nutritional risk.

In New Zealand there is no nutrition screening tool specific for children that is used in the community setting. Therefore, this study will test the reliability of the Canadian NutriSTEP when adapted to a New Zealand setting. The aim of research is to produce a reliable adaptation of the Canadian NutriSTEP tool, appropriate for use by parents and health care professionals in a community setting to identify preschool aged children at low, medium or high nutrition risk.

As a parent/guardian/primary caregiver of a preschool aged child, you are invited to participate in a study which aims to adapt a nutrition screening tool to fit the New Zealand setting that can help to identify poor eating habits of preschool children.

Participant Identification and Recruitment

Parents/primary caregivers of preschool aged children will be invited to participate by recruitment through preschools that their child attends. Recruitment phone calls will be made to preschool centers Auckland wide asking for interest of involvement. Preschools that show interest will be emailed or visited by myself to discuss the involvement of parents that wish to partake in this research project and supplied with an information sheet and consent form.

Parents that show interest in participation will receive an information sheet about the study before giving written consent to participate.

Participants will be de-identified by being given an ID number to ensure privacy and personal information are kept confidential.

Selection criteria

- Being a parent/primary caregiver of a preschool child (two to five years old)
- Having lived in New Zealand for the last 5 years
- Be able to read and write in English.

Exclusion Criteria

- Not be able to read and write in English
- Have lived in New Zealand for less than 5 years
- Involvement of a child that is below the age of two or above the age of five
- Involvement of a child with a chronic disease

Phase one of this research project, Intercept Interviews, is aiming for the recruitment of around 30 parents that will participate in the intercept interviews in groups of 6. This number aims to include all ethnicities, groups and cultures living in New Zealand.

Project Procedures

Parents who consent to be involved in the intercept interviews are invited to:

Participate in a group discussion with the student researcher to discuss the comprehension/understanding of the questions that are asked in the adapted NutriSTEP tool. Feedback given will be used to further change the NutriSTEP to be more suitable for a NZ setting.

You will be required to:

- Complete two consent forms (one for yourself, one for the researcher)
- Complete the adapted NutriSTEP nutrition screening tool
- Provide feedback on your understanding of the adapted NutriSTEP nutrition screening tool. This will be voice recorded.
- Complete a questionnaire online which will involve questions about your: gender, ethnicity, age, number of children, marital status, income, education and language that you mostly speak.

Time involved.

Group Interviews will be a maximum time of one hour. This hour will involve completion of the questionnaire in your own amount of time and then a group discussion about how easy the questionnaire was to complete.

Incentives

A chance to win a \$100 voucher via a prize draw and also refreshments during the interview.

Data Management

Use of data.

Feedback from the intercept interviews will be used by the researcher to further adapt any part of the tool to make the tool best suited and comprehensible for use in the New Zealand setting.

Storage and disposal of data.

Paper consent forms collected by the researcher, feedback forms collected by the researcher and demographic questionnaires collected by the researcher will be kept in a locked cupboard in a secure building on the Massey University Campus. Disposal of any forms will be via a paper shredder.

Method for preserving confidentiality of identity

Participants identity and confidentiality will remain strictly private by being given an ID number in place of your name. This ensures privacy, confidentiality and anonymity are upheld during this research process.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study;
- ask any questions about the study at any time during participation;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
- be given access to a summary of the project findings when it is concluded.
- ask for the recorder to be turned off at any time during an intercept interview.

Completion and return of the questionnaire implies consent. You have the right to decline to answer any particular question.

