

“Improving Population Wide Implementation of a Healthy Food Policy in Primary Schools”

Kathryn Louise Reilly BHSc (Nut & Diet)
(University of Newcastle)

A thesis submitted in fulfilment of the requirements for the
degree of Doctor of Philosophy in Behavioural Science

June 2018

This research was supported by an Australian Government
Research Training Program (RTP) Scholarship

STATEMENT OF ORIGINALITY

I hereby certify that the work embodied in the thesis is my own work, conducted under normal supervision.

The thesis contains published scholarly work of which I am a co-author. For each such work a written statement, endorsed by the other authors, attesting to my contribution to the joint work has been included.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University's Digital Repository, subject to the provisions of the Copyright Act 1968. I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

THESIS BY PUBLICATION

I hereby certify this thesis is submitted in the form of a series of published papers of which I am a joint author. I have included as part of the thesis a written statement from each co-author; endorsed by the Faculty Assistant Dean (Research Training), attesting to my contribution to the joint publications. The University of Newcastle Thesis by Publication Guidelines are included in Appendix 1.1

Signed:

Name: Kathryn Louise Reilly

Date: 1st June, 2018

COPYRIGHT PERMISSION

I warrant that I have obtained, where necessary, permission from the copyright owners to use any of my own published work, (ie. journal publications) in which the copyright is held by another party.

SUPERVISORS

Associate Professor Luke Wolfenden
Hunter New England Population Health
School of Health and Medicine
Faculty of Medicine and Public Health
University of Newcastle, Australia

Professor John Wiggers
Hunter New England Population Health
School of Health and Medicine
Faculty of Medicine and Public Health
University of Newcastle, Australia

Dr Serene Yoong
Hunter New England Population Health
School of Health and Medicine
Faculty of Medicine and Public Health
University of Newcastle, Australia

Dr Nicole Nathan
Hunter New England Population Health
School of Health and Medicine
Faculty of Medicine and Public Health
University of Newcastle, Australia

ACKNOWLEDGEMENTS

There are a number of people whom I am extremely grateful for guiding and supporting me through this PhD journey.

Firstly, my supervisors; Dr Nicole Nathan, Dr Serene Yoong, Professor John Wiggers and Associate Professor Luke Wolfenden. All of you have been an amazing source of knowledge, expertise and experience. I have thoroughly enjoyed working closely with you and the mentorship you have provided has been invaluable. Nicole, you have been a great support since I commenced working at Population Health and you have always believed in me and encouraged me to strive to achieve more. If it wasn't for you Nicole I probably would never have embarked on this journey, you have always been my go-to-person and for that a huge thank you for always being there. Serene, thank you for your amazing knowledge and expertise and for continuing as a supervisor even when you had your own growing family commitments along the way. John, you have been a great mentor and supporter throughout my candidature. I have enjoyed being able to work closely with you and learning from your invaluable experience and knowledge. I always looked forward to my supervisors meetings and getting to hear your input. Luke, I could not have asked for a better primary supervisor. You have guided and supported me from day one and have always had your door open. I feel very fortunate to have shared in your passion for research and public health and look forward to working with you in the future. I am extremely grateful to you all for making this experience not only one in which I learned a great deal, but a challenge that I have thoroughly enjoyed both on a personal and professional level.

Secondly, to the team of people who have helped me and my project along the way. To the project team; Katie Robertson, Renee Reynolds, Melanie Sharp and Christophe Lecathelinais, for your dedication, expertise and enthusiasm. It has been a great pleasure working with you all, you consistently stepped up when needed and your passion and hard work ensured '*healthy food@school*' was a success! I would also like to acknowledge my PhD colleagues at Population Health; Tessa, Tameka and Kirsty, you have been a great source of inspiration, support and friendship. Sharing this journey with you all has made it much more achievable, enjoyable and fun! Many thanks also to Karen Gillham, Director Health Promotion, for supporting me to take on this PhD and providing all the necessary infrastructure and resources.

To my family; Mum and Dad, thank you for supporting and encouraging me throughout this journey. You are always there to help out when needed and nothing is ever too much to ask. To Richard, you have not been here for the whole journey however the support and encouragement I have felt from you to get across the finish line has been amazing. Thank you for being so thoughtful and considerate, your attitude towards life is truly an inspiration and I love you deeply.

Lastly, to my three gorgeous children, Flynn, Marli and Hugo, thank you for your continued patience and understanding when I have not always been able to do things with you, take you somewhere or watch you play something. The biggest challenge for me during this candidature has been juggling my time with you guys. I have felt copious amounts of guilt over not spending enough time with you, or missing out on doing the little things with you. I hope one day you can fully appreciate what it took for me to achieve this and that it serves as some inspiration for all of you to achieve whatever it is you want in life. I love you dearly and can't wait to spend more time with you.

CONFLICT OF INTEREST STATEMENT

Kathryn Reilly reports no conflict of interest.

LIST OF PUBLICATIONS FROM THESIS CHAPTERS

This thesis is presented as a series of five papers. At the time of submission, all five of these papers were either published or under editorial review in peer reviewed journals.

Table 1.1: Outline of Thesis Chapters and associated publications.

CHAPTER	CHAPTER TITLE	RESEARCH PAPERS
Two	Effectiveness of a multi-component intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial.	Nathan N, Yoong SL, Sutherland R, Reilly K , Delaney T, Janssen L, Robertson K, Reynolds R, Chai LK, Lecathelinais, Wiggers J, Wolfenden L. Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i> . 2016;13(1):106.
Three	Economic analysis of three interventions of different implementation intensity of healthy school canteen policies in Australia: costs and incremental cost effectiveness.	Reilly K , Reeves P, Deeming S, Yoong S, Wolfenden L, Nathan N, Wiggers J. Economic analysis of three interventions of different implementation intensity of healthy school canteen policies in Australia: costs and incremental cost effectiveness. <i>BMC Public Health</i> . 2018 Dec;18(1):378.
Four	Validity of four different measures to assess compliance of school canteen menus with a State-based healthy canteen policy.	Reilly K , Nathan N, Wolfenden L, Wiggers J, Sutherland R, Wyse R, Yoong S. Validity of four different measures to assess compliance of school canteen menus with a State-based healthy canteen policy. <i>Health Promotion Journal of Australia</i> . 2017 Jan 11;27(3):215-21.
Five	Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy (healthyfood@school).	Reilly K , Nathan N, Wiggers J, Yoong S, Wolfenden L. Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy. <i>BMC Public Health</i> . 2018 .Dec;18(1):860.
Six	Assessing the potential impact of a front-of-pack nutritional rating system on food availability in school canteens: A randomised controlled trial.	Reilly K , Nathan N, Wu J, Delaney T, Wyse R, Cobcroft M, Wiggers J, Sutherland R, Buffet K, Yoong S, Wolfenden L. Assessing the potential impact of a front-of-pack nutritional rating system on food availability in school canteens: A randomised controlled trial. <i>Appetite</i> . 2018 Feb 1;121:309-15.

CO-AUTHOR STATEMENTS FOR CHAPTER 2

I attest that Research Higher Degree candidate **Kathryn Reilly** contributed to the paper/publication entitled:

Effectiveness of a multi-component intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial.

By:

- Contributing to the research question
- Contributing to the research design
- Development of measures to be used
- Developing and delivering intervention delivery
- Carrying out data collection
- Assisting in the analysis and interpretation of the data
- Assisting in the writing of the manuscript

FULL NAME OF CO-AUTHOR	SIGNATURE OF CO-AUTHOR	DATE
Nicole Nathan		17 th April 2018
Sze Lin Yoong		10 th May 2018
Rachel Sutherland		26 th April 2018
Tessa Delaney		13 th April 2018
Lisa Janssen		13 th April 2018
Katie Robertson		12 th April 2018
Renee Reynolds		13 th April 2018
Li Kheng Chai		12 th April 2018

Christophe Lecathelinais

12th April 2018

John Wiggers

17th April 2018

Luke Wolfenden

16th April 2018

Signature of Assistant Dean (Research Training (ADRT))

Full Name of ADRT: Robert Callister

Date: 15/05/18

CO-AUTHOR STATEMENTS FOR CHAPTER 3

I attest that Research Higher Degree candidate **Kathryn Reilly** contributed to the paper/publication entitled:

Economic analysis of three interventions of different intensity in improving school implementation of a government healthy canteen policy in Australia: costs, incremental and relative cost effectiveness.

By:

- Developing the research question
- Assisting the research design
- Development of measures to be used
- Assisting in development of measures to be used
- Overseeing data collection
- Assisting in interpretation of the data
- Leading the writing of the manuscript

FULL NAME OF CO-AUTHOR	SIGNATURE OF CO-AUTHOR	DATE
Penny Reeves		12 th April 2018
Simon Deeming		2 nd May 2018
Serene Yoong		10 th May 2018
Nicole Nathan		13 th April 2018
Luke Wolfenden		16 th April 2018
John Wiggers		17 th April 2018

Signature of Assistant Dean (Research Training (ADRT))
Full Name of ADRT: Robert Callister
Date: 15/05/18

CO-AUTHOR STATEMENTS FOR CHAPTER 4

I attest that Research Higher Degree candidate **Kathryn Reilly** contributed to the paper/publication entitled:

Validity of four different measures to assess compliance of school canteen menus with a State-based healthy canteen policy.

By:

- Developing the research question
- Determining the research design
- Development of measures to be used
- Overseeing data collection
- Assisting in the analysis and interpretation of the data
- Leading the writing of the manuscript

FULL NAME OF CO-AUTHOR	SIGNATURE OF CO-AUTHOR	DATE
Nicole Nathan		17 th April 2018
Luke Wolfenden		16 th April 2018
John Wiggers		17 th April 2018
Rachel Sutherland		26 th April 2018
Rebecca Wyse		16 th April 2018
Sze Lin Yoong		10 th May 2018

Signature of Assistant Dean (Research Training (ADRT))
Full Name of ADRT: Robert Callister
Date: 15/05/18

CO-AUTHOR STATEMENTS FOR CHAPTER 5

I attest that Research Higher Degree candidate **Kathryn Reilly** contributed to the paper/publication entitled:

Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy.

By:

- Developing the research question
- Determining the research design
- Development of measures to be used
- Developing, delivering and overseeing intervention delivery
- Overseeing data collection
- Assisting in the analysis and interpretation of the data
- Leading the writing of the manuscript

FULL NAME OF CO-AUTHOR	SIGNATURE OF CO-AUTHOR	DATE
Nicole Nathan		17 th April 2018
John Wiggers		17 th April 2018
Sze Lin Yoong		10 th May 2018
Luke Wolfenden		16 th April 2018

Signature of Assistant Dean (Research Training (ADRT))
Full Name of ADRT: Robert Callister
Date: 15/05/18

CO-AUTHOR STATEMENTS FOR CHAPTER 6

I attest that Research Higher Degree candidate **Kathryn Reilly** contributed to the paper/publication entitled:

Assessing the potential impact of a front-of-pack nutritional rating system on food availability in school canteens: A randomised controlled trial.

By:

- Developing the research question
- Determining the research design
- Development of measures to be used
- Developing, delivering and overseeing intervention delivery
- Overseeing data collection
- Assisting in the analysis and interpretation of the data
- Leading the writing of the manuscript

FULL NAME OF CO-AUTHOR	SIGNATURE OF CO-AUTHOR	DATE
Nicole Nathan		17 th April 2018
Jason Wu		12 th April 2018
Tessa Delaney		12 th April 2018
Rebecca Wyse		16 th April 2018
Megan Cobcroft		14 th April 2018
John Wiggers		17 th April 2018
Rachel Sutherland		26 th April 2018

Kym Buffet

2nd May 2018

Sze Lin Yoong

10th May 2018

Luke Wolfenden

16th April 2018

Signature of Assistant Dean (Research Training (ADRT))
Full Name of ADRT: Robert Callister
Date: 15/05/18

ADDITIONAL PUBLICATIONS, PRESENTATIONS AND AWARDS ASSOCIATED WITH THE THESIS

PUBLICATIONS

Reilly K, Nathan N, Grady A, Wu JHY, Wiggers J, Yoong S, Wolfenden L. Barriers to implementation of a healthy canteen policy: A survey using the theoretical domains framework. *Health Promotion Journal of Australia*. 2018 Nov. DOI: 10.1002/hpja.218

Lee H, Hall A, Nathan N, **Reilly KL**, Seward K, Williams CM, et al. Mechanisms of Implementing public health interventions: a pooled causal mediation analysis of randomised trials. *Implementation Science*. 2018;13(1):42.

Wolfenden L, Nathan N, Janssen LM, Wiggers J, **Reilly K**, Delaney T, et al. Multi-strategic intervention to enhance implementation of healthy canteen policy: a randomised controlled trial. *Implement Science*. 2017 Dec;12(1):6.

Yoong SL, Nathan N, Wolfenden L, Wiggers J, **Reilly K**, Oldmeadow C, et al. CAFÉ: a multicomponent audit and feedback intervention to improve implementation of healthy food policy in primary school canteens: a randomised controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*. 2016 Dec;13(1):126.

Williams CM, Nathan N, Yoong SL, Delaney T, Wiggers J, Preece S, Lubans N, Sutherland R, Pinfold JA, Smith K, Small T, **Reilly K**, Wyse R, Wolfenden L. CAFE - a multi-component audit and feedback intervention to improve implementation of healthy food policy in primary school canteens: design of a randomised controlled trial. *BMJ Open* 5(6): e006969 (June 2015)

Wolfenden L, Nathan N, Williams CM, Delaney T, **Reilly K**, Freund M, Gillham K, Sutherland R, Bell AC, Campbell E, Yoong SL, Wyse R, Janssen L, Preece S, Asmar M, Wiggers J. A randomised controlled trial of an intervention to increase the implementation of a healthy canteen policy in Australian primary schools: study protocol. *Implementation Science*. 2014, 9:147 doi:10.1186/s13012-014-0147-3

PRESENTATIONS

International Society of Behavioral Nutrition and Physical Activity 2018 Annual Meeting June 2018 Hong Kong.

Accepted Oral Presentation: Assessing the potential impact of a front-of-pack nutritional rating system on food availability in school canteens: A randomised controlled trial.

International Society of Behavioral Nutrition and Physical Activity 2018 Annual Meeting June 2018 Hong Kong.

Accepted Oral Presentation: Validity of various measures to assess compliance of school canteen menus.

2017 Annual Hunter Cancer Research Symposium Nov 2017, Newcastle, NSW.

Accepted Oral Presentation: Scale up of a multi-strategic intervention to increase implementation of a mandatory state-based healthy canteen policy.

NSW Rural Health & Research Congress Sept 2017 Wagga Wagga, NSW.

Accepted Oral Presentation: Scale up of a multi-strategic intervention to increase implementation of a mandatory state-based healthy canteen policy across both urban and rural schools.

International Society of Behavioral Nutrition and Physical Activity 2017 Annual Meeting June 2017 Victoria, Canada.

Accepted Oral Presentation: Comparative cost-effectiveness of interventions to improve school implementation of a healthy canteen policy.

International Society of Behavioral Nutrition and Physical Activity 2017 Annual Meeting June 2017 Victoria, Canada.

Accepted Poster presentation: Scale up of a multi-strategic intervention to increase implementation of a mandatory state-based healthy canteen policy.

World Congress on Public Health 3-7 April 2017 Melbourne, Australia.

Oral Presentation: Comparative Cost-effectiveness of Interventions to Improve School Canteen Implementation of a Healthy Canteen Policy.

3rd Biennial Australasian Implementation Conference 2016 Melbourne, Australia.

Oral Presentation: Validity of four different measures to assess compliance of school canteen menus with a State-based healthy canteen policy.

AWARDS

- 1 2018 Jennie Thomas Research Travel Grant \$9300.00
- 2 2017 HNE High Value Health Care Awards (Prevention) – ‘*healthy food@school*’ program
- 3 Finalist 2017 NSW Health Awards – ‘Keeping people healthy’ category.
- 4 Finalist 2017 NSW Premier’s Awards – ‘Tackling Childhood Obesity’.
- 5 Hunter Cancer Research Alliance 2018 Implementation Science HDR Student Award \$5000.00
- 6 Priority Research Centre for Health Behaviour. 2017 Project Grant \$4930.00

TABLE OF CONTENTS

Statement of originality	ii
Thesis by Publication	iii
Copyright Permission	iv
Supervisors	iv
Acknowledgements	v
Conflict of Interest	vii
List of Publications from Thesis Chapters	viii
Co-author Statements	ix
Additional Publications, Presentations and Awards associated with the Thesis	xvi
Table of Contents	xix
List of Tables	xxvi
List of Figures	xxviii
List of Appendices	xxix
Abstract	xxxii
Contribution	xxxiv
Statement	

CHAPTER 1: THESIS INTRODUCTION

Chapter Overview	1
Burden of disease: overweight and obesity	2
Prevalence of overweight and obesity	3
Poor diet is a key driver of excessive weight gain in children	4
Overview of dietary guidelines for good health in children	5
Children do not meet recommendations from dietary guidelines	7
School-based interventions are effective in improving child diet	9
School healthy eating policies are a recommended childhood obesity prevention strategy	35

Schools often do not implement evidence based nutrition policies	36
Barriers to school implementation of evidence based healthy canteen policies	37
Effectiveness of strategies to increase school's implementation of a healthy canteen policy	38
Implementation of healthy canteen interventions at scale	44
Theories and frameworks to help guide program design for implementation scale	49
Conclusions and Aims	52
Chapter 2: Effectiveness of a multi-component intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial	52
Chapter 3: Economic analysis of three interventions of different intensity in improving school implementation of a Government healthy canteen policy in Australia: cost, incremental and relative cost effectiveness	53
Chapter 4: Validity of four different measures in assessing school canteen menu compliance with a state-based healthy canteen policy	53
Chapter 5: Scale-up of a multi-strategic intervention to increase implementation of a school healthy canteen policy: findings of an intervention trial	53
Chapter 6: Assessing the potential impact of a front-of-pack nutritional rating system on food availability in school canteens: a randomised controlled trial	54
Chapter 7: A summary of findings, future directions and policy, practice and research	54
Thesis Structure	54
References	57
CHAPTER 2: EFFECTIVENESS OF A MULTI-COMPONENT INTERVENTION TO ENHANCE IMPLEMENTATION OF A HEALTHY CANTEEN POLICY IN AUSTRALIAN PRIMARY SCHOOLS: A RANDOMISED CONTROLLED TRIAL	63
Abstract	64
Background	66
Methods	67

	Design and setting	67
	Participants	68
	Randomisation, recruitment and allocation	70
	Multi-component implementation intervention	70
	Data collection and measures	72
	Sample size and power	73
	Analyses	74
Results		74
	Primary trial outcomes	77
	Delivery of the multi-strategy intervention	77
Discussion		79
Conclusion		81
References		82
CHAPTER 3: ECONOMIC ANALYSIS OF THREE INTERVENTIONS OF DIFFERENT INTENSITY IN IMPROVING SCHOOL IMPLEMENTATION OF A GOVERNMENT HEALTHY CANTEEN POLICY IN AUSTRALIA: COST, INCREMENTAL AND RELATIVE COST EFFECTIVENESS		85
Abstract		86
Background		87
Methods		89
	Study design	89
	Context	89
	Trial design and setting	90
	Participants and recruitment	90
	Implementation interventions and outcomes	90
	Trial outcome data collection procedures and measures	95
	Cost data collection procedures and measures	96
	Analyses	97
Results		98
	Trial effectiveness	98
	Within-trial cost and cost effectiveness	100
	Sensitivity analysis	101
	Relative cost effectiveness of interventions	101
Discussion		102

Conclusion	104
References	105
CHAPTER 4: VALIDITY OF FOUR DIFFERENT MEASURES IN ASSESSING SCHOOL CANTEEN MENU COMPLIANCE WITH A STATE-BASED HEALTHY CANTEEN POLICY	107
Abstract	108
Introduction	109
Methods	112
Design and setting	112
Participants	112
Data collection procedures	112
Measures	113
School characteristics	113
Canteen compliance with healthy canteen policy	113
Menu audits	113
Analysis	116
Results	117
Discussion	122
Conclusion	123
References	124
CHAPTER 5: SCALE UP OF A MULTI-STRATEGIC INTERVENTION TO INCREASE IMPLEMENTATION OF A SCHOOL HEALTHY CANTEEN POLICY: FINDINGS OF AN INTERVENTION TRIAL	127
Abstract	128
Introduction	130
Measures	132
Design and setting	132
Sample	133
Recruitment	133
Multi-component implementation intervention	133
Data collection and measures	135
Outcomes	136
Analyses	138

Results	139
Participants and characteristics	139
Primary trial outcome	141
Secondary outcomes	142
Process evaluation	144
Exposure to other nutrition interventions	145
Discussion	145
Conclusion	147
References	148
 CHAPTER 6: ASSESSING THE POTENTIAL IMPACT OF A FRONT-OF-PACK NUTRITIONAL RATING SYSTEM ON FOOD AVAILABILITY IN SCHOOL CANTEENS: A RANDOMISED CONTROLLED TRIAL	 152
Abstract	153
Background	154
Methods	155
Context	155
Design and setting	156
Sample and recruitment	156
Randomisation	156
Intervention	157
Data collection and measures	158
Analyses	159
Results	160
School and canteen characteristics	160
Primary outcome	162
Awareness of and attitudes toward using the nutritional rating system in decisions regarding canteen food availability	162
Perceived barriers to use of the Health Star Rating System in canteens	164
Discussion	164
Conclusion	167
References	168

CHAPTER 7: A SUMMARY OF THE FINDINGS AND FUTURE DIRECTIONS FOR POLICY, PRACTICE AND RESEARCH	171
A summary of findings and future directions for policy, practice and research	171
Thesis findings	173
Chapter 1: Thesis Introduction	173
Chapter 2: Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomized controlled trial	174
Chapter 3: Economic analysis of three interventions of different implementation intensity of healthy school canteen policies in Australia: costs and incremental cost effectiveness	176
Chapter 4: Validity of four different measures to assess compliance of school canteen menus with a State-based healthy canteen policy	177
Chapter 5: Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy: healthy food@school	178
Chapter 6: Assessing the potential impact of a front-of- pack nutritional rating system on food availability in school canteens: A randomised controlled trial	179
Significance	181
Strengths	182
Limitations and opportunities for future research	183
i) Identification of specific strategies that increase implementation of healthy food availability policies	183
a) Mediation Analysis	184
b) Trial designs: Factorial Designs	186
ii) Cost-effectiveness of implementation support strategies delivered at scale: including opportunity costs	187
iii) Identification of specific strategies that sustain implementation of healthy food availability policies	188
Implications for policy and practice	192
Recommendations	193
Conclusions	195
References	196

LIST OF TABLES

Table 1.1: Outline of Thesis Chapters and associated publications	viii
Table 1.2: Australian recommended serves of vegetables and legumes/beans per day	6
Table 1.3: Australian recommended serves of fruit per day	6
Table 1.4: Systematic Review evidence of the effectiveness of school healthy eating policies and practices	10
Table 1.5: School based strategies to improve implementation of food availability policies	40
Table 1.6: Evidence of interventions at scale (>50 schools) in the school setting targeting healthy eating	45
Table 1.7: Thesis Chapters	55
Table 2.1: Classification and examples of Red, Amber and Green items based on “Fresh Tastes @ School”	69
Table 2.2: The occasional food criteria for determining if a food is red	69
Table 2.3: Baseline characteristics of participating schools by group	77
Table 2.4: Summary of strategies and costs for the three trials	78
Table 2.5: Extent of delivery of multi-strategy intervention	79
Table 3.1: Summary of strategies and costs for the three trials	91
Table 3.2: Intention to treat analysis of the three trials primary outcomes (composite): overall compliance	99
Table 4.1: Descriptive statistics of study sample	118
Table 4.2: Percentage agreement, sensitivity, specificity, positive predictive values, negative predictive values, kappa in canteen menu compliance based on FT@S guidelines	119
Table 4.3: Direct cost per measure of compliance per school	121
Table 5.1: Baseline characteristics of eligible schools	140
Table 5.2: Primary outcome: implementation	141
Table 5.3: Secondary outcomes: reach and adoption	143
Table 5.4: Secondary outcomes: maintenance	144
Table 5.5: Number of schools receiving implementation strategies	145
Table 6.1: Baseline characteristics of participating schools	161
Table 6.2: Availability of food and beverage products	163
Table 6.3: Canteen managers who had heard of the Health Star Rating: Awareness of and attitudes toward using the Health Star Rating system in decisions regarding canteen food availability	164

LIST OF FIGURES

Figure 1.1	4
Figure 2.1: CONSORT flow chart describing progress of participants through the study	76
Figure 3.1: Incremental cost effectiveness ratios for the three trials	100
Figure 3.2: Sensitivity analysis for high intensity and medium intensity interventions	101
Figure 3.3: Indirect comparison between high intensity intervention and medium intensity intervention	102
Figure 6.1: CONSORT flow chart describing progress of participants through the study	160

LIST OF APPENDICES

1.1 Thesis by Publication information Sheet	iii
2.1 Ethics Variation Approval	68
2.2 Trial Registration	68
2.3 Fresh Tastes@School Canteen Manu Planning Guide	68
2.4 Theoretical Domains and Constructs	70
2.5 Sample Canteen Manager Training – Registration Flyer	71
2.6 Sample Canteen Manager Training – Registration Letter	71
2.7 Canteen Manager Training Agenda	71
2.8 Canteen Manager Training Presentation	71
2.9 Sample Canteen Manager Training Evaluation Form	71
2.10 Action Plan Template	71
2.11 Canteen Manager Training Resource List	71
2.12 Sample Canteen Menu	71
2.13 Sample Canteen Recipe Card	71
2.14 SMS Text Communication Support Schedule	71
2.15 Menu Feedback Template	72
2.16 Sample Recognition Letter	72
2.17 Menu Assessment Tool	73
2.18 Canteen Observational Tool	73
2.19 Example of Intervention Project Records	73
3.1 Sample LLW@S Action Plan	89
3.2 Fresh Tastes@School Canteen Manu Planning Guide	89
3.3 Wolfenden et al Implementation Science 2017	95
3.4 Yoong et al International Journal of behavioral Nutrition and Physical Activity 2016	95
3.5 Menu Assessment Protocol	95
3.6 Example Project Records of Intervention Costs	96
4.1 Sample Fresh Tastes@School Ready Reckoner	110
4.2 Occasional Food Criteria Table	110

4.3 Principal Information Letter	112
4.4 Canteen Manager Information Statement	112
4.5 Principal Survey	113
4.6 Canteen Manager Survey	113
4.7 Comprehensive Menu Assessment Protocol	113
4.8 Standard Additional Information Template	114
4.9 Quick Menu Audit Assumptions Guide	114
4.10 Sample Colour Coded Menu	116
5.1 Ethics Variation Approval 05112015	132
5.2 Ethics Variation Approval 08022016	132
5.3 Ethics Variation Approval 22022016	132
5.4 Principal Information Statement	133
5.5 Canteen Manager Information Statement	133
5.6 Sample Online Canteen Product Database	134
5.7 Sample canteen Manager Training – Registration Flyer	134
5.8 Sample Canteen Manager Training – Registration Letter	134
5.9 Action Plan Template	134
5.10 Training Workshop Agenda	134
5.11 Canteen Manager Training Presentation – Fresh Tastes@School	134
5.12 Canteen Manager Training Presentation – Making a healthy profit	134
5.13 Training Workshop Resource Contents Page	135
5.14 Sample Canteen Recipe Card	135
5.15 Sample Canteen Menu	135
5.16 Resource Common canteen Drinks	135
5.17 Small Schools Resource	135
5.18 Sample Recognition Letter	135
5.19 Sample Menu Feedback Report	135
5.20 Principal Baseline Survey	135
5.21 Principal Follow-up CATI Script	135
5.22 Canteen Manager Baseline Survey	135
5.23 Canteen Manager Follow-up CATI Script	135

5.24 RE-AIM Framework	136
5.25 Menu Assessment Protocol	136
5.26 Example of Intervention Project Records	138
5.27 Sample Training Workshop Evaluation Form	138
6.1 Ethics Variation Approval	155
6.2 Principal baseline Survey	156
6.3 Canteen Manager Baseline Survey	156
6.4 Sample Foodswitch Online Database	158
7.1 Hopin et al Implementation Science 2018	185

ABSTRACT

BACKGROUND AND AIMS

Nutrition risk factors are the leading cause of the global disease burden. To reduce this burden, the World Health Organization recommends the population-wide implementation of policies to improve the relative availability of healthy foods at schools. To ensure the potential benefits of school healthy eating policies are realised, identification of strategies that are effective in improving implementation of healthy school canteen or nutrition policies is required. While a number of relevant theories and frameworks exist to guide efforts to implement effective interventions at scale, at present, the evidence base regarding the impact of strategies to increase school implementation of healthy eating policies is limited. This thesis sought to address a number of evidence gaps to better guide efforts to improve the implementation of school nutrition policies. Specifically it aimed to:

- Assess the effectiveness of a theoretically designed multi-strategy intervention in increasing the implementation of a healthy canteen policy in Australian primary schools.
- Evaluate the most effective and cost-effective means of implementing a healthy school canteen policy through pooling data from three random controlled trials (RCTs) of implementation interventions.
- Describe the validity of four methods of assessing school menu compliance with canteen policies and report the direct cost and time to administer each. Such information is required to support rigorous research in the field and facilitate implementation monitoring.
- Assess the effectiveness of an intervention to support implementation, at scale, of a healthy canteen policy in Australian primary schools.
- Assess the potential impact of front-of-pack labelling on canteen manager's intentions regarding products they would make available for sale in their canteen.

- Provide recommendations for future research and practice regarding increasing the implementation of healthy canteen policies in primary schools.

RESULTS

A small randomised control trial with 53 schools found that a multi-strategic intervention involving training, performance monitoring and feedback, telephone and text messaging support can improve schools' implementation of a healthy school canteen policy (intervention vs comparison: RR 4.29; 95% CI 1.04-17.68, $p=0.02$). An economic evaluation of three RCTs of different implementation interventions of various intensity levels, identified that both 'medium' and 'high' intensity interventions were potentially more cost-effective in supporting schools to improve implementation of a healthy canteen policy than a 'low' intensity approach. The thesis demonstrated that a quick menu audit represents an inexpensive pragmatic and valid method to assess healthy canteen policy implementation on a large scale. Using this quick menu audit approach the thesis found that the effectiveness of a multi-strategic implementation intervention can be maintained when delivered at scale across an entire region covering over 150 schools (baseline vs follow-up: OR 2.7; 95% CI 1.6-4.7, $p<0.001$). Finally, through an additional RCT, the thesis found that the inclusion of product nutritional rating information has the potential to improve the availability of 'healthier' items on canteen menus and contribute to improving implementation of a healthy canteen policy.

CONCLUSION

This thesis provides a comprehensive suite of implementation-focused research on improving implementation of a state based healthy canteen policy with the aim of reducing childhood obesity. Furthermore, it provides a framework of implementation strategies proven to improve policy implementation at a population level.

CONTRIBUTION STATEMENT

I was the sole PhD student on this study and was intricately involved in all aspects of the study conceptualization, design, development, implementation, and evaluation. I was the contact person for schools, principals and canteen managers throughout the study and was responsible for managing all enquiries. A summary of the various contributions I made to the studies reported in this thesis is provided below.

PROGRAM DESIGN AND DEVELOPMENT

I took a lead role in program design and development and was responsible for a team of staff involved in the implementation of the '*healthy food@school*' trial. With guidance from my supervisors, I led the development of the '*healthy food@school*' trial. This required the creation of a range of program components and resources. The trial included: the development and delivery of canteen manager training workshops, development of tools and resources for canteen managers, development of SMS text messaging schedule, development and maintenance of an online canteen product database, development of a menu feedback report, and a suite of resources designed to monitor the implementation of the trial.

ETHICS APPROVAL AND CLINICAL TRIAL REGISTRY

I was responsible for correspondence with the Hunter New England Local Health District Human Research Ethics Committee (06/07/26/4.04), the University of Newcastle's Human Research Ethics Committee (H-2008-0343), the NSW Department of Education State Education Research Applications Process (SERAP) and the relevant Catholic School Offices' Ethics Committees, including drafting applications and addressing feedback from committees. I was responsible for completing all ethics forms, designing the program recruitment material and developing the information statements.

STUDY MEASURES

In consultation with my supervisors, I selected the menu and survey assessments for this study. I developed and validated the quick menu audit tool and developed the canteen manager and principal survey items.

DATA COLLECTION, ENTRY, AND MANAGEMENT

I was responsible for planning and coordinating the data collection procedure for menu audits and the canteen manager and principal Computer Assisted Telephone Interviews (CATI). This involved developing the training protocols and training a team of Dietitians at three time points to collect canteen menus, conduct menu audits and generate feedback reports. I managed two dietitians and a project officer assisting with aspects of the data management. I also trained CATI staff and coordinated the canteen manager and principal CATIs over two time points. Data collection was undertaken over an 18-month period on three separate occasions.

PROGRAM IMPLEMENTATION

With support from my supervisors and the project team, I oversaw the implementation of the '*healthy food@school*' intervention. I was responsible for managing the intervention delivery.

DATA CLEANING AND ANALYSIS

In correspondence with my supervisors, the methods of statistical analysis were decided upon and I led the data analysis process. I was also responsible for interpreting the results and presenting the data in either text, table or figure formats.

PRESENTATION OF STUDY RESULTS

During my candidature, the results of the research have been presented at four international and three national conferences. In 2017, the '*healthy food @school*' program was awarded the 2017 Hunter New England High Value Health Care Awards (Prevention), was a finalist in the 2017 NSW Health Awards – 'Keeping People Healthy' category and a finalist in the 2017 NSW Premier's Awards – 'Tackling Childhood Obesity'.

CHAPTER 1

Thesis Introduction

CHAPTER OVERVIEW

This introductory Chapter provides an overview of the important role school healthy eating policies and practices play in addressing childhood overweight and obesity. The Chapter begins by outlining the burden of disease attributed to overweight and obesity for all ages, including children, along with prevalence rates both internationally and in Australia. The role of diet in childhood overweight and obesity is discussed as are dietary guidelines recommended to prevent excessive weight gain in childhood and the rationale for school-based interventions to improve child diet. The Chapter concludes by examining the barriers to implementing school-based healthy eating policies at scale and presents the overarching aim of the thesis and the specific objectives of studies included within.