Project Contacts

Please contact the researcher at any time if you have any questions about this research project

Breanna Edge
Student Dietitian, Massey University Albany
Phone: 02102477083
Email: b.edge@massey.ac.nz

Carol Wham
Associate Professor School of Sport, Exercise and Nutrition
+64 (09) 414 0800 ext. 43644
C.A.Wham@massey.ac.nz

Rozanne Kruger
Associate Professor in Dietetics and Human Nutrition School of Sport, Exercise and Nutrition
+64 (09) 414 0800 ext. 43661
R.Kruger@massey.ac.nz

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern A, Application 18/17. If you have any concerns about the conduct of this research, please contact Dr Lesley Batten, Chair, Massey University Human Ethics Committee: Southern A, telephone 06 356 9099 x 85094, email humanethicsoutha@massey.ac.nz

Consent form to participate in intercept interviews



MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

School of Sport, Exercise and Nutrition
Massey University
Private Bag 102904
North Shore City
Auckland
0754
New Zealand

Reliability of an adapted Nutri-Step nutrition risk screening tool for preschool aged children 2-5 years old in a New Zealand setting.

FOCUS GROUP PARTICIPANT CONSENT FORM

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I understand that I have an obligation to respect the privacy of the other members of the group by not disclosing any personal information that they share during our discussion.

I understand that all information I give will be kept confidential to the extent permitted by law, and the names of all people in the study will be kept confidential by the researcher.

Note: There are limits on confidentiality as there are no formal sanctions on other group participants from disclosing your involvement, identity or what you say to others in the focus group. There are risks in taking part in focus group research and taking part assumes that you are willing to assume those risks.

I agree/do not agree to the interview being sound recorded.

I agree to participate in the focus group under the conditions set out in the Information Sheet.

Signature:

Date:

.....

Full Name - printed

.....

Consent form to release audio transcript recorded at intercept interviews



MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Massey University
Private Bag 102904
North Shore City
Auckland
0754
New Zealand

**Reliability of an adapted Nutri-Step nutrition risk screening tool for preschool
aged children 2-5 years old in a New Zealand setting.**

AUTHORITY FOR THE RELEASE OF TRANSCRIPTS

I confirm that I have had the opportunity to read and amend the transcript of the
interview(s) conducted with me.

I agree that the edited transcript and extracts from this may be used in reports and
publications arising from the research.

Signature:

Date:

Full Name - printed

Demographic questionnaire used in intercept interviews and online reliability testing



School of Sport, Exercise and Nutrition
Massey University
Private Bag 102904
North Shore City
Auckland
0754
New Zealand

Demographic Questionnaire for Parents/Caregivers of Preschoolers

We are interested in gathering some information about you and your family in order to better understand who is participating in our research. Please complete the following questions to provide us with some background information on your child and family. Provide only one response for each question. Feel free to not answer certain questions if they make you uncomfortable.

Please do not put your name on this paper.

1. a) How old is your preschooler in this study _____ (years)
b) What is the gender of this child? _____
c) Does your preschooler have a medical condition diagnosed by a doctor? [] Yes [] No
If Yes, please describe _____

2. For the following people, what is the language they first learned as a child, the country they were born in, and ethnic or cultural background?

	Mother/Grandmother/Other Primary Caregiver	Father/Grandfather/Other Primary Caregiver	Your Preschooler
First language			
Country born in			
Ethnic or cultural Background (e.g. Māori, Pacific Island, Asian, etc.)			

3. Age and Gender

- a) Your age: _____
- b) Your Gender: _____

4. Your Marital Status:
☐ Married/Common-law ☐ Single ☐ Widowed ☐ Separated/Divorced
5. a) How many PEOPLE live in your household (*include all adults and children*)

- b) How many ADULTS live in your household? _____
- c) How many CHILDREN live in your household? _____
6. What is YOUR highest level of education?
- | | |
|--|--|
| <input type="checkbox"/> Primary School | <input type="checkbox"/> Graduated High School |
| <input type="checkbox"/> Intermediate School | <input type="checkbox"/> Some University |
| <input type="checkbox"/> Some High School | <input type="checkbox"/> Graduated University |

Thank you for your input!