1 Burden of disease: Overweight and obesity

Overweight and obesity are leading causes of chronic diseases such as cardiovascular disease and diabetes,¹⁻³ and increases the risk of cancers of the esophagus, colon (in men), pancreas, breast (postmenopausal women), endometrium, and kidney.⁴ The 2013 Global Burden of Disease study reports that high body-mass accounts for 3.4 million deaths and 3.8% (>93million) of global disability-adjusted life years (DALYs) annually.⁵ The Australian Burden of Disease Study (2011) found 5.5% of the total burden of disease was attributed to high body-mass.⁶ High body-mass also contributed to a range of disease groups, including 49% of the burden for endocrine disorders, 28% for kidney and urinary diseases, 21% for cardiovascular diseases and 4.5% for cancers.⁶

The economic costs to individuals and society from obesity are also considerable.⁷ A recent systematic review of the economic impact of obesity from selected high-income countries including the United States (U.S.), Canada, Australia, Switzerland and France, estimated that obesity accounted for between 0.7% and 2.8% of a country's total healthcare expenditures.⁸ Such estimates are expected to be conservative as they exclude indirect costs such as productivity loss, and psychological, social and intangible costs associated with the decreased quality of life associated with obesity.⁸ An economic analysis by the research organization, the McKinsey Global Institute, estimated the global economic impact of obesity to be upwards of 2 trillion U.S. dollars per annum.⁹

2 Prevalence of overweight and obesity

Globally the prevalence of obesity has nearly doubled between 1980 and 2014.¹⁰ In 2014, 38% of men and 40% of women were overweight, an increase from 29% of men and 30% of women in 1980.¹⁰ Eleven per cent of men and 15 % of women were obese, an increase from 5% of men and 8% of women in 1980.¹⁰ Data from the U.S. shows an increase in the prevalence of obesity from 27.5% of men and 33% of women in 1999-2000 to 35.5% of men and 36% of women in 2009-2010.¹¹ Similar increases have been seen in other developed countries such as England where obesity rates have increased from 15% of adults in 1993 to 26% in 2014.¹² Likewise, the Australian Bureau of Statistics (ABS) 2014–15 Australian Health Survey reports the prevalence of overweight and obesity in Australia has increased from 56% in 1995, to 61% in 2007-2008 to 63% in 2014-2015.¹³

The prevalence of overweight and obesity among children and adolescents is similarly increasing. Globally in 2013, 24% of boys and 23% of girls were classified as overweight or obese, an increase of 17% for boys and 16% for girls since 1980.⁵ Data from the U.S. indicates similar increases with 14% of boys and girls classified as overweight and obese in 1999-2000 and 19% of boys and 15% of girls in 2009-2010.¹¹ In the United Kingdom (U.K.), the prevalence of overweight and obesity in 5-10 year old boys has steadily increased from 5.7% and 0.6% respectively in 1984, to 15.1% and 4.3% in 2000-2001,¹⁴ and 17.9% and 5.7% in 2006-2007.¹⁵ The prevalence of overweight and obesity in girls of the same age group in the U.K. has increased from 9.9% and 1.6% in 1984,¹⁴ to 21.9% and 5.7% in 2000-2001 and has plateaued in 2006-2007 at 21.8% and 6.1%.¹⁵ While there has been rapid increases in excessive weight gain across decades since the 1980's, there is evidence from some countries such as France, Sweden, Switzerland, Germany and New Zealand that the prevalence of overweight and obesity in children may have plateaued in recent years.¹⁶

Similarly, Australian data show the prevalence of overweight and obesity in children has doubled over recent decades. In 1985 9.3% of boys and 10.6% of girls aged 7-15 years of age were overweight and 1.7% and 1.6% respectively were obese.¹⁷ Ten years later (1995) the figures for overweight increased to 15% for boys and 15.8% for girls aged 2-18 years of age.¹⁷ A further 4.5% of boys and 5.3% of girls were obese. In 2011-12, for children aged 5-14, the ABS Australian Health Survey, estimated 26% were either overweight (19%) or obese (7%).¹⁸ Like other developed countries, population surveys conducted since 2012, however, suggests that there has been a levelling off in child

overweight and obesity rates in this country. For example, Figure 1.1 demonstrates this change in overweight and obesity trends in the state of New South Wales (NSW) Australia from 1985 to 2015.

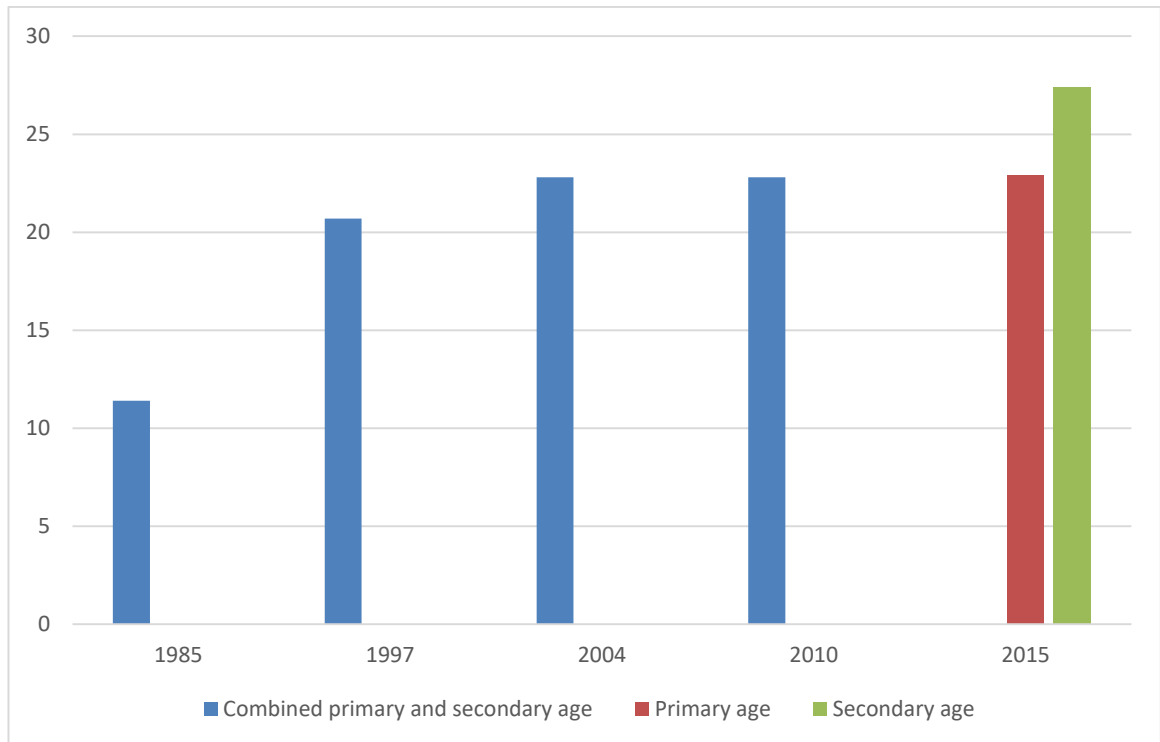


Figure 1.1: Prevalence of combined overweight and obesity among boys and girls for the 1985, 1997, 2004, 2010 and 2015 NSW data sets (%).^{19, 20}

Note: Primary age is 5-12 years, Secondary age is 13-18 years.

3 Poor diet is a key driver of excessive weight gain in children

Increases in population prevalence of overweight and obesity are suggested to be a result of a chronic imbalance between the energy consumed by individuals, and that expended, driven primarily by greater consumption of energy dense, nutrient poor foods and beverages, and insufficient intake of fruits and vegetables.²¹ A recent systematic review which included seven prospective studies shows a positive relationship between dietary patterns that consist of energy-dense, high fat, low fibre foods in childhood and increased risk of obesity in later life.²² Four of the seven longitudinal studies included in this review identified a comparable dietary pattern that consisted of a high consumption of energy-dense, high fat and low fibre foods and a greater risk of obesity later in life. The remaining three studies, which were found to be of lesser quality, found no relationship between the

intake of unhealthy food and beverages and increased risk of overweight or obesity in children.²²

The majority of studies (five) found that the dietary pattern of high energy-dense, high fat and low fibre foods was also associated with lower fruit and vegetable intakes and higher total fat and saturated fat intakes.²² Further a 2008 systematic review which included three cross-sectional studies and four cohort studies found an unequivocal association between the consumption of energy-dense nutrient-poor food and beverages and obesity²³, as have reviews of experimental studies for associations between soft drink consumption and Body Mass Index (BMI).²⁴ Collectively, such evidence suggests that attempts to reduce population prevalence of overweight and obesity must target key dietary risk factors for excessive weight gain including insufficient fruit, vegetable and fibre intake, increased total fat and saturated fat intake and increased soft drink consumption in children.²⁵

Adding to the complexity of childhood obesity is that health disparities exist for children from low-income and/or ethnic minority communities. The proportion of high-calorie–low-nutrient–density school food choices and fast-food restaurants has been found to be higher in communities with higher poverty rates, lower household median incomes, and higher concentrations of ethnic minority residents.²⁶ Research shows that children from ethnic minority and low-socio-economic-communities have less favourable behavioural determinants of obesity such as fruit and vegetable consumption, fast-food intake, breakfast frequency, soft drink and low nutrient– energy dense snack intake.

4 Overview of dietary guidelines for good health in children

The World Health Organization (WHO) has developed several guidelines for individuals, society and the food industry to assist in the prevention of obesity.²⁷ At an individual level, it is recommended children limit energy intake from total fats and sugars; increase consumption of fruit and vegetables, as well as legumes, whole grains and nuts; and engage in regular physical activity (60 minutes a day for children and 150 minutes per week for adults).²⁵ Most recently the WHO Commission on Ending Childhood Obesity (May 2016) recommended limiting energy intake from total fats and sugars, increasing consumption of fruit and vegetables, as well as legumes, whole grains and nuts to halt the rise in child obesity.²⁸

For good health, the American Heart Association (AHA) recommends children reach or maintain desirable body weight by eating foods low in saturated fat, trans fat, cholesterol, salt (sodium), and added sugars.²⁹ The AHA also recommends a child daily fruit intake of 1½-2 cups depending on age and vegetable intake of 1-3 cups (4-18 years of age).²⁹ In the U.K. the National Eat Well Guide³⁰ advises a healthy diet should include ‘5 a day’ serves of fruit and vegetables, more starchy carbohydrates, and fewer sugary foods and beverages.³⁰

In Australia, the Australian Dietary Guidelines (2013) recommend that to achieve and maintain a healthy weight individuals, including children, need to be physically active and choose appropriate amounts of nutritious food and beverages to meet energy needs.³¹ The guidelines make specific recommendations regarding fruit and vegetable intake, and limiting ‘discretionary choices’, that is, foods and beverages high in kilojoules, saturated fat, added sugars and added salt, to special occasions.³¹ Tables 1.2 and 1.3 below outline the recommended number of serves of vegetables and fruit per day for Australian children.

Table 1.2: Australian recommended serves of vegetables and legumes/beans per day

	2-3 YEARS	4-8 YEARS	9-11 YEARS	12-13 YEARS	14-18 YEARS
BOYS	2.5	4.5	5	5.5	5.5
GIRLS	2.5	4.5	5	5.5	5.5

Table 1.3: Australian recommended serves of fruit per day

	2-3 YEARS	4-8 YEARS	9-11 YEARS	12-13 YEARS	14-18 YEARS
BOYS	1	1.5	2	2	2
GIRLS	1	1.5	2	2	2

In addition to the prevention of obesity and associated risk of chronic disease, nutrition guidelines and policies are essential for guiding adequate dietary intake for physical growth, mental development, performance and productivity, and overall health and well-being.

5 Children do not meet recommendations from dietary guidelines

Research in the U.S. and U.K. indicates that children fail to consume sufficient serves of fruit and vegetables and over consume energy dense, nutrient poor foods.^{12,32} In the U.S. greater than 90 % of children aged 4-18 fall short of consuming the recommended number of serves of vegetables, the majority (69-89% of 4-18 year olds) do not consume adequate serves of fruit, and most children overconsume foods that are high in fat and sugar.³² Likewise, a U.K. National Diet and Nutrition Survey in 2012 found that only 9 % of children aged 11-18 years of age met the “five-a-day” guideline for fruit and vegetables, salt intake exceeded the recommendation for the majority of children and 69% of children aged four to ten years and 78% of those aged 11 to 18 years consumed soft drinks over the four day recording period.¹² A study describing changes in dietary intake of approximately 1000 Norwegian teenagers from adolescence through to adulthood, found that children of 14 years of age consume fruit, on average, six times per week and vegetables five times per week.³³ This decreases to almost half by the age of 21.³³ Further, the cohort study found an over-consumption of foods and beverages high in energy and low in nutrients. Specifically, boys daily consumption of soft drink within this group increased from 9% of boys aged 14, to 30% of men aged 21.³³

The 2014-15 Australian National Health Survey¹³ reported 68.1 % of children aged 2-18 years met the guidelines for recommended daily serves of fruit, while only 5.4% met the guidelines for serves of vegetables. For children aged 4-8 years of age, 3.3% consumed adequate vegetables compared to recommendations, while 12-13 year olds had the lowest percentage meeting recommendations at 1.4%.¹³ Australian data also indicate an overconsumption of non-core foods and beverages (discretionary) with Australian children consuming just under half of their daily energy intake (45.5% for boys and 43.9% for girls aged 9-10 years) from this group resulting in excessive sodium and sugar intakes.⁸ Similarly, the NSW School Physical Activity and Nutrition Survey (SPANS) 2015²⁰ found that children and adolescents frequently consume a range of energy-dense and nutrient poor foods and beverages, for example;

- 48 % of children and adolescents ate processed snack food products (sweet and savoury biscuits, cakes, donuts or muesli bars) three or more times a week.
- 32 % of children and adolescents ate potato chips three or more times a week.
- 27 % of children and adolescents ate confectionery three or more times a week.
- 10 % of children and adolescents ate fried potato products three or more times a week.
- 35 % of children and 44 % of adolescents ate processed meats three or more times per week.
- 9 % of children and adolescents drank one or more cups of soft drink daily.

6 School-based interventions are effective in improving child diet

Schools are recommended as a relevant setting to improve children's dietary intake as they provide access to almost all children during a key developmental period.³⁴ In addition, a substantial proportion (37%) of children's daily energy intake is consumed at school³⁵ and schools typically provide, or have available for sale, food and beverages for children.

Systematic review evidence demonstrates that school based healthy eating policies and practices can improve child diet and impact on child obesity. Table 1.4 provides a summary of 16 selected systematic reviews targeting the effectiveness of school-based healthy eating interventions, focused on food availability.³⁶⁻⁵¹ These reviews found that school interventions targeting environmental changes that increased availability of healthier foods such as fruit and vegetables, and restricted availability of unhealthy foods and beverages had favorable impacts on BMI, purchases of healthier items and/or self-reported food consumption.³⁶⁻⁵¹ Further areas for future research recommended in the reviews was the identification of specific components of interventions that are most effective and those that are cost-effective.³⁶⁻⁵¹

Table 1.4: Systematic Review evidence of the effectiveness of school healthy eating policies and practices

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Sacco J, Lillico HG, Chen E, Hobin E. The influence of menu labelling on food choices among children and adolescents: a systematic review of the literature. Perspectives in Public Health May 2017 Vol 137 No 3. ⁴⁴	To assess whether menu labelling influences the amount of calories ordered by children and adolescents (or parents on behalf of youth) in food outlets including restaurants and cafeterias.	<p>Databases: Medline, Scopus, PsycINFO, CINAHL, SocINDEX, and Embase</p> <p>Years: Published before 21st August 2015.</p> <p>Languages: English</p> <p>Additional Search Strategy: An examination of the references cited in the included articles.</p> <p>Inclusion Criteria: Articles were included if they described primary research on menu labelling, were in English, included children under 18 years, or parents with children under 18 years, and examined outcomes of actual or intended food purchasing decisions or consumption behaviours.</p>	<p>11 studies 6 were conducted in 'real-world' settings and examined impacts of menu labelling on actual food purchases, while 5 were conducted in artificial settings and assessed changes in hypothetical food selections. 3 studies examined the impact of menu labelling in school cafeterias. 2 applied repeat cross sectional pre–post designs in either a middle-school or high-school setting; only the latter study included a control group. The final study was a RCT examining the impact of menu labelling on food purchases from high-school cafeterias</p>	<p>2 of 3 studies conducted in school cafeterias suggested a potential impact of menu labelling. The introduction of menu labels in high-school cafeterias was associated with increased purchasing of lower calorie food options (e.g. hamburgers vs cheeseburgers). Following the introduction of calorie labelling in a middle-school cafeteria, average energy and fat content of food purchases decreased by 47 calories and 2.1 g, respectively, per student.</p> <p>5 of the 7 studies in which children or adolescents made food purchasing decisions for themselves demonstrated evidence of the effectiveness of menu labelling including notable decreases in calorie and/or fat content of food selections, or shifts towards healthier purchasing patterns.</p> <p>Results indicate that children and adolescents, including children as young as 6–8 years of age, are able to use menu labelling to make lower calorie choices.</p>

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Godin K, Leatherdale ST, Elton-Marshall T. A systematic review of the effectiveness of school-based obesity prevention programmes for First Nations, Inuit and Métis youth in Canada. Clinical Obesity. 2015; 5: 103–115. ⁴⁰	The primary objective was to identify school-based programs that have been developed to prevent obesity and the determinants of obesity (physical activity and healthy eating) among FNIM youth in Canada. Secondary objectives include determining the program's effectiveness and assessing the strength of the methodology used to describe and evaluate the programs.	<p>Databases: Medline (PubMed), Web of Science (Science Citation Index and Social Science Citation Index), EMBASE, Cochrane Library, Scopus, CINAHL, Bibliography of Native North Americans, Canadians Business and Current Affairs, and Canadian Periodic Index.</p> <p>Years: 2003-2014</p> <p>Languages: No language restrictions reported</p> <p>Additional Search Strategy: Reference lists of relevant papers were checked for other relevant studies.</p> <p>Inclusion Criteria:</p> <ul style="list-style-type: none"> i the paper was a peer-reviewed primary research published between 2003 and 2014; ii the paper was published in English; iii the program specifically targeted one or more FNIM youth populations in Canada; iv the program was school-based or had a component that was implemented in a school setting; and v the outcomes of the program related to obesity, healthy eating and/or physical activity 	<p>15 studies from 7 school-based interventions.</p> <p>Programs were categorized into 3 categories based on the behaviours and outcomes targeted in the intervention: obesity, HE and PA.</p> <p>5 programs targeted all 3 outcomes (obesity, HE and PA), the remaining 2 programs focused solely on HE-related outcomes.</p>	<p>5 programs targeting obesity-related outcomes such as BMI, percentage of body fat, triceps and subscapular skinfold thicknesses and waist circumference. 1 demonstrated significant improvements.</p> <p>7 programs including HE-related outcomes such as included number of servings of various foods/food groups (e.g. milk and milk alternatives, vegetables and fruits, sugar-sweetened beverages, high-fat foods), food knowledge, attitudes and intentions, and intake of energy, fat and sucrose. All 7 demonstrated limited success in improving students' HE behaviours. The majority of the improvements were related to HE-related intentions and knowledge, rather than healthy eating behaviours.</p> <p>4 programs included PA outcomes such as PA summary score, fitness test performance, healthy PA knowledge and time spent watching TV. None consistently and effectively increased PA.</p>

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Wang Y, cai L, Wu Y, Wilson RF, Weston C, Fawole O, Bleich SN, Cheskin LJ, Showell NN, Lau BD, Chiu DT, Zhang A, Segal J. What childhood obesity prevention programmes work? A systematic review and meta-analysis. <i>Obes Rev.</i> 2015 July; 16(7): 547–565. ⁴⁹	To systematically evaluate the effectiveness of all childhood obesity prevention programmes implemented in various settings or designs (e.g. school, home, primary care, childcare, community, consumer health informatics [CHI]) conducted in high-income countries.	<p>Databases: Medline, EMBASE, PsysINFO, CINAHL and the Cochrane Library.</p> <p>Years: Inception through to 22 April 2013</p> <p>Languages: No language restrictions reported</p> <p>Additional Search Strategy: Reference lists of all included articles and all pertinent review articles to identify articles the database searches may have missed. Conducted a grey literature search in ClinicalTrials.gov to identify relevant unpublished research through 23 July 2012.</p> <p>Inclusion Criteria: Conducted in high-income countries, defined as those with a very high human development index (18), that evaluated interventions to prevent obesity (or ‘excessive weight gain’) in children aged 2–18 years. Only included RCTs, quasi-experimental studies and natural experiments that reported intervention effects on adiposity-related outcomes. The studies followed participants for at least 1 year from baseline measures, or for 6 or more months in school-based interventions (considering the length of the school year).</p>	<p>147 articles from 139 studies</p> <p>This included 115 studies that assessed school-based interventions. The majority of the 139 studies (104 or 75%) evaluated diet–PA combined interventions, 7 evaluated diet-only interventions. 61 studies took place in a school-only setting</p>	<p>76 of the 115 studies (66%) evaluating school-based interventions showed favourable intervention effects on adiposity-related outcomes, but only 42 of them (36%) were statistically significant.</p> <p>3 RCTs in a school-only setting evaluated diet-only interventions and showed a decrease in BMIs or BMI z-scores. They were designed to prevent weight gain and focused on promoting a healthy diet and reducing the consumption of carbonated drinks.</p> <p>40 studies assessed the effect of combined strategy interventions ie. PA and diet. 5 of the combined interventions were RCTs, reported BMI z-score as an outcome and had sufficient data for meta-analysis (38–42). Together, they showed an overall difference in BMI z-score of –0.05 (95% CI: –0.10, –0.01, P = 0.025) in favour of the intervention groups.</p> <p>Greater proportion of multi-setting studies demonstrated significant and beneficial results compared with single-setting interventions.</p> <p>Very few studies measured or showed that intervention effects were sustained beyond the active intervention period. More future research, including systematic reviews, is needed in this area.</p>

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Mayne SL, Auchincloss AH, Michael YL. Impact of policy and built environment changes on obesity-related outcomes: a systematic review of naturally occurring experiments. <i>Obes Rev.</i> 2015; 16(5): 362-375. ⁴³	A systematic review was conducted to identify all published studies in the medical literature relating to natural- or quasi-experiments in obesity research.	Databases: PubMed (Medline) Years: January 1, 2005 and January 1, 2014 Languages: English Additional Search Strategy: Other papers based on expert knowledge of the topic Inclusion Criteria: <ol style="list-style-type: none"> the intervention was a natural event due to a new policy (defined as municipal or federal government regulations and laws including school district policies) or change to the built environment that could affect physical activity, diet, or obesity; and where the study collected data on obesity-related outcomes, which we defined as body mass index (BMI), weight, diet, and physical activity Studies that met the definition of a natural- or quasi-experiment, specifically: <ol style="list-style-type: none"> studies where investigators did not control allocation of the intervention and intervention was not a randomized trial; the exposure was well-defined (a sharp difference in conditions) and not a rubric defined by the investigators; and participants were not able to knowingly self-select into the treatment group. 	37 studies 16 focused on adults, 8 on children & adolescents, & 10 included a combination of age groups. 18 assessed impacts on diet. 5 assessed school food environment.	School food environments (restrictions on sugary foods and beverages or higher fat foods, and/or increases in availability of milk and fruits/vegetables) assessed impacts 12–20 months post-implementation (most were repeat cross-sectional, case only) and reported favourable impacts on purchases or self-reported food consumption. A school nutrition policy change found elementary students had increased odds of meeting recommendations for vegetables and fruit (OR: 1.44, 95% CI: 1.00–2.07) Current research suggests some policy and built environmental interventions, especially active transportation infrastructure improvements, bans or restriction on unhealthy foods, and altering purchase/payment rules for low-income food vouchers, can increase certain types of physical activity and improve diet.

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Driessen CE, Cameron AJ, Thornton LE et al. Effect of changes to the school food environment on eating behaviours and/or body weight in children: a systematic review. <i>Obes Rev.</i> 2014; 15(12):968-982. ³⁹	<p>To systematically review the evidence relating to interventions that change the school food environment, with outcomes including both food-related behaviours (purchasing, consumption) and body weight.</p> <p>Descriptive systematic literature review</p>	<p>Databases: Academic Search Complete, Global Health, Ovid MEDLINE®, PsycINFO®, SPORTDiscus™</p> <p>Years: 2008 onwards, plus reference lists of 3 previous reviews.</p> <p>Languages: English</p> <p>Additional Search Strategy: Reference lists of relevant papers and all previous reviews relating to the school food environment were also searched.</p> <p>Inclusion Criteria: Only studies reporting the results of interventions targeting the school food environment in isolation, or those that had a mechanism to evaluate the effect of food environment changes separately. School settings included primary/elementary or secondary (middle and high) schools only. Outcomes considered were i change in weight or other anthropometric measures (body mass index [BMI] or waist circumference) and eating-related behaviours. Reference lists on 3 previous reviews where food environment changes were assessed were included along with reference lists of another 11 previous reviews</p>	<p>18 articles from 16 studies</p> <p>11 studies were conducted in middle schools.</p>	<p>17 studies reported a positive outcome on either BMI (or change in BMI) or the healthfulness of food sold or consumed (note that three papers were reports of the same study).</p> <p>Improving the school food environment has the potential to be an important strategy for obesity prevention in children.</p> <p>Evidence suggesting that high-level policy changes impacting the school food environment are possible and can simultaneously impact a large number of children.</p> <p>Food environment interventions that limit the possibility for compensatory behaviour (i.e. the same products not still available elsewhere) should be a priority.</p> <p>There is a clear need for high-quality intervention studies to provide more conclusive evidence.</p>

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Chriqui JF, Pickel M, Story M. Influence of School Competitive Food and Beverage Policies on Obesity, Consumption, and Availability. A Systematic Review. JAMA Pediatr. 2014;168(3):279-286. ³⁷	To examine the potential influence that the federal rule may have based on peer-reviewed published studies examining the relationship between state laws and/or school district policies and student body mass index (BMI) and weight outcomes, consumption, and availability of competitive foods and beverages (CF&Bs).	<p>Databases: PubMed, CINAHL, EconLit, ERIC, and the Public Affairs Information Service (PAIS) literature databases, as well as the Childhood Obesity journal archives database.</p> <p>Years: Peer-reviewed articles published between January 2005 and March 2013.</p> <p>Languages: English</p> <p>Additional Search Strategy: Cross-checks were performed of the reference lists of the selected articles.</p> <p>Inclusion Criteria: Peer-reviewed article published in scientific literature, US-based, English language study, Policy focuses on a specific enacted state law and/or district policy, Policy category is CF&B, Quantitative study, age range of interest is K-12, Outcome of interest is CF&B availability, CF&B consumption, weight/BMI.</p>	<p>24 studies 14 studies examined the influence of specific state laws, 8 studies examined district policy influences, and 2 studies examined both state and district policy influences on the outcomes of interest. 18 studies focused on food and beverage policies, 4 focused on beverage-only policies, and 2 focused on food-only policies.</p> <p>The studies were examined for state and/or district policy influences on 3 primary outcomes:</p> <ol style="list-style-type: none"> 1 BMI and weight outcomes; 2 student food and/or beverage consumption, purchasing, or dietary intake; and 3 in-school CF&B availability or access 	<p>15 of the 24 studies reviewed found state laws and/or district policies have influenced outcomes in the expected direction.</p> <p>Most of the studies reporting results in the expected direction focused on in-school availability and/or in-school consumption, in particular. The studies examining BMI and weight outcomes and overall consumption were mixed.</p> <p>The findings suggest that on-the-books laws and policies are doing what they were intended to do—namely, they are reducing the in-school availability of unhealthy competitive foods and beverages and in-school student consumption of such items.</p> <p>More robust study designs examining pre-policy/post-policy influences longitudinally are needed, particularly for studies examining outcomes that may take longer to be influenced by in-school policy changes (ie, overall consumption and BMI and weight outcomes).</p>

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Waters E, de Silva-Sanigorski A, Burford BJ, Brown T, Campbell KJ, Gao Y, Armstrong R, Prosser L, Summerbell CD. Intervention studies for preventing obesity in children (Review). 2011 The Cochrane Collaboration. ⁵⁰	Primarily aims to update the previous Cochrane review of childhood obesity prevention research and determine the effectiveness of evaluated interventions intended to prevent obesity in children, assessed by change in BMI.	<p>Databases: CENTRAL, MEDLINE, EMBASE, PsychINFO and CINAHL</p> <p>Years: Searched during March 2010</p> <p>Languages: Non English language papers were excluded</p> <p>Search terms: Combinations of key words relating to population (child*,</p> <p>Additional Search Strategy: Website search - The Campbell Library, The Centre for Reviews and Dissemination (CRD), The Cochrane Library, including DARE, Health evidence, Canada, http://www.health-evidence.ca/, NHS Evidence, The Evidence for Policy and Practice Information and Coordinating Centre (EPPI Centre) database of health promotion research, World Health Organization International Clinical Trials Registry Platform (ICTRP), Google (included to increase the potential for identifying relevant grey literature for inclusion)</p> <p>Inclusion Criteria: Included studies published during or after 2005.</p>	<p>36 new studies have been included in this version of the review, giving a total number of 55 included studies.</p> <p>43 studies were conducted in the school setting.</p>	<p>Sub-groups by age;</p> <p>6-12 years - Of those included in a meta-analysis, a statistically significant mean effect size for BMI or zBMI of -0.15 (95%CI: -0.23 to -0.08) was found. Analysing only those interventions conducted solely in an education setting did not reduce heterogeneity and resulted in a similar effect size as the whole group (-0.17, 95% CI: -0.25 to -0.09; P < 0.001). Diet-related factors were significantly positively altered in 20 studies.</p> <p>13-18 years - Of those included in a meta-analysis a mean standardised difference between change in BMI/zBMI from baseline to post-intervention between intervention and control groups was -0.09 units (95%CI: -0.20 to 0.03) – the results show there was a trend for intervention children to have smaller increases in these measures of adiposity over time.</p> <p>Although a number of dietary behaviours were targeted by all but two interventions, and a range of measures of dietary intake were utilised, significant positive dietary changes were reported in only 3 studies.</p>

Included and excluded studies published between 1990 and 2005 that were identified for previous versions of this review were carried forward to this review.

Included studies of interventions or programmes that involved diet and nutrition, exercise and physical activity, lifestyle and social support within the community, school and out of school hours care, home, childcare or preschool/nursery/kindergarten setting.

Included studies that compared diet or physical activity interventions, or both with a non-intervention control group who received usual care or another active intervention (i.e. head-to-head comparisons).

Excluded studies of interventions designed specifically for the treatment of childhood obesity and studies designed to treat eating disorders such as anorexia and bulimia nervosa.

Interventions need to be developed that can be embedded into ongoing practice and operating systems, rather than implementing interventions that are resource intensive and cannot be maintained long-term.

Lack of knowledge of which specific intervention components are most effective and what is affordable and cost-effective.

Future trials should be larger, longer term and include assessments of costs, harm, equity impacts, implementation factors and sustainability.

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Williams AJ, Henley WE, Williams CA, Hurst AJ, Logan S, Wyatt KM. Systematic review and meta-analysis of the association between childhood overweight and obesity and primary school diet and physical activity policies. 2013. IJBNPA 10:101 ⁵¹	To evaluate the effects of policies related to diet and physical activity in schools, either alone, or as part of an intervention programme on the weight status of children aged 4 to 11 years	<p>Databases: Medline In-Process & Other Non-Indexed Citations, Medline, EMBASE, PsychINFO, SportDISCUS, Web of Science, Education Resource Information Center, British Education Index, Australian Education Index, CINAHL Plus, The Cochrane Library.</p> <p>Years: Earliest record to June 2011</p> <p>Languages: No language restrictions</p> <p>Additional Search Strategy: Grey literature search for unpublished and continuing research was undertaken in July 2011 in the metaRegister of Controlled Trials, ClinicalTrials.gov and the International Clinical Trials Registry Platform, the Robert Wood Johnson Foundation website was searched for items not published within journals, and references of included studies and systematic reviews were inspected for any additional studies.</p> <p>Inclusion Criteria: Population: children undertaking primary education aged between 4 and 11 years.</p>	<p>21 studies</p> <p>10 examined diet related policies, 6 both diet and PA.</p> <p>5 evaluated the National School Lunch Program (NSLP) (US), 5 evaluated the school Breakfast Program (SBP) (US).</p> <p>The other diet related policies evaluated included: removing low nutrient, energy-dense foods, fried potato products, desserts and whole or 2% milk from cafeterias, ensuring fruits and vegetables are available in the cafeteria, children being prevented from eating any food at break periods and attending a school with a nutrition policy which enabled children to choose healthier foods.</p>	<p>The pooled result of participation in the NSLP was a small non-significant rise in BMI-SDS (0.038 BMI-SDS, 95% confidence interval (95% CI) -0.193 to 0.269).</p> <p>The pooled result of the five studies that evaluated the SBP was a significantly lower BMI-SDS among those who participated in the SBP (-0.080 BMI-SDS, 95% CI -0.143 to -0.017)</p> <p>The pooled effect of the other diet related policies was a small and non-significant reduction of -0.021 BMI-SDS (95% CI -0.066 to 0.023).</p> <p>The positive effects of school policies upon diet identified by Jaime and Lock and Van Cauwenberghe, were not found to extend to improved weight status in this review most likely due to the difficulties in accurately assessing diet.</p> <p>Nutrition guidelines formed a component in each of the combined policies which may indicate that diet related policies are beneficial when used in combination with physical activity policies.</p> <p>Diet and physical activity related policies need to be located</p>

Intervention: diet or physical activity related school policies either alone or as part of intervention programmes.

Outcome: body mass index (using valid reference curves to define overweight and obesity), body mass index z-score or standard deviation score, percentage of body fat, waist circumference, waist-to-hip ratio, waist-to-height ratio, skin pinch/skin fold thickness.

Context: primary school or equivalent.

Study design: any experimental or observational study design (randomised controlled trial, controlled before and after study, interrupted time series, cohort study or cross-sectional study).

Follow-up: ≥ 6 months.

within more complex approaches to preventing childhood obesity which focus on multiple factors (e.g. diet, physical activity, sedentary behaviour, self-esteem) and at multiple levels of influence (e.g. home, school, neighbourhood).

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Sobol-Goldberg S, Rabinowitz J, Gross R. School-Based Obesity Prevention Programs: A Meta-Analysis of Randomized Controlled Trials. Obesity (2013) 21, 2422–2428 ⁴⁵	An updated systematic review and meta-analysis of RCTS of school-based obesity prevention programs covering studies January 2012.	<p>Databases: MEDLINE, ERIC, EMBASE, CINAHL, PSYCInfo, Dissertation Abstracts, Science Citation Index, Social Science Citation Index, and the Cochrane CENTRAL Database of controlled clinical trials.</p> <p>Years: Studies published from 2006 through January 2012</p> <p>Languages: At least an abstract in English.</p> <p>Additional Search Strategy: Not reported</p> <p>Inclusion Criteria: Included RCTs of children and teenagers (ages 5-18 years) where school-based intervention programs were tested based on their effect on BMI, relative to controls who did not receive an intervention. As our focus was prevention, we excluded studies focused exclusively on obese children and studies designed to treat eating disorders or other medical conditions.</p>	<p>32 studies</p> <p>The interventions included in the studies were designed to reduce body mass by altering lifestyle. This includes changing eating habits by increasing intake of healthy foods and decreasing consumption of unhealthy foods; and by changing patterns of activity to more physical and less sedentary</p>	<p>Meta-analysis demonstrated that school-based obesity prevention programs were effective in significantly reducing BMI in both the fixed effects model, SMD = -0.057 (95%CI = -0.071 to -0.043; $p < 0.01$) and random effects model SMD = -0.076 (95%CI = -0.123 to -0.028; $p < 0.01$).</p> <p>The 18 studies focusing exclusively on children reported significant BMI decline, whereas the 11 studies focusing exclusively on teenagers did not.</p> <p>School-based obesity prevention intervention programs were significantly, but mildly effective (effect size = 0.076) in reducing BMI, primarily in children but not teenagers.</p> <p>Long-term interventions—lasting 1-4 years—were more effective than shorter ones. Comprehensive interventions were most effective in reducing BMI particularly among children.</p> <p>More work is needed in developing and testing school-based interventions for teenagers.</p>

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Verstraeten R, Roberfroid D, Lachat C, Leroy JL, Holdsworth M, Maes L, Kolsteren PW. Effectiveness of preventive school-based obesity interventions in low- and middle-income countries: a systematic review. <i>Am J Clin Nutr</i> 2012; 96:415–38 ⁴⁷	Systematic review of the evidence on the effectiveness of school-based interventions targeting dietary behaviour and/or physical activity for the primary prevention of obesity in children and adolescents aged 6–18 y in low- and middle-income countries.	<p>Databases: MEDLINE, EMBASE, Web of Science, CENTRAL, ERIC, Cochrane Library, and Centre for Reviews and Dissemination databases for peer-reviewed controlled studies.</p> <p>Years: January 1990 and July 2011.</p> <p>Languages: English, Spanish, French, German, or Dutch.</p> <p>Additional Search Strategy: Additional eligible studies were identified from the bibliographies of published reviews and included articles.</p> <p>Inclusion Criteria: Studies had to</p> <ol style="list-style-type: none"> 1 be conducted in a school setting in an LMIC, based on the World Bank classification; 2 include healthy children and adolescents 6–18 y of age; 3 use a controlled trial design (with or without randomization); 4 focus on primary prevention of overweight or obesity through dietary and/or PA behaviour; and 	<p>29 articles from 25 studies</p> <p>4 studies were diet-only intervention, 11 involved both diet and PA. Diet-only interventions mainly used nutrition education promoting healthy diets as a key intervention strategy; one study was a breakfast program.</p>	<p>The diet interventions reported a positive effect on preferences for healthy food and a decrease in daily consumption of sweetened carbonated drinks.</p> <p>A significant decrease in the fast food eating behaviour score, in the frequency of fast food consumption in general and in schools, and in fried food consumption, soda intake, and snacks high in fat, sugar, and salt were observed in favour of the combined interventions.</p> <p>8 of the 12 studies with BMI data reported a statistically significant effect for the intervention. The 2 dietary behaviour interventions did not have a significant effect on mean BMI.</p> <p>2 of the 3 diet interventions that measured the adolescents' diet significantly improved this outcome; however, the diet interventions did not have an effect on any of the BMI-related outcomes.</p> <p>Need for more well-conducted evaluation studies to strengthen the evidence base. Process evaluations are needed to learn from program implementation and adoption to</p>

- 5 include both baseline and post intervention measurements of dietary and PA behaviour outcomes and/or anthropometric outcomes. Studies targeting parental or teacher behaviour were eligible if outcome data could be extracted for children and/or adolescents

identify which intervention components are effective and feasible.

The following studies were excluded:

- 1 correspondence letters, book chapters, dissertations, conference proceedings, and abstracts; and
- 2 secondary prevention interventions targeting only overweight, obese, or underweight subjects.

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Wang D, Stewart D. The implementation and effectiveness of school-based nutrition promotion programmes using a health-promoting schools approach: a systematic review. Public Health Nutrition: 2012;16(6), 1082–1100 ⁴⁸	To evaluate implementation and effectiveness of nutrition promotion programmes using the health-promoting schools (HPS) approach, to indicate areas where further research is needed and to make recommendations for practice in this field.	<p>Databases: CINAHL, Cochrane Library, Health Reference Center, Informit Search, MEDLINE, ProQuest, PsycINFO, PubMed, ScienceDirect, Scopus, Social Services Abstracts and Web of Science.</p> <p>Years: Published before 30 September 2011</p> <p>Languages: No language restrictions</p> <p>Additional Search Strategy: Reference lists of all retrieved articles were screened for potentially eligible articles.</p> <p>Inclusion Criteria:</p> <ol style="list-style-type: none"> 1 They had to be controlled studies, or before-and-after studies, evaluating school-based interventions on nutrition involving health-promoting activities in all or one or two of the following three areas: <ol style="list-style-type: none"> a the school ethos and/or environment, such as school policy; b the curriculum, specifically the nutrition curriculum; c the family and/or community; and demonstrate active participation by the school. 	<p>19 studies</p> <p>3 articles involved interventions on nutrition policy only, 6 articles referred to interventions on nutrition education only and 10 articles involved interventions using a comprehensive or holistic HPS approach.</p>	<p>The studies showed that nutrition intervention based on HPS processes had a wide range of benefits. It can increase participants' intakes of high-fibre foods and healthier snacks, their consumption of water, milk, fruit and vegetables and also their intakes of energy and all nutrients consumed.</p> <p>It can reduce participants' 'breakfast skipping' as well as intakes of red food, low-nutrient dense foods, fatty and cream foods and sweet drinks consumption.</p> <p>The sustainability of nutritional interventions is worth studying in further research.</p>

- 2 They had to provide information about the components and delivery of the intervention.
- 3 They had to report all evaluated outcomes.

There were no restrictions on study duration, follow-up period, control condition or who delivered the intervention




Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
De Bourdeaudhuij I, Van Cauwenberghe E, Spittaels H, Oppert JM, Rostami C, Brug J, Van Lenthe F, Lobstein T, Maes L. School-based interventions promoting both physical activity and healthy eating in Europe: a systematic review within the HOPE project. <i>Obes Rev.</i> 2011; (12); 205–216. ³⁸	To systematically review the evidence of school-based interventions targeting dietary and physical activity behaviour in primary (6–12 years old) and secondary school (12–18 years old) children in Europe. Descriptive systematic literature review.	Databases: Pubmed, Web of Science, CINAHL, The Cochrane Library and MDConsult Years: 1990 up to and including December 2007 Languages: No language restrictions Search Terms: Search strategy was designed to be inclusive and focused on Additional Search Strategy: Reference lists of relevant papers were checked for other relevant studies. A number of web sites of collaborative groups that conduct systematic reviews of public health and health promotion interventions were scanned. A comprehensive search of additional electronic databases: SIGLE, Social Care Online and British National Bibliography for Report Literature. Additionally, the supplements of 'International Journal of Obesity' and 'Acta Paediatrica' were hand searched.	27 articles from 11 studies 6 were conducted in primary schools and 5 in secondary school children. Results were synthesised based on outcome measure, type of intervention and target group population within each age group.	The results suggest that combining educational and environmental components that focus on both sides of the energy balance give better and more relevant effects. Results suggest that combining an educational and environmental component might be preferable in school-based nutrition and physical activity interventions to reduce obesity in European children and adolescents. A computer-tailored personalized education in the classroom showed better results than a generic classroom curriculum. Future studies of sufficient duration are needed so that (sustained) effects on BMI or other obesity indicators can be documented.

Inclusion Criteria:

Interventions within the school setting aimed at the primary prevention of obesity and obesity-related diseases in which the main component or one of the components was the promotion of a healthy diet combined with physical activity in young people (6–18 years old).

Studies had to report at least the effects on behaviour or on measures of obesity. Studies were considered regardless of their design.

Only European studies were included

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Van Cauwenberghe E, Maes L, Spittaels H, van Lenthe FJ, Brug J, Oppert JM, De Bourdeaudhuij I. Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: systematic review of published and 'grey' literature. British Journal of Nutrition (2010), 103, 781–797. ⁴⁶	<p>To summarise the existing European published and 'grey' literature on the effectiveness of school-based interventions to promote a healthy diet in children (6–12 years old) and adolescents (13–18 years old).</p> <p>Descriptive systematic literature review.</p>	<p>Databases: PubMed, Web of Science, CINAHL, The Cochrane Library and MDConsult</p> <p>Years: January 1990 up to and including December 2007</p> <p>Languages: No language restrictions</p> <p>Additional Search Strategy: Reference lists of relevant papers were checked for other relevant studies.</p> <p>A number of websites of research groups that conduct and publish systematic reviews of public-health and health promotion interventions were scanned. These strategies were complemented with a comprehensive search of the 'grey' literature: SIGLE; Social Care Online; British National Bibliography for Report Literature.</p> <p>Additionally, the supplements of 'International Journal of Obesity' and 'Acta Paediatrica' were hand searched.</p> <p>Finally, authors of relevant reports, abstracts and non-English articles, derived from the searches detailed earlier, were contacted and</p>	<p>53 articles from 42 studies</p> <p>29 studies included children, 13 included adolescents.</p> <p>Results were synthesised based on outcome measure (i.e. dietary behaviour and anthropometrics), type of intervention (i.e. educational, environmental and multi-component, i.e. combining education and environmental changes) and target group population (i.e. populations with a low socio-economic background and ethnic minority populations) within each age group (i.e. children and adolescents).</p>	<p>Children related studies;</p> <p>14 studies evaluated the effect of education-only interventions in children on dietary behaviour, of which there was limited evidence that educational interventions in children can alter dietary behaviour positively or change body composition.</p> <p>6 studies evaluated environmental interventions in children (5 on fruit and vegetable programs and 1 breakfast distribution program. Effectiveness was found in the 4 studies however only 1 had a long term effect.</p> <p>9 multi component interventions based on fruit and vegetable intake in children were assessed and found strong evidence for a positive effect on intakes. None measured anthropometrics.</p> <p>8 studies targeted children from low socio-economic backgrounds and assessed the effect on dietary behaviour. 2 studies reported mixed results, the others reported improvements in dietary behaviour. None measured effects on body composition.</p> <p>2 studies evaluated the effect of an intervention in children from ethnic minority</p>

asked for additional information about their study.

Inclusion Criteria:

Conducted in European Union countries, target young children (6–18 years old) in a school setting, aim at the primary prevention of obesity and diseases related to obesity in which the main component or one of the components was the promotion of a healthy diet, report effects on dietary behaviour or on anthropometrics.

No restrictions on study design, study duration, follow-up period, intervention strategies, control condition and on who delivered the intervention.

populations of which a significant positive effect on dietary intake was found in both. Neither measured anthropometrics.

Evidence of effect found for European school-based interventions that promote a healthy diet in school-aged children on behaviour.

Sustainability, integrity, context and cost-effectiveness should be considered a long with effectiveness.

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. Obes Rev 2009; 10:110–141. ³⁶	<p>This systematic review aimed to examine new research evidence and update the review of interventions that focus on improving diet and physical activity (PA) behaviours in school children contained within the National Institute for Health and Clinical Excellence (NICE) obesity guidance.</p> <p>Descriptive systematic literature review</p>	<p>Databases: MEDLINE and EMBASE</p> <p>Years: January 2006 to September 2006</p> <p>Languages: No language restrictions</p> <p>Additional Search Strategy: Reference lists of relevant papers were checked for other relevant studies.</p> <p>Inclusion Criteria: Study inclusion criteria were identical to the criteria used within the NICE obesity guidance, with one exception: this review only includes studies that reported a weight outcome.</p> <p>Randomized controlled trials or controlled clinical trials, of a lifestyle intervention, set in schools and at least 12 weeks of duration.</p> <p>School aged children, 5–18 years old, were included. Study designs that compared lifestyle interventions with usual care or with other active interventions were included.</p> <p>This review only includes studies that reported a weight outcome including but not</p>	<p>38 studies; 15 new studies and 23 studies included within the NICE obesity guidance.</p> <p>23 studies were set in primary schools and 12 studies were based in secondary schools.</p>	<p>1 of 3 diet studies, 5 of 15 physical activity studies and 9 of 20 combined diet and physical activity studies demonstrated significant and positive differences between intervention and control for body mass index.</p> <p>The findings are inconsistent, but overall suggest that combined diet and PA interventions may help to prevent children becoming overweight in the long term.</p> <p>Dietary interventions such as providing breakfast for adolescents and PA interventions particularly in girls in primary schools may help to prevent these children from becoming overweight in the short term.</p>

restricted to, body mass index (BMI), BMI z-score, percentage of body fat, skin-fold thickness and percentage of overweight.




Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Jaime PC, Lock K. Do school based food and nutrition policies improve diet and reduce obesity? Prev Med. 2009; 48(1):45-53. ⁴¹	To review the effectiveness of school food and nutrition policies world-wide in improving the school food environment, student's dietary intake, and decreasing overweight and obesity. Narrative review.	<p>Databases: Pubmed, CAB abstracts, Web of Knowledge (including Web of Science and ISI database), The Cochrane Library and Lilacs databases.</p> <p>Years: Earliest record to November 2007</p> <p>Languages: No language restrictions reported</p> <p>Additional Search Strategy: Reference lists checked for other relevant studies, complemented by a search using Google search engine to locate original unpublished information on evaluation of school food and nutrition policies. Websites of known national school lunch programs and contacted experts worldwide to seek additional references that may have been missed.</p> <p>Inclusion Criteria: Reported on the following outcomes: menu composition, availability or sales of food and beverages at school, and student's dietary intake or BMI.</p> <p>Included randomised and non-randomised, controlled and non-controlled trials and cross-sectional studies carried out after the</p>	<p>27 articles from 18 studies.</p> <p>Nutrition guidelines n=9 studies, regulation of food and beverage availability policy n=2 studies, and price intervention n=8.</p> <p>Results were synthesised as categories of outcomes (menu composition, availability and sales of food and beverages at school, student's dietary intake and BMI).</p>	<p>9 studies assessed intervention with <i>nutrition guidelines</i> - 24 different outcomes reported. Grouped into 3 categories; menu composition, food availability and students' intake. 3 found a significant decrease in total and saturated fat on the school menus, all that measured the impact of guidelines on food availability showed that guidelines led to increased fruit and vegetable availability, of 5 studies which had reported changes in students' dietary intake, 3 had measured impact on fat intake and two on fruit and vegetable consumption. All guideline interventions targeting fat intake led to significant decreases in total fat and saturated fat intakes, 2 studies showed positive impact of nutrition guidelines on fruit and vegetable intake.</p> <p>2 studies <i>regulation of food and beverage availability</i> - outcome measures focused on sales of food and beverages, neither measured impact on dietary intake. Both studies suggest a significant but limited decrease in the sales of banned foods, such as chips and sweetened beverages.</p> <p>8 studies focused on a <i>price intervention</i> – 2 U.S. studies focused on measuring the impact of reducing prices of low fat foods and showed significant increases in low-fat snacks</p>

implementation of school-based nutrition policies which had a non-exposed comparison group.

and fruit and vegetables sales. 6 European studies have evaluated the impact of a range of interventions related to provision of fruit and vegetables for free or by subsidised subscription programs on student's intake and found statistically significant increases in consumption of fruit during and after the programs.

Evidence suggests that nutrition guidelines and price interventions focused on healthier foods are effective to improve the school food environment and students' dietary intake.

Few studies which have measured the impact of school food policies on BMI.

Table 1.4 - continued

REFERENCE	AIM / METHOD	SEARCH STRATEGY/SCOPE	NO: OF STUDIES/SYNTHESIS	RESULTS
Katz DL, O'Connell M, Njike VY, Yeh MC, Nawaz H. Strategies for the prevention and control of obesity in the school setting: systematic review and meta-analysis. <i>Int. Journal of Obesity</i> (2008) 32, 1780–1789 ⁴²	To determine the effectiveness of school-based strategies for obesity prevention and control using methods of systematic review and meta-analysis.	<p>Databases: MEDLINE, HealthStar, Psych Info and Embase.</p> <p>Years: Studies published between 1966 and February 2000.</p> <p>Languages: Published in English</p> <p>Additional Search Strategy: Additional searches were conducted to retrieve studies published between February 2000 and October 2004 using Medline Ovid, Cinahl and PsychInfo. The Cochrane Library was searched to identify systematic reviews to be used for manual bibliography searching. Other meta-analyses, review articles and articles written by prominent authors in the field of obesity were also reviewed for relevant citations.</p> <p>Inclusion Criteria: Studies needed to: be published in English; target children aged 3–18 in a school setting; report commonly used weight-related outcomes (BMI, body weight, etc.); include a control measurement (either with pre/post-measures or using control group(s); and</p>	<p>19 studies</p> <p>8 trials included in the meta-analysis (all were combination nutrition and PA).</p>	<p>Combination interventions, the single nutrition intervention and TV reduction were equally effective. All showed significant ($p < 0.05$) reduction of body weight in children. The pooled effect sizes of the combination, nutrition interventions and TV reduction were ((SMD = -0.29, 95%CI = -0.45 to -0.14), random-effects model); (SMD = -0.39, 95%CI = -0.56 to -0.23) and (SMD = -0.35, 95% CI = -0.63 to -0.06), respectively.</p> <p>The results indicate that the major contributing factor to the success of combination nutrition and physical activity interventions may be the nutrition component.</p> <p>Found that combination interventions (nutrition and PA) with a parent or family component produced significant weight reduction.</p>

follow participants for at least 6 months from
the beginning of the intervention.

7 School healthy eating policies are a recommended childhood obesity prevention strategy

Consistent with the findings of systematic reviews, in most high-income countries, governments have introduced nutrition policies that support the provision of food and beverages in schools in line with national dietary guidelines. In the U.S. nearly 100,000 schools/institutions serve school lunches to 30.5 million students each day,⁵² including almost all public schools and many private schools as part of the National School Lunch Program (NSLP). The Nutrition Standards in the NSLP align with the Dietary Guidelines for Americans and aims to increase the availability of fruits, vegetables, whole grains, and reduced fat dairy in school meals and to reduce the levels of sodium, saturated fat and trans fats to enhance the diet and health of school children and halt the childhood obesity trend.⁵³ Similarly, in the U.K. the Department of Education in 2015 launched a new set of mandated standards for all food served in schools titled the 'School Food Plan' to ensure all children have access to healthy, nutritious meals at school.⁵⁴

In Australian public schools, where children commonly purchase foods and beverages over the counter from a canteen,⁵⁵ the 2010 National Healthy School Canteen (NHSC) guidelines encourage a nationally consistent approach to promoting healthy food through Australian school canteens that align with the Australian Dietary Guidelines. All states and territories have introduced healthy canteen policies that utilise a food classification system to promote healthy foods and restrict the sale of less healthy foods and beverages.⁵⁶ In NSW, the Fresh Tastes @ School Healthy Canteen Strategy (FT@S) (2005 to 2017) was developed and mandated by the NSW Department of Education (DoE) to promote the availability of healthy food options in school canteens and to limit the sale of foods and beverages with poor nutritional value.⁵⁷ Schools were required to have a canteen menu dominated by 'green' (healthier) food options, while the sale of 'red' (less healthy) food items were restricted to no more than two occasions per school term.⁵⁷ A 'Sugar Sweetened Drink Ban' which restricted the sale of all sugar sweetened drinks was introduced in 2007.⁵⁷

Recently in NSW a new 'Healthy School Canteen Strategy' was launched (February 2017).⁵⁸ The Australian Dietary Guidelines³¹ and the national labelling system that provides Health Star Ratings (HSRs) on the front of packaged food and beverages sold in all retail outlets forms the basis of the minimum benchmark food and drink criteria for the revised 'Healthy School Canteen Strategy'.⁵⁸ There are two categories of menu items

based on the Australian Dietary Guidelines, ‘core’ and ‘discretionary’ classification; i) ‘everyday’ items which include nutritious foods and drinks from the five food groups (grain foods, vegetables and legumes, fruits, dairy foods and lean meats, poultry and fish etc) and ii) ‘occasional’ items which are considered discretionary foods that are energy dense/nutrient poor. School canteen menus are required to have at least three-quarters of the menu consisting of ‘everyday’ foods and beverages, and no more than one-quarter of the menu comprising of ‘occasional’ foods and beverages.⁵⁸ Portion limits also exist for certain ‘everyday’ items (flavoured milk, juice and ready-to-eat hot meals) and all ‘occasional’ items, and ‘occasional’ menu items must have a HSR of 3.5 stars or greater.⁵⁸ Further, sugary drinks are not to be sold in schools.⁵⁸

8 Schools often do not implement evidence based nutrition policies

Despite the existence of school nutrition policies and guidelines, international research suggests that most schools fail to implement such guidelines.^{59,60} For example, results of the 2014 School Health Policies and Practices Study in the U.S. found that 95 % of secondary schools sold sugar sweetened beverages and the percentage of schools where fruit and vegetables were available for purchase was approximately 6%, contradictory to the policy guidelines.⁶¹ Similarly, a 2007 survey of 50 schools in New Zealand found 84% of schools sold foods of poor nutritional value such as meat pies, hot dogs and sausage rolls that are inconsistent with the Food and Nutritional Guidelines for Schools and only 48% had fruit on the menu.⁶² Likewise, a study of 1169 schools in British Columbia, Canada, found that less healthy foods were widely available in elementary, middle, and secondary schools through a variety of outlets.⁹ Masse et al (2013) also reported that less than 40% of schools in the province perceived they were meeting the Food and Beverage Sales in Schools guidelines.⁶³

A recent review (2016) of the implementation of healthy eating policies in Australian schools identified 12 eligible studies regarding the purchase of food from school canteens.⁶⁴ The review found that compliance with healthy eating policies in canteens was low, guidelines were rarely implemented in terms of the provision of certain foods and beverages, and children had preferences for non-healthy foods.⁶⁴ Similarly, Woods et al. (2014) in a study involving 263 school menus from all states and territories in Australia found variable and less than optimal implementation with state healthy canteen policies from as low as 5% to 62%.⁵⁶ A 2010 study by Hills et al similarly reported that 78% of 135 school menus assessed in NSW contained ‘red’ menu items and were

therefore non-compliant with the state policy.⁶⁵ Such findings suggest that the intended benefits of healthy canteen food policies may not be being realised at the population level due to ineffective policy implementation.

9 Barriers to school implementation of evidence based healthy canteen policies

Schools face a number of barriers to implementing policies and practices to improve child health and nutrition through the provision of foods and beverages. For example, a recent qualitative systematic review of 18 studies assessed the views of stakeholders, such as parents, school staff, school governors, school nurses and students, on the role of, and barriers to primary schools contributing to the prevention of childhood obesity.⁶⁶ The identified barriers to promoting public health nutrition in schools were children's perceived preferences for unhealthy foods, their perceived resistance to trying new, healthier foods, a perceived lack of parental support for healthy eating at school, a perceived lack of kitchen facilities to prepare healthier choices and a lack of volunteers to prepare healthier lunchtime foods.⁶⁶

Pettigrew et al. (2009) reported the results of a survey of barriers to the implementation of the Western Australian Department of Education and Training's Healthy Food and Drink Policy. The study which surveyed 1200 parents, 286 principals, 115 teachers, 71 canteen managers and 56 Parents and Carers Group representatives found that the primary factors impeding implementation of the healthy canteen policy were; a lack of volunteers, labour intensive food preparation, abilities of canteen managers and concerns about children boycotting the canteen if mainly healthy products were available.⁶⁷

Similarly, a 2004 study by Cleland and colleagues, of students, parents and teachers regarding barriers to the purchase of healthy foods in 12 primary schools in Victoria, Australia, reported that an emphasis on profit, strong parental influence on school committees, students dislike for healthier foods and lack of healthy options were hindering successful policy implementation.⁶⁸ Of children surveyed in this study (n=384), 34% reported their preference for unhealthy alternatives as a barrier to choosing healthy foods from the canteen.⁶⁸ Further, 17% of children said that there were very few healthy foods available for purchase from the canteen. Of approximately 400 parents surveyed, 27% felt that the school did not encourage healthy food and beverage choices in the

canteen.⁶⁸ Similarly, 53% of teachers surveyed (n=40) reported their school did not encourage healthy food and beverage choices.⁶⁸ Other barriers identified by teachers in increasing the sale of healthy food and beverage choices from the canteen was the emphasis on profit-making by the canteen (15%), lack of parental education and strong parental influence on school committees (15%) and students dislike for healthy foods (15%).⁶⁸

10 Effectiveness of strategies to increase school's implementation of a healthy canteen policy

A recent systematic review (2017) examining the effectiveness of strategies aiming to improve the implementation of school-based healthy eating, physical activity, tobacco, alcohol or obesity prevention policies, programs or practices identified 19 school-based studies to improve the implementation of healthy eating policies or practices in schools.⁶⁹ Fifteen of the studies included food availability strategies, three of which were conducted in Australian school canteens. Table 1.5 outlines the details of the 15 school-based food availability studies of implementation support strategies.⁷⁰⁻⁸⁴ The majority of studies employed multiple implementation strategies, the most common of which were educational materials, educational meetings and educational outreach visits. The reported effect sizes ranged from -3% to 67%.⁶⁹ The authors concluded that it was uncertain whether the strategies in the included studies improved implementation of the targeted school-based policies or practices. The review also noted a lack of evidence regarding costs and cost-effectiveness, which is critical information to guide the decisions of public health policy makers, and frequent use of tools to assess program implementation that had not been validated.⁶⁹

Of the trials included in the review, three tested strategies to improve implementation of healthy canteen policies specifically – one of which forms a part of this thesis (Chapter 2).⁸²⁻⁸⁴ These randomised controlled trials assessed the effectiveness of varying implementation support intensity in enhancing the implementation of the healthy eating policy for school canteens in NSW, Australia. The intensity of the three trials was defined as 'high', 'medium' or 'low' based on the number of strategies employed in the trials and the level of on-going implementation support, that is, whether it was based on face-to-face contact with schools or telephone/email/text messaging. The first trial was of a high intensity multi-strategic approach including executive support, consensus processes, training, provision of tools and resources, academic detailing, recognition, performance

monitoring and feedback and marketing strategies.⁸² Implementation support was delivered over 12-14 months to 35 intervention canteens. Thirty-five control school canteens within the Hunter region of NSW received no implementation support. Relative to control, at follow-up, schools receiving intensive implementation support were significantly more likely (70% versus 3%) to have menus without 'red' or 'banned' items ($p<.01$) and to have at least 50% of menu items classified as 'green' (81% versus 27 %) ($p<.01$) according to the healthy canteen policy guidelines.⁸²

The second trial assessed the effectiveness of a low intensity implementation intervention.⁸³ Thirty-six schools were allocated to receive implementation support and 36 allocated to receive no support (controls schools). Implementation support included a menu audit to assess compliance of items with the policy and subsequent provision of feedback regarding the content of their menu via written report and telephone call each school term (four times) for a 12-month period. At follow-up, the proportion of schools receiving support without 'red' or 'banned' items on their menu (10% versus 3%) or those that had more than 50 % of items classified as 'green' (13% versus 7%) was not statistically significantly different to control schools ($p=0.0895$ and $p=0.2568$ respectively).⁸³

The third trial assessed the effectiveness of a medium intensity, multi-strategic implementation intervention delivered to 28 schools (versus 25 control schools).⁸⁴ Implementation support included gaining executive support, consensus processes, training, provision of tools and resources, academic detailing, recognition and performance monitoring and feedback and was delivered over a nine month period. The trial was designed with scalability in mind and thus tested a modified version of ongoing support in the form of telephone and text messaging. Compared to control schools, intervention schools were significantly more likely to have menus without red or banned items (RR = 5.78 (1.45–23.05); $p=0.002$) and significantly more likely to have at least 50 % of menu items classified as green than control schools (RR = 2.03 (1.01–4.08); $p=0.03$).⁸⁴

Table 1.5: School based strategies to improve implementation of food availability policies

AUTHOR YEAR COUNTRY	STUDY POPULATION	IMPLEMENTATION STRATEGIES	PRIMARY IMPLEMENTATION OUTCOME AND MEASURES	EFFECT SIZE
Alaimo et al ⁷⁰ 2015 U.S.	Middle schools (7 th and 8 th grades)	Clinical practice guidelines, educational materials, educational outreach visits, external funding, local consensus processes, tailored interventions	Continuous: Score: i) Nutrition policy score and ii) Nutrition education and/or practice score (2 measures)	Median (range) 0.65 (0.2 to 1.1)
Cunningham- Sabo et al ⁷¹ 2003 U.S.	Primary schools (5 th grade)	Clinical practice guidelines, educational materials, educational meetings, educational outreach visits	Continuous: Nutrient content of schools meals % of calories from fat breakfast / Lunch (2 measures)	Median (range) -3% (-3.3% to 2.7%)
De Villiers et al ⁷² 2015 South Africa	Primary schools	Local opinion leaders, educational materials, educational outreach visits, education meetings, other	Dichotomous: % of staff or schools implementing a practice: % implementing a variety of policies and practices (3 measures)	Median (range) 25% (12.5% to 29.5%)
French et al ⁷³ 2014 U.S.	Secondary schools	Local consensus processes, tailored intervention, educational meetings, pay for performance.	Continuous: % of program implementation (5 measures)	Median (range) 33% (11% to 41%)

AUTHOR YEAR COUNTRY	STUDY POPULATION	IMPLEMENTATION STRATEGIES	PRIMARY IMPLEMENTATION OUTCOME AND MEASURES	EFFECT SIZE
Heath et al ⁷⁴ 2002 U.S.	Elementary schools	Educational materials, educational meetings, educational outreach visits	Continuous: % fat in school meal (2 measures), Sodium of school meals (2 measures)	Median (range) ^a 1.7% (-1% to 4.4%) Median (range) 29.5 (11 to 48)
Lytle et al ⁷⁵ 2006 U.S.	Middle schools	Educational materials, educational meetings, local opinion leaders, local consensus processes	Dichotomous: % of staff or schools implementing a practice: % of schools offering or selling targeted foods (4 measures)	Median (range) 8.5% (4% to 12%)
Mobley et al ⁷⁶ 2012 U.S.	Middle schools	Educational games, educational meetings, external funding, tailored intervention, educational materials, educational outreach, other	Continuous: % of program implementation (2 measures) % schools meeting various nutrition goals (12 measures)	Median (range) 15.5% (0 to 88%)
Perry et al ⁷⁷ 2004 U.S.	Elementary schools	Educational meetings, educational outreach visits, educational materials, local consensus processes	Continuous: % of program implementation (2 measures) Mean number of fruit and vegetables available (2 measures)	Median (range) 14% (-2% to 30%) Median (range) 0.64 (0.48 to 0.80)

AUTHOR YEAR COUNTRY	STUDY POPULATION	IMPLEMENTATION STRATEGIES	PRIMARY IMPLEMENTATION OUTCOME AND MEASURES	EFFECT SIZE
Saraf et al ⁷⁸ 2015 India	Middle schools	Educational games, educational materials, educational meetings, local consensus processes, local opinion leaders, tailored interventions, other	Dichotomous: % of staff or schools implementing a practice: % implementing a variety of policies and practices (7 measures)	Median (range) 31.6% (-5.3% to 79.5%)
Simons-Morton et al ⁷⁹ 1988 U.S.	Elementary school	Educational materials, educational outreach visits, Local consensus processes, local opinion leaders, managerial supervision, monitoring of performance, other.	Continuous: Macro-nutrient content of school meals (2 measures)	N/A ^b
Story et al ⁸⁰ 2000 U.S.	Elementary schools	Educational meetings, other	Continuous: Mean number of fruit and vegetables available (2 measures); % of guidelines implemented and % of promotions held (4 measures)	Median (range) 1.15 (1 to 13) Median (range) 38.4% (28.5% to 43.8%)
Whatley Blum et al ⁸¹ 2007 U.S.	Secondary schools	Clinical practice guidelines, educational materials, educational meetings, educational outreach visits, external funding and distribution of supplies	Continuous: % of food and beverage items meeting guideline nutrient and portion criteria (6 measures)	Median (range) 42.95% (15.7% to 60.6%)

AUTHOR YEAR COUNTRY	STUDY POPULATION	IMPLEMENTATION STRATEGIES	PRIMARY IMPLEMENTATION OUTCOME AND MEASURES	EFFECT SIZE
Wolfenden et al ⁸² 2017 Australia	Primary schools	Audit and feedback, continuous quality improvement, external funding, education materials, education meeting, education outreach visits, local consensus process, local opinion leader, tailored intervention other	Dichotomous: % implementing a variety of policies and practices (2 measures)	Median (range) 66.6% (60.5% to 72.6%)
Yoong et al ⁸⁴ 2016 Australia	Primary schools	Audit and feedback, continuous quality improvement, education materials, tailored intervention	Dichotomous: % implementing a variety of policies and practices (2 measures)	Median (range) 21.6% (15.6% to 27.5%)
Nathan et al ⁸³ 2016 Australia	Primary schools	Audit and feedback, continuous quality improvement, education materials, education meeting, local consensus processes, local opinion leader, tailored intervention, other	Dichotomous: % implementing a variety of policies and practices (2 measures)	Median (range) 35.5% (30.0% to 41.1%)

^a reverse scored so median represents an improvement in macronutrient content (an actual reduction)

^b did not report aggregate results by group

11 Implementation of healthy canteen interventions at scale

While effective strategies to improve implementation of healthy canteen policies have been reported, the trials reporting such evidence have involved a small numbers of schools. If the health benefits of interventions are to be realised at the population level, interventions that are effective need to be implemented at scale, across an entire population of schools. The above mentioned Cochrane review⁶⁹ examining the effectiveness of strategies to improve the implementation of school-based healthy eating, physical activity, tobacco, alcohol or obesity prevention policies, programs or practices, however, found only three implementation trials of healthy eating interventions that were conducted at scale, that is, including more than 50 schools. Two trials reported significant improvements in the majority of the reported implementation outcomes (Nathan 2012⁸⁵; Perry 1997⁷⁷), while one reported no improvements across any implementation outcome (Alaimo 2015⁷⁰) (Table 1.6).

Table 1.6: Evidence of interventions at scale (>50 schools) in the school setting targeting healthy eating

REFERENCE	AIM / DESIGN	SAMPLE / DURATION / DATA COLLECTION	INTERVENTION	THEORETICAL FRAMEWORK / IMPLEMENTATION SUPPORT STRATEGIES	OUTCOME
Alamio K et al. The Michigan Healthy School Action Tools Process Generates Improvements in School Nutrition Policies and Practices, and Student Dietary Intake. Health Promotion Practice, 2015;16(3):401– 410 ⁷⁰	<p>Aim: To evaluate whether completing the HSAT with a facilitator assistance and small grant funding resulted in</p> <p>1 improvements in school nutrition practices and policies and</p> <p>2 improvements in student dietary intake.</p> <p>Design: Quasi-randomised control trial and non-randomised component</p>	<p>Sample: 54 intervention schools and 21 control schools</p> <p>Duration: Oct 2007 – June 2009, Sept 2008 – June 2010 (1yr 9mth per cohort)</p> <p>Data Collection: Survey administered to principals and food service director / kitchen managers.</p> <p>The Block Kids Food Frequency Questionnaire 2004 (ages 8-17 years) at baseline and follow- up.</p>	Provision of Healthy School Action Tools, provision of a facilitator, meetings to assess student nutrition environment and policies, incentives, coordinated School Health Team, educational materials, tailored interventions.	Not reported	No difference in change scores on nutrition policy (mean difference (MD) 0.2, 95% CI; - 0.7 to 1.1) or nutrition education and/or practice (MD 1.1, 95%CI; -0.8 to 3.0) as assessed by the School Environment and Policy Survey.

REFERENCE	AIM / DESIGN	SAMPLE / DURATION / DATA COLLECTION	INTERVENTION	THEORETICAL FRAMEWORK / IMPLEMENTATION SUPPORT STRATEGIES	OUTCOME
Perry CL et al. The Child and Adolescent Trial for Cardiovascular Health (CATCH): Intervention, Implementation, and Feasibility for Elementary Schools in the United States. Health Education & Behaviour 1997; 24 (6): 716-735 ⁷⁷	<p>Aim: To assesses the feasibility of the CATCH intervention programs as models for broader dissemination in the United States, by examining how well they were received and implemented during the trial.</p> <p>Design: RCT</p>	<p>Sample: 96 elementary schools from 12 districts – 56 intervention schools, 50 control schools.</p> <p>Duration: 3 yrs 1991-1994</p> <p>Data Collection: Nutrient content of school lunches, school menu, recipe and vendor product information were collected, in person interviews with managers and cooks, 24hr dietary recall.</p>	Educational meetings, on-going support, educational materials and manual, family fun nights, home curricula.	Social Learning Theory and Organisational Change	<p>The Eat Smart program was successful in reducing fat and cholesterol to 31.9% of calories and 74.9 mg, respectively, and approached nationally recommended levels in the lunches served.</p> <p>86% of the cooks and 78% of the food service managers and supervisors participated in training programs.</p> <p>The Eat Smart school lunch did not deter students from eating school lunch.</p>

REFERENCE	AIM / DESIGN	SAMPLE / DURATION / DATA COLLECTION	INTERVENTION	THEORETICAL FRAMEWORK / IMPLEMENTATION SUPPORT STRATEGIES	OUTCOME
Nathan N et al. Effectiveness of a multi-strategy intervention in increasing the implementation of vegetable and fruit breaks by Australian primary schools: a non- randomized controlled trial. BMC Public Health 2012; 12:651 ⁸⁵	<p>Aim: To assess the effectiveness of a multi-strategy intervention, relative to information-based support, in increasing the implementation of an in-class vegetable and fruit break by a population of primary schools.</p> <p>Design: Quasi-experimental</p>	<p>Sample: 422 intervention schools and 406 comparison schools.</p> <p>Duration: 11-15 mths intervention</p> <p>Data Collection: Telephone interviews with school principals at baseline and f/up</p>	Components included leadership support, staff training, program resources and materials, follow up telephone support, tailored feedback report	Structured multi-strategy intervention was developed based on theoretical frameworks of practice change and recommendations from reviews and implementation studies conducted in schools and other settings.	<p>Intervention schools had 2.36 times (95%CI 1.60-3.49, $p < 0.001$) the odds of having a vegetable and fruit break compared to comparison schools at follow-up.</p> <p>The intervention effect size (OR > 2) was similar across all subgroups ($p=0.031$- <0.001).</p> <p>The median improvement in the proportion of schools implementing a policy or practice = 16.2%</p>

Transferring a proven intervention from a small well controlled and defined research setting into population wide implementation presents a number of challenges. For example, workforce capacity and program delivery infrastructure limitations, including staffing and resource allocation, may indicate an intervention cannot be feasibly delivered at scale.⁸⁶ Furthermore, delivering programs at scale may require adaptation of implementation support strategies, to ensure alignment to different school contexts, for example metropolitan versus regional or rural schools.⁸⁶ Adaptations to implementation support strategies may also be required in order for population wide delivery to occur in the contexts of limited project resources.⁸⁶ For example the provision of telephone and online support versus face-to-face or on-site delivery, may not only enable greater reach, for example, to those in rural regions but additionally provide further stretch of resources and/or support personnel.