School of Sport, Exercise and Nutrition
Massey University
Private Bag 102904
North Shore City
Auckland
0754
New Zealand

Key Intercept Interviews (2018)

INTERVIEW GUIDE TO BE FOLLOWED FOR EACH PARENT:

WELCOME THE PARENT AND ESTABLISH COMFORTABLE LOCATION

THE SCRIPT FOR YOU TO FOLLOW IS IN ITALICS

A. Informed Consent and Ethical Ground Rules:

Hello and welcome to this interview. Thank you for taking the time to join me to talk about nutrition and preschoolers. My name is Breanna Edge and I am writing my thesis for my Master of Science on adaptation of the NutriSTEP tool to be reliable and suitable in a New Zealand setting.

*The **main purpose** of today's interview is to ask your opinions and thoughts on a preschool nutrition checklist that is being adapted to a New Zealand setting. This research part will take about 45 minutes.*

After the research part is done, we will have another 10 - 15 minutes to discuss general nutrition questions you may have about children, food and eating habits.

The whole interview today will take about an hour. First, I will ask you to sign an informed consent form and then will move on to ask you to complete some written and verbal questions.

These questions are designed to help us adapt an easy to use nutrition-screening check list for preschoolers and their parents that will be adapted for New Zealand use

This nutrition-screening check list will be used by parents to help them find out if their child is already eating a healthy diet or it can help parents to find any possible nutrition problems affecting their child.

*Now, let's begin with the **Research Study Participant Information and Consent Form**. Please read it over and sign both copies of the consent form. The white copy is for you to keep; I will keep the green one. If you have any questions, please ask and I'll be happy to explain.*

I'd like to start by saying that, for parents, thinking or talking about children's eating habits can be emotional. There are a lot of things that influence or affect how well a child eats. Some of these are within the control of parents and some are not. This is important to know as there are no right or wrong answers today.

Don't feel you have to answer all the questions I ask or that you need to comment on each one. We are interested in your general impressions as well as any specific comments you might have.

(HANDOUT NutriSTEP® for preschoolers).

So to begin, please take the time you need to complete the Preschool NutriSTEP® checklist.

Please keep in mind one of your children who is between two and five years of age, when filling this in.

B. RA observations during Preschool NutriSTEP® completion:

1. Record how long (in minutes) it took for parent to complete the questionnaire (you'll need a watch!): _____minutes

C. Cognitive testing questions about the tool:

(Place completed Preschool NutriSTEP® checklist in front of parent).

Now I am going to be asking your thoughts about the actual wording and understanding of each of the questions on the Preschool NutriSTEP® checklist you just filled out.

Remember there are no right or wrong answers and your opinion is valued. Please feel free to refer back to the questionnaire as I ask my questions.

I will be taking some notes as you tell me your opinions on the checklist. Let's take one question at a time.

Record open-ended responses in space below for each question.

1. My child usually eats grain products:

Examples are bread, bagel, bun, cereal, pasta, rice, roti and tortillas.

- ☐ **More than 5 times a day**
- ☐ **4 to 5 times a day**
- ☐ **2 to 3 times a day**
- ☐ **Less than 2 times a day**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

2. My child usually has milk products:

Examples are white or chocolate milk, cheese, yogurt, milk puddings or milk substitutes such as fortified soy beverages.

- ☐ **More than 3 times a day**
- ☐ **3 times a day**
- ☐ **2 times a day**
- ☐ **Once a day or less**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

3. My child usually eats fruit:

- ☐ **More than 3 times a day**
- ☐ **3 times a day**
- ☐ **2 times a day**
- ☐ **Once a day**
- ☐ **Not at all**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

4. My child usually eats vegetables:

- ☐ **More than 2 times a day**
- ☐ **2 times a day**
- ☐ **Once a day**
- ☐ **Not at all**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

5. My child usually eats meat, fish, poultry or alternatives:

Alternatives can be eggs, peanut butter, tofu, nuts, or dried beans, peas and lentils.

- ☐ **More than 2 times a day**
- ☐ **2 times a day**
- ☐ **Once a day**
- ☐ **A few times a week**
- ☐ **Not at all**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

6. My child usually eats “fast food”:

- ☐ **4 or more times a week**
- ☐ **2-3 times a week**
- ☐ **Once a week**
- ☐ **A few times a month**

☐ **Once a month or less**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

7. I have difficulty buying food to feed my child because food is expensive:

- ☐ **Always**
- ☐ **Most of the time**
- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

8. My child has problems chewing, swallowing, gagging or choking when eating:

- ☐ **Always**
- ☐ **Most of the time**
- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

9. My child is **not** hungry at mealtimes **because** he/she drinks all day:

- ☐ **Always**
- ☐ **Most of the time**

- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

10. My child usually eats:

- ☐ **Less than 2 times a day**
- ☐ **2 times a day**
- ☐ **3 to 4 times a day**
- ☐ **5 times a day**
- ☐ **More than 5 times a day**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

11. I let my child decide how much to eat:

- ☐ **Always**
- ☐ **Most of the time**
- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

12. My child eats meals while watching TV:

- ☐ **Always**
- ☐ **Most of the time**
- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

13. My child usually takes supplements:

Examples are multivitamins, iron drops, cod liver oil

- ☐ **Always**
- ☐ **Most of the time**
- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

14. My child:

- ☐ **Needs more physical activity**
- ☐ **Gets enough physical activity**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

15. My child usually watches TV, uses the computer, and plays video games:

- ☐ **5 or more hours a day**
- ☐ **4 hours a day**
- ☐ **3 hours a day**
- ☐ **2 hours a day**
- ☐ **1 hour or less a day**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

16. I am comfortable with how my child is growing:

- ☐ **Yes**
- ☐ **No**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

17. I think my child:

- ☐ **Should weigh more**
- ☐ **Is about the right weight**
- ☐ **Should weigh less**

Do you have any comments about the first part of the question? If so, please specify:

Do you have any comments about the responses to the question? If so, please specify:

Do you have any other comments? If so, please describe:

Overall Opinion about the Preschool NutriSTEP® checklist:

(Questionnaire still on the table in front of parent)

The next few questions I am going to ask are about your overall opinions about the tool.

1. Overall, would you say that the questionnaire was:

- a) easy to complete, or
- b) hard to complete, or
- c) You don't have an opinion about this, or
- d) You don't know

(Circle one response)

2. Is there anything missing that you think should be in the tool?

No _____ Yes _____, if yes, please describe:

E. Participant Background Form:

(HANDOUT Demographic Questionnaire)

"We are now at the end of the research part of the interview. There is just one more form to complete. I have a one-page Demographic Questionnaire that you can choose to fill out if you want to.

It gives us an idea of the background of parents who are coming out to the interviews, so at the end of the project we know that we heard from a real mix of parents across Auckland.

Please do not put your name on it.

Don't feel you have to answer all the questions if you don't want to.

You can simply put this form in the envelope that is on the table.

(Give the parent a few minutes to fill in)

This now ends the research part of this interview. Thank you so much for providing me with excellent feedback on the Preschool NutriSTEP® checklist.

F. Nutrition Education Resources/General Advice to Parent:

"We now have 15 minutes left to talk about general preschool nutrition and physical activity topics/issues you may wish to discuss.

"Once again, thanks so much for sharing your thoughts on this important topic!"

Post-Interview Questions the RA Interviewer Answers:

1. Please list what nutritional resources/materials you provided:
2. While the purpose of the interview was not to conduct an actual dietary assessment of a preschooler, was there nutrition advice you gave because you felt you needed to give the parent? Please describe:
3. Please describe any community nutrition/health referrals/recommendations you advised the parent to contact for additional preschool nutrition information:

Information sheet for online reliability testing



School of Sport, Exercise and Nutrition
Massey University
Private Bag 102904
North Shore City
Auckland
0754
New Zealand

Reliability of an adapted Nutri-Step nutrition risk screening tool for preschool aged children 2-5 years old in a New Zealand setting.