Research suggests that program effectiveness and program implementation may attenuate when adapted to be delivered at scale, in the real-world.⁸⁷ For example, a randomised trial in Australian childcare services tested an intervention to support implementation of practices recommended to improve child physical activity in 20 services.⁸⁸ The intervention yielded substantial improvements (>40% in most instances) in practice implementation.⁸⁸ A large scale quasi experimental trial, in which an adapted version of implementation support was delivered, at scale, in the same region across 300 childcare services reported no significant improvements in eight of the 11 practices targeted.⁸⁹

Similarly, a randomised trial conducted in primary schools to increase physical activity and improve fundamental movement skill competency of students, had a statistically significant effect in favour of the intervention group of 13 minutes of moderate-to-vigorous physical activity (MVPA) ($p=0.008$).⁹⁰ The program was then adapted for delivery at scale including modifications to the delivery mode of professional learning sessions to include non-face-to-face sessions and the removal of student reward booklets and a community physical activity link strategy.⁹¹ The adapted study failed to detect a significant effect at follow-up (six-months) in overall daily minutes of MVPA between groups (1.96 minutes, 95% CI:-3.49,7.41, $p=0.48$).⁹¹

12 Theories and frameworks to help guide program design for implementation scale

A number of theories and frameworks have been published to guide efforts to scale-up interventions for delivery at the population level. A systematic review of implementation and dissemination frameworks, for example, identified eight frameworks for scaling-up health interventions.⁹² The most frequently applied theoretical framework for policy or program dissemination identified was Rogers' Diffusion of Innovations Theory. The theory describes the process by which an innovation (policy or practice) is communicated through certain channels over time.⁹³ The theory identifies a number of characteristics of an innovation that impact on the rate of implementation by the target population.⁹³

These characteristics are;

- i relative advantage – the innovation is perceived as advantageous;
- ii compatibility – the innovation is perceived to being consistent with existing values and needs;
- iii complexity – the innovation is perceived to be difficult to understand and /or use;
- iv trialability – the innovation can be trialed/experimented with; and
- v observability – the results of the innovation are visible.⁹³

Rogers suggests that individuals more rapidly adopt innovations that are perceived to have greater advantage, are compatible, are able to be trialed and experimented, have visible results but that are of less complexity.⁹³

The Diffusion of Innovation Theory is recognised as an appropriate framework from which to draw on when designing health risk prevention innovations at scale.⁹⁴ Rogers expands on his previous work in this area of application and provides a further five strategies to speed up diffusion of such interventions;

- i change the perceived attributes of preventive innovations – any means to increase the perceived relative advantage of innovations;
- ii utilise champions – using personal influence to encourage adoption of an innovation;
- iii change the norms of the system through peer support – changing norms gradually over time;
- iv use entertainment-education – placing educational ideas in entertainment messages; and
- v activate peer networks – the social process of talking about, giving meaning to and adoption of an innovation.⁹⁴

Recent reviews of school based implementation and dissemination have identified small numbers of studies assessing the impact of efforts to implement evidence based programs at scale using the Diffusion of Innovations Theory to guide support strategy selection.⁹⁴ Such reviews have reported positive outcomes, suggesting its potential utility.⁹⁵ Glanz and colleagues (2015) trialed two dissemination strategies for a skin cancer prevention program in the U.S. where implementation, maintenance, and sustainability strategies, and measures were based on the Diffusion of Innovations Theory.⁹⁶ The study found that whilst both intervention groups improved their implementation of the program, the ‘enhanced’ strategy had greater overall maintenance of the program over time and supportive environments and policies.⁹⁶ Another included study in the review⁹⁷ used the Diffusion of Innovations Theory as the basis of the primary outcome measures to study curriculum adoption and implementation of an overweight prevention program (*Planet Health*) by Boston Public Schools and their teachers.⁹⁷ Previously *Planet Health* had undergone an efficacy and economic evaluation, therefore the current study measured components of diffusion such as compatibility, relative advantage, broad applicability, observability, and indirectly, trialability to determine program adoption, implementation and sustainability. The study found that planning for diffusion by assessing innovation characteristics is an effective method by which to assess the acceptability and feasibility of a health education innovation.⁹⁷ Whilst these studies provide evidence for the use of the Diffusion Innovations Theory in school-based

prevention programs at scale, evidence is limited in the use of such theories or frameworks in relation to improving implementation at scale of school-based healthy eating policies and practices.

A recent systematic review (2015) on scaling-up public health interventions into population-wide policy and practice, identified a number of frameworks that specifically support the scale-up of public health initiatives,⁹² however none have been formally evaluated. One included review was Milat's 'Increasing the scale of population health interventions Guide' (2014) specifically designed for scale-up of public health interventions in high income countries.⁹⁸ The guide was developed following policy and practitioner engagement in an Australian context. Of particular relevance is the frameworks recommendation to consider context, resource and infrastructure when designing strategies to implement programs at scale, and specifically the importance of strong leadership, a local delivery system, and engaged government and community stakeholders as key support strategies to successful scaling-up.⁹⁸

More recently, Barker and colleagues (2016) developed a framework for taking health interventions to scale based on two large-scale improvement initiatives in Africa.⁹⁹ The authors outline four phases required to scale-up evidence-based programs;

- 1 **Set-up** establishes an entry point for the planned intervention, defines what needs to be scaled-up and identifies test sites, early adopters and potential 'champions';
- 2 **Develop the scalable unit** - tests local ideas for best-practice implementation and generates context specific strategies;
- 3 **Test of scale-up** - tests the underlying theory of change in a broader range of settings and the infrastructure needed to support full scale-up;
- 4 **Go to full scale** - focus is on rapid uptake, with less emphasis on new learning, supported by reliable data feedback.⁹⁹

The authors concluded that there are three essential themes to successful scale-up; a sequential approach to reach full scale; enhancing the receptivity of the environment; and presence of system-level factors to support scale-up.⁹⁹ Whilst scaling-up frameworks and

guidelines such as these exist, the evaluation of such in improving implementation of evidence based policies and practices is limited and warrants further investigation to ensure public health benefits at a population level are achieved.

CONCLUSION AND AIMS

To ensure the potential benefits of school healthy eating policies are realised, identification of strategies that are effective in implementing healthy school canteen or nutrition policies is required. Only a small number of trials have identified strategies that help improve policy compliance, few have been delivered at scale as seen in Table 1.6, hence, the ability to deliver these strategies across a large number of schools and maintain effectiveness is unknown. Likewise, the cost effectiveness of health promotion interventions is often under reported, representing a significant impediment to research to scale up effective programs.

While a number of relevant theories and frameworks exist to guide efforts to implement effective interventions at scale, at present, the evidence base regarding the impact of strategies to increase school implementation of healthy eating policies is limited. In this context the thesis comprises of the following Chapters;

CHAPTER 2: EFFECTIVENESS OF A MULTI-COMPONENT INTERVENTION TO ENHANCE IMPLEMENTATION OF A HEALTHY CANTEEN POLICY IN AUSTRALIAN PRIMARY SCHOOLS: A RANDOMISED CONTROLLED TRIAL

To build the existing evidence base regarding approaches to improve healthy canteen policies, this Chapter sought to assess the effectiveness of a theoretically designed multi-strategy intervention in increasing the implementation of a healthy canteen policy in Australian primary schools. The Chapter found that a multi-strategic intervention involving training, performance monitoring and feedback, telephone and text messaging support, chosen with 'scale' in mind, can improve schools' implementation of a healthy school canteen policy. The study makes a novel contribution to a currently sparse implementation research landscape in the school setting and provides evidence to improve nutrition policy implementation in schools.

**CHAPTER 3:
ECONOMIC ANALYSIS OF THREE INTERVENTIONS OF DIFFERENT
IMPLEMENTATION INTENSITY OF HEALTHY SCHOOL CANTEEN POLICIES
IN AUSTRALIA: COSTS AND INCREMENTAL COST EFFECTIVENESS**

To address the lack of studies describing the costs of school-based implementation strategies, and to inform policy and practice decision making, this Chapter sought to pool data from RCTs of three implementation interventions to evaluate the most effective and cost-effective means of implementing a healthy school canteen policy. The Chapter found that both a 'medium' and 'high intensity' intervention were potentially cost-effective strategies to support schools to improve implementation of a healthy canteen policy. Such findings provide previously unavailable evidence to inform policy and practice decisions regarding the nature and extent of investment required to achieve the intended public health benefits of school food availability policies.

**CHAPTER 4:
VALIDITY OF FOUR DIFFERENT MEASURES TO ASSESS COMPLIANCE OF
SCHOOL CANTEEN MENUS WITH A STATE-BASED HEALTHY CANTEEN
POLICY**

To aid researchers in the selection of outcome measures for healthy canteen policy implementation research, this Chapter sought to describe the validity of four methods of assessing school menu compliance with canteen policies and report the direct cost and time to administer each. The Chapter found that self-reported measures are unlikely to provide an accurate representation of policy compliance. A quick menu audit represents an inexpensive, relative to a gold standard approach, and valid method that can be used to assess healthy canteen policy compliance on a large scale. The availability of such valid measures is essential to support future research assessing the impact of intervention strategies to overcome policy implementation failure in this field.

**CHAPTER 5:
SCALE UP OF A MULTI-STRATEGIC INTERVENTION TO INCREASE
IMPLEMENTATION OF A SCHOOL HEALTHY CANTEEN POLICY (HEALTHY
FOOD@SCHOOL)**

This Chapter sought to assess the effectiveness of an intervention to support implementation, at scale, of a healthy canteen policy in Australian primary schools. The study was the first trial of an intervention to scale-up a healthy canteen policy in Australia and provide policy makers and practitioners with a model which could be

adopted in other jurisdictions. The Chapter found school canteen compliance with a healthy food policy increased in association with a multi-strategy intervention delivered at scale. The study provides evidence for public health policy makers and practitioners regarding strategies and modes of support required to support improvement in nutrition policy implementation across an entire population of schools.

CHAPTER 6:

ASSESSING THE POTENTIAL IMPACT OF A FRONT-OF-PACK NUTRITIONAL RATING SYSTEM ON FOOD AVAILABILITY IN SCHOOL CANTEENS: A RANDOMISED CONTROLLED TRIAL

Recent changes to healthy canteen policies require canteen managers to assess the healthiness of products using a 'health star' food classification system. Health star ratings are often displayed on the front-of-pack for packaged foods. Therefore, this Chapter sought to assess the potential impact of this policy change on canteen manager's intentions regarding products they would make available for sale in their canteen when presented with health star rating product information. The Chapter found the inclusion of product nutritional rating information has the potential to improve the availability of some 'healthier' items on canteen menus and contribute to improving child dietary intake. Further research is required to determine the impact a policy utilising the health star rating system has on the availability of foods and beverages in school canteens, student purchases and their subsequent dietary intake.

CHAPTER 7:

A SUMMARY OF FINDINGS AND FUTURE DIRECTIONS FOR POLICY, PRACTICE AND RESEARCH

This Chapter will summarise the thesis findings and make recommendations for future research and practice.

THESIS STRUCTURE

This thesis includes a series of papers that are published or submitted for publication, and conforms to the University of Newcastle rules regarding thesis submission by publication [Appendix 1.1]. Following this introductory Chapter, the subsequent Chapters, which address the thesis aims are as follows;

Table 1.7 Thesis Chapters

CHAPTER	CHAPTER TITLE	RESEARCH AIMS	RESEARCH PAPERS
Two	Effectiveness of a multi-component intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial.	To assess the effectiveness of a theoretically designed multi-strategy intervention in increasing the implementation of a healthy canteen policy in Australian primary schools.	Nathan N, Yoong SL, Sutherland R, Reilly K , Delaney T, Janssen L, Robertson K, Reynolds R, Chai LK, Lecathelinais, Wiggers J, Wolfenden L. Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i> . 2016;13(1):106.
Three	Economic analysis of three interventions of different implementation intensity of healthy school canteen policies in Australia: costs and incremental cost effectiveness.	To evaluate the most effective and cost effective school healthy eating intervention from three randomised controlled trials of interventions of varying implementation support intensity, aimed at enhancing the implementation of a state-based healthy eating policy.	Reilly K , Reeves P, Deeming S, Yoong S, Wolfenden L, Nathan N, Wiggers J. Economic analysis of three interventions of different implementation intensity of healthy school canteen policies in Australia: costs and incremental cost effectiveness. <i>BMC public health</i> . 2018 Dec;18(1):378.
Four	Validity of four different measures to assess compliance of school canteen menus with a State-based healthy canteen policy.	To describe the validity of four canteen menu assessment methods to the 'gold standard' of on-site observations, including the direct cost and time to administer of each.	Reilly K , Nathan N, Wolfenden L, Wiggers J, Sutherland R, Wyse R, Yoong S. Validity of four different measures to assess compliance of school canteen menus with a State-based healthy canteen policy. <i>Health promotion Journal of Australia</i> . 2017 Jan 11;27(3):215-21.
Five	Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy (healthy food@school).	To assess the effectiveness of an intervention to support implementation, at scale, of a healthy canteen policy in Australian primary schools.	Reilly K , Nathan N, Wiggers J, Yoong S, Wolfenden L. Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy. <i>BMC Public Health</i> . 2018 Dec;18(1):860.

CHAPTER	CHAPTER TITLE	RESEARCH AIMS	RESEARCH PAPERS
Six	Assessing the potential impact of a front-of-pack nutritional rating system on food availability in school canteens: A randomised controlled trial	To assess the impact of providing the Health Star Rating on canteen manager's intentions regarding products they would make available for sale in their canteen along with their current awareness, attitudes and perceived barriers to using the Health Star Rating in decisions regarding canteen food availability.	Reilly K , Nathan N, Wu J, Delaney T, Wyse R, Cobcroft M, Wiggers J, Sutherland R, Buffet K, Yoong S, Wolfenden L. Assessing the potential impact of a front-of-pack nutritional rating system on food availability in school canteens: A randomised controlled trial. <i>Appetite</i> . 2018 Feb 1;121:309-15.
Seven	A summary of findings and future directions for policy, practice and research.	To provide recommendations for future research and practice regarding increasing the implementation and sustainability of school-based healthy canteen policies at scale.	N/A

REFERENCES

- 1 Kaikkonen JE, Mikkila V, Magnussen CG, Juonala M, Viikari JS, Raitakari OT. Does childhood nutrition influence adult cardiovascular disease risk? - Insights from the Young Finns Study. *Annals of Medicine*. 2013;45(2):120-8.
- 2 Maynard M, Gunnell D, Emmett P, Frankel S, Davey Smith G. Childhood diet and adult cancer. *Journal of Epidemiology and Community Health*. 2003;57:218-25.
- 3 Shay CM, Gooding HS, Murillo R, Foraker R. Understanding and Improving Cardiovascular Health: An Update on the American Heart Association's Concept of Cardiovascular Health. *Progress in Cardiovascular Diseases*. 2015;58(1):41-9.
- 4 Stewart BW, Wild CP. *World Cancer Report*. Lyon: World Health Organization, 2014.
- 5 Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*. 2014 Aug 30;384(9945):766-81.
- 6 Australian Institute of Health and Welfare. *Australian Burden of Disease Study: Impact and causes of illness and death in Australia 2011*. Canberra: 2016.
- 7 Wang LY, Yang Q, Lowry R, Wechsler H. Economic Analysis of a School-Based Obesity Prevention Program. *Obesity*. 2003 Nov 1;11(11):1313-24.
- 8 Whitrow MJ, Moran L, Davies MJ, Collins CE, Burrows TL, Edwards S, et al. Core food intakes of Australian children aged 9-10 years: nutrients, daily servings and diet quality in a community cross-sectional sample. *Journal of Human Nutrition and Dietetics*. 2016.
- 9 Dobbs R, Sawers C, Thompson F, Manyika J, Woetzel J, Child P, et al. *How the world could better fight obesity*. McKinsey Global Institute, 2014.
- 10 World Health Organization. *Global status report on noncommunicable diseases*. Geneva: 2014.
- 11 Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *Jama*. 2012 Feb 1;307(5):483-90.
- 12 Public Health England. *National diet and nutrition survey. Results from years 1, 2, 3 and 4 (combined) of the rolling program (2008/2009 - 2011/2012)*. 2014.
- 13 Australian Bureau of Statistics. *National Health Survey First Results Australia 2014-15*. Canberra: 2015.
- 14 Stamatakis E, Primatesta P, Chinn S, Rona R, Falaschetti E. Overweight and obesity trends from 1974 to 2003 in English children: what is the role of socioeconomic factors? *Archives of Disease in Childhood*. 2005;90(10):999-1004.
- 15 Stamatakis E, Wardle J, Cole TJ. Childhood obesity and overweight prevalence trends in England: evidence for growing socioeconomic disparities. *International Journal of Obesity (London)*. 2010;34(1):41-7.
- 16 Wabitsch M, Moss A, Kromeyer-Hauschild K. Unexpected plateauing of childhood obesity rates in developed countries. *BMC Medicine*. 2016;12(17).
- 17 Magarey AM, Daniels LA, Boulton TJ. Prevalence of overweight and obesity in Australian children and adolescents: reassessment of 1985 and 1995 data against new standard international definitions. *The Medical Journal of Australia*. 2001;174(11):561-4.
- 18 Australian Institute of Health and Welfare 2014. *Australia's health 2014*. Australia's health series no. 14. Cat. no. AUS 178. Canberra: AIHW.

- 19 Hardy LL, King L, Espinel P, Cosgrove C, Bauman A. NSW Schools Physical Activity and Nutrition Survey (SPANS) 2010: Short Report. Sydney: 2010.
- 20 Hardy LL, Mhrshahi S, Drayton BA, Bauman A. NSW Schools Physical Activity and Nutrition Survey (SPANS) 2015: Full Report. Sydney: NSW Department of Health; 2016.
- 21 Gortmaker SL, Swinburn BA, Levy D, Carter R, Mabry PL, Finegood DT, et al. Changing the future of obesity: science, policy, and action. *The Lancet*. 2011;378(9793):838-47.
- 22 Ambrosini GL. Childhood dietary patterns and later obesity: a review of the evidence. *Proceedings of the Nutrition Society*. 2014;73(1):137-46.
- 23 Rosenheck R. Fast food consumption and increased caloric intake: a systematic review of a trajectory towards weight gain and obesity risk. *Obesity Reviews*. 2008;9(6):535-47.
- 24 Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. *American Journal of Public Health*. 2007;97(4):667-75.
- 25 World Health Organization. Overweight and Obesity Fact Sheet 2016. Available from: <http://www.who.int/mediacentre/factsheets/fs311/en/>.
- 26 Yancey AK, Kumanyika SK. Bridging the gap: understanding the structure of social inequities in childhood obesity. *American Journal of Preventive Medicine*. 2007 Oct 1;33(4):S172-4.
- 27 World Health Organization. Global Strategy on Diet, Physical Activity and Health France: WHO; 2006.
- 28 World Health Organization. Report of the commission on ending childhood obesity. Geneva: World Health Organisation, 2016.
- 29 American Heart Association. Dietary Recommendations for Healthy Children 2016. Available from: http://www.heart.org/HEARTORG/HealthyLiving/Dietary-Recommendations-for-Healthy-Children_UCM_303886_Article.jsp#.V3oe1I97IU.
- 30 Public Health England. The Eatwell Guide 2016 [9 May 2018]. Available from: <https://www.gov.uk/government/publications/the-eatwell-guide>.
- 31 National Health and Medical Research Council. Australian Dietary Guidelines. Canberra: National Health and Medical Research Council; 2013.
- 32 Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. *Journal of Nutrition*. 2010;140(10):1832-8.
- 33 Lien N, Lytle LA, Klepp KI. Stability in consumption of fruit, vegetables, and sugary foods in a cohort from age 14 to age 21. *Preventive Medicine*. 2001;33(3):217-26.
- 34 Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: policy and environmental approaches. *Annual Review of Public Health*. 2008;29:253-72.
- 35 Bell AC, Swinburn BA. What are the key food groups to target for preventing obesity and improving nutrition in schools? *European Journal of Clinical Nutrition*. 2004;58(2):258-63.
- 36 Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obesity Reviews*. 2009;10(1):110-41.
- 37 Chriqui JF, Pickel M, Story M. Influence of school competitive food and beverage policies on obesity, consumption, and availability: a systematic review. *JAMA Pediatrics*. 2014;168(3):279-86.

- 38 De Bourdeaudhuij I, Van Cauwenberghe E, Spittaels H, Oppert JM, Rostami C, Brug J, et al. School-based interventions promoting both physical activity and healthy eating in Europe: a systematic review within the HOPE project. *Obesity Reviews*. 2011;12(3):205-16.
- 39 Driessen CE, Cameron AJ, Thornton LE, Lai SK, Barnett LM. Effect of changes to the school food environment on eating behaviours and/or body weight in children: a systematic review. *Obesity Reviews*. 2014;15(12):968-82.
- 40 Godin K, Leatherdale ST, Elton-Marshall T. A systematic review of the effectiveness of school-based obesity prevention programmes for First Nations, Inuit and Metis youth in Canada. *Clinical Obesity*. 2015;5(3):103-15.
- 41 Jaime PC, Lock K. Do school based food and nutrition policies improve diet and reduce obesity? *Preventive Medicine*. 2009;48(1):45-53.
- 42 Katz DL, O'Connell M, Njike VY, Yeh MC, Nawaz H. Strategies for the prevention and control of obesity in the school setting: systematic review and meta-analysis. *International Journal of Obesity (London)*. 2008;32(12):1780-9.
- 43 Mayne SL, Auchincloss AH, Michael YL. Impact of policy and built environment changes on obesity-related outcomes: a systematic review of naturally occurring experiments. *Obesity Reviews*. 2015;16(5):362-75.
- 44 Sacco J, Lillico HG, Chen E, Hobin E. The influence of menu labelling on food choices among children and adolescents: a systematic review of the literature. *Perspectives in Public Health*. 2017;137(3):173-81.
- 45 Sobol-Goldberg S, Rabinowitz J, Gross R. School-based obesity prevention programs: A meta-analysis of randomized controlled trials. *Obesity*. 2013 Dec;21(12):2422-8.
- 46 Van Cauwenberghe E, Maes L, Spittaels H, van Lenthe FJ, Brug J, Oppert JM, et al. Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: systematic review of published and 'grey' literature. *British Journal of Nutrition*. 2010;103(6):781-97.
- 47 Verstraeten R, Roberfroid D, Lachat C, Leroy JL, Holdsworth M, Maes L, et al. Effectiveness of preventive school-based obesity interventions in low-and middle-income countries: a systematic review. *The American Journal of Clinical Nutrition*. Jul 2012;96(2):415-38.
- 48 Wang D SD. The implementation and effectiveness of school-based nutrition promotion programmes using a health-promoting schools approach: a systematic review. *Public Health Nutrition*. Jun 2013;16(6):1082-100.
- 49 Wang Y, Cai L, Wu Y, Wilson RF, Weston C, Fawole O, et al. What childhood obesity prevention programmes work? A systematic review and meta-analysis. *Obesity Reviews*. 2015 Jul;16(7):547-65.
- 50 Waters E, de Silva-Sanigorski A, Burford BJ, Brown T, Campbell KJ, Gao Y, et al. Interventions for preventing obesity in children. *The Cochrane Library*. Dec 2011.
- 51 Williams AJ, Henley WE, Williams CA, Hurst AJ, Logan S, Wyatt KM. Systematic review and meta-analysis of the association between childhood overweight and obesity and primary school diet and physical activity policies. *International Journal of Behavioral Nutrition and Physical Activity*. Dec 2013;10(1):101.
- 52 U.S. Department of Health and Human Services Centers for Disease Control and Prevention. Results from the School Health Policies and Practices Study 2014. 2015; https://www.cdc.gov/healthyyouth/data/shpps/pdf/shpps-508-final_101315.pdf.
- 53 United States Department of Agriculture. Food and Nutrition Service. Nutrition Standards in the National School Lunch and School Breakfast Programs. *Federal Register*. 2012;77(17):4087-4167.

- 54 Dimpleby H, Vincent J. The School Food Plan 2013. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/251020/The_School_Food_Plan.pdf.
- 55 Sanigorski AM, Bell AC, Kremer PJ, Swinburn BA. Lunchbox contents of Australian school children: room for improvement. *European Journal of Clinical Nutrition*. 2005;59(11):1310-6.
- 56 Woods J, Bressan A, Langelaan C, Mallon A, Palermo C. Australian school canteens: menu guideline adherence or avoidance? *Health Promotion Journal of Australia*. 2014;25(2):110-5.
- 57 NSW Department of Health (DoH), Department of Education and Training (DET). *Fresh Tastes @ School NSW Healthy School Canteen Strategy: canteen menu planning guide*. 3rd ed. Sydney: NSW Department of Health, NSW Department of Education and Training.; 2012.
- 58 Department of Education. *Healthy School Canteens* 2017. Available from: <https://healthyschoolcanteens.nsw.gov.au/>.
- 59 Downs SM, Farmer A, Quintanilha M, Berry TR, Mager DR, Willows ND, et al. From paper to practice: barriers to adopting nutrition guidelines in schools. *Journal of Nutrition Education and Behavior*. 2012;44(2):114-22.
- 60 Gabriel CG, Vasconcelos Fde A, Andrade DF, Schmitz Bde A. First law regulating school canteens in Brazil: evaluation after seven years of implementation. *Archivos Latinoamericanos De Nutricion*. 2009;59(2):128-38.
- 61 U.S. Department of Health and Human Services Centers for Disease Control and Prevention. *Results from the School Health Policies and Practices Study 2014*. 2015; https://www.cdc.gov/healthyyouth/data/shpps/pdf/shpps-508-final_101315.pdf.
- 62 Green Party of Aotearoa New Zealand. *Annual tuckshop survey shows pies, chips still staples*. 2007. Available from: <https://home.greens.org.nz/press-releases/annuالتuckshop-survey-shows-pies-chips-still-staples>.
- 63 Masse LC, Naiman D, Naylor PJ. From policy to practice: implementation of physical activity and food policies in schools. *International Journal of Behavioral Nutrition and Physical Activity*. 2013;10:71.
- 64 Lawlis T, Knox M, Jamieson M. *School canteens: A systematic review of the policy, perceptions and use from an Australian perspective*. Nutrition & Dietetics. 2016.
- 65 Hills A, Nathan N, Robinson K, Fox D, Wolfenden L. Improvement in primary school adherence to the NSW Healthy School Canteen Strategy in 2007 and 2010. *Health Promotion Journal of Australia*. 2015.
- 66 Clarke J, Fletcher B, Lancashire E, Pallan M, Adab P. The views of stakeholders on the role of the primary school in preventing childhood obesity: a qualitative systematic review. *Obesity Reviews*. 2013;14(12):975-88.
- 67 Pettigrew S, Donovan RJ, Jalleh G, Pescud M, Cowie S. *Addressing Childhood Obesity through School Canteens*. In: Training RttWDoEa, editor. Perth: UWA Business School, the University of Western Australia, and the Centre for Behavioural Research in Cancer Control, Curtin University; 2009.
- 68 Cleland V, Worsley A, Crawford D. What are grade 5 and 6 children buying from school canteens and what do parents and teachers think about it? *Nutrition and Dietetics*. 2004;61(3):145-50.
- 69 Wolfenden L, Nathan NK, Sutherland R, Yoong SL, Hodder RK, Wyse RJ, et al. *Strategies for enhancing the implementation of school-based policies or practices targeting risk factors for chronic disease*. The Cochrane Library. 2017 Nov.

- 70 Alaimo K OS, Golzynski D, Drzal N, Lucarelli J, Reznar M, et al. The Michigan healthy school action tools process generates improvements in school nutrition policies and practices, and student dietary intake. *Health Promotion Practice*. 2015;16(3):401-10.
- 71 Cunningham-Sabo L, Snyder MP, Anliker J, Thompson J, Weber JL, Thomas O, et al. Impact of the Pathways food service intervention on breakfast served in American-Indian schools. *Preventive Medicine*. 2003;37:S46-54.
- 72 de Villiers A, Steyn NP, Draper CE, Hill J, Dalais L, Fourie J, et al. Implementation of the HealthKick intervention in primary schools in low-income settings in the Western Cape Province, South Africa: a process evaluation. *BMC Public Health*. 2015;15:818.
- 73 French SA, Story M, Fulkerson JA, Hannan P. An environmental intervention to promote lower-fat food choices in secondary schools: outcomes of the TACOS Study. *American Journal of Public Health*. 2004;94(9):1507-12.
- 74 Heath EM, Coleman KJ. Evaluation of the institutionalization of the coordinated approach to child health (CATCH) in a US/Mexico border community. *Health Education and Behavior* 2002;29(4):444-60.
- 75 Lytle LA, Kubik MY, Perry C, Story M, Birnbaum AS, Murray DM. Influencing healthful food choices in school and home environments: results from the TEENS study. *Preventive Medicine*. 2006;43(1):8-13.
- 76 Mobley CC, Stadler DD, Staten MA, El ghormli L, Gillis B, Hartstein J, et al. Effect of nutrition changes on foods selected by students in a middle school-based diabetes prevention intervention program: The HEALTHY Experience. *Journal of School Health*. 2012;82(2):82-90.
- 77 Perry CL, Bishop DB, Taylor GL, Davis M, Story M, Gray C, et al. A randomized school trial of environmental strategies to encourage fruit and vegetable consumption among children. *Health Education and Behavior*. 2004;31(1):65-76.
- 78 Saraf DS, Gupta SK, Pandav CS, Nongkinrih B, Kapoor SK, Pradhan SK, et al. Effectiveness of a school based intervention for prevention of non-communicable diseases in middle school children of rural North India: a randomized controlled trial. *Indian Journal of Pediatrics*. 2015;82(4):354-62.
- 79 Simons-Morton BG, Parcel GS, O'Hara NM. Implementing organizational changes to promote healthful diet and physical activity at school. *Health Education and Behavior*. Quarterly 1988;15(1):115-30.
- 80 Story M, Mays RW, Bishop DB, Perry CL, Taylor G, Smyth M, et al. 5-a-day Power Plus: process evaluation of a multicomponent elementary school program to increase fruit and vegetable consumption. *Health Education and Behavior*. 2000;27(2):187-200.
- 81 Whatley Blum JE, Davee AM, Devore RL, Beaudoin CM, Jenkins PL, Kaley LA, et al. Implementation of lowfat, low-sugar, and portion-controlled nutrition guidelines in competitive food venues of Maine public high schools. *Journal of School Health*. 2007;77(10):687-93.
- 82 Wolfenden L, Nathan N, Janssen LM, Wiggers J, Reilly K, Delaney T, et al. Multi-strategic intervention to enhance implementation of healthy canteen policy: a randomised controlled trial. *Implementation Science*. 2017 Dec;12(1):6.
- 83 Yoong SL, Nathan N, Wolfenden L, Wiggers J, Reilly K, Oldmeadow C, et al. CAFÉ: a multicomponent audit and feedback intervention to improve implementation of healthy food policy in primary school canteens: a randomised controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*. 2016 Dec;13(1):126.
- 84 Nathan N, Yoong S, Sutherland R, Reilly K, Delaney T, Janssen L, et al. Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen

- policy in Australian primary schools: a randomised controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*. 2016 Dec;13(1):106.
- 85 Nathan N, Wolfenden L, Bell AC, Wyse R, Morgan PJ, Butler M, et al. Effectiveness of a multi-strategy intervention in increasing the implementation of vegetable and fruit breaks by Australian primary schools: a nonrandomized controlled trial. *BMC Public Health*. 2012;12:651.
 - 86 Milat AJ, King L, Newson R, Wolfenden L, Rissel C, Bauman A, et al. Increasing the scale and adoption of population health interventions: experiences and perspectives of policy makers, practitioners, and researchers. *Health Research Policy and Systems*. 2014;12:18.
 - 87 Yoong SL, Wolfenden L, Clinton-McHarg T, Waters E, Pettman TL, Steele E, et al. Exploring the pragmatic and explanatory study design on outcomes of systematic reviews of public health interventions: a case study on obesity prevention trials. *Journal of Public Health (Oxford)*. 2014;36(1):170-6.
 - 88 Finch M, Wolfenden L, Morgan PJ, Freund M, Jones J, Wiggers J. A cluster randomized trial of a multi-level intervention, delivered by service staff, to increase physical activity of children attending center-based childcare. *Preventive Medicine*. 2014;58:9-16.
 - 89 Finch M, Wolfenden L, Falkiner M, et al. Impact of a population based intervention to increase the adoption of multiple physical activity practices in centre based childcare services: a quasi-experimental, effectiveness study. *International Journal of Behavioral Nutrition and Physical Activity*. 2012;29;9(1):101.
 - 90 Cohen KE, Morgan P, Plotnikoff RC, Callister R, Lubans DR. Physical activity and skills intervention: SCORES cluster randomized controlled trial. *Medicine and science in sports and exercise*. 2015 47(4):765-74.
 - 91 Sutherland RL, Nathan NK, Lubans DR, Cohen K, Davies LJ, Desmet C, et al. An RCT to Facilitate Implementation of School Practices Known to Increase Physical Activity. *American Journal of Preventive Medicine*. 2017 Dec 1;53(6):818-28.
 - 92 Milat AJ, Bauman A, Redman S. Narrative review of models and success factors for scaling up public health interventions. *Implementation Science*. 2015;10:113.
 - 93 Rogers E. *Diffusion of Innovations*. 5th Edition. ed. New York: Free Press; 2003.
 - 94 Rogers EM. Diffusion of preventive innovations. *Addictive Behaviors*. 2002;27:989–993.
 - 95 Rabin BA, Glasgow RE, Kerner JF, Klump MP, Brownson RC. Dissemination and implementation research on community-based cancer prevention: a systematic review. *American Journal of Preventive Medicine*. 2010;38(4):443-56.
 - 96 Glanz K, Escoffrey C, Elliott T, Nehl E. Randomised Trial of Two Dissemination Strategies for a Skin Cancer Prevention Program in Aquatic Settings. *American Journal of Public Health*. 2015;105(7):1415-23.
 - 97 Wiecha JL, El Ayadi AM, Fuemmeler BF, Carter JE, Handler S, Johnson S, et al. Diffusion of an integrated health education program in an urban school system: planet health. *Journal Pediatric Psychology*. 2004;29(6):467-74.
 - 98 Milat AJ, King L, Newson R, et al. Increasing the scale and adoption of population health interventions: experiences and perspectives of policy makers, practitioners, and researchers. *Health Research Policy and Systems*. 2014; 12:18.
 - 99 Barker PM, Reid A, Schall MW. A framework for scaling up health interventions: lessons from large-scale improvement initiatives in Africa. *Implementation Science*. 2016;11(12).

CHAPTER 2

Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial

Published in:

Nicole Nathan, Sze Lin Yoong, Rachel Sutherland, Kathryn Reilly, Tessa Delaney, Lisa Janssen, Katie Robertson, Renee Reynolds, Li Kheng Chai, Christophe Lecathelinais, John Wiggers, Luke Wolfenden. Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial. **International Journal of Behavioral Nutrition and Physical Activity**. 2016; 13:106. DOI: 10.1186/s12966-016-0431-5

ABSTRACT

Background

The implementation of school nutrition policies, which govern the provision of food in schools, is recommended as a public health strategy to support the development of healthy dietary behaviours in school-aged children. Despite this, research internationally and in Australia indicates that few schools implement such policies. This study aims to examine whether a theoretically designed, multi-strategy intervention was effective in increasing the implementation of a healthy canteen policy in Australian primary schools.

Methods

A parallel group randomised controlled trial was conducted with all government and Catholic primary schools within one region in New South Wales, Australia who had an operational canteen that provided food to primary school aged children (5–12 years) and were not currently receiving an intervention to change their canteen practices. Schools randomised to the intervention arm received a 9-month multicomponent intervention including ongoing support, provision of resources, performance monitoring and feedback, executive support and recognition. The primary outcomes were the proportion of the schools with a canteen menu that: i) did not include 'red' or 'banned' items according to the healthy canteen policy; and ii) had more than 50 % 'green' items. The primary outcome was assessed via menu audit at baseline and follow-up by dietitians blinded to group allocation.

Results

Fifty-three eligible schools were randomised to either the intervention or control group (28 intervention; 25 control). Analyses with 51 schools who returned school menus found that intervention schools were significantly more likely relative to control schools to have a menu without 'red' or 'banned' items (RR = 5.78 (1.45–23.05); $p = 0.002$) and have at least 50 % of menu items classified as green (RR = 2.03 (1.01–4.08); $p = 0.03$).

Conclusions

This study found that a multi-component intervention was effective in improving primary schools' compliance with a healthy canteen policy. Given the lack of evidence regarding how best to support schools with implementing evidence-based policies to improve child diet, this trial for the first time provides high quality evidence to practitioners and policy makers seeking to improve nutrition policy implementation in schools.