INFORMATION SHEET FOR ONLINE QUESTIONNAIRES

Researcher Introduction

This project is being undertaken by Breanna Edge for her thesis to complete a Master of Science in Human Nutrition and Dietetics. The project will be supervised by Associate Professors Carol Wham and Rozanne Kruger from the School of Sport, Exercise and Nutrition. The project aims to adapt a nutrition screening tool called Nutri-Step that has been developed in Canada for use in New Zealand to identify the adequacy of eating habits of pre-school children.

Project Description and Invitation

Children aged two to five years old may be vulnerable to poor nutrition or risk factors that can impair healthy eating. A nutrition screening tool provides an opportunity to identify nutritional risk factors specific to New Zealand children such as excessive sugar intake, high fat intake, low vegetable and fruit intake, limited physical activity and long periods of screen time. Delayed intervention and inadequate management of poor nutritional status can have health consequences in preschool children including poor growth and overweight and obesity. NutriSTEP is a validated nutrition screening tool specific for preschool aged children aged two to five years old that has shown significant success in identifying young children with low, medium or high nutritional risk.

In New Zealand there is no nutrition screening tool specific for children that is used in the community setting. Therefore, this study will test the reliability of the Canadian NutriSTEP when adapted to a New Zealand setting. The aim of research is to produce a reliable adaptation of the Canadian NutriSTEP tool, appropriate for use by parents and health care professionals in a community setting to identify preschool aged children at low, medium or high nutrition risk.

As a parent/guardian/primary caregiver of a preschool aged child, you are invited to participate in a study which aims to adapt a nutrition screening tool to fit the New Zealand setting that can help to identify poor eating habits of preschool children.

Participant Identification and Recruitment

Parents/primary caregivers of preschool aged children will be invited to participate by recruitment through preschools that their child attends. Recruitment phone calls will be made to preschool centers Auckland wide asking for interest of involvement. Preschools that show

interest will be emailed or visited by myself to discuss the involvement of parents that wish to partake in this research project and supplied with an information sheet and consent form. Parents that show interest in participation will receive an information sheet about the study before giving written consent to participate.

Participants will be de-identified by being given an ID number to ensure privacy and personal information are kept confidential.

Selection criteria

- Being a parent/primary caregiver of a preschool child (two to five years old)
- Having lived in New Zealand for the last 5 years
- Be able to read and write in English.
- Have email and internet access

Exclusion Criteria

- Not be able to read and write in English
- Have lived in New Zealand for less than 5 years
- Involvement of a child that is below the age of two or above the age of five
- Involvement of a child with a chronic disease

This research project is aiming for the recruitment of around 120 parents/primary caregivers. This number aims to include all ethnicities, groups and cultures living in New Zealand.

Project Procedures

Participants who consent to participate in completing online questionnaires will be required to:

- 1) Complete an online version of the original Canadian NutriSTEP tool,
- 2) Complete an online version of the adapted NutriSTEP tool 4 weeks after completing the original Canadian NutriSTEP tool
- 3) Complete a questionnaire online which will involve questions about your: gender, ethnicity, age, number of children, marital status, education and language that you mostly speak.

Time involved.

- a) A maximum of 20 minutes for the completion of the online version of the original Canadian NutriSTEP tool. This is completed on a personal device of the participants, at a time that suits the participant.
- b) A maximum of 20 minutes for the completion of the online version of the NutriSTEP tool 4 weeks after completing the original Canadian NutriSTEP tool. This is completed on a personal device of the participants, at a time that suits the participant.
- c) A maximum of 20 minutes for the completion of the demographic questionnaire online via the survey link SurveyMonkey. This is completed on a personal device of the participants, at a time that suits the participant.
- d) This results in a total of 60 minutes for participation in this research project.

Incentives

A chance to win one of two \$100 vouchers via a prize draw

Data Management

Use of data.

Data will be collected from the results of the participants completing; the original Canadian NutriSTEP tool, the adapted NutriSTEP tool and the demographic questionnaire from each participant (a total of 3 completed items).

What will happen to the data when it is obtained?

The results from the two completed tools (NutriSTEP and adapted NutriSTEP) will be compared to assess whether the same results are obtained. The results will also be interpreted to assess and identify whether children are at nutrition risk. This will show if the adapted NutriSTEP tool is reliable for use in a New Zealand community setting. Feedback will be given back to parents/primary caregivers on their results of the questionnaires.

Storage and disposal of data.

Data collected from the online version of the original Canadian NutriSTEP tool, online version of the adapted NutriSTEP and the online demographic questionnaire will be kept only on the researcher's personal electronic device, secured by a password only known to the researcher. Any paper documents will be kept in a locked cupboard in a secure building on the Massey University Campus. Any paper documents collected will be shredded by a paper shredder after use.

Method for preserving confidentiality of identity

Participants identity and confidentiality will remain strictly private as ID numbers in place of given names will be used. This ensures privacy, confidentiality and anonymity are upheld during this research process.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study;
- ask any questions about the study at any time during participation;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
- be given access to a summary of the project findings when it is concluded.
- ask for the recorder to be turned off at any time during an intercept interview.
- Completion and return of the questionnaire implies consent. You have the right to decline to answer any particular question.

Project Contacts

Please contact the researcher at any time if you have any questions about this research project

Breanna Edge
Student Dietitian, Massey University Albany
Phone: 02102477083
Email: b.edge@massey.ac.nz

Carol Wham
Associate Professor School of Sport, Exercise and Nutrition
+64 (09) 414 0800 ext. 43644
C.A.Wham@massey.ac.nz

Rozanne Kruger
Associate Professor in Dietetics and Human Nutrition School of Sport, Exercise and Nutrition
+64 (09) 414 0800 ext. 43661
R.Kruger@massey.ac.nz

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern A, Application 18/17. If you have any concerns about the conduct of this research, please contact Dr Lesley Batten, Chair, Massey University Human Ethics Committee: Southern A, telephone 06 356 9099 x 85094, email humanethicsoutha@massey.ac.nz

Consent form to participate in online reliability testing



School of Sport, Exercise and Nutrition
Massey University
Private Bag 102904
North Shore City
Auckland
0754
New Zealand

Reliability of an adapted Nutri-Step nutrition risk screening tool for preschool aged children 2-5 years old in a New Zealand setting.

PARTICIPANT CONSENT FORM – ONLINE QUESTIONNAIRES

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature:

Date:

.....

Full Name - printed

.....



Nutrition Education for Parents/Caregivers of Preschoolers

Nutrition Behaviour Questionnaire for Parents of Preschoolers

Instructions

- Below are questions about your preschool child's (3-5-year-old) eating and other habits.
 - Please complete the questions yourself or with the help of others who take care of your child.
 - Check (✓) only one answer for each question.
 - Think about your child's *usual* habits when answering each question.
-

1. My child usually eats grain products:

Examples are bread, bagel, bun, cereal, pasta, rice, roti and tortillas.

- ☐ 0 More than 5 times a day
- ☐ 1 4-5 times a day
- ☐ 2 2-3 times a day
- ☐ 4 Less than 2 times a day

2. My child usually has milk products:

Examples are white or chocolate milk, cheese, yogurt, milk puddings or milk substitutes such as fortified soy beverages.

- ☐ 0 More than 3 times a day
- ☐ 1 3 times a day
- ☐ 2 2 times a day
- ☐ 4 Once a day or less

3. My child usually eats fruit:

- ☐ 0 More than 3 times a day
- ☐ 1 3 times a day
- ☐ 2 2 times a day
- ☐ 3 Once a day
- ☐ 4 Not at all

4. My child usually eats vegetables:

- ☐ **More than 2 times a day**
- ☐ **2 times a day**
- ☐ **Once a day**
- ☐ **Not at all**

5. My child usually eats meat, fish, poultry or alternatives:

Alternatives can be eggs, peanut butter, tofu, nuts, or dried beans, peas and lentils.