Trial registration

This trial was prospectively registered with the Australian New Zealand Clinical Trials Registry (ACTRN12614001148662) 30th October 2014.

BACKGROUND

Poor dietary behaviours are associated with the development of numerous chronic diseases including cardiovascular disease,¹ some cancers,² stroke³ and type 2 diabetes.⁴ Evidence suggests that a large proportion of children in high income countries, including the United States,^{5,6} United Kingdom,⁷ and Australia⁸ do not meet national dietary guidelines.⁵⁻⁸ As dietary behaviours established in childhood can track through to adulthood,⁹⁻¹¹ supporting the establishment of healthy dietary habits in childhood has the potential to reduce the burden of both current and future diet related disease.^{12,13}

As schools provide almost universal access to children,¹⁴ during which time they consume almost 40 % of their daily energy intake,¹⁵ they have been recommended as a key setting for population-based nutrition initiatives.¹⁶ Evidence from systematic reviews suggests that school food and beverage nutrition policies and guidelines have been effective in improving the food environment of schools and the dietary intake of students.^{17, 18} As a result, the World Health Organization has recommended that schools implement nutrition policies to control the types of foods and beverages available to students.¹⁹ Accordingly, school healthy eating policies and guidelines have been implemented by various jurisdictions including Canada,²⁰ the United States,²¹ New Zealand,²² and Australia.²³ For example in Canada the Ontario government's nutrition standards for schools, which extends to all foods and beverages sold in schools, requires that they 'sell most' (at least 80 %) of foods and beverages that are the healthiest options, 'sell less' (no more than 20 %) of less healthier options and are not permitted to sell foods or beverages that contain few or no essential nutrients and/or high amounts of fat, sugar, and/or sodium.²⁰ Similarly, New Zealand schools are encouraged to develop school canteen menus which are mostly made up of 'every day' foods and beverages, to not let 'sometimes' foods and beverages dominate the menu and that occasional foods and beverages not be sold at all.²⁴

Although such policies exist, their implementation by schools is less than optimal. For example, results of the 2012 School Health Policies and Practices Study (SHPPS) in the United States found that 57.3 % of secondary schools did not adhere to recommended nutrition standards by selling energy dense nutrient poor foods, including chocolate, pastries, salty snacks and sweetened drinks.²⁵ Similarly a 2007 study of New Zealand schools found poor adherence to healthy nutrition guidelines where 52 % of school

canteen menus did not offer fruit, 24 % did not offer rolls/sandwiches, and only 39 % included water in the menu.²⁶ Furthermore, a 2012 cross-sectional study of 263 Australian schools found that less than 35 % of schools implemented state-specific healthy canteen policies that restricted the sale of unhealthy foods and beverages.²⁷ A number of barriers have been reported to impede the implementation of nutrition policies in schools including; insufficient school leadership support,²⁸ a perceived lack of school community support,²⁹ profitability concerns,²⁹ limited nutrition knowledge and food classification skills of food service personnel.³⁰

To ensure the potential benefits of school healthy eating policies are realised, identification of strategies that are effective in implementing healthy school canteen or nutrition policies is required. A 2010 review by Rabin et al. of the effectiveness of interventions to increase community settings implementation of cancer prevention programs identified just one study which aimed to improve schools' implementation of healthy eating policies or practices.³¹ This multi-component quasiexperimental study was conducted in four matched schools over 4 years and included: training; resources; and financial and in-school advice to support schools' implementation of healthy food service guidelines.³² The trial found no significant difference between the intervention and control groups in the fat or sodium content of school cafeteria lunches at follow-up.

Given the limited evidence base regarding strategies to increase school implementation of healthy eating policies, further research identifying such strategies that are effective in overcoming schools' barriers to implementation of nutrition policies that can reach geographically diverse schools in a timely and cost-effective manner is required.³³ In this context, we undertook a study to assess the effectiveness of a theoretically designed multi-strategy intervention in increasing the implementation of a healthy canteen policy in Australian primary schools.

METHODS

DESIGN AND SETTING

A group randomised controlled trial was conducted in government and Catholic schools located in the Hunter New England (HNE) Local Health District in New South Wales (NSW), Australia. The HNE region covers a large non-metropolitan area (more than 130 000 km²); with a demographically and socioeconomically diverse population of children

aged 5 to 12 years.³⁴ This trial was prospectively registered with the Australian New Zealand Clinical Trials Registry (ACTRN12614001148662) on the 30th October 2014 [Appendix 2.1, 2.2].

Policy context

In 2005, the NSW state government introduced a healthy school canteen policy (“Fresh Tastes @ School”),²³ [Appendix 2.3] mandatory for implementation by state schools and strongly encouraged for use in Catholic schools. Utilising a ‘traffic light’ food classification system, the policy classifies foods and beverages sold in school canteens (whether that be pre-packaged foods or those made on site by canteen staff) as either ‘red’, ‘amber’ or ‘green’ based on their nutritional content [See Tables 2.1 and 2.2 below]. For all foods sold in the canteen at recess and lunch the policy requires schools to remove all red foods from regular sale and to fill the menu (that is more than 50 %)³⁵ with green foods and to not let amber foods dominate the menu. Furthermore, in 2007 a ban was introduced on all sugar-sweetened drinks (>300 kJ and/or have >100 mg of sodium/serve), prohibiting them from being sold in schools. Whilst the policy is mandatory in state schools, to date there has been no monitoring of implementation and as such no consequences for schools that fail to adhere.

PARTICIPANTS

Government and Catholic primary schools (children 5 to 12 years of age) in the HNE region with an operational canteen (n = 315) served as the sampling frame for the study. Government schools are run by a state government whilst the Catholic schools are run by a diocese-based educational institution. All school systems must follow the same educational curriculum. Schools were ineligible to participate if they; were an independent school, had secondary students (including central schools i.e. enrolling students from Kindergarten to Grade 12), exclusively catered for children requiring specialist care, didn’t have a canteen that operated at least once per week, if they were participating in another canteen intervention study or if they were identified by the NSW government as a high performing health promoting school in terms of implementing nutrition (including canteens) and physical activity policies and practices.³⁶

Table 2.1: Classification and examples of Red, Amber and Green items based on “Fresh Tastes @ School”

Red Foods	Amber Foods	Green foods
‘Red’ foods are nutrient poor, high-energy foods such as confectionary, deep fried foods and chocolate coated or premium ice creams.	‘Amber’ foods are considered to have some nutritional value however if consumed in large amounts can contribute to excess energy intake such as full fat dairy products, processed meats, some snack food bars and biscuits, some savoury snack foods, some muffins and cakes, some ice creams and dairy desserts.	‘Green’ foods are considered to provide good sources of nutrients such as fruit, vegetables, reduced fat dairy products, lean meat, fish and poultry and bottled water.

Table 2.2: The occasional food criteria for determining if a food is red²³

Hot food assessed per 100g	Nutrient criteria per 100g			
Food category	Energy (kJ)	Saturated fat (g)	Sodium (mg)	NA
Savoury pastries, pasta, pizzas, oven baked potato products, spring rolls, fried rice and noodles	>1000 kJ	>5 g	>400 mg	
Crumbed & coated foods (eg patties, chicken products, frankfurters)	>1000 kJ	>5 g	>700 mg	

Snack food and drinks assessed per serve	Nutrient criteria per serve (as sold in canteen)			
Food category	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Fibre (g)
Snack food bars, sweet biscuits	>600 kJ	>3 g		<1.0 g
Savoury snack foods, biscuits	>600 kJ	>3 g	.200 mg	
Ice creams, milk based ice confections	>600 kJ	>3 g		
Cakes, muffins, sweet pastries	>600 kJ	>3 g		<1.5 g

RANDOMISATION, RECRUITMENT AND ALLOCATION

Prior to baseline data collection, schools were randomly allocated in a 1:1 ratio to either an intervention or control group by an independent investigator using a computerised random number function in Microsoft Excel. Group allocation was concealed from staff involved in school recruitment. Such staff contacted school administrators and asked for a copy of the school's menu to be emailed or faxed to the project team. Schools were not blind to group allocation. Dietitians conducting menu assessments at baseline and follow-up were blind to group allocation.

MULTI-COMPONENT IMPLEMENTATION INTERVENTION

The study utilised the Theoretical Domains Framework (TDF)³⁷ to identify the potential behavioural determinants of implementation of the Fresh Tastes @ School policy as a guide to the selection of implementation intervention strategies [Appendix 2.4]. The TDF is an integrative framework of organisational change theory that draws on 33 theories relevant to improving implementation across disciplines. The TDF is comprised of 14 domains and 84 theoretical constructs that allow implementation scientists to assess practitioners' barriers and enablers to policy implementation, and help inform the design of appropriately targeted interventions. The framework has been widely used in the development of effective clinical practice change interventions.³⁸ The framework was applied and associated intervention development procedures were used to design the multi-component implementation strategy to improve primary schools' implementation of the policy. Specifically, implementation of the framework involved the following steps:

- i Literature reviews of previous nutrition implementation interventions in schools,
- ii Surveys with canteen managers in the study region using a modified TDF questionnaire³⁹ and
- iii Discussions with health promotion practitioners experienced in working with school canteens were undertaken to identify possible barrier and enablers for policy implementation

Utilising such information, the identified barriers were mapped to TDF constructs, and implementation strategies recommended by the TDF to address identified barriers were then selected using a process described by Michie et al.⁴⁰ Delivered over a 9-month period

(three school terms October 2014 - June 2015) the implementation intervention included:

- 1 Executive support - School principals were telephoned to inform them of the training and resources available to their school canteen and asked to demonstrate their support for implementation of the Fresh Tastes @ School policy by encouraging the canteen manager and a parent representative to attend canteen manager training and for receipt of ongoing support.
- 2 Canteen manager/parent training [Appendix 2.5, 2.6] - A 1 day (5 h) group training workshop was offered to canteen managers and parent representatives providing education and skill development in the Fresh Tastes @ School policy, label reading, canteen stock and financial management, pricing and promotion, and change management [Appendix 2.7, 2.8, 2.9]. Dietitians, experienced in delivering training to canteen managers, conducted the training. The workshop provided opportunities for canteen managers to participate in consensus processes through the development of a canteen action plan [Appendix 2.10] identifying how they would implement Fresh Tastes @ School in their school. If a school canteen manager was unable to attend the workshop, they were telephoned and offered a 30-45 min-teleconference call or a face-to-face meeting with a dietitian to discuss workshop content and resources.
- 3 Tools and resources - Printed instructional materials, sample policies/menus, planning templates, pricing guides, product lists of policy compliant menu items, supplier contacts and menu assessment feedback were provided to all school canteen managers during the workshop or mailed to non-attenders of the workshop [Appendix 2.11, 2.12, 2.13]. Canteen managers who attended the workshop also received kitchen equipment to the value of AUD\$100.
- 4 On-going support - Following training, canteen managers received two support contacts per school term via text messages [Appendix 2.14]. Framed by the TDF these contacts provided targeted advice to overcome common barriers to policy implementation and encouraged canteen managers to review progress against their action plan. Canteen managers who requested additional support were contacted by a project officer after the workshop and provided tailored advice.

- 5 Performance monitoring and feedback - During the workshop, schools were provided a written feedback report [Appendix 2.15] on their previously supplied canteen menu. The feedback report identified the included foods and beverages that were red/banned, amber or green and the proportion of the menu contributed by each category. Red/banned food items in the report were advised to be removed, with alternatives, where possible, identified. Where amber foods dominated the menu (>50%), green alternative food items were recommended. The feedback report included a sample 'compliant' menu, individually tailored using the schools baseline menu. Canteen managers were asked to send an updated version of the menu for review and a second feedback report was generated.
- 6 Recognition- Schools with a menu assessed as adhering to the policy (i.e. greater than 50% green items and no red or banned items) received a congratulatory letter from the research team [Appendix 2.16], and provided a positive feedback article they could include in their school newsletter.

Note: To access intervention materials go to:

<http://www.goodforkids.nsw.gov.au/primary-schools/canteens/>.

COMPARISON SCHOOLS

Comparison schools were not offered the multi-strategy intervention described above. However during the trial period, teachers from either intervention or control group schools were able to access NSW Government run programs directed at supporting school promotion of healthy eating and physical activity generally.⁴¹

DATA COLLECTION AND MEASURES

School characteristics

Data regarding school type (Government, non-Government Catholic), number of students and the postcode of the locality of the school were obtained from the Australian Governments 'My School' website.⁴²

Primary trial outcomes

The primary outcomes of the trial were:

- i the proportion of schools with a canteen menu that did not include red or banned foods and beverages and
- ii the proportion of schools where green items make up the majority of the menu defined as more than 50 % of listed menu items.³⁵

Outcome data were collected at baseline (winter 2014 i.e. May-July 2014) and follow-up (winter 2015 i.e. May-July 2015) via audits of canteen menus faxed or emailed to the project team by the school. Trained dietitians, blinded to group allocation, conducted an assessment of the canteen menu using a menu analysis assumptions guide [Appendix 2.17]. This method has previously been validated with a cross-sectional study in 38 schools that compared menu analysis using assumptions to an observational audit (the criterion standard).⁴³ Observational audits involved 2-3 trained research assistants visiting a school canteen to record the nutritional information from product nutrition panels of all food and beverage items sold in the canteen so that items could be classified according to the Fresh Tastes @ School guidelines [Appendix 2.18]. Menu assessment using assumptions was found to have substantial agreement ($\kappa = 0.68$) when compared to direct observation.

Delivery of the multi-strategy interventions

Project records were used to assess the fidelity and reach of the intervention in relation to number of schools that were provided each of the implementation intervention strategies [Appendix 2.19].

SAMPLE SIZE AND POWER

Assuming 80 schools would be assessed as eligible to participate, and a response rate of 70% would yield a total sample of 56 schools (28 per group). Such a sample would allow the study to detect as significant an absolute change in the primary trial outcomes of approximately 35 with 80% power and an alpha of 0.05, assuming a control group prevalence of 15% at follow-up.

ANALYSES

All analyses were performed in SAS 9.3 (SAS Institute Inc., Cary, NC). Descriptive statistics were used to describe school characteristics. School postcodes were used to categorise the school's locality as either 'rural' (those schools in outer regional, remote and very remote areas) or 'urban' (those in regional cities and inner regional areas) based upon the Australian Standard Geographical Classification (ASGC) (Australian Bureau of Statistics (ABS), 2011). Schools with postcodes ranked in the top 50 % of NSW postcodes based on the Socio-Economic Indexes For Australia (SEIFA) (Australian Bureau of Statistics (ABS), 2011) were categorised as schools in 'higher socio-economic areas' while those in the lower 50% were categorized as schools in 'lower socioeconomic areas'. Menu items were classified and counted from which the percentage of red, amber, green or banned items on each menu could be determined. Descriptive statistics were used to determine the overall percentage of green, amber and red items for the groups. The primary trial outcomes were analysed under an intention-to-treat framework using all available data. Between group differences in the primary outcomes at follow-up were assessed using Fishers exact test and presented as relative risks (with approximate 95 % confidence intervals). In addition a post-hoc analysis was undertaken to determine if implementation of the policy differed by school characteristics. Given only one school was lost to follow-up, sensitivity analyses using imputation to examine the impact of loss to follow-up were not undertaken.

RESULTS

Sixty-eight schools were randomised prior to baseline data collection and approached to participate in the study of which 61 schools agreed (89.7%). However five schools were excluded, as they did not have a canteen and one school was excluded as they were a central school. Of the remaining schools, 55 consented and returned menus (88.7%) for baseline assessment, two of which were deemed ineligible as they did not have a regular canteen leaving a final baseline sample of 53 schools (28 intervention, 25 control) [Figure 2.1: CONSORT]. There were no significant differences for schools that consented and participated to those that did not. Furthermore, there were no significant differences between groups in school characteristics or menu composition.

The baseline characteristics of participating schools in intervention and control groups are shown in Table 2.3. Of the 53 schools, 51 (96%; 27 intervention and 24 control) provided menus at follow-up.

There were no significant differences between groups in school characteristics or menu composition at baseline.

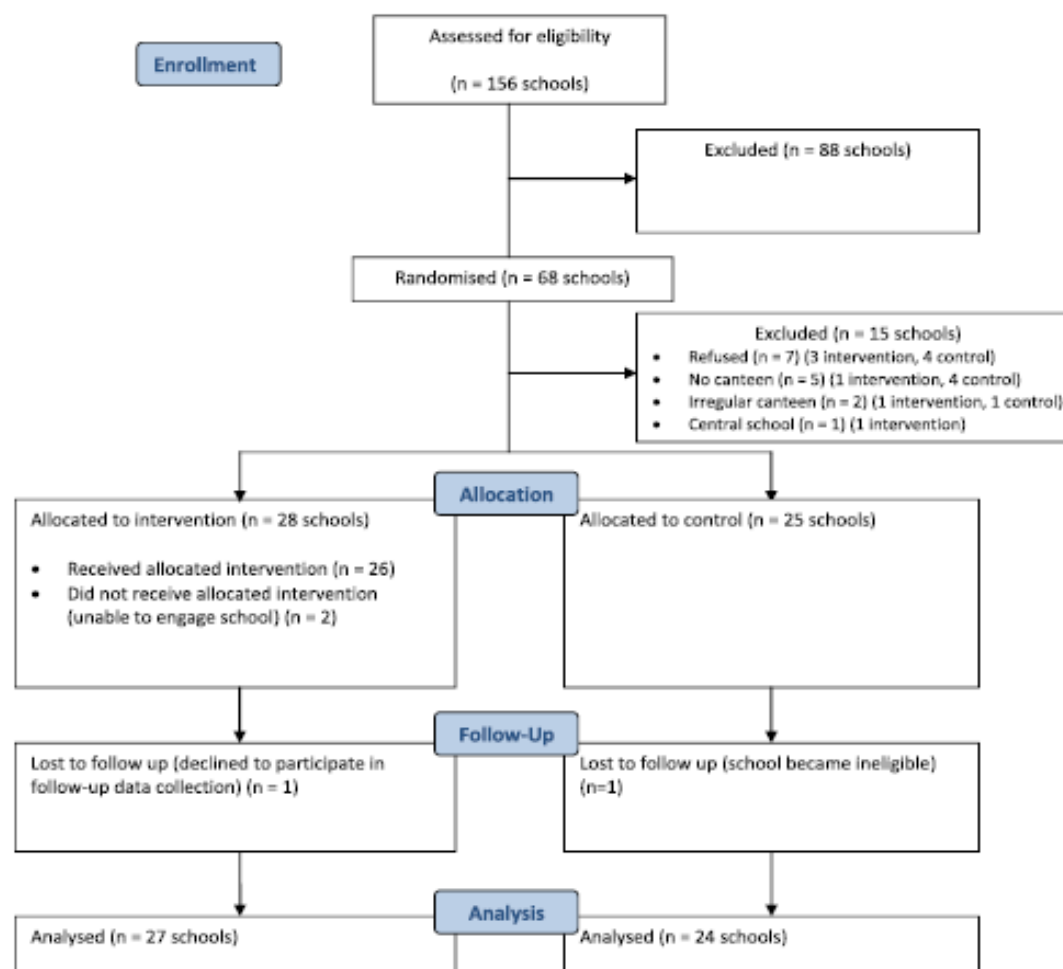


Figure 2.1: CONSORT flow chart describing progress of participants through the study

Table 2.3: Baseline characteristics of participating schools by group

Characteristics	Intervention <i>N</i> =28		Control <i>N</i> =25	
School type				
Government	19	68%	16	64%
Catholic	9	32%	9	36%
Number of students [†]	232±192		267±209	
Urban/Rural region				
Major cities + inner regional	22	79%	23	92%
Outer regional / remote Australia	6	21%	2	8%
Socio-economic index				
Lower socio-economic areas	19	68%	18	72%
Higher socio-economic areas	9	32%	7	28%

NB: Number of students from on control schools I missing

[†] Values reported in mean ± SD

PRIMARY TRIAL OUTCOMES

As seen in Table 2.4, intervention schools were significantly more likely than control schools to have a menu without red or banned items ($RR=5.78$ (1.45–23.05); $p=0.002$). Similarly, intervention schools were significantly more likely to have at least 50% of menu items classified as green than control schools ($RR=2.03$ (1.01–4.08); $p=0.03$). There were no significant differences in intervention effect based on school characteristics that is school type, geographic or socio-demographic location. The overall percentage green, amber and red menu items for intervention schools at follow-up was 52.0, 45.7 and 2.3 % respectively compared to control schools which had an overall percentage of 47.0 % green, 46.5 % amber and 6.5 % red menu items.

DELIVERY OF THE MULTI-STRATEGY INTERVENTION

Table 2.5 shows the proportion of intervention schools that received each of the implementation strategies. All schools received the resources and kitchen equipment, and most schools (96.4 %) received training, menu feedbacks (92.9 %) and 75 % of canteen managers provided a mobile phone number so that text messages could be distributed.

Table 2.4: Summary of strategies and costs for the three trials

	BASELINE				FOLLOW-UP				INTERVENTION GROUP v CONTROL GROUP (95 % CI)	
	Intervention (N=28)		Control (N=25)		Intervention (N=27) ^a		Control (N=24) ^b		Relative risk (95% CI)	p Value
	n	%	n	%	n	%	n	%		
Canteen menu does not contain foods and beverages restricted for sale (red or banned)	5	17.9	2	8.0	13	48.2	2	8.33	5.78 (1.45-23.05)	0.002
Healthy canteen items (green) represent >50% of products listed on the canteen menu	7	25.0	9	36.0	16	59.3	7	29.2	2.03 (1.01-4.08)	0.03

^a denotes one school refused to provide follow-up data

^b denotes one school canteen closed

Table 2.5: Extent of delivery of multi-strategy intervention

Intervention component	Intervention schools (N=28)
Principal engagement	26
Resources (printed and electronic materials)	28
Kitchen equipment	28
Training Workshop	12
Modified training workshop (over phone/face to face)	14
Action plan follow-up contact	21
Menu audit and feedback report	26
Recognition newsletter snippets	14
Number of targeted text messages sent (4 texts per term)	21 provided mobile number for text messages

DISCUSSION

This study sought to evaluate the effectiveness of a theoretically designed intervention to facilitate the implementation of a mandatory healthy canteen policy in Australian schools. The findings suggest that a multi-strategy intervention involving training, performance monitoring and feedback, telephone and text messaging support can improve schools' implementation of a healthy school canteen policy. The study makes a novel contribution to a currently sparse implementation research landscape in the school setting³¹ and provides evidence to improve nutrition policy implementation in schools.

The findings contrast with the only previous trial of a strategy to improve school food availability identified in an Agency for Health Care Research and Quality systematic review that found no improvement in food service policy implementation following receipt of training, resources, financial and in-school advice.³² The effect sizes for the primary trial outcomes in this study (25-42% relative to comparison schools) are however consistent with trials of other interventions that have sought to enhance implementation of a vegetable and fruit program in schools specifically⁴⁴ or other health promotion programs generally⁴⁵⁻⁴⁷ that have used similar implementation support

strategies (13–45%). Given previously reported evidence that changing the relative availability of healthy food in schools can improve student diet,^{48,18} the findings suggest that the provision of implementation support to school canteens has the potential to make a meaningful contribution to improving child nutrition, health and well-being. Despite the success of the intervention in terms of the primary outcome measures, 52% of schools continued to include red items on their canteen menu. 41% of schools continued to have menus where the majority of items were not classified as green. Given this, further research to identify strategies that are effective in improving food availability for sale by all schools is warranted to ensure all children gain the intended benefits of healthy school canteen policies.

The use of an implementation theoretical framework to guide the development of the intervention was a strength of the study. Whilst the findings suggest that the intervention enabled schools to overcome barriers to policy implementation, the size of the study sample precluded verification of this hypothesis empirically. Examining the impact of the intervention on the antecedents to school canteen policy implementation, for example through mediation analyses, would represent particularly useful additional research for researchers, policy makers and practitioners to better understand intervention mechanisms and identify implementation strategies that could be added to enhance effect size, or removed to enhance intervention cost-effectiveness. The lack of psychometrically robust, theoretically informed tools to assess implementation barriers in the school setting is an impediment to such research. Addressing this gap in the scientific literature should be seen a priority to advance the field of implementation science and improve the impact of strategies to implement evidence-based nutrition policies.

The study findings should be considered in the context of the trial methods. The study is strengthened by the trial's randomised controlled design, the theoretical basis for the implementation intervention, blinded outcome assessment and high study retention at follow-up. However, given schools were sampled from only one region within New South Wales the generalizability of the findings to other school systems, or other jurisdictions is limited. Encouragingly though, at least within the study sample, there appeared little difference in the effect of the implementation strategy according to school characteristics suggesting that the intervention may be similarly effective across a variety of socioeconomic and geographic localities. The trial did also not assess canteen manager's

satisfaction with the intervention. Whilst the high level of reach would suggest that the intervention was acceptable to the canteen managers, the collection of such process data could have informed future implementation interventions.

CONCLUSION

Low rates of implementation of school canteen policies in Australia have persisted for more than a decade since policy release, despite government investment in supportive infrastructure. Whilst multi-strategic interventions are often recommended for school-based interventions the cost to government agencies to deliver such interventions at scale is often challenging. The use of telephone and text messaging support employed in this trial enhances the potential scalability of this intervention, thereby providing novel information for public health policy makers and practitioners regarding strategies to facilitate the implementation of nutrition policies and guidelines broadly, and healthy canteen policies specifically.

REFERENCES

- 1 Shay C, Gooding H, Murillo R, Foraker R. Understanding and Improving Cardiovascular Health: An Update on the American Heart Association's Concept of Cardiovascular Health. *Progress Cardiovascular Diseases*. 2015;58:41-9.
- 2 Maynard M, Gunnell D, Emmett P, Frankel S, Davey S. Fruit, vegetables, and antioxidants in childhood and risk of adult cancer: the Boyd Orr cohort. *Journal of Epidemiology and Community Health*. 2003;57(3):218-25.
- 3 Galimanis A, Mono M, Arnold M, Nedeltchev K, Mattle H. Lifestyle and stroke risk: a review. *Current Opinion in Neurology*. 2009;22:60-8.
- 4 Frazao E. America's Eating Habits: Changes and Consequences: High costs of poor eating patterns in the United States. *Agriculture Information Bulletin No. (AIB-750)* 494 pp. Washington, DC: Economic Research Service, USDA; 1999.
- 5 Haack SA, Byker CJ. Recent population adherence to and knowledge of United States federal nutrition guides, 1992–2013: a systematic review. *Nutrition Reviews*. 2014;72(10):613-26.
- 6 Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans Do Not Meet Federal Dietary Recommendations. *Journal Nutrition*. 2010;140(10):1832-8.
- 7 Bates B, Lennox A, Prentice A, et al. National Diet and Nutrition Survey: Results from Years 1-4 (combined) of the Rolling Programme (2008/2009 - 2011/12): Executive summary. London: Public Health England; 2014.
- 8 Commonwealth Scientific Industrial Research Organisation Preventative Health National Research Flagship, University of South Australia. 2007 Australian National Children's Nutrition and Physical Activity Survey Main Findings. Commonwealth of Australia; 2008.
- 9 Jaaskelainen P, Magnussen CG, Pahkala K, et al. Childhood nutrition in predicting metabolic syndrome in adults: the cardiovascular risk in Young Finns Study. *Diabetes Care*. 2012;35(9):1937-43.
- 10 Kaikkonen JE, Mikkila V, Magnussen CG, Juonala M, Viikari JS, Raitakari OT. Does childhood nutrition influence adult cardiovascular disease risk? – insights from the Young Finns Study. *Annals of Medicine*. 2013;45(2):120-8.
- 11 Mikkila V, Rasanen L, Raitakari OT, Pietinen P, Viikari J. Longitudinal changes in diet from childhood into adulthood with respect to risk of cardiovascular diseases: The Cardiovascular Risk in Young Finns Study. *European Journal of Clinical Nutrition*. 2004;58(7):1038-45.
- 12 World Health Organisation. WHO Fruit and Vegetable Promotion Initiative – report of the meeting, Geneva, 25–27 August 2003. Geneva: World Health Organisation; 2003.
- 13 World Health Organisation. Global Strategy on Diet, Physical Activity and Health. 2004; <http://www.who.int/dietphysicalactivity/goals/en/index.html>. Accessed 8 Dec 2013.
- 14 Carter MA, Swinburn B. Measuring the 'obesogenic' food environment in New Zealand primary schools. *Health Promotion International*. 2004;19(1):15-20.
- 15 Bell AC, Swinburn B. What are the key food groups to target for preventing obesity and improving nutrition in schools? *European Journal of Clinical Nutrition*. 2004;58:258-63.
- 16 Masse LC, de Niet-Fitzgerald J, Watts A, Naylor P, Saewyc E. Associations between the school food environment, student consumption and body mass index of Canadian

- adolescents. *International Journal of Behavioral Nutrition and Physical Activity*. 2014;11:29.
- 17 Driessen CE, Cameron AJ, Thornton LE, Lai SK, Barnett LM. Effect of changes to the school food environment on eating behaviours and/or body weight in children: a systematic review. *Obesity Reviews*. 2014;15(12):968-82.
- 18 Jaime PC, Lock K. Do school based food and nutrition policies improve diet and reduce obesity? *Preventive Medicine*. 2009;48(1):45-53.
- 19 World Health Organization. School policy framework: implementation of the WHO global strategy on diet, physical activity and health. Geneva: WHO Press; 2008.
- 20 Ontario Ministry of Education. School Food and Beverage Policy. 2016; <http://www.edu.gov.on.ca/extra/eng/ppm/150.html>. Accessed 27 July 2016.
- 21 National Conference of State Legislatures. Healthy, Hunger-Free Kids Act of human-services/healthy-hunger-free-kids-act-of-2010-summary.aspx. Accessed 23 Mar 2016.
- 22 New Zealand Ministry of Education. Food and nutrition for healthy, confident kids. Wellington: New Zealand Ministry of Education; 2007.
- 23 NSW Department of Health, NSW Department of Education and Training. Fresh tastes @ school NSW healthy school canteen strategy: canteen menu planning guide. 3rd ed. Sydney: NSW Department of Health, NSW Department of Education and Training; 2012.
- 24 Heart Foundation. Fuelled4Life. 2016; <http://www.fuelled4life.org.nz/> Accessed 27 July 2016.
- 25 U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Results from the School Health Policies and Practices Study 2012. In: National Center for HIV/AIDS VH, STD, and TB Prevention (Division of Adolescent and School Health). 2013.
- 26 Green Party of Aotearoa New Zealand. Annual tuckshop survey shows pies, chips still staples. 2007; <https://home.greens.org.nz/press-releases/annuالتuckshopsurvey-shows-pies-chips-still-staples>. Accessed 26 Mar 2016.
- 27 Woods J, Bressan A, Langelaan C, Mallon A, Palermo C. Australian school canteens: menu guideline adherence or avoidance? *Health Promotion Journal of Australia*. 2014;25(2):110-5.
- 28 Middleton G, Keegan R, Henderson H. A qualitative exploration of stakeholder perspectives on a school-based multi-component health promotion nutrition programme. *Journal of Human Nutrition and Dietetics*. 2012;25:547-56.
- 29 Ardzejewska K, Tadros R, Baxter D. A descriptive study on the barriers and facilitators to implementation of the NSW (Australia) Healthy School Canteen Strategy. *Health Education Journal*. 2012;72:136-45.
- 30 Masse LC, Naiman D, Naylor PJ. From policy to practice: implementation of physical activity and food policies in schools. *International Journal of Behavioral Nutrition and Physical Activity*. 2013;10:71.
- 31 Rabin BA, Glasgow RE, Kerner JF, Klump MP, Brownson RC. Dissemination and implementation research on community-based cancer prevention: a systematic review. *American Journal of Preventive Medicine*. 2010;38(4):443-56.
- 32 Coleman KJ, Tiller CL, Sanchez J, et al. Prevention of the epidemic increase in child risk of overweight in low-income schools: the El Paso coordinated approach to child health. *Archives of Pediatrics and Adolescent Medicine*. 2005;159(3):217-24.

- 33 Hills A, Nathan N, Robinson K, Fox D, Wolfenden L. Improvement in primary school adherence to the NSW Healthy School Canteen Strategy in 2007 and 2010. *Health Promotion Journal of Australia*. 2015;26(2):89-92.
- 34 Health Stats NSW. Population growth by Local Health District. 2014; http://www.healthstats.nsw.gov.au/Indicator/dem_pop_lhnmap/dem_pop_lhn_sna_p. Accessed 23 Mar 2016.
- 35 NSW Healthy Kids Association. Fresh Tastes @ School in the Canteen. 2016; <http://healthy-kids.com.au/school-canteens/canteen-guidelines/fresh-tastesschool/>. Accessed 21 Aug 2016.
- 36 NSW Ministry of Health. NSW Office of Preventive Health: The First Year (2012–13) in Review. Sydney: NSW Health; 2013.
- 37 Cane J, Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation Science*. 2012;7:37.
- 38 French SD, Green SE, O'Connor DA, et al. Developing theory-informed behaviour change interventions to implement evidence into practice: a systematic approach using the Theoretical Domains Framework. *Implementation Science*. 2012;7:38.
- 39 Michie S, Johnston M, Abraham C, Lawton R, Parker D, Walker A. Making psychological theory useful for implementing evidence based practice: a consensus approach. *Quality and Safety in Health Care*. 2005;14:26-33.
- 40 Michie S, Johnston M, Francis J, Hardeman W, Eccles M. From Theory to Intervention: Mapping Theoretically Derived Behavioural Determinants to Behaviour Change Techniques. *Applied Psychology*. 2008;57(4):660-80.
- 41 NSW Government. Live Life Well @ School. 2013; <http://www.healthykids.nsw.gov.au/campaigns-programs/live-life-well-@-school.aspx>. Accessed 8 Dec 2013.
- 42 Australian Curriculum Assessment and Reporting Authority. My School. 2016; <https://www.myschool.edu.au/>. Accessed 26 Mar 2016.
- 43 Reilly K, Nathan N, Wolfenden L, et al. Validity of four different measures to assess compliance of school canteen menus with a State-based healthy canteen policy. *Health Promotion Journal of Australia*. 2016 (Special Issue Evaluation in Health Promotion): in press.
- 44 Nathan N, Wolfenden L, Bell AC, et al. Effectiveness of a multi-strategy intervention in increasing the implementation of vegetable and fruit breaks by Australian primary schools: a non-randomised controlled trial. *BMC Public Health*. 2012;12:651. doi:10.1186/1471-2458-12-651.
- 45 Parcel GS, O'Hara-Tompkins NM, Harrist RB, et al. Diffusion of an effective tobacco prevention program. Part II: evaluation of the adoption phase. *Health Education Research*. 1995;10(3):297-307.
- 46 Schofield MJ, Edwards K, Pearce R. Effectiveness of two strategies for dissemination of sun protection policy in New South Wales primary and secondary schools. *Australian and New Zealand Journal of Public Health*. 1997;21(7):743-50.
- 47 Hoelscher D, Kelder S, Murray N, Cribb P, Conroy J, Parcel G. Dissemination and adoption of the Child and Adolescent Trial for Cardiovascular Health (CATCH): a case study in Texas. *Journal of Public Health Management and Practice*. 2001;7(2):90-100.
- 48 Mâsse LC, de Niet-Fitzgerald JE, Watts AW, Naylor PJ, Saewyc EM. Associations between the school food environment, student consumption and body mass index of Canadian adolescents. *International Journal of Behavioral Nutrition and Physical Activity*. 2014;11:29.

CHAPTER 3

Economic analysis of three interventions of different intensity in improving school implementation of a government healthy canteen policy in Australia: Costs, incremental and relative cost effectiveness

Published in:

Kathryn L. Reilly, Penny Reeves, Simon Deeming, Sze Lin Yoong, Luke Wolfenden, Nicole Nathan, John Wiggers. Economic analysis of three interventions of different intensity in improving school implementation of a government healthy canteen policy in Australia: costs, incremental and relative cost effectiveness. **BMC Public Health**. 2018; 18:378. [83https://doi.org/10.1186/s12889-018-5315-y](https://doi.org/10.1186/s12889-018-5315-y)

ABSTRACT

Background

No evaluations of the cost or cost effectiveness of interventions to increase school implementation of food availability policies have been reported. Government and non-government agency decisions regarding the extent of investment required to enhance school implementation of such policies are unsupported by such evidence. This study sought to i) Determine cost and cost-effectiveness of three interventions in improving school implementation of an Australian government healthy canteen policy and; ii) Determine the relative cost-effectiveness of the interventions in improving school implementation of such a policy.

Methods

An analysis of the cost and cost-effectiveness of three implementation interventions of varying support intensity, relative to usual implementation support conducted during 2013–2015 was undertaken. Secondly, an indirect comparison of the trials was undertaken to determine the most cost-effective of the three strategies. The economic analysis was based on the cost of delivering the interventions by health service delivery staff to increase the proportion of schools 'adherent' with the policy.

Results

The total costs per school were \$166,971, \$70,926 and \$75,682 for the high, medium and low intensity interventions respectively. Compared to usual support, the cost effectiveness ratios for each of the three interventions were: AUD\$2982 (high intensity), AUD\$2627 (medium intensity) and AUD\$4730 (low intensity) per percent increase in proportion of schools reporting 'adherence'). Indirect comparison between the 'high' and 'medium intensity' interventions showed no statistically significant difference in cost-effectiveness.

Conclusions

The results indicate that while the cost profiles of the interventions varied substantially, the cost-effectiveness did not. This result is valuable to policy makers seeking cost-effective solutions that can be delivered within budget.

BACKGROUND

The prevalence of overweight and obesity in children of high income countries has become a major health concern. Globally in 2013, approximately 24 % of children were classified as overweight or obese, an increase of almost 17 % since 1980.¹ Similarly, Australian data indicates that the prevalence of overweight and obesity in children has doubled over recent decades.^{2,3} Childhood obesity contributes to a significant financial burden on the healthcare system, with over 50 % of obese children continuing to be so as they move into adulthood.⁴ A recent systematic review estimated that obesity accounted for between 0.7 % and 2.8 % of a country's total healthcare expenditure.⁵ As such, interventions to prevent excessive weight gains have been identified as a priority by governments globally.

Recent reviews and trials suggest that improving the relative availability of healthy foods, particularly in schools, is effective in reducing the prevalence of child overweight and obesity⁶ and/or its behavioral determinants.⁷ For example a recent review by Mayne et al. (2015) found that school food environments that restrict sugary foods and beverages or higher fat foods, and/or had increases in availability of milk and fruits/vegetables reported favorable impacts on purchases or self-reported food consumption.⁷ Likewise, in a trial to increase the availability of healthy food products and restrict the availability of unhealthy products reported by Wolfenden et al. (2017), student purchases from intervention school canteens were significantly lower in total fat (– 132.32 kJ; 95 % CI – 280.99 to 16.34; $p = 0.080$) with trends towards improvement in sodium (– 46.81 mg; 95 % CI – 96.97 to 3.35; $p = 0.067$) and energy intake (– 132.32 kJ; 95 % CI – 280.99 to 16.34; $p = 0.080$).⁸ A review by Katz et al (2008) also found that interventions that include improvements to the school nutrition environment are effective in achieving weight reduction in the school setting.⁶

Evidence from systematic reviews also suggests that obesity prevention interventions delivered in schools are cost-effective.^{9,10} A recent review (2014) of the cost-effectiveness of childhood obesity prevention programs identified three school based programs that were cost-effective.⁹ Of these studies two included, amongst other strategies, changes to the availability of food, suggesting that the inclusion of food availability policies may contribute to cost-effective obesity prevention.^{11,12}

Many high income countries have introduced nutrition policies in schools that support the provision of healthier food and beverage options and restrict unhealthy options in line with national dietary guidelines.¹³⁻¹⁵ Despite the introduction of such policies, the extent of school adherence to such policies is limited. For example, results of the 2012 School Health Policies and Practices Study (SHPPS) in the United States found that almost 60% of secondary schools did not adhere to recommended nutrition standards by selling energy dense nutrient poor foods, such as chocolate, pastries, salty snacks and sweetened drinks.¹⁶ Similarly, a recent review (2016) of the adoption of healthy school food policies in Australian schools found that adherence with such policies in canteens was low.¹⁷ Without widespread school implementation of such policies, their intended benefits at the population level are unlikely to be achieved. Such findings suggest a need for research regarding strategies to increase school adherence to school food availability policies and recommendations.

Three such implementation studies have investigated the effectiveness of strategies to increase schools' implementation of nutrition initiatives broadly, and of policies and practices regarding the availability of food in school canteens and food service settings specifically.^{8,18,19} The trials were conducted in a single region of Australia, in the same time period (2013–15), involved common outcome measures (food availability/ policy adherence) and assessed interventions involving differing modalities and intensity. Two of the trials were found to be effective^{8,18} with the third approaching statistical significance ($p = 0.06$).¹⁹ No economic analyses of the trials were reported.

To the author's knowledge, no evaluations of the cost or cost-effectiveness of other interventions to increase school implementation of food availability policies have been reported. In the absence of such information, government and non-government agency decisions regarding the nature and extent of investment required to enhance school implementation of such policies is unsupported by relevant evidence.

To address the evidence gap regarding the cost and cost effectiveness of interventions to increase school adherence with food availability policies, an economic evaluation was conducted of the three recently reported intervention trials.^{8,18,19} Specifically, the study sought to;

- i Determine the cost and cost-effectiveness of each of the three interventions in improving school implementation of a government healthy canteen policy and;
- ii Determine the relative cost-effectiveness of the three interventions in improving school implementation of such a policy.

METHODS

STUDY DESIGN

Two separate but related analyses were undertaken. First, a within-trial evaluation of the cost and cost-effectiveness of three implementation interventions, relative to usual implementation support, was undertaken. Usual implementation support involved government-provided training for schools to develop action plans [Appendix 3.1] targeting a variety of healthy eating practices, including healthy food availability in school canteens.²⁰ Second, a between-trial comparison was undertaken to determine the most cost-effective of the three intervention strategies in increasing school implementation of the policy.

The studies adopted a health service delivery perspective and involved analysis of the direct costs to health services of providing implementation support. Health services in the state of New South Wales (NSW) Australia are a provider of support for school implementation of the healthy school canteen policy. Health services, alongside school-aged children and families, are also a significant potential beneficiary of the interventions in terms of the benefits that may accrue from improved nutrition, such as net savings in healthcare utilisation. The base year for all analyses was 2015 with costs reported in Australian dollars.

CONTEXT

In Australia, children are able to purchase foods and drinks during recess and lunch time over the counter from a canteen physically located on school premises. All Australian states and territories have introduced healthy canteen policies that utilize a 'traffic light' system to promote healthy foods and restrict the sale of less healthy foods.²¹ In NSW specifically, the government mandated a healthy school canteen policy for all government primary and secondary schools in 2005 [Appendix 3.2].¹⁵ The policy categorized canteen menu items based on their nutritional value.¹⁵ To adhere with the policy, school canteens

were required to fill at least 50 % of the menu with ‘green’ (healthier) foods, limit the availability of ‘amber’ (less healthy) foods and restrict the sale of ‘red’ (poor nutritional value) foods. In 2007, a ‘Sugar Sweetened Drink Ban’ was introduced which bans the sales of sugar sweetened drinks based on their nutrient content.¹⁵ School support officers employed by local health services across the state provided policy implementation support to schools.

TRIAL DESIGN AND SETTING

Three randomized controlled trials were conducted involving primary schools in one region of NSW, Australia.^{8,18,19} The region covers a large geographic area (more than 130,000km²) and consists of a socioeconomically and demographically diverse population of approximately 112,000 children aged 5–12 years.²²

PARTICIPANTS AND RECRUITMENT

Primary schools (with students 5 to 12 year of age) were eligible to participate in the three trials if they had a canteen open at least one day per week. Schools enrolling both primary and secondary students and schools catering exclusively for children requiring specialist care were excluded from the trials. Additional eligibility criteria for the ‘high intensity’ and ‘low intensity’ trials included only government schools with menus not adherent to the healthy canteen policy. For all three trials, school principals were contacted via phone or email and invited to participate in the study.

IMPLEMENTATION INTERVENTIONS AND OUTCOMES

All three randomized controlled trials aimed to enhance school implementation of the government healthy canteen policy by addressing known barriers to the implementation of the policy.^{21,23,24} The three trials employed intervention strategies of varying intensity defined according to three levels of labor support provided by school support officers and number of strategies included (‘high’, ‘medium’ or ‘low’). Intervention strategies for the ‘high intensity’ and ‘medium intensity’ intervention were guided by the Theoretical Domains Framework^{8,18} whilst the ‘low intensity’ intervention was designed using Control Theory [Table 3.1].¹⁹

Table 3.1: Summary of strategies and costs for the three trials

Strategies	Description and/or cost components	High intensity intervention ⁸ Trial registration: ACTRN12613000311752	Medium intensity intervention ¹⁸ Trial registration: ACTRN12614001148662	Low intensity intervention ¹⁹ Trial registration: ACTRN12613000543785
Percentage of schools for each trial that provided menus for audit at follow-up		81%	96%	74%
1] Policy implementation support	The support officer provided targeted advice to overcome common barriers to policy implementation and to encourage canteen managers to review progress against action plans	\$151,062	\$65,111	\$71,128
2] Executive Support	School principals were asked to communicate support for policy implementation and maintenance to teachers, parents, students and canteen managers during staff meetings, in newsletters, and assemblies.	Cost included in support staff wages in Policy Implementation		
3] Consensus processes	Meetings between support staff and canteen staff were held to discuss and reach consensus regarding the policy, how best to implement it and to develop local canteen action plans to co-ordinate implementation tasks.	Cost included in support staff wages in Policy Implementation		

Continued next page

CHAPTER 3: Economic analysis of three interventions of different intensity in improving school implementation of a government healthy canteen policy in Australia: costs, incremental and relative cost effectiveness

Strategies	Description and/or cost components	High intensity intervention ⁸ Trial registration: ACTRN12613000311752	Medium intensity intervention ¹⁸ Trial registration: ACTRN12614001148662	Low intensity intervention ¹⁹ Trial registration: ACTRN12613000543785
4] Training	Canteen managers, canteen staff and parent representatives were invited to attend a training workshop (five hours) with the aim of providing education and skill development in the policy, nutrition and food label reading, canteen stock and financial management, pricing and promotion, and change management. Training combined didactic and interactive components including opportunities for self-assessment, role play and facilitator provided feedback. Training was facilitated by support staff.	\$6,376	\$833	N/A
5] Tools and resources	Provision of “Canteen Resource Kit” containing various printed and electronic instructional materials, including electronic menu and pricing templates, and a poster_sized checklist that prompted canteen managers to regularly review their canteen practices. Canteen managers also received kitchen equipment to the value of AUD\$100.	\$4,781	\$2,959	N/A

Continued next page

CHAPTER 3: Economic analysis of three interventions of different intensity in improving school implementation of a government healthy canteen policy in Australia: costs, incremental and relative cost effectiveness

Strategies	Description and/or cost components	High intensity intervention ⁸ Trial registration: ACTRN12613000311752	Medium intensity intervention ¹⁸ Trial registration: ACTRN12614001148662	Low intensity intervention ¹⁹ Trial registration: ACTRN12613000543785
6] Academic detailing	School canteen visits were conducted one and three months post canteen manager training to enable support officers to observe the operational canteen environment, provide feedback, and assist with problem solving barriers to policy implementation.	Cost included in support staff wages in Policy Implementation	N/A	N/A
7] Recognition	Schools with a menu assessed as adhering to the policy (i.e. greater than 50% 'green' items and no 'red' or 'banned' items) were acknowledged.	\$27	\$0	N/A
8] Performance monitoring and feedback	Menu reviews were conducted (unless menus were unchanged) and the results were used to compile written feedback reports to the canteen manager and school principal. Costs; collection of menus, conduct audits and generate feedback reports	\$4,428 (4/school)	\$2,024 (2/school)	\$4,554 (4/school)

Continued next page

CHAPTER 3: Economic analysis of three interventions of different intensity in improving school implementation of a government healthy canteen policy in Australia: costs, incremental and relative cost effectiveness

Strategies	Description and/or cost components	High intensity intervention ⁸ Trial registration: ACTRN12613000311752	Medium intensity intervention ¹⁸ Trial registration: ACTRN12614001148662	Low intensity intervention ¹⁹ Trial registration: ACTRN12613000543785
9] Marketing strategies	Quarterly project newsletters communicated key messages, provided information and case studies of successful implementation approaches to common barriers.	\$298	N/A	N/A
Total Cost		\$166,971	\$70,926	\$75,682
Total Cost / school		\$4,771	\$2,216	\$2,102

HIGH INTENSITY SUPPORT TRIAL [Appendix 3.3]

The trial involved 35 intervention and 35 control schools over a 12–14 month period. The intervention consisted of a multi-strategic approach involving policy implementation support in conjunction with executive support, consensus processes, staff training, provision of tools and resources, academic detailing, recognition, performance monitoring and feedback and marketing strategies. The intervention also involved intensive on-going support provided by local health district project officers which involved bi-monthly school visits with the canteen manager, principal meetings and school parent representative group (P&C meetings) presentations.

MEDIUM INTENSITY SUPPORT TRIAL

The trial involved 28 intervention and 25 control schools over a 9 month period. Implementation strategies used in the 'high intensity' support trial were included such as executive support, the provision of tools and resources, staff training, performance monitoring and feedback, and recognition in conjunction with a less expensive mode of on-going support via text messaging as oppose to school onsite-visits. Canteen managers received two support contacts per school term via text messages which provided targeted advice to overcome common barriers to policy implementation and encouraged canteen managers to review progress against their action plan.

LOW INTENSITY SUPPORT TRIAL [Appendix 3.4]

The trial involved 36 intervention and 36 control schools over a 12 month period. Implementation support designed to test the effectiveness of a low intensity, lower cost strategy, including canteen menu audits to assess compliance with the State policy and subsequent provision of feedback regarding the content of canteen menus via a written report and telephone call each school term (four times) was delivered.

TRIAL OUTCOME DATA COLLECTION PROCEDURES AND MEASURES

For the three trials, outcome data were collected at baseline and immediately following completion of each of the interventions. Full details of menu audit procedures are reported elsewhere.^{8,18,19,25} In brief, schools provided copies of their current canteen menu for audit by a dietitian, trained in menu assessment, blinded to group allocation. Using a menu assessment protocol [Appendix 3.5], dietitians classified all food and

beverage menu items as either 'green', 'amber', 'red' or 'banned' according to the policy criteria and determined menu composition by calculating the percentage of the total number of items on the menu that were 'green', 'amber', 'red' or 'banned'. The primary trial outcomes of all three trials was the proportion of canteen menus that:

- i did not contain foods or beverages restricted for sale ('red' / 'banned'), and;
- ii where healthy canteen items ('green') represented more than 50 % of listed menu items.^{8,18,19}.

For the purposes of the economic analysis, and in order to have a single comparable effect measure, we combined these two trial outcomes and calculated a measure of full compliance of the policy for all interventions.

COST DATA COLLECTION PROCEDURES AND MEASURES

A retrospective economic analysis was undertaken based on the cost of delivering the interventions by health service delivery staff. For each of the three trials, project management records [Appendix 3.6] relating to intervention delivery included recording of costs regarding (where relevant):

- i school support staff salary costs for support contacts with school principals and canteen staff; menu collection, assessment and generation of feedback reports; canteen staff training and workshop co-ordination; and for project management;
- ii canteen staff training expenses such as venue hire, catering and reimbursement of canteen staff expenses to attend workshops
- iii the provision of canteen equipment and the printing of resources assisting in the financial management and development of menus for canteen staff and;
- iv health service overheads such as administration support, telephone and car usage.

In terms of school support staff salary costs, due to the number and diversity of seniority of personnel involved (six staff across the three trials), school support staff time was

costed at the mid-point in the relevant pay scale, whereas project manager time was actual manager salary (two managers across the three trials). Salary costs for conducting menu audits and coordination of canteen staff training workshops was based on the relevant casual salary rate of employed staff. Venue hire costs for canteen staff training workshops were the actual rates charged, or if held on health service premises at no cost, the external rate for hire was included. Consumable costs such as catering, printing, stationary and canteen equipment were measured directly and valued using market prices.

For control schools, it was assumed that no additional costs were incurred in implementing their usual canteen management practices.

ANALYSES

All analyses were undertaken using Microsoft Excel software 2013. Research related costs together with intervention development and set up costs were excluded from the analysis to achieve a focus on the costs and cost-effectiveness of delivering the interventions only. As the analysis was taken from a health service delivery perspective, costs to canteen managers, principals or schools, including opportunity costs were not assessed.

WITHIN-TRIAL COST AND COST EFFECTIVENESS

Incremental costs and costs per school were calculated for all three interventions. The average cost per school for each intervention was determined by summing the intervention delivery costs and dividing the total cost by the number of intervention schools. Incremental cost-effectiveness ratios (ICERs) were calculated within trials and expressed as costs per percentage point increase in the proportion of schools adherent with the policy. Uncertainty intervals around each of the ICERs were derived from the confidence intervals around the 'adherence' outcome of each of the three interventions.

RELATIVE COST EFFECTIVENESS OF INTERVENTIONS

The relative cost-effectiveness of the interventions was explored using an indirect comparison of the trials' efficacy results and calculating the ICER between the two most effective trials.

SENSITIVITY ANALYSIS

Uni-variate sensitivity analyses were conducted to test plausible variation in the analysis parameters compared to base case ICERs for the interventions with positive ICERs. The sensitivity analyses assessed the effect of:

- i variation in the magnitude of treatment effect using the lower and upper confidence interval limits and
- ii variation in costs of intervention strategy 1 (support officers) using the lower and upper bounds of project officer salary.

The three trials were approved by the Hunter New England Area Human Research Ethics Committee (06/07/26/4.04), the University of Newcastle Human Research Ethics Committee (H-2008-0343) and the NSW Department of Education and Communities (DEC) (#2012277).

RESULTS

TRIAL EFFECTIVENESS

Relative to control groups, schools receiving the 'high' and 'medium intensity' interventions were significantly more likely to have menus adherent to the policy (RR = 14.41 (95 % CI 2.08, 99.97); $p = < 0.001$ and RR = 4.29 (95 % CI 1.04, 17.68); $p = 0.02$ respectively). For schools receiving the 'low intensity' intervention, the difference in the proportion of schools adherent compared to control schools approached statistical significance (RR = 4.44 (0.65, 30.11); $p = 0.06$) [Table 3.2].¹⁹

Table 3.2: Intention to treat analysis of the three trials primary outcomes (composite): overall compliance

	BASELINE				FOLLOW-UP				INTERVENTION v CONTROL AT FOLLOW-UP				
	Intervention		Control		Intervention		Control		Estimated difference		Relative Risk		<i>p</i> -value
	n	%	n	%	n	%	n	%	%	(95%CI)	%	(95%CI)	
High Intensity	0	0	0	0	21	60	2	5	56	35 to 76	14.41	2.08 to 99.97	<0.001 ^a
Medium Intensity	2	7	1	4	10	36	2	8	27	6 to 48	4.29	1.04 to 17.68	0.02 ^a
Low Intensity	0	0	1	3	8	22	4	5	16	-1 to 34	4.44	0.65 to 30.11	0.0624

^a Significant

WITHIN-TRIAL COST AND COST EFFECTIVENESS

Table 1 shows the total delivery costs for the three interventions, the costs per school, and cost per intervention strategy. The total cost of delivering the ‘high intensity’ intervention was \$166,971, the cost for the ‘medium intensity’ intervention was \$70,926 and for the ‘low intensity’ intervention \$75,682. Adjusting for the duration over which the interventions were conducted, 12 months, 9 months and 12 months, respectively, the cost of the ‘medium’ intensity intervention was scaled to be \$94,568. The average cost per school for each of the interventions was \$4771 (high intensity), \$2216 (medium intensity), and \$2102 (low intensity).

Incremental cost effectiveness ratios (ICERs) were calculated as the incremental cost per additional percentage point increase in proportion of schools reporting adherence. The point estimate ICERs for the three interventions versus usual support were \$2982 (high intensity), \$2627 (medium intensity) and \$4730 (low intensity). Figure 3.1 presents the ICERs and associated uncertainty intervals. The low intensity intervention was excluded from further analysis due to the higher point estimate ICER and dominated upper uncertainty interval, indicative of both higher costs and lower efficacy than usual support. In contrast, the tightness of the uncertainty intervals around the ‘high intensity’ intervention suggests a higher degree of certainty in the effectiveness of that trial.

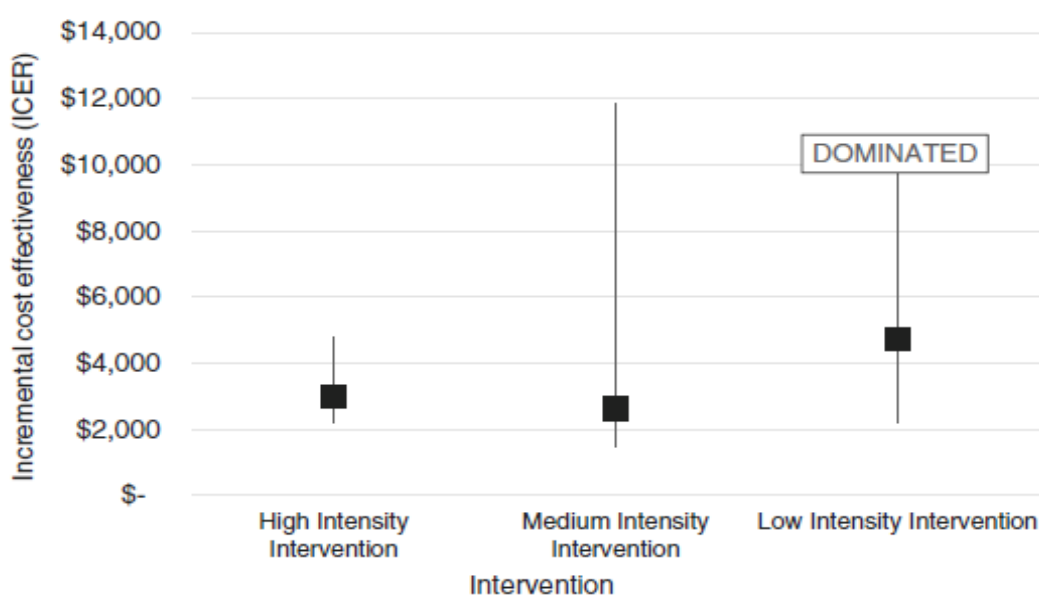


Figure 3.1: Incremental cost effectiveness ratios for the three trials

SENSITIVITY ANALYSIS

Figure 3.2 presents the univariate sensitivity testing results for the ‘high’ and ‘medium intensity’ interventions. The results of the analysis indicate that the ICERs for the ‘high’ and ‘medium intensity’ interventions were most sensitive to the estimate of treatment effect, specifically the lowest bound of the efficacy confidence intervals

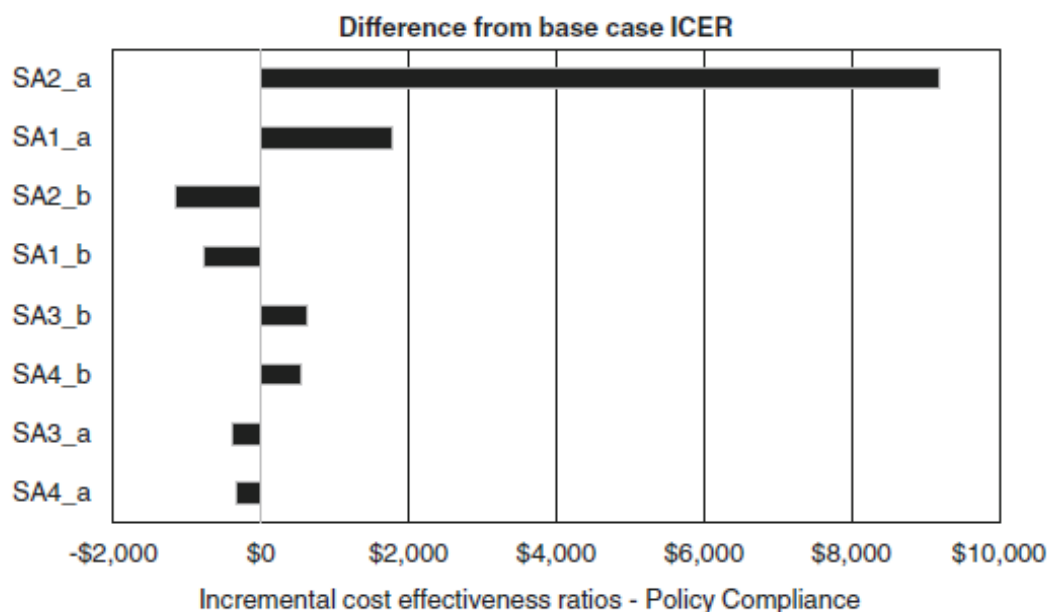


Figure 3.2: Sensitivity analysis for high intensity and medium intensity interventions

RELATIVE COST EFFECTIVENESS OF INTERVENTIONS

The similarity or homogeneity of the trials in terms of design, setting and outcomes measured supports the validity of using indirect comparison to test the relative cost-effectiveness of the interventions. The indirect comparison between the ‘high’ and ‘medium intensity’ interventions showed no statistically significant difference in efficacy. For the overall compliance outcome, the risk difference between these trials was calculated to be 0.29 (95 % CI – 0.003, 0.583) [Figure 3.3]. This result translated into overlapping uncertainty intervals around the ICERs, indicating a strong likelihood that there is no difference in cost-effectiveness between the interventions. However, at a significantly lower overall cost, even when scaled over 12 months, the ‘medium intensity’ intervention would be the optimal choice for policy makers.

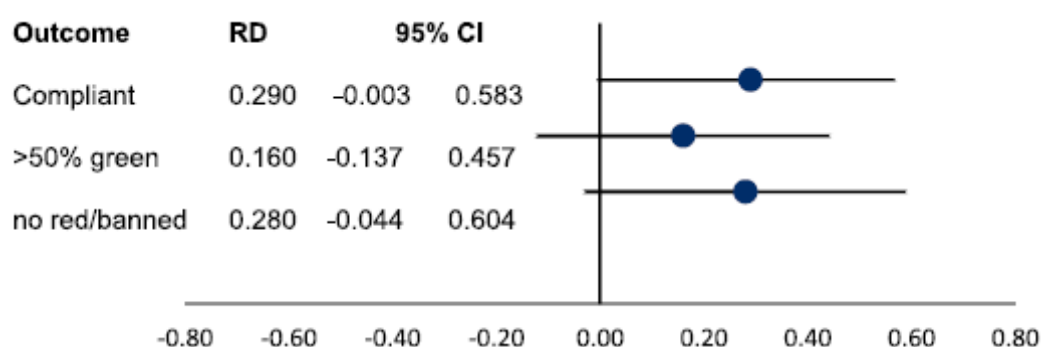


Figure 3.3: Indirect comparison between high intensity intervention and medium intensity intervention

DISCUSSION

This is the first study to assess the cost and cost-effectiveness of three implementation support interventions of varying intensity using similar methods in enhancing the implementation of a healthy school canteen policy, and one of few cost-effectiveness studies of strategies to implement school or community based health promotion initiatives. The 'high intensity' intervention incurred the greatest costs per school (\$4771/ school), followed by the 'medium intensity' intervention (\$2216/school) and the 'low intensity' intervention (\$2102/school). The comparison between the 'high' and 'medium intensity' interventions showed no statistically significant difference between the two in cost-effectiveness. The results indicate that the 'medium' and 'high intensity' interventions were potentially cost-effective strategies to support schools to improve implementation of a healthy canteen policy. Such findings provide previously unavailable evidence to inform policy and practice decisions regarding the nature and extent of investment required to achieve the intended public health benefits of school food availability policies.

Cost-effectiveness analyses of implementation strategies in non-clinical settings are not common²⁶ and to the author's knowledge, are non-existent with regard to food availability policy interventions in schools. As a consequence, no comparable ICERs were available to place the ICERs of the individual interventions addressed in this study in a broader cost-effectiveness context however, the analyses of three interventions in this study provides a strong basis for future research in this area. Without standardized outcomes for economic evaluation of implementation strategies, comparisons across different interventions are difficult. Similarly, no previous research has reported the relative cost-effectiveness of multiple implementation interventions in improving school

adherence with food availability policies or guidelines. Researchers in other disciplines have conducted economic analyses to compare alternative implementation strategies in their field^{27,28} however comparison to ICERs reported in these studies was not plausible due to differences in outcomes.

The on-going support provided by school support staff in the 'high intensity' intervention was the largest cost driver (average of \$4316 /school). It is likely intensive support contributed to the overall greater effectiveness of the intervention.²⁹ Text messaging as opposed to intensive on-going support, which included on-site visits, was the major difference in program delivery between the 'medium' and 'high intensity' interventions and therefore is assumed to have contributed significantly to the lower cost of the 'medium intensity' intervention.

The costs and time required for intervention development and set up is likely to be significant. While many of the resources developed for the three trials have the potential to be implemented in other jurisdictions, some adaptation may be required to address local context differences in terms of policy guidelines, availability of appropriate foods and beverages and type of food service provided by schools. Notwithstanding these potential differences the structure and focus of the implementation support strategies are likely to be applicable across jurisdictions.

Limitations of this study include the relative small sample size of each trial and short follow-up period. Secondly, it should be noted that comparisons are indirect only as the interventions were not tested in a single factorial trial. As cost-effectiveness was measured using a health service delivery perspective, opportunity costs to canteen managers, principals or schools were not included in the study. Further, the aggregate nature of the costs does not permit uncertainty analysis considering variation in both costs and outcomes at the school or student level, and the generalizability of the findings to other countries or jurisdictions is unknown.

The translation of the outcomes captured by the three trials into outcomes commonly used for economic evaluations such as DALYs or percent body fat reduction was not possible in this analysis given the study focus on canteen rather than student level outcomes.^{12,30} Interventions targeting school healthy food policy implementation that include individual outcome data capturing child dietary intake may provide policy

makers with additional useful information on which to make cost-effectiveness comparisons.

A major strength of the study is that it is based on data collected from rigorous implementation RCTs, minimizing bias, all conducted within the same region, and, using comprehensive menu audits to assess policy adherence. Costs associated with the intervention were collected prospectively thus improving accuracy by eliminating recall bias.

CONCLUSION

This study provides the first information regarding the cost-effectiveness of strategies for supporting implementation of school healthy canteen policies and for guiding policy decisions regarding the allocation of scarce resources. Whether such findings are achieved when the strategies are implemented at-scale warrants further research to ensure the benefits of finite health resources return the greatest health benefits to the community.

REFERENCES

- 1 Global Burden of Disease 2013 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990–2013: a systematic analysis for the global burden of disease study 2013. *Lancet*. 2015;386:2287–323.
- 2 Australian Institute of Health and Welfare 2014. Australia's health 2014. Australia's health series no. 14. Cat. No. AUS 178. Canberra: AIHW. 2014.
- 3 Magarey AMDL, Boulton TJ. Prevalence of overweight and obesity in Australian children and adolescents: reassessment of 1985 and 1995 data against new standard international definitions. *The Medical Journal of Australia*. 2001;174(11):561–4.
- 4 Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. Do obese children become obese adults? A review of the literature. *Preventive Medicine* 1993;22(2):167–77.
- 5 Withrow D, Alter DA. The economic burden of obesity worldwide: a systematic review of the direct costs of obesity. *Obesity Reviews*. 2011;12(2):131–41.
- 6 Katz DL, O'Connell M, Njike VY, Yeh MC, Nawaz H. Strategies for the prevention and control of obesity in the school setting: systematic review and meta-analysis. *International Journal of Obesity*. 2008;32(12):1780–9.
- 7 Mayne SL, Auchincloss AH, Michael YL. Impact of policy and built environment changes on obesity-related outcomes: a systematic review of naturally occurring experiments. *Obesity Reviews*. 2015;16(5):362–75.
- 8 Wolfenden L, Nathan N, Janssen LM, et al. Multi-strategic intervention to enhance implementation of healthy canteen policy: a randomised controlled trial. *Implementation Science*. 2017;12(1):6.
- 9 Erdol S, Mazzucco W, Boccia S. Cost effectiveness analysis of childhood obesity primary prevention programmes: a systematic review. *Epidemiology Biostatistics and Public Health*. 2014;24:11(3).
- 10 Haby MM, Vos T, Carter R, et al. A new approach to assessing the health benefit from obesity interventions in children and adolescents: the assessing cost-effectiveness in obesity project. *International Journal of Obesity*. 2006;30(10):1463–75.
- 11 Wang LY, Gutin B, Barbeau P, et al. Cost-effectiveness of a school-based obesity prevention program. *Journal of School Health*. 2008;78(12):619–24.
- 12 Wang LY, Yang Q, Lowry R, Wechsler H. Economic analysis of a school based obesity prevention program. *Obesity*. 2003;11(11):1313–24.
- 13 Hirschman J, Chriqui JF. School food and nutrition policy, monitoring and evaluation in the USA. *Public Health Nutrition*. 2013;16(6):982–8.
- 14 Department of Education. Dimbleby H, Vincent J. The School Food Plan. 2013. <https://www.gov.uk/government/publications/the-school-food-plan>. Accessed 19 Mar 2018.
- 15 NSW Department of Health (DoH) Department of Education and Training (DET). Fresh tastes @ school NSW healthy school canteen strategy: canteen menu planning guide. 3rd ed. Sydney: NSW DoH, NSW DET; 2012.
- 16 U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Results from the School Health Policies and Practices Study 2012. In: National Center for HIV/AIDS VH, STD, and TB Prevention (Division of Adolescent and School Health). Washington: US Department of Health and Human Services; 2013.

- 17 Lawlis T, Knox M, Jamieson M. School canteens: a systematic review of the policy, perceptions and use from an Australian perspective. *Nutrition and Dietetics*. 2016; 73(4):389-98.
- 18 Nathan N, Yoong SL, Sutherland R, et al. Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*. 2016;13(1):106.
- 19 Yoong SL, Nathan N, Wolfenden L, et al. CAFE: a multicomponent audit and feedback intervention to improve implementation of healthy food policy in primary school canteens: a randomised controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*. 2016;13(1):126.
- 20 NSW Department of Education and NSW Ministry of Health. Live Life Well @ School. 2017. Healthy Kids Website. <https://www.healthykids.nsw.gov.au/teachers-childcare/live-life-well-@-school.aspx>. Accessed 19 Mar 2018.
- 21 Woods J, Bressan A, Langelaan C, Mallon A, Palermo C. Australian school canteens: menu guideline adherence or avoidance? *Health Promotion Journal of Australia*. 2014;25(2):110-5.
- 22 Health Stats NSW. Population growth by Local Health District. 2014. http://www.healthstats.nsw.gov.au/Indicator/dem_pop_lhnmap/dem_pop_lhn_snap. Accessed 19 Mar 2018.
- 23 Ardzejewska K, Tadros R, Baxter D. A descriptive study on the barriers and facilitators to implementation of the NSW (Australia) healthy school canteen strategy. *Health Education Journal*. 2012;72(2):136-45.
- 24 Pettigrew S, Donovan RJ, Jalleh G, Pescud M. Predictors of positive outcomes of a school food provision policy in Australia. *Health Promotion International*. 2014;29(2):317-27.
- 25 Reilly K, Nathan N, Wolfenden L, et al. Validity of four measures in assessing school canteen menu compliance with state-based healthy canteen policy. *Health Promotion Journal of Australia*. 2017;27(3):215-21.
- 26 Lau R, Stevenson F, Ong BN, et al. Achieving change in primary care effectiveness of strategies for improving implementation of complex interventions: systematic review of reviews. *BMJ Open*. 2015;5(12):e009993.
- 27 Coudeville L, Van Rie A, Getsios D, Caro JJ, Crepey P, Nguyen VH. Adult vaccination strategies for the control of pertussis in the United States: an economic evaluation including the dynamic population effects. *PLoS One*. 2009;4(7):e6284.
- 28 Kania D, Sangare L, Sakande J, et al. A new strategy to improve the cost effectiveness of human immunodeficiency virus, hepatitis B virus, hepatitis C virus, and syphilis testing of blood donations in sub-Saharan Africa: a pilot study in Burkina Faso. *Transfusion*. 2009;49(10):2237-40.
- 29 Wolfenden L, Nathan N, Williams C, et al. A randomised controlled trial of an intervention to increase the implementation of a healthy canteen policy in Australian primary schools: study protocol. *Implementation Science*. 2014;9(1):1-8.
- 30 Carter R, Moodie M, Markwick A, et al. Assessing cost-effectiveness in obesity (ACE-obesity): an overview of the ACE approach, economic methods and cost results. *BMC Public Health*. 2009;9:419.