- ☐ **More than 2 times a day**
- ☐ **2 times a day**
- ☐ **Once a day**
- ☐ **A few times a week**
- ☐ **Not at all**

6. My child usually eats “fast food”:

- ☐ **4 or more times a week**
- ☐ **2-3 times a week**
- ☐ **Once a week**
- ☐ **A few times a month**
- ☐ **Once a month or less**

7. I have difficulty buying food to feed my child because food is expensive:

- ☐ **Always**
- ☐ **Most of the time**
- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

8. My child has problems chewing, swallowing, gagging or choking when eating:

- ☐ **Always**
- ☐ **Most of the time**
- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

9. My child is **not** hungry at mealtimes **because** he/she drinks all day:

- ☐ **Always**
- ☐ **Most of the time**
- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

10. My child usually eats:

- 4 ☐ **Less than 2 times a day**
- 3 ☐ **2 times a day**
- 1 ☐ **3 to 4 times a day**
- 0 ☐ **5 times a day**
- 2 ☐ **More than 5 times a day**

11. I let my child decide how much to eat:

- 0 ☐ **Always**
- 1 ☐ **Most of the time**
- 2 ☐ **Sometimes**
- 3 ☐ **Rarely**
- 4 ☐ **Never**

12. My child eats meals while watching TV:

- 4 ☐ **Always**
- 3 ☐ **Most of the time**
- 2 ☐ **Sometimes**
- 1 ☐ **Rarely**
- 0 ☐ **Never**

13. My child usually takes supplements:

Examples are multivitamins, iron drops, cod liver oil.

- 4 ☐ **Always**
- 3 ☐ **Most of the time**
- 2 ☐ **Sometimes**
- 1 ☐ **Rarely**
- 0 ☐ **Never**

14. My child:

- 4 ☐ **Needs more physical activity**
- 0 ☐ **Gets enough physical activity**

15. My child usually watches TV, uses the computer, and plays video games:

- 4 ☐ **5 or more hours a day**
- 3 ☐ **4 hours a day**
- 2 ☐ **3 hours a day**
- 1 ☐ **2 hours a day**
- 0 ☐ **1 hour or less a day**

16. I am comfortable with how my child is growing:

- 0 ☐ **Yes**
- 4 ☐ **No**

17. My child:

- 4 ☐ Should weigh more
 0 ☐ Is about the right weight
 2 ☐ Should weigh less

Total Score (Maximum 68) =		
Score Total	Nutritional risk	Recommendations according to original NutriSTEP article (Simpson et al., 2008)
< 20	Low risk	Your child's eating and activity habits are good. There may be things that you want to work on; check out the educational material provided for tips and more information. (Simpson et al., 2008)
>20 and ≤25	Moderate risk	Your child's eating and activity habits can be improved by making some small changes. (Simpson et al., 2008)
≥25	High risk	Your child's eating and activity habits can be improved by making some changes. For suggestions, talk to a registered dietitian, your family doctor or paediatrician. (Simpson et al., 2008)

Adapted NZ NutriSTEP (with scoring)



Nutrition Education for Parents/Caregivers of Preschoolers

Nutrition Behavior Questionnaire for Parents of Preschoolers

Instructions

- Below are questions about your preschool child's (2-5-year-old) eating and other habits.
 - Please complete the questions yourself or with the help of others who take care of your child.
 - Tick (✓) only one answer for each question.
 - Think about your child's *usual* habits when answering each question.
 - The word “times” in the response section refers to at least a half standard serving of food offered at a single eating occasion”
-

1. My child usually eats bread, cereals and grain products:

Examples are bread, buns, breakfast cereals (i.e. Weetbix, porridge), pasta, rice, roti, wraps and crackers.

- ☐ More than 5 times a day
- ☐ 4-5 times a day
- ☐ 2-3 times a day
- ☐ Less than 2 times a day

2. My child usually has milk and dairy products:

Examples are cow's milk, flavoured milk (i.e. chocolate), cheese, yoghurt, custard, dairy foods and fortified soy milk.

(This excludes almond, rice and coconut milks and products).

- ☐ More than 3 times a day
- ☐ 3 times a day
- ☐ 2 times a day
- ☐ Once a day or less

3. My child usually eats fresh fruit:

- ☐ **More than 3 times a day**
- ☐ **3 times a day**
- ☐ **2 times a day**
- ☐ **Once a day**
- ☐ **Not at all**

4. My child usually eats vegetables:

- ☐ **More than 2 times a day**
- ☐ **2 times a day**
- ☐ **Once a day**
- ☐ **Not at all**

5. My child usually eats meat, fish, poultry or alternatives:

Alternatives can be eggs, peanut butter, tofu, nuts, or dried beans, peas and lentils.

- ☐ **More than 2 times a day**
- ☐ **2 times a day**
- ☐ **Once a day**
- ☐ **A few times a week**
- ☐ **Not at all**

6. My child usually eats “fast food”:

- ☐ **4 or more times a week**
- ☐ **2-3 times a week**
- ☐ **Once a week**
- ☐ **A few times a month**
- ☐ **Once a month or less**

7. I have difficulty buying food to feed my child because food is expensive:

- ☐ **Always**
- ☐ **Most of the time**
- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

8. My child has problems chewing, swallowing, gagging or choking when eating:

- ☐ **Always**
- ☐ **Most of the time**
- ☐ **Sometimes**
- ☐ **Rarely**
- ☐ **Never**

9. My child is **not** hungry at mealtimes **because** he/she drinks all day:

- ☐ **Always**

- 3☐ **Most of the time**
- 2☐ **Sometimes**
- 1☐ **Rarely**
- 0☐ **Never**

10. My child usually eats:

- 4☐ **Less than 2 times a day**
- 3☐ **2 times a day**
- 1☐ **3 to 4 times a day**
- 0☐ **5 times a day**
- 2☐ **More than 5 times a day**

11. I let my child decide how much to eat:

- 0☐ **Always**
- 1☐ **Most of the time**
- 2☐ **Sometimes**
- 3☐ **Rarely**
- 4☐ **Never**

12. My child eats meals while watching TV or other digital devices:

- 4☐ **Always**
- 3☐ **Most of the time**
- 2☐ **Sometimes**
- 1☐ **Rarely**
- 0☐ **Never**

13. My child usually takes supplements:

Examples are multivitamins, iron drops, fish oil.

- 4☐ **Always**
- 3☐ **Most of the time**
- 2☐ **Sometimes**
- 1☐ **Rarely**
- 0☐ **Never**

14. My child:

- 4☐ **Needs more physical activity**
- 0☐ **Gets enough physical activity**

15. My child usually watches TV, uses the computer/other devices, and plays video games:

- 4☐ **5 or more hours a day**
- 3☐ **4 hours a day**
- 2☐ **3 hours a day**
- 1☐ **2 hours a day**
- 0☐ **1 hour or less a day**

16. I am comfortable with how my child is growing:

☐ Yes

☐ No

17. My child:

☐ Should weigh more

☐ Is about the right weight

☐ Should weigh less

Total Score (Maximum 68) =		
Score Total	Nutritional risk	Recommendations according to original NutriSTEP article (Simpson et al., 2008)
< 20	Low risk	Your child's eating and activity habits are good. There may be things that you want to work on; check out the educational material provided for tips and more information. (Simpson et al., 2008)
>20 and ≤25	Moderate risk	Your child's eating and activity habits can be improved by making some small changes. (Simpson et al., 2008)
≥25	High risk	Your child's eating and activity habits can be improved by making some changes. For suggestions, talk to a registered dietitian, your family doctor or paediatrician. (Simpson et al., 2008)