CHAPTER 4

Validity of four different measures in assessing school canteen menu compliance with a state-based healthy canteen policy

Published in:

Kathryn Reilly, Nicole Nathan, Luke Wolfenden, John Wiggers, Rachel Sutherland, Rebecca Wyse, Sze Lin Yoong. Validity of four measures in assessing school canteen menu compliance with state-based healthy canteen policy **Health Promotion Journal of Australia**. 2016; <http://dx.doi.org/10.1071/HE16053>

ABSTRACT

Issue addressed

In order to assess the impact of healthy school canteen policies on food availability for students, valid methods of measuring compliance are needed that can be applied at scale. The aim of this study is to assess the validity and direct cost of four methods to assess policy compliance: 1) principal and 2) canteen manager self-report via a computer-assisted telephone interview; and 3) comprehensive and 4) quick menu audits by dietitians, compared with observations.

Methods

A cross-sectional study took place in the Hunter region of NSW, Australia, in a sample of 38 primary schools that had previously participated in a randomised controlled trial to improve healthy canteen policy compliance. Policy compliance was assessed using the four methods specified above. Percentage agreement, kappa, sensitivity and specificity compared with observations was calculated together with the direct time taken and costs of each method. Indirect costs (including set-up costs) for all measures have not been included.

Results

Agreement with observations was substantial for the quick menu audit (kappa = 0.68), and moderate for the comprehensive menu audit (kappa = 0.42). Principal and canteen manager self-report resulted in poor agreement and low specificity with the gold standard. The self-reported measures had the lowest cost, followed by the quick menu audit and lastly the comprehensive menu audit.

Conclusions

The quick menu audit represents a valid and potentially low-cost method of supporting policy implementation at scale.

So what?

This study demonstrates that a quick menu audit represents a valid measure of undertaking assessment of school canteen policy compliance at a population level.

INTRODUCTION

Suboptimal dietary intake, including excess kilojoule intake and low fruit and vegetable consumption, is associated with overweight, obesity and chronic diseases including cardiovascular disease and some types of cancer.^{1,2} In countries such as the United States (USA), the United Kingdom (UK) and Australia, it has been reported that ~90% of adults and children do not consume adequate vegetables and fruit to meet nationally recommended guidelines, and that the majority consume foods high in energy, sodium, saturated fat and/ or sugar on a daily basis.³⁻⁵ As eating behaviours and habits formed during childhood persist into adulthood,⁶ interventions to improve child dietary intake are recommended as a key strategy in reducing the future burden of chronic disease.⁷

Schools are recommended as a relevant setting to improve children's dietary intake as they provide access to almost all children during a key developmental period.⁸ Importantly, children can consume a significant proportion (almost 40%) of their dietary intake while at school.⁹ In Australia, in the majority of schools, children can purchase foods and drinks from a canteen or tuckshop.¹⁰ With over 7000 school canteens in Australia, they represent one of the largest and most frequently accessed food outlets for school-aged children.⁹

To support schools implement strategies to improve the nutrition of children, the World Health Organization's Global Action Plan encourages governments to develop or strengthen national food and nutrition policies and action plans in public institutions including schools.¹¹

A further recommendation is that the implementation of such strategies be monitored and evaluated to ensure such programs are effective.¹¹ Internationally there have been concerted efforts to support the monitoring of nutrition environments. The International Network for Food and Obesity/Non-communicable Diseases Research, Monitoring and Action Support group (INFORMAS), a global network of public interest organisations and researchers, have outlined a framework for monitoring the provision of food in line with nutrition policies in public settings including schools.¹² The group outlines a stepwise framework for monitoring, which includes a variety of approaches including 'direct observations or on-site visits' as the optimal approach, or the use of menu audits and self-report as approaches to obtain data from large numbers of schools.¹²

In Australia, all states and territories have introduced healthy canteen policies that utilise a traffic light system to promote healthy foods and restrict the sale of less healthy foods.¹³ In NSW in 2005, the government mandated a healthy school canteen policy – Fresh Tastes @ School (FT@S) Healthy Canteen Strategy [Appendix 2.3] - for all government primary and secondary schools.¹⁴ The guidelines are based on best-practice dietary guidelines at the time¹⁴ and use a traffic light system to categorise menu items based on nutritional profile. ‘Green’ menu items are sources of essential nutrients, contain less saturated fat and/or added sugar and/or salt. ‘Amber’ foods are mainly processed foods with some nutritional value that can, in large serve sizes, contribute to excess energy intake.¹⁴ ‘Red’ foods lack nutritional value, are high in saturated fat, and/or added sugar and/or salt, and can contribute to excess energy intake.¹⁴ To be compliant with the policy, school canteens are encouraged to fill the menu with ‘green’ foods and restrict the sale of ‘amber’ and ‘red’ foods. In 2007, a ban on sales of sugar-sweetened drinks with more than 300 kJ per serve or more than 100mg sodium per serve was introduced.¹⁴ The FT@S guidelines provide a Ready Reckoner¹⁴ of ‘green’, ‘amber’ or ‘red’ commonly sold foods in school canteens [Appendix 4.1]. Other menu items, including most commercial products, require comparison to the Occasional Food Criteria Table [Appendix 4.2], which provides specific nutrient cut-off points for kilojoules, saturated fat, sodium and fibre. For this purpose, additional detail regarding menu products - such as brand, serve size and flavour – are needed to allow for classification according to the policy. Typically, schools offer two types of menus during the school year: a ‘summer menu’ during the warmer months and a ‘winter menu’ during the colder months.

Despite the popularity of such policies in Australia, only a small number of studies have assessed whether schools adequately implement these policies. These studies have found variable implementation ranging from 0-97%,¹³⁻²⁰ which may be due to the use of different methods of measuring policy implementation across the studies. Studies that use principal or canteen manager self-report typically report a higher compliance rate (61-97%)^{17,19} compared with studies where menu audits were undertaken (0-62%).^{14,16,18} One study that undertook observations of food items within four schools found that none were compliant with state policy guidelines.¹⁵

To assess the impact of healthy canteen policies on food provision in schools, valid tools that are inexpensive and time-efficient in their administration are needed to assess policy compliance at a population level.²¹ While observations are the ‘Gold Standard’ method for

assessing school nutrition environments,²² this method is typically costly to administer as it relies on on-site observations by trained field staff.²¹ As such, it is impractical for ongoing monitoring of entire school populations on a jurisdictional basis. Menu audits can be conducted with canteen managers via telephone or email and represent a potentially less expensive method with greater reach. This process, however, requires dietary assessment expertise in auditing the menus¹⁶ and relies on canteen managers knowing the nutritional profile of products sold in the canteen to accurately classify foods. Brief self-reported measures represent the lowest cost approach and the one most readily administered. These measures, however, have been suggested to overestimate policy compliance.²³ The relative validity and cost of these policy compliance assessment methods have not been reported previously. This represents a significant impediment to research aimed at improving or monitoring policy compliance.

This study compares the relative validity and cost of four school canteen policy compliance assessment methods:

- 1 principal self-report,
- 2 canteen manager self-report,
- 3 comprehensive menu audit, and
- 4 quick menu audit with observations. Further, the direct cost and time of undertaking each canteen policy compliance assessment method was also described.

Approval to conduct the study was obtained from Hunter New England Area Health Service Human Research Ethics Committee (no. 06/07/26/4.04), the University of Newcastle (H-2008-0343), the New South Wales Department of Education (DoE); and relevant Catholic School Offices.

METHODS

DESIGN AND SETTING

This cross-sectional study compared four methods of assessing school canteen menu compliance with the state healthy canteen policy with observations. The study took place in the Hunter region of NSW, which has a socioeconomically and demographically diverse population of ~74 709 children aged 5-14 years.²⁴

PARTICIPANTS

Out of 159 public primary schools (servicing children aged 5-12 years) in the Hunter region that had an operational canteen, 70 were randomly selected to participate in a randomised controlled trial (RCT) undertaken by the research team.²⁵ From these schools a quota sample of 50 were invited to participate in this validation study.

DATA COLLECTION PROCEDURES

Principal and canteen manager self-report

From October–December 2014 (summer menu, also offered during February–April), principals at all primary schools in the Hunter region of NSW were approached by letter [Appendix 4.3] to participate in a computer assisted telephone interview (CATI) regarding the promotion of healthy eating and physical activity in schools. Principals were telephoned 2 weeks later by a trained interviewer who confirmed school eligibility, sought consent and scheduled a time to complete the CATI. Consent was also sought from principals to invite canteen managers to participate in a separate CATI. Where such consent was obtained, an information letter [Appendix 4.4] was sent to the canteen manger and followed up with a telephone call to participate in the CATI.

Comprehensive and quick menu audits

Canteen managers were asked to provide a copy of their current (summer) canteen menus to the research team on the day of observations (February–April) for audit by a dietitian using both the comprehensive and quick menu audit methods.

Observations of canteen food and beverage products

A subsample (n=50) of principals and canteen managers was asked to provide consent for observations of canteen food and beverage products. A research assistant subsequently contacted the schools to arrange a suitable time to undertake the observations.

MEASURES

SCHOOL CHARACTERISTICS

During the CATI [Appendix 4.5] principals were asked the number of students attending the school. School postcode was also obtained from school websites.

CANTEEN COMPLIANCE WITH HEALTHY CANTEEN POLICY

Principal self-report

Principals were asked: 'Does your school provide healthy food options consistent with the FT@S menu guidelines in the canteen?' (Yes/No/Don't know)[Appendix 4.5].

Canteen manager self-report

Canteen managers were asked: 'Is your canteen currently compliant with FT@S?' (Yes/No/Not sure) [Appendix 4.6].

Both principal and canteen manager's one-item measure was embedded in a larger survey of school healthy eating and physical activity practices.

MENU AUDITS

Comprehensive menu audit

Comprehensive menu audits were completed by trained dietitians with extensive knowledge of the FT@S guidelines and experience in carrying out audits of school canteen menus. A standardised Menu Assessment Protocol [Appendix 4.7] was developed based on the FT@S guidelines and the Australian Dietary Guidelines for Children and Adolescents,²⁶ which outlines the menu assessment procedure including a step by step process for collecting additional product information and colour coding menu items according to the FT@S guidelines. The protocol also includes an assumptions list for menu items where the colour code has not been clearly defined in the FT@S guidelines and menu counting guidelines. A menu audit was undertaken using a canteen

product database of most commonly sold canteen products in the Hunter New England region developed by the research team.²⁷ This database was developed based on the team's experience working with school canteens, collection of nutritional information of products provided by local suppliers to school canteens in the region and the assessment of menus from over 200 schools. Additionally, canteen managers in each school were telephoned to collect additional information about a food or beverage item such as product brand, serve size or flavours not typically provided on menus. Dietitians used a standard template [Appendix 4.8] to record any additional information needed to assess compliance. On average three phone calls were required per school to collect this additional information. All menu items were colour coded according to the FT@S guidelines as 'green', 'amber' or 'red'. A double audit of 15 menus using the comprehensive menu audit by two independent dietitians achieved a high percentage of agreement (90%) in relation to the percentage of 'green' and 'red' menu items.²⁸

Quick menu audit

The quick menu audit method was adapted from the comprehensive menu audit by a team of dietitians, using the following steps:

- 1 assessment of canteen products to develop a centralised database of the most commonly sold canteen products in the HNE region;²⁷
- 2 engagement with key stakeholders, which included communication with canteen managers, suppliers and health promotion practitioners supporting schools;
- 3 piloting of the quick menu audit tool – the measure was pilot tested using different assumptions needed to classify items according to the FT@S criteria where product information is not available (e.g. full-fat vs low-fat dairy) and modified accordingly; and
- 4 evidence-based application of policy/guidelines similar to the comprehensive menu audit.

Based on this, the tool assigns product information and serve sizes for each menu item [Appendix 4.9], eliminating the need to collect such additional information from canteen managers. The tool consists of a detailed list of common canteen menu items grouped

into categories such as drinks, hot food, frozen dairy treats, snacks, sandwiches and salads, with colour-coded classifications and justifications for each assumption made [Appendix 4.9]. Two trained dietitians independently carried out double audits of the 38 schools using the quick menu audit method and found a 100% agreement in terms of having a menu that was compliant to the FT@S policy. All menu items were colour coded according to the FT@S guidelines as 'green', 'amber' or 'red'.

Observations of canteen food and beverage products

Two to three research assistants collected observational data regarding all food and beverages sold in schools on a single day of data collection. The observations were conducted between February and April 2015 (summer menu). On the day of data collection, research assistants recorded nutritional information from product nutrition panels of all food and beverage items sold in the canteen to classify items according to the FT@S guidelines [Appendix 2.17]. For food products made by canteen staff (e.g. sandwiches), recipes were obtained from the canteen manager and the nutrient profile of included food items was generated using a nutrient analysis software package (FoodWorks). A menu audit was carried out using the collected data to classify menu items according to the FT@S guidelines ('green', 'amber' or 'red').

The research assistants underwent a day's training in recording product nutritional information and use of audit tools by a dietitian. Data collection tools were developed and piloted in two school canteens before their use. Training incorporated quality assurance tests with all research assistants required to score 100% agreement with a dietitian before commencement of data collection.

Direct cost and time of collecting data and undertaking menu audits

For time and cost estimation, only direct costs (e.g. salary and time taken to directly administer the measures) related to obtaining information needed to assess compliance were included. All indirect costs were excluded from cost estimations. For self-reported measures, indirect costs related to development of the questionnaire and programming of the CATI were excluded. The cost of undertaking the telephone calls was also excluded. For menu audits, indirect costs related to development of the canteen database, interviews and pilot testing with stakeholders in the field were excluded. Further, time taken to collect school menus was not included as menus were collected during observations. For both principal and canteen manager self-report, the one-item measure

described here was conducted as part of a larger survey, which took 20-30 min to complete. The cost per completed survey is described in the manuscript, as it was not possible to isolate the cost for a single question. For the comprehensive and quick menu audit, staff time taken for collection of additional information and completion of menu audits were calculated where relevant.

ANALYSIS

SCHOOL CHARACTERISTICS

Statistical analyses were conducted using SAS version 9.3 (SAS Institute Inc., Cary, NC, USA). Descriptive statistics were used to describe the characteristics of participating schools. School postcodes were used to categorise schools into 'higher' and 'lower socioeconomic' regions using the Socioeconomic Indexes For Australia (SEIFA) database.²⁹ School postcodes were also used to categorise schools as rural (outer regional, remote, and very remote areas) or urban (major cities and inner regional areas) using the Accessibility/Remoteness Index of Australia (ARIA).³⁰ Schools were categorised as small (1-159 students); medium (160-450 students); or large (451+ students) based on number of students enrolled.³¹

VALIDITY OF CANTEEN COMPLIANCE TO HEALTHY CANTEEN POLICY

For menu audits, total menu items were tallied and percentage of 'green', 'amber' and 'red' items was calculated [Appendix 4.10]. Schools were classified as compliant with the policy if the menu did not contain foods or beverages restricted from regular sale ('red' and banned items) and had healthy items ('green' items) representing the majority (>50%) of products. For self-report measures, principal and canteen manager responses of 'yes' to the survey question were deemed compliant. Percentage agreement, sensitivity, specificity, predictive and kappa values were reported for each of the four measurement methods compared with observations. Percentage agreement of 80% or greater was considered 'strong agreement'.³² In order to take into account agreement by chance, kappa is reported in addition to percent agreement. Consistent with previous research,³³ where positive agreement accounted for over 75% or under 25% of total agreement, prevalence-adjusted and bias-adjusted kappa (PABAK) was reported based on benchmarks suggested by Landis and Koch (<0.00 = poor, 0.00–0.20 = slight, 0.21–0.40 = fair, 0.41–0.60 = moderate, 0.61–0.80 = substantial, 0.81–1.0 = almost perfect).³⁴ The sensitivity, specificity, positive predictive values (PPV) and negative predictive values

(NPV) of all four measures relative to the observational audits were calculated with 95% confidence intervals. Sensitivity is the proportion of schools found to be compliant with the FT@S policy that were identified as compliant through observations. Specificity is the proportion of schools found to be non-compliant that were identified as noncompliant through observations.

COST AND TIME

The direct cost of the principal and canteen manager self-report was calculated using the total casual salary cost (A\$13 805.23 and A\$6939.79 respectively) of each CATI divided by the number of schools surveyed. The cost per menu audit was calculated using the average hourly rate of A\$113/h for menu audit by dietitians in private practice, according to a Dietitians Association of Australia survey (2009).³⁵

RESULTS

Consent to participate in observations was given by 38 of the 50 schools approached to participate (78% consent rate). Of these 38 schools, 58% were classified as higher socioeconomic status, 82% were located in a major city and the majority of schools were medium-sized (63%)[See Table 4.1]. There was no significant differences between the included sample and rest of the primary schools located in the Hunter region in terms of school size (student enrolment: small, medium, large) ($P=0.21$), socioeconomic region ($P=0.18$) or remoteness ($P=0.29$). Twenty-six canteen managers and 30 principals answered the CATI question regarding menu compliance with the FT@S policy.

Table 4.1: Descriptive statistics of study sample

Characteristic	%	n
School size		
Small (1-159 students)	26	10
Medium (160-450 students)	63	24
Large (451+ students)	11	4
Socio-economic region (SEIFA 2006)		
Lower socio-economic region	42	16
Higher socio-economic region	58	22
Accessibility/Remoteness Index of Australia (ARIA)³⁰		
Rural	0	0
Urban – major cities	82	31
Urban – inner regional	18	7

Observations found 16% of the 38 schools (n=6) had menus compliant with the FT@S guidelines. The quick menu audit produced the highest percentage agreement (84%) and kappa rating ($k=0.68$) with observational audits, followed by the comprehensive menu audit (71% agreement, $k = 0.42$) [See Table 4.2]. Likewise, the quick menu audit had the highest PPV and NPVs, followed by the comprehensive menu audit. Both principal and canteen manager self-report on compliance resulted in 100% sensitivity, but poor percentage agreement, kappa, specificity, and positive and negative predictive values with observations.

Table 4.2: Percentage agreement, sensitivity, specificity, positive predictive values, negative predictive values, kappa in canteen menu compliance based on FT@S guidelines (*n*=38)

CI, confidence interval

	Principal survey vs observations (<i>n</i> =30) ^A (95% CI)	Canteen manager survey vs observations (<i>n</i> =26) ^A (95% CI)	Comprehensive menu audit vs observations (<i>n</i> =38) ^A (95% CI)	Quick menu audit vs observations (<i>n</i> =38) ^A (95% CI)
% agreement	13% (0.4-26.2)	23% (5.7-40.4)	71% (56.0-86.2)	84% (72.1-96.4)
Sensitivity	100% (100-100)	100% (100-100)	50% (0-100)	100% (100-100)
Specificity	0%	5% (0-14.7)	75% (59.1-90.8)	81% (67.0-95.6)
PV+	13% (0.42-26.2)	20% (3.2-36.9)	27% (0-58.7)	50% (16.8-83.2)
PV-	100%	100%	89% (76.2-100)	100% (100-100)
Kappa (PABAK)	-0.73	-0.54	0.42	0.68
Kappa rating	Poor	Poor	Moderate	Substantial

^A Missing data represents those principals or canteen managers who responded 'don't know' or 'not sure' (1 and 6 respectively) to the computer assisted telephone interview question related to policy compliance or who did not participate in the telephone survey (7 and 6 respectively)

Table 4.3 presents the average time taken and corresponding staff costs associated with the four measures of compliance. The quick menu audit method took on average 10 min per menu, costing approximately \$18.83. The comprehensive menu audit took on average 45 min to complete at just under \$85.00 per menu. Principal and canteen manager self-reports cost \$34.17 and \$26.29, respectively; however, this accounted for the entire CATI (58 and 55 items in total, respectively) and not the single policy compliance measure alone.

Table 4.3: Direct cost per measure of compliance per school

NA, menu audit not undertaken as part of this measure

	Principal self-report	Canteen manager self-report	Comprehensive menu audit	Quick menu audit
Average time for data collection (min) ^A	30 ^B	30 ^B	25	0
Average cost for data collection ^A (based on appropriate hourly rate)	\$34.17 ^C	\$26.29 ^C	\$47.08 (\$113/h)	0
Average time per menu audit (min)	NA	NA	20	10
Average cost per menu audit	NA	NA	\$37.67	\$18.83
Total cost ^D	\$34.17 ^C	\$26.29 ^C	\$84.75	\$18.83

^A Does not include time to collect menu^B One item measure part of a larger survey of 58 items for principal and 55 items for canteen manager survey^C Cost for whole CATI^D Excludes set up costs for each of the measures

DISCUSSION

This study sought to assess the validity of various measures of compliance, including varying levels of cost and time burden, to the NSW FT@S Healthy Canteen Strategy. The quick menu audit resulted in best agreement with observations. In contrast, both principal and canteen manager self-report had the lowest agreement (13% and 23%, respectively) and low specificity. These findings are similar to those of other studies that have found low agreement between principals/teachers and their ability to report on foods sold in the school canteen and vending machines relative to observations.^{36,37} The comprehensive menu audit had lower agreement and sensitivity/specificity than the quick menu audit, despite significant investment to obtain additional information. As the comprehensive menu audit relies on additional reporting by canteen managers in regards to nutritional information of products sold in the canteen, this method may be limited by recall and social desirability bias associated with the reporting of such items.²³ Findings from this study indicate that self-reported one-item measures, while feasible and lower cost to administer, do not provide an accurate representation of policy compliance. Our study found that both principal and canteen manager self-report had very low specificity indicating inadequate assessment of non-compliance. Such findings are likely due to social desirability bias associated with self-report,²³ which can result in a significant overestimation of compliance. Future use of self-report measures should include strategies such as the inclusion of appropriate introductory information to minimise such reporting biases.³⁸

While the quick menu audit incurred low direct cost, the tool and product database was developed based on the research team's extensive work with key stakeholders in the region and substantial investment in obtaining information about foods sold in canteens. This study did not quantify the costs and time required to establish this infrastructure. These costs are likely to be significant suggesting that future efforts to implement such an approach to measuring school canteen compliance are likely to require substantial investment to ensure the validity and applicability of the tool to a local level context. While some adaptation of the database is required, it is likely that product information of nationally available commercial products could be transferred across jurisdiction. Future efforts to monitor the impact of food service or healthy canteen policies should consider such costs when adapting menu audit processes to support local level evaluation. For example, the Western Australia School Canteen Association product database developed in conjunction with the National Heart Foundation and Department of Health³⁹ provides

a potential infrastructure to support development of such menu audit tools for state-wide assessment of compliance with healthy canteen policies.

A strength of this study is the comparison of multiple measures of compliance to a gold standard measure. The inclusion of labour and time costs provides essential information regarding the utility of such measures to be applied at scale. A limitation of the study is the relatively small number (38) of schools included in the sample. Given the differences in food services found in schools internationally, use of the quick menu audit method is likely to be limited to regions that provide a canteen facility similar to that found in Australian schools. Similar to other studies assessing compliance in schools,¹⁹ the self-report measures only consisted of one item. While increasing the number of items to assess compliance may have increased specificity of this tool, a previous validation study in Australian schools suggest that principals can accurately report on the implementation of a fruit and vegetable project using a one-item measure.⁴⁰ This study also did not assess indirect costs (including development of the canteen database and set-up of the CATIs) associated with the measures. While the initial costs associated with development of the canteen database that underpins the menu audit methods are likely to be significant, ongoing costs in updating this database are likely to be minimal once established.

CONCLUSION

Findings from this study indicate that self-reported measures are unlikely to provide an accurate representation of policy compliance. The quick menu audit represents an inexpensive, relative to a gold standard approach, and valid method that can be used to assess healthy canteen policy compliance on a large scale. The availability of such valid measures are essential to support future research assessing the impact of intervention strategies to overcome policy implementation failure in this field.

REFERENCES

- 1 Kaikkonen JE, Mikkilä V, Magnussen CG, Juonala M, Viikari JS, Raitakari OT. Does childhood nutrition influence adult cardiovascular disease risk? - Insights from the Young Finns Study. *Annals of Medicine*. 2013;45(2):120-8. doi:10.3109/07853890.2012.671537
- 2 Shay CM, Gooding HS, Murillo R, Foraker R. Understanding and improving cardiovascular health: an update on the American Heart Association's concept of cardiovascular health. *Progress in Cardiovascular Diseases*. 2015;58(1):41-9. doi:10.1016/j.pcad.2015.05.003
- 3 Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. *The Journal of Nutrition*. 2010;140(10):1832-8. doi:10.3945/jn.110.124826
- 4 Public Health England. National diet and nutrition survey. Results from years 1–4 (combined) of the rolling program (2008/2009–2011/2012). 2014. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/310997/NDNS_Y1_to_4_UK_report_Executive_summary.pdf [Verified 8 August 2016].
- 5 Whitrow MJ, Moran L, Davies MJ, Collins CE, Burrows TL, Edwards S, et al. Core food intakes of Australian children aged 9-10 years: nutrients, daily servings and diet quality in a community cross-sectional sample. *Journal of Human Nutrition and Dietetics*. doi:10.1111/jhn.12358
- 6 Mikkilä V, Räsänen L, Raitakari OT, Pietinen P, Viikari J. Consistent dietary patterns identified from childhood to adulthood: the Cardiovascular Risk in Young Finns Study. *British Journal of Nutrition*. 2005;93(6):923–31. doi:10.1079/BJN20051418
- 7 Hawkes C, Smith TG, Jewell J, Wardle J, Hammond RA, Friel S, et al. Smart food policies for obesity prevention. *Lancet* 2015;385(9985):2410-21. doi:10.1016/S0140-6736(14)61745-1
- 8 Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: policy and environmental approaches. *Annual Review of Public Health* 2008;29:253-72. doi:10.1146/annurev.publhealth.29.020907.090926
- 9 Bell AC, Swinburn BA. What are the key food groups to target for preventing obesity and improving nutrition in schools? *European Journal of Clinical Nutrition*. 2004;58(2):258-63. doi:10.1038/sj.ejcn.1601775
- 10 Sanigorski AM, Bell AC, Kremer PJ, Swinburn BA. Lunchbox contents of Australian school children: room for improvement. *European Journal of Clinical Nutrition*. 2005;59(11):1310-6. doi:10.1038/sj.ejcn.1602244
- 11 World Health Organisation. Global action plan for the prevention and management of non-communicable diseases 2013-2020. Geneva: WHO Document Production Services; 2013.
- 12 L'Abbé M, Schermel A, Minaker L, Kelly B, Lee A, Vandenijvere S, et al. Monitoring foods and beverages provided and sold in public sector. *Obesity Reviews*. 2013;14(1):96-107. doi:10.1111/obr.12079
- 13 Woods J, Bressan A, Langelaan C, Mallon A, Palermo C. Australian school canteens: menu guideline adherence or avoidance? *Health Promotion Journal of Australia*. 2014;25(2):110-5. doi:10.1071/HE14009
- 14 NSW Department of Health (DoH) Department of Education and Training. (DET). Fresh Tastes @ School NSW Healthy School Canteen Strategy: canteen menu planning guide. 3rd edn. Sydney: NSW DoH, NSW DET; 2012. Available from:

- https://www.det.nsw.edu.au/policies/student_serv/student_health/nutrition/implementation_1_PD20110420.shtml [Verified 16 August 2016].
- 15 Ardzejewski K, Tadros R, Baxter D. A descriptive study on the barriers and facilitators to implementation of the NSW (Australia) Healthy School Canteen Strategy. *Health Education Journal*. 2013;72(2):136-45. doi:10.1177/0017896912437288
 - 16 de Silva-Sanigorski A, Breheny T, Jones L, Lacy K, Kremer P, Carpenter L, et al. Government food service policies and guidelines do not create healthy school canteens. *Australian and New Zealand Journal of Public Health*. 2011;35(2):117-21. doi:10.1111/j.1753-6405.2010.00694.x
 - 17 Dick M, Lee A, Bright M, Turner K, Edwards R, Dawson J, et al. Evaluation of implementation of a healthy food and drink supply strategy throughout the whole school environment in Queensland state schools, Australia. *European Journal of Clinical Nutrition*. 2012;66(10):1124-9. doi:10.1038/ejcn.2012.108
 - 18 Hills A, Nathan N, Robinson K, Fox D, Wolfenden L. Improvement in primary school adherence to the NSW Healthy School Canteen Strategy in 2007 and 2010. *Health Promotion Journal of Australia*. 2015;26(2):89-92. doi:10.1071/HE14098
 - 19 Pettigrew S, Donovan RJ, Jalleh G, Pescud M. Predictors of positive outcomes of a school food provision policy in Australia. *Health Promotion International*. 2014;29(2):317-27. doi:10.1093/heapro/das075
 - 20 Lawlis T, Knox M, Jamieson M. School canteens: a systematic review of the policy, perceptions and use from an Australian perspective. *Nutrition and Dietetics*. doi:10.1111/1747-0080.12279
 - 21 McGraw SA, Sellers D, Stone E, Resnicow KA, Kuester S, Fridinger F, et al. Measuring implementation of school programs and policies to promote healthy eating and physical activity among youth. *Preventive Medicine*. 2000;31(2):S86-97. doi:10.1006/pmed.2000.0648
 - 22 McPherson RS, Hoelscher DM, Alexander M, Scanlon KS, Serdula MK. Dietary assessment methods among school-aged children: validity and reliability. *Preventive Medicine*. 2000;31(2):S11-33. doi:10.1006/pmed.2000.0631
 - 23 Adams SA, Matthews C, Ebbeling C, Moore C, Cunningham J, Fulton J, et al. The effect of social desirability and social approval on self report of physical activity. *American Journal of Epidemiology*. 2005;161(4):389-98. doi:10.1093/aje/kwi054
 - 24 Australian Bureau of Statistics. Census Data. Canberra: Commonwealth of Australia; 2011. Available from: http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quic kstat/111?opendocument&navpos=220 [Verified 16 August 2016].
 - 25 Wolfenden L, Nathan N, Williams C, Delaney T, Reilly K, Freund M, et al. A randomised controlled trial of an intervention to increase the implementation of a healthy canteen policy in Australian primary schools: study protocol. *Implementation Science*. 2014;9(1):147. doi:10.1186/s13012-014-0147-3
 - 26 National Health and Medical Research Council. Australian Dietary Guidelines. Canberra: National Health and Medical Research Council; 2013.
 - 27 NSW Department of Health. Good for kids. Good for life; Canteen product database. 2016. Available from: <http://www.goodforkids.nsw.gov.au/primary-schools/canteens/product-search/> [Verified 16 August 2016].
 - 28 Yoong SL, Nathan NK, Wyse RJ, Preece SJ, Williams CM, Sutherland RL, et al. Assessment of the school nutrition environment: a study in Australian primary school

- canteens. *American Journal of Preventive Medicine*. 2015;49(2):215-22. doi:10.1016/j.amepre.2015.02.002.
- 29 Australian Bureau of Statistics. Technical paper: census of population and housing: Socioeconomic Indexes For Australia (SEIFA). Cat. no 2039.0.55.001. Canberra: Commonwealth of Australia; 2006. Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/mf/2039.0.55.001> [Verified 16 August 2016].
- 30 Australian Bureau of Statistics. Australian Standard Geographical Classification (ASGC). Cat. no 1216.0. Canberra: Commonwealth of Australia; 2011. Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/mf/1216.0> [Verified 16 August 2016].
- 31 New South Wales Department of Education and Training. 2009 DET Directory. Sydney, NSW: Department of Education and Training; 2009.
- 32 Hartmann DP. Considerations in choice of interobserver reliability estimates. *Journal of Applied Behavior Analysis*. 1977;10(1):103-16. doi:10.1901/jaba.1977.10-103
- 33 Byrt T, Bishop J, Carlin J. Bias prevalence and kappa. *Journal of Clinical Epidemiology*. 1993;46(5):423-9. doi:10.1016/0895-4356(93)90018-V
- 34 Landis JR, Kottch G. The measurement of observer agreement for categorical data. *Biometrics*. 1977;33(1):159-74. doi:10.2307/2529310
- 35 Dietitians Association of Australia. Private practice fee survey results. 2009. Available from: http://dmsweb.daa.asn.au/files/DAA_A_Z/R_V/Private_Practice_%20Fee_Survey_Results.pdf [Verified 16 August 2016].
- 36 Nathan N, Wolfenden L, Morgan PJ, Bell AC, Barker D, Wiggers J. Validity of a self-report survey tool measuring the nutrition and physical activity environment of primary schools. *International Journal of Behavioral Nutrition and Physical Activity*. 2013;10(1):75. doi:10.1186/1479-5868-10-75
- 37 Manske S. In pilot phase of the 2007–2008 school health environment survey: technical report. Waterloo, Ontario: University of Waterloo; 2008.
- 38 Wolfenden L, Kypri K, Britton B, James EL, Francis JL, Wyse R. Effects of introductory information on self-reported health behavior. *Epidemiology*. 2013;24(1):170-2. doi:10.1097/EDE.0b013e3182788c98
- 39 WASCA Inc. Star choice program product database 2016. Available from: <http://www.waschoolcanteens.org.au/star-choice-program/product-database/> [Verified 16 August 2016].
- 40 Nathan N, Wolfenden L, Bell A, Wyse R, Morgan P, Butler M, et al. Effectiveness of a multi-strategy intervention in increasing the implementation of vegetable and fruit breaks by Australian primary schools: a non-randomized controlled trial. *BMC Public Health*. 2012;12:651. doi:10.1186/1471-2458-12-651

CHAPTER 5

Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy: findings of an intervention trial.

Under editorial review:

Kathryn Reilly, Nicole Nathan, John Wiggers, Sze Lin Yoong, Luke Wolfenden. Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy: findings of an intervention trial. **BMC Public Health**. 2018.

ABSTRACT

Background

Implementation interventions delivered in schools to improve food provision have been found to improve student diet and reduce child obesity risk. If the health benefits of food availability policies are to be realised, interventions that are effective need to be implemented at scale, across an entire population of schools. This study aims to assess the potential effectiveness of an intervention in increasing the implementation, at scale, of a healthy canteen policy by Australian primary schools.

Methods

A non-controlled before and after study was conducted in primary schools located in the Hunter New England region of New South Wales (NSW), Australia. Schools received a multi-component intervention adapted from a previous efficacious and cost-effective randomised control trial. The primary trial outcome was the proportion of canteen menus compliant with the state healthy canteen policy, assessed via menu audit at baseline and follow-up by dietitians. Secondary outcomes included policy reach, and adoption and maintenance of policy implementation.

Results

Of the 173 schools eligible for inclusion in the trial, 168 provided menus at baseline and 157 menus were collected at follow-up. At follow-up, multiple imputation analysis found 35 % (55/157) of schools compared to 17 % (29/168) at baseline (OR= 2.8 (1.6-4.7), $p<0.001$) had menus compliant with the state healthy canteen policy. As an assessment of the impact of the intervention on policy reach, canteen manager and principal knowledge of the policy increased from 64 % (n=76) and 38% (n=44) respectively at baseline to 69 % (n=89) and 60 % (n=70) at follow-up ($p=0.393$, $p=0.026$). Adoption of the policy increased from 80 % (n=93) at baseline to 90 % (n=104) at follow-up ($p=0.005$) for principals, and from 86 % (n=105) to 96 % (n=124) ($p=0.0001$) for canteen managers. Multiple imputation analysis showed intervention effects were maintained six-months post intervention (33 % of menus compliant OR = 2.6 (1.5-4.5), $p<0.001$ compared to baseline).

Conclusions

This study found school canteen compliance with a healthy food policy increased in association with a multi-strategy intervention delivered at scale. The study provides evidence for public health policy makers and practitioners regarding strategies and modes of support required to support improvement in nutrition policy implementation across entire populations of schools.

INTRODUCTION

Globally in 2013, 24 % of boys and 23 % of girls were classified as overweight or obese (ages 2-19 years).¹ Childhood overweight and obesity is a predictor of adult obesity, which is associated with chronic diseases including cardiovascular disease, diabetes and some cancers.²⁻⁵ As a result, the economic costs of overweight and obesity to individuals and society are considerable.⁶

Schools are recommended by the World Health Organisation (WHO) as a critical setting to improve public health nutrition and to reduce the risk of unhealthy weight gain in childhood.⁷ Given this, policies have been introduced in the school setting in a number of jurisdictions internationally that support the provision of food in line with national dietary guidelines.^{8,9} For example, in the United Kingdom, the Department of Education in 2015 mandated the 'School Food Plan'; a set of standards which requires schools to provide children access to healthy, nutritious meals at school.¹⁰ Similarly, in Australia, where children can purchase foods and drinks over the counter from a canteen or tuckshop,¹¹ all states and territories have introduced mandatory healthy canteen policies that promote the purchase of healthy foods and restrict the sale of less healthy foods.⁹

In 2005, in the state of New South Wales (NSW), Australia, the Fresh Tastes @ School Healthy Canteen Strategy [Appendix 2.3] was developed and mandated by the Department of Education for government schools to promote the availability of healthy food options in school canteens and limit the sale of foods with poor nutritional value.¹² The policy involves the use of a 'traffic light' system that categorizes canteen menu items based on their nutritional value. Schools are required to have a canteen menu dominated (>50 %) by 'green' (healthier) food options, to limit the availability of 'amber' foods and drinks (less healthy) and to restrict the sale of 'red' (poor nutritional value) items.¹² A 'Sugar Sweetened Drink Ban' restricting the sales of all sugar sweetened drinks was also introduced in NSW in 2007.¹² Local population health services are responsible for providing policy implementation support to schools as part of usual service delivery practice.

Despite the existence of school nutrition policies and guidelines, international research suggests that most schools fail to implement them.^{13,14} For example, results of the 2014 School Health Policies and Practices Study in the United States found that 95 % of secondary schools sold sugar sweetened beverages and the percentage of schools where

fruit and vegetables were available for purchase was approximately 6 %.¹⁵ Similarly, a 2007 survey of 50 schools in New Zealand found 84 % of schools sold foods in contravention of the guidelines and only 48 % had fruit on the menu.¹⁶ Likewise, Woods et al (2014) analysed a total of 263 school menus from all states and territories in Australia and found variable compliance with state policies from as low as 5 % to 62 %, indicating a clear deficit between the existence of school nutrition policy and its implementation. Hills and colleagues (2015) assessed canteen menus in an Australian region over time (2007-2010) and found little improvement in policy adherence.¹⁷

Despite the importance of implementing school nutrition policies, few trials have investigated the effectiveness of strategies that support the scaled-up implementation by schools of nutrition initiatives broadly, and of policies governing the availability of food in school canteens and food service settings specifically. Three randomised controlled trials of varying implementation support intensity have recently been conducted in NSW, Australia, to enhance the implementation of the state-based school healthy canteen policy.¹⁸⁻²⁰ Specifically, relative to control groups, schools receiving a 'high' intensity implementation support consisting of bi-monthly school visits, executive support, consensus processes, staff training, provision of tools and resources, academic detailing, recognition, performance monitoring and feedback, and marketing strategies reported an absolute improvement in menus adherent to the state-based school healthy canteen policy of 56 % (RR=14.41; 95 % CI: 2.08, 99.97, $p<0.001$).²¹ Similarly, those receiving a 'medium' intensity implementation support involving similar strategies, in conjunction with a less expensive mode of on-going support (text messaging as oppose to school onsite-visits) reported an absolute improvement of 27 % (RR=4.29; 95 % CI: 1.04, 17.68, $p=0.02$) [Appendix 3.3].²¹ The implementation support strategies tested in both of these trials were shown to be cost-effective.²¹

To our knowledge these controlled trials form part of the very limited evidence base of strategies to improve implementation of healthy canteen policies globally.²² While the three trials provide evidence of the effectiveness and cost-effectiveness of implementation strategies and modalities that support policy implementation, they were conducted in relatively small numbers of schools (approximately 35 schools per intervention group). If the health benefits of interventions are to be realised, interventions need to be effective when implemented at scale, across an entire population of schools.^{23,24} Scaling up of a proven intervention from small, well-controlled and defined

research studies into population-wide implementation presents unique challenges related to workforce capacity, infrastructure limitations, and catering for a greater diversity of implementation contexts, including differences in geographic or socio-economic characteristics.²⁵

Research suggests program implementation and effectiveness may attenuate as programs are attempted to be implemented in real-world contexts, as scaling up effective interventions has been associated with a reduction in the impact of implementation support^{26,27} For example, a randomised trial in Australian childcare services tested an intervention to support implementation of practices recommended to improve child physical activity in 20 services.²⁸ In the 10 services receiving implementation support, substantial improvements of over 40 % in most instances in practice implementation were evident.²⁸ A large scale quasi-experimental trial assessed the impact of attempts to implement such practices, at scale, in the same region across 300 childcare services.²⁶ The implementation strategy was modified slightly to enable delivery at scale, including the removal of on-site visits. However, the implementation support was largely ineffective with no significant improvements in eight of the 11 practices targeted.²⁶

At present, there are no reported trials of strategies to support the implementation of school healthy canteen policies at scale. To address this evidence gap, the aim of this study is to assess the potential effectiveness of an intervention in increasing the implementation, at scale, of a healthy canteen policy by Australian primary schools.

MEASURES

DESIGN AND SETTING

A non-controlled before and after study, which is acknowledged as an appropriate design for interventions at this scale,²⁹ was conducted in primary schools located in the Hunter New England region of NSW, Australia. The Hunter New England region covers a large geographical region (more than 130,000km²) and consists of a socioeconomically and demographically diverse population of approximately 112,000 children aged 5-12 years³⁰ and over 400 primary schools.

Approval to conduct the study was obtained from the Hunter New England Human Research Ethics Committee (no. 06/07/26/4.04) [Appendix 5.1, 5.2, 5.3], the University

of Newcastle Human Research Ethics Committee (Approval Number H-2008-0343) as well as the NSW Department of Education and the relevant Catholic Schools Offices.

SAMPLE

All primary schools (serving children aged 5-12 years) (n=338) in the study region identified via health service record as having an operational canteen were eligible to participate. Schools were ineligible if they catered for secondary students (children aged 13-18 years old), were special purpose schools, that is, catering for students with special needs, juvenile justice or hospitalised, or had already participated in other trials by the research team.^{18-20,31}

RECRUITMENT

Principals of all eligible schools were sent an information letter [Appendix 5.4] inviting them to participate in the study. Two weeks following receipt of the invitation, principals were telephoned by a trained research assistant, who confirmed school eligibility, and sought their consent to complete a 20-min Computer-Assisted Telephone Interview regarding school canteen characteristics and policy knowledge and adoption. The interview was conducted during February - April 2016. At the conclusion of interview, principal consent was sought to forward an information letter [Appendix 5.5] to the school canteen manager inviting them to attend training workshops and to receive support to implement the policy.

MULTI-COMPONENT IMPLEMENTATION INTERVENTION

Theoretical framework

Rogers' Diffusion of Innovation Theory, a framework for designing health prevention innovations at scale, was chosen to guide the development of the intervention.^{32,33} The theory identifies a number of characteristics of an innovation that impact on the rate of adoption by the target population including; the innovation being perceived to have greater advantage over what they are currently doing; be compatible with how they work; be of less complexity; be easily trialled first; and have visible results.³²

Intervention to support implementation at scale

To facilitate the implementation of the state healthy canteen policy across the population of schools in the study region, a previous efficacious and cost-effective randomised control trial was replicated.¹⁹ In order to address an identified barrier to policy implementation, that being the classification of menu items according to policy guidelines,³⁴ and to enable implementation support across a large geographical area, an online canteen product database [Appendix 5.6] was included as an additional strategy.³⁵ The intervention was delivered in partnership with the local population health service as part of its usual service delivery practice.³⁶ The intervention was delivered over a nine-month period (Feb - Oct 2016). The intervention strategies involved the following:

- 1 **Leadership support** - An information letter was sent to all eligible school principals and canteen managers providing an overview of the state healthy canteen policy requirements and informing them of an upcoming implementation training workshop and resources available. Principals were sent information regarding the training workshop via email and mail [Appendix 5.7, 5.8] and asked to support and encourage the canteen manager and a parent representative to attend the training workshop and to participate in receiving ongoing support. Securing leadership support has been associated with implementation success.³⁷
- 2 **Consensus processes** - A consensus process involving the canteen manager, canteen staff and/or parent representative was undertaken.³⁸ A canteen policy implementation action plan was developed [Appendix 5.9]. The action plan outlined the school's goals and key tasks towards implementation of the policy.
- 3 **Education** - One-day (5hr) face to face group training workshops were delivered to canteen managers and parent representatives to provide education and skill development³⁸ in: categorizing menu items according to the policy guidelines; use of a canteen product database and website; financial management of canteens including stock selection, pricing, promotion and operation; and managing volunteers [Appendix 5.10, 5.11, 5.12].
- 4 **Tools and resources** - Canteen managers received a manual of resources to facilitate implementation³⁹ of the state healthy canteen policy including: sample canteen policies; planning templates; pricing guides; online product database instructions;

guidelines for small schools; and self-assessment forms [Appendix 5.13, 5.14, 5.15, 5.16, 5.17].

- 5 **Provision of implementation support** - Schools received at least one contact per school term by a school support officer (trained dietitian) across the intervention period (minimum of four contacts). Contact was made via email, telephone or text messaging with the aim to review implementation progress, prompt action plan delivery and facilitate problem solving.³⁹
- 6 **Reinforcement** - Throughout the intervention period, schools whose canteens were assessed to be compliant with the state policy received a letter of recognition [Appendix 5.18] from the research team to acknowledge their positive change.³²
- 7 **Audit and feedback** – Audit and feedback has been shown to produce significant practice changes.^{40,41} Schools received up to two menu audit and feedback reports [Appendix 5.19] regarding canteen progress towards achieving implementation action plan goals (Summer and Winter menus). Canteen menus were collected via school administration personnel and assessed according to the policy criteria. The reports identified menu food and beverage items that were restricted for sale and made suggestions for suitable replacements.⁴²
- 8 **Canteen product database** - A canteen product database was developed and placed on the project website (*Good for Kids. Good for Life* website)³⁵ to provide access to a range of potential products coded according to the state healthy canteen policy.

DATA COLLECTION AND MEASURES

School principals were invited to participate in a telephone interview regarding school characteristics and policy knowledge and adoption at baseline [Appendix 5.20] (Feb - Apr 2016) and again immediately post intervention [Appendix 5.21] (Nov - Dec 2016). Canteen managers who attended the training workshops were invited to complete a pen-paper survey prior to commencing the training workshops [Appendix 5.22] (Feb-Apr 2016). Canteen managers who did not attend the training workshops were contacted via telephone and invited to complete the survey via a computerised assisted telephone interview. All canteen managers were contacted immediately post intervention to complete a follow-up telephone interview [Appendix 5.23] (Nov - Dec 2016).

School and canteen characteristics

Information regarding school size (number of enrolled students), school type (Government, Catholic or Independent) and the locality of the school (school postcode) was collected from school websites and school databases. Canteen characteristics such as days of operation, staffing and management of the canteen were collected through the baseline canteen manager interview.

Exposure to other nutrition interventions

During the follow-up telephone interview, canteen managers were asked to report any exposure to and/or involvement in other initiatives to assist with the implementation of the policy.

OUTCOMES

Assessment of the trial outcomes of the intervention was informed by the RE-AIM evaluation model⁴³ and involved four of the RE-AIM domains [Appendix 5.24]. Implementation of the policy (compliance) was the primary trial outcome. Measures of Reach, Adoption and Maintenance⁴⁴ were identified as secondary. We did not re-assess 'Effectiveness' of the intervention on dietary outcomes at the level of individual students as that has previously been found to be effective in improving the nutritional quality of foods purchased,²⁰ and the effectiveness of the intervention is supported by a systematic review of experimental research.⁴⁵

Primary trial outcome – Compliance with the 'Fresh Tastes @ School' Policy

The primary trial outcome was the proportion of canteen menus that were compliant with the state policy:¹² defined as containing no 'red' or 'banned' menu items and having >50 % 'green' menu items. We also report the proportion meeting each of these two criteria separately. Outcome data were collected at baseline and follow-up via audits of canteen menus faxed or emailed to the project team by the school. Menus were audited by a dietitian, trained in menu classification, using a validated Quick Menu Audit tool [Appendix 5.25].⁴⁶ The tool consisted of a list of common canteen menu items grouped into categories such as drinks, hot food, frozen dairy treats, snacks, sandwiches and salads. The tool included colour coded classifications and justifications for assumptions made regarding menu item details such as brand and portion size, to categorise menu

items as 'green', 'amber', 'red' and 'banned' according to the criteria specified by the state policy.

Menu compliance was determined by tallying all items on the menu, and determining the percentage of items that were categorised as either 'green', 'amber', 'red' and 'banned' [Appendix 4.10].

Secondary outcomes

Policy reach

As a measure of school exposure to the policy (reach) by assessing awareness of it, principals and canteen managers were asked during telephone interviews, to identify the intent of the state policy. Specifically, principals and canteen managers were asked which one of the following statements they thought was consistent with the policy; "Foods high in saturated fat, salt or excess kilojoules:

- a should not be available for regular sale (correct response);
- b can be sold regularly but must not comprise more than 10 % of items listed on canteen menus; or
- c can be sold regularly but schools must have 2 days per term where such foods are not available".

Policy adoption

As a measure of stage of adoption, during the telephone interviews, principals and canteen managers were asked: "Which of the following statements best represents your school's intent to use the Fresh Tastes @ School guidelines?" Based on the Alberta Nutrition Guideline Outcomes Telephone-Survey Questionnaire,⁴⁷ respondents were asked to categorise their school according to the five stages of behaviour change;

- 1 We have not thought about using the Fresh Tastes guidelines in the canteen / Don't know (pre-contemplation);
- 2 We are thinking about using the Fresh Tastes guidelines in the canteen (contemplation);

- 3 We are planning to or have taken some steps to using the guidelines in the canteen (preparation);
- 4 We are currently using the Fresh Tastes guidelines (action); or
- 5 We have been using the Fresh Tastes guidelines for more than 6 months (maintenance)⁴⁸ [Table 5.3].

Implementation maintenance

Maintenance of implementation of the policy, was assessed by measuring compliance (primary outcome), six months after the immediate post-intervention outcome follow-up measure.

Process evaluation

Project records [Appendix 5.26] were used to determine the proportion of schools that: received principal information letters, developed action plans, attended training workshops, received tools and resources, received menu feedback reports, and received on-going support via text messaging or email. Acceptability of the training workshop content was measured through a pen and paper survey conducted at the completion of workshops [Appendix 5.27].

ANALYSES

All analyses were conducted using the statistical package SAS 9.3 (SAS Institute Inc., Cary, NC). Descriptive statistics were used to describe the demographic, school and canteen characteristics of the group. The number of enrolled students in each school were used to categorise school size as small (1-159 students), medium (160-450) or large (>450 students) based on the NSW Department of Education's classifications of school size.⁴⁹ School socio-economic status was based on postcode. Similar to other Australian based implementation studies,¹⁸⁻²⁰ 'higher socio-economic status' were those schools ranked in the top 50 % of NSW, whilst 'lower socio-economic' status was the bottom 50 %.⁵⁰ School postcode was also used to describe locality; 'rural' defined as outer regional, remote and very remote areas, 'urban' defined as regional cities and inner regional areas.⁵¹

Pre-post differences were assessed using mixed effects logistic regression models to assess the impact of the intervention on the following compliance outcomes: overall compliance, no 'red' items on the menu and greater than 50 % 'green' items, as per policy requirements.¹² Exploratory chi-square analysis was performed to assess whether there was an association between compliance at follow-up and school characteristics. All analyses were performed on complete case data, where schools provided menus at both baseline and follow-up (primary outcome) or maintenance (secondary outcome). Additionally, analyses employing multiple imputation was performed for schools with missing data at either follow-up or maintenance.

Pearson Chi-square tests were used to measure pre-post differences in the measure of 'reach' - proportion of principals and canteen managers who could correctly identify the statement consistent with the policy. For the adoption measure, schools who responded they were in the preparation, action or maintenance stage of change were classified as 'adopters' whilst schools in the pre-contemplation and contemplation stages were classified as 'non-adopters'.⁵²

RESULTS

PARTICIPANTS AND CHARACTERISTICS

Of the 338 schools in the study region identified as having an operational canteen, 173 schools were deemed eligible for participation. Twenty-four schools had secondary students, and 134 had participated in trials conducted by the research team.^{18-20,31} Seven principals reported they had no operational canteen during the baseline telephone interview and were therefore excluded from the study. At baseline 168 (97 %) schools provided their menu for assessment and 125 (72 %) principals and 122 (71%) canteen managers completed their respective telephone interviews. At follow-up, 157 schools provided their menu for assessment, eight schools reported they had recently closed their canteen and four refused to participate. The proportion of canteen managers and principals who completed the follow-up telephone interviews was 129 (75 %) and 115 (66 %) respectively.

Table 5.1 outlines the baseline characteristics of all eligible schools. Small schools (<160 students) ($p=0.002$), schools categorised as being in lower socioeconomic regions

($p=0.01$) and those located in outer regional or remote areas ($p=0.04$) were more likely to not provide a menu at follow-up.

Table 5.1: Baseline characteristics of eligible schools

CHARACTERISTICS		INTERVENTION GROUP	
		n=173	%
School type			
Government		129	75
Catholic		40	23
Independent		4	2
School size			
Small	(1-159 students)	77	45
Medium	(160-450 students)	81	47
Large	(450+ students)	15	9
Urban/Rural region^a			
Major cities + Inner regional		149	89
Outer regional + Remote Australia		19	11
Socio-economic index^b			
Lower socio-economic areas		102	61
Higher socio-economic areas		64	39
Canteen staff^c (may select more than one option)			
Paid manager/supervisor		39	32
Paid assistant(s)/workers/parents		6	5
Volunteer manager/supervisor		56	46
Volunteer workers/parents		109	89
Contractor		0	0
Student help		6	5
Other		2	2
Days of operation			
5 days/week		55	45
4 days/week		10	8
3 days/week		21	17
2 days/week		9	7
1 day/week		26	21
Less than 1 day/week		1	1

^a 5 missing data

^b 7 missing data

^c Percentages greater than 100 as participants may select more than one response

PRIMARY TRIAL OUTCOME – COMPLIANCE WITH THE STATE POLICY

As seen in Table 5.2, 41 % (64/157) of schools at follow-up had no 'red' or 'banned' menu items compared to 24 % (41/168) at baseline ($p=0.002$) and 72 % (113/157) had greater than 50 % 'green' menu items compared to 62 % (104/168) at baseline ($p=0.043$). In terms of overall compliance with the state policy, 35 % (55/157) of schools at follow-up compared to 17 % (29/168) at baseline (OR=2.7 (1.6-4.7), $p<0.001$) had menus compliant with the state healthy canteen policy. A similar effect was found using multiple imputation for missing data (OR= 2.8 (1.6-4.7), $p<0.001$).

Table 5.2: Primary outcome: implementation

	BASELINE		FOLLOW-UP		COMPLETE CASE (n=157)		MULTIPLE IMPUTATIONS (n=168)	
	n	%	n	%	Odds ratio (95%CI)	p-value	Odds ratio (95%CI)	p-value
No red/banned	41	24	64	41	2.4 (1.4-3.7)	0.001*	2.3 (1.4-3.7)	<0.001*
>50% green	104	62	113	72	1.7 (1.0-2.9)	0.043*	1.7 (1.0-2.8)	0.05
Overall compliance	29	17	55	35	2.7 (1.6-4.7)	<0.001*	2.8 (1.6-4.7)	<0.001*

* Statistically significant

Exploratory analysis

Exploratory analysis of compliance rates at follow-up based on school and canteen characteristics identified government schools as significantly more likely to have menus compliant with the policy than Catholic or Independent schools ($p=0.049$). There was no other statistically significant difference between characteristics such as school size ($p=0.779$), geographical location ($p=0.428$), socio-economic status ($p=0.17$), canteen management ($p=0.115$), or days of operation ($p=0.761$) in terms of compliance at follow-up.

SECONDARY OUTCOMES

Policy reach and adoption results are outlined in Table 5.3. Canteen managers and principals who correctly identified the statement consistent with the policy increased from 64 % (n=76) and 54 % (n=63) respectively at baseline to 69 % (n=89) and 68 % (n=79) respectively at follow-up ($p=0.38$, $p=0.034$). The proportion of canteen managers who completed the telephone interview classified as ‘adopters’ increased from 86 % (n=105) at baseline to 97 % (n=124) at follow-up ($p<0.0001$). Likewise, the proportion of principals who were classified as ‘adopters’ increased from 80 % (n=93) at baseline to 90 % (n=104) at follow-up ($p=0.0001$). Similar effects were seen with multiple imputation analysis for both policy reach and adoption. [Table 5.3].

Table 5.3: Secondary outcomes: reach and adoption

	CANTEEN MANAGERS BASELINE		CANTEEN MANAGERS FOLLOW-UP		COMPLETE CASE (n=99 ^a , 100 ^b) <i>p</i> -value	MULTIPLE IMPUTATIONS (n=122) <i>p</i> -value	PRINCIPALS BASELINE		PRINCIPALS FOLLOW-UP		COMPLETE CASE (n=88) <i>p</i> -value	MULTIPLE IMPUTATIONS (n=125) <i>p</i> -value
	n	%	n	%			n	%	n	%		
Reach	76	64	89	69	0.38	0.41	63	54	79	68	0.034*	<0.001*
Adoption	105	86	124	97	0.0001*	<0.001*	93	80	104	90	0.0001*	

* Statistically significant

^a = Reach outcome^b = Adoption outcome

Of the 148 schools who provided menus six-months post intervention (implementation maintenance), 33 % (n=48, OR=2.4 (1.4-4.0), $p=0.001$ compared to baseline) had menus that were compliant with the state policy, an effect that remained significant following multiple imputation for missing data (OR=2.6 (1.5-4.5), $p<0.001$). [Table 5.4]

Table 5.4: Secondary outcomes: maintenance

	BASELINE		6 MONTHS MAINTENANCE		COMPLETE CASE (n=148)		MULTIPLE IMPUTATIONS (n=168)	
	n	%	n	%	Odds ratio (95%CI)	p-value	Odds ratio (95%CI)	p-value
No red/banned	41	24	57	39	2.0 (1.2-3.3)	0.007*	2.1 (1.3-3.5)	0.003*
>50% green	104	62	100	68	1.3 (0.8-2.1)	0.29	1.3 (0.8-2.2)	0.26
Overall compliance	29	17	49	33	2.4 (1.4-4.2)	0.001*	2.6 (1.5-4.5)	<0.001*

* Statistically significant

PROCESS EVALUATION

Table 5.5 shows the proportion of schools who received each of the implementation strategies. All schools were mailed the principal information letter, sent text messages or emails as part of on-going support, received tools and resources at workshops or mailed to the school, provided with product database information and mailed at least 1 menu feedback report. Almost half (49 %) of schools developed an action plan, half (50 %) attended the training workshops and 75 % supplied a second menu for review and hence received a second menu feedback report.

Table 5.5: Number of schools receiving implementation strategies

IMPLEMENTATION STRATEGY	NUMBER OF SCHOOLS IN SAMPLE	
	n=157	%
Principal Information Letter (leadership and buy-in)	157	100
Developed action plan (consensus process)	77	49
Attended training workshop (education)	79	50
Tools and resources	157	100
Text messages or emails (on-going support)	157	100
Received 1 menu report (audit and feedback)	157	100
Received 2 menu report (audit and feedback)	117	75
Product database	157	100

EXPOSURE TO OTHER NUTRITION INTERVENTIONS

Canteen managers from 22 schools reported receiving support to assist in implementation of the policy beyond that provided by the trial. Nine of these schools reported receiving educational and promotional material from a multi-faceted program to promote the consumption of fresh fruit and vegetables amongst school-aged children. Three schools reported liaising with other canteen managers, three had gained information from manufacturers or suppliers and the remaining seven schools listed unspecific support such as receiving 'brochures' and 'leaflets'.

DISCUSSION

This is the first study to assess the potential effectiveness of an intervention to support implementation at scale, by 173 schools, of a healthy canteen policy in Australian primary schools. The findings suggest that a multi-strategy intervention involving leadership, consensus processes, education, resources, audit and feedback, and on-going support in the form of text messages/emails may improve schools' implementation of a healthy school canteen policy at scale. The study makes a novel contribution to a currently sparse research landscape in the school setting regarding implementation at scale²⁴ and

provides evidence to support improvement in nutrition policy implementation across populations of schools.

The high level of participation in this study (91 %, 157/173) is consistent with that required by scale-up programs to reach a large proportion of the target population in order to have a public health impact.⁵³ The size of the change in compliance in this study (18 %) is similar to the effect sizes in other school based obesity prevention interventions designed to support large numbers of schools' implementation of health promotion programs (13 %-45%).⁵⁴⁻⁵⁷ The observed change in compliance in this study (18 %) is, however, lower than the effects achieved in the randomised control trial from which the study was adapted (29 % effect size),¹⁹ a finding that is consistent with previous pragmatic studies.^{26,27} Gottfredson et al (2015) suggests that adaptations or differences in population characteristics may reduce the effects of interventions when delivered at scale.

Logistical challenges of expanding implementation into larger and more rural geographic areas appeared to have reduced exposure of the schools to the implementation support provided. For example, just 50 % of schools (n=79) attended training and 49 % of schools developed an action plan (n=77) compared with 93% (26/28)¹⁹ for both in the original trial. Such findings may be due to the greater distances required for school staff to attend training in this trial compared to the original trial. Further research into ways to extend the reach of strategies such as workshops to rural and remote regions, including the possibility of online training,⁵⁸ may be warranted.

Whilst the policy is strongly endorsed by the Catholic Schools sector in the region and the Association of Independent Schools, it is mandated for government schools only. Government schools were more likely to have menus compliant with the state healthy eating policy ($p=0.049$) suggesting a positive relationship between a mandatory policy and implementation. There were no other differences in compliance and school characteristics such as location, size or socioeconomic status, indicating that the intervention is effective across a diverse population of schools. Such findings suggest that the policy implementation approach may not further exacerbate existing nutrition inequalities among these groups.

The observed small increases in knowledge of the policy by canteen managers (5 %, $p=0.393$) found in this study is unsurprising as the policy was first launched over 10 years ago. Although baseline levels of 'adoption' were similarly high, there was a small but significant shift in schools' adoption of the policy for both canteen managers and principals. The proportion of schools in which an intervention effect was maintained (determined at 6-months post intervention menu audit) (33 %, $n=49$) was similar to that at immediate post-intervention follow-up (35 %, $n=55$). As previous research has shown that policy implementation improves student diet,^{20,45,59} the findings demonstrates the potential contribution the implementation support strategy can make in achieving public health nutrition enhancements.

Limitations of the study include its non-controlled study design. Whilst the lack of a control group precludes causal inference that the observed changes over time were the result of the intervention, policy implementation over the past decade has remained stable¹⁷ and steps were taken to assess contamination such as any exposure to and/or involvement in other initiatives to assist with implementation of the policy. A further limitation is possible selection bias, as schools that chose to take part in the intervention may be different from those schools that did not.⁶⁰ It is not known whether differences existed, for example, in canteen managers' self-motivation and/or support from principals in study participants compared to non-participants.

CONCLUSION

Despite the introduction of healthy eating policies in schools in many countries, their implementation across the population of schools has been limited. Few trials have investigated the effectiveness of strategies designed to increase schools' implementation of such policies and this study is the first to do so at scale. The study provides novel information for public health policy makers and practitioners regarding strategies and modes of support required to facilitate the implementation of nutrition policies and guidelines broadly and healthy canteen policies specifically across entire jurisdictions.

REFERENCES

- 1 Global Burden Disease 2013 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2015;386:2287-323.
- 2 World Health Organisation. World Cancer Report 2014. Int Agency for Research on Cancer. Geneva: World Health Organisation.
- 3 Kaikkonen JE, Mikkilä V, Magnussen CG, Juonala M, Viikari JS, Raitakari OT. Does childhood nutrition influence adult cardiovascular disease risk? - Insights from the Young Finns Study. *Annals Of Medicine*. 2013;45(2):120-128.
- 4 Maynard M GD, Emmett P, Frankel S, Davey Smith G. Childhood diet and adult cancer. *Journal of Epidemiology and Community Health*. 2003;57:218-225.
- 5 Shay CM, Gooding HS, Murillo R, Foraker R. Understanding and Improving Cardiovascular Health: An Update on the American Heart Association's Concept of Cardiovascular Health. *Progress in Cardiovascular Diseases*. 2015;58(1):41-49.
- 6 Withrow D, Alter DA. The economic burden of obesity worldwide: a systematic review of the direct costs of obesity. *Obesity Reviews*. 2011;2(2):131-141.
- 7 World Health Organisation. Report of the commission on ending childhood obesity. 2016. Geneva: World Health Organisation.
- 8 United States Department of Agriculture. Food and Nutrition Service. Nutrition Standards in the National School Lunch and School Breakfast Programs. *Federal Register*. 2012;77(17):4087-4167.
- 9 Woods J, Bressan A, Langelaan C, Mallon A, Palermo C: Australian school canteens: menu guideline adherence or avoidance? *Health Promotion Journal of Australia*. 2014, 25(2):110-115.
- 10 Public Health England. The Eatwell Guide. Helping you eat a healthy, balanced diet. <https://www.gov.uk/government/publications/the-eatwell-guide>. Accessed 3 January 2018.
- 11 de Silva-Sanigorski A, Breheny T, Jones L, et al. Government food service policies and guidelines do not create healthy school canteens. *Australian and New Zealand Journal of Public Health*. 2011;35(2):117-121.
- 12 NSW Department of Health (DoH) Department of Education and Training (DET). Fresh Tastes @ School NSW Healthy School Canteen Strategy: canteen menu planning guide. 3rd ed. Sydney: NSW DoH, NSW DET; 2012.
- 13 Downs SM, Farmer A, Quintanilha M et al. From paper to practice: barriers to adopting nutrition guidelines in schools. *Journal of Nutrition Education and Behavior*. 2012;44(2):114-122.
- 14 Gabriel CG, de Assis Guedes de Vasconcelos, de Andrade DF, de Abreu Soares Schmitz B. First law regulating school canteens in Brazil: evaluation after seven years of implementation. *Archivos Latinoamericanos De Nutricion*. 2009;59(2):128-138.
- 15 U.S. Department of Health and Human Services Centers for Disease Control and Prevention. Results from the School Health Policies and Practices Study 2014. 2015; https://www.cdc.gov/healthyyouth/data/shpps/pdf/shpps-508-final_101315.pdf. Accessed 3 January 2018.
- 16 Green Party of Aotearoa New Zealand. Annual tuckshop survey shows pies, chips still staples. 2007; <https://home.greens.org.nz/press-releases/annualtuckshop-survey-shows-pies-chips-still-staples>. Accessed 28 June 2017.

- 17 Hills A, Nathan N, Robinson K, Fox D, Wolfenden L: Improvement in primary school adherence to the NSW Healthy School Canteen Strategy in 2007 and 2010. *Health Promotion Journal of Australia* 2015.
- 18 Yoong SL, Nathan N, Wolfenden L, et al. CAFE: a multicomponent audit and feedback intervention to improve implementation of healthy food policy in primary school canteens: a randomised controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*. 2016;13(1):126.
- 19 Nathan N, Yoong SL, Sutherland R, et al. Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*. 2016;13(1):106.
- 20 Wolfenden L, Nathan N, Janssen LM, et al. Multi-strategic intervention to enhance implementation of healthy canteen policy: a randomised controlled trial. *Implementation Science*. 2017;12(1):6.
- 21 Reilly KL, Reeves P, Deeming S, Yoong SL, Wolfenden L, Nathan N, Wiggers J. Economic analysis of three interventions of different intensity in improving school implementation of a government healthy canteen policy in Australia: costs, incremental and relative cost effectiveness. *BMC Public Health*. 2018 Dec;18(1):378.
- 22 Wolfenden L, Nathan N, Sutherland R, et al. Strategies for enhancing the implementation of school-based policies or practices targeting risk factors for chronic disease. *Cochrane Database of Systematic Reviews*. 2017(11):Art. No.: CD011677.
- 23 Rychetnik L, Bauman A, Laws R, et al. Translating research for evidence-based public health: key concepts and future directions. *Journal of Epidemiology and Community Health*. 2012;jech-2011.
- 24 Glasgow RE, Klesges LM, Dzewaltowski DA, Bull SS, Estabrooks P. The future of health behavior change research: what is needed to improve translation of research into health promotion practice? *Annals of Behavioral Medicine*. 2004;27(1):3.
- 25 Milat AJ, King L, Newson R, et al. Increasing the scale and adoption of population health interventions: experiences and perspectives of policy makers, practitioners, and researchers. *Health Research Policy and Systems*. 2014; 12:18.
- 26 Finch M, Wolfenden L, Falkiner M, et al. Impact of a population based intervention to increase the adoption of multiple physical activity practices in centre based childcare services: a quasi-experimental, effectiveness study. *International Journal of Behavioral Nutrition and Physical Activity*. 2012;29;9(1):101.
- 27 Yoong SL, Wolfenden L, Clinton-McHarg T, et al. Exploring the pragmatic and explanatory study design on outcomes of systematic reviews of public health interventions: a case study on obesity prevention trials. *Journal of Public Health (Oxf)*. 2014;36(1):170-176.
- 28 Finch M, Wolfenden L, Morgan PJ, Freund M, Jones J, Wiggers J. A cluster randomized trial of a multi-level intervention, delivered by service staff, to increase physical activity of children attending center-based childcare. *Preventive Medicine*. 2014 Jan 31;58:9
- 29 Bauman A, Nutbeam D. *Evaluation in a Nutshell*. McGraw-Hill Education Australia; 2013.
- 30 Health Stats NSW. Population growth by Local Health District. 2014. http://www.healthstats.nsw.gov.au/Indicator/dem_pop_lhnmap/dem_pop_lhn_sna p. Accessed 3 January 2018.

- 31 Delaney T, Wyse R, Yoong SL, et al. Cluster randomised controlled trial of a consumer behaviour intervention to improve healthy food purchases from online canteens: study protocol. *BMJ Open*. 2017;7(4):e014569.
- 32 Rogers EM. Diffusion of preventive innovations. *Addictive Behaviors*. 2002;27:989-993.
- 33 Owen N, Glanz K, Sallis JF, Kelder SH: Evidence-based approaches to dissemination and diffusion of physical activity interventions. *American Journal of Preventive Medicine*. 2006;31Suppl 4:S35-44.
- 34 Ardzejewska K, Tadros R, Baxter D. A descriptive study on the barriers and facilitators to implementation of the NSW (Australia) Healthy School Canteen Strategy. *Health Education Journal*. 2012;72(2):136-145.
- 35 Good for Kids. Good for Life; Canteen Product Database.
<http://www.goodforkids.nsw.gov.au/primary-schools/canteens/product-search/>. Accessed 3 January 2018.
- 36 Wolfenden L, Yoong SL, Williams CM, et al. Embedding researchers in health service organizations improves research translation and health service performance: the Australian Hunter New England Population Health example. *Journal of Clinical Epidemiology*. 2017;85:3-11. doi: 10.1016/j.jclinepi.2017.03.007
- 37 Rohrbach LA, Grana R, Sussman S, Valente TW. Type II translation: transporting prevention interventions from research to real-world settings. *Evaluation and the Health Professionals*. 2006;29(3): 302-333.
- 38 Forsetlund L, Bjørndal A, Rashidian A, et al. Continuing education meetings and workshops: effects on professional practice and health care outcomes. *Cochrane Database of Systematic Reviews*. 2009;2 CD003030.
- 39 Karuza J. Enhancing Physician Adoption of Practice Guidelines: Dissemination of Influenza Vaccination Guideline Using a Small-Group Consensus Process. *Archives of Internal Medicine*. 1995;155(6): 625-632.
- 40 Ivers N, Jamtvedt G, Flottorp S, et al. Audit and feedback: effects on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*. 2012;6.
- 41 Alvero A, Bucklin BR & Austin A. An Objective Review of the Effectiveness and Essential Characteristics of Performance Feedback in Organizational Settings (1985-1998). *Journal of Organizational Behavior Management*. 2001;21:1-28.
- 42 Brehaut JC, Colquhoun HL, Eva KW, et al. Practice Feedback Interventions: 15 Suggestions for Optimizing Effectiveness Practice Feedback Interventions. *Annals of Internal Medicine*. 2016;164(6):435-441.
- 43 Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *American Journal of Public Health*. 1999;89(9):1322-1327.
- 44 Glasgow RE, Klesges LM, Dzewaltowski DA, Estabrooks PA, Vogt TM. Evaluating the impact of health promotion programs: using the RE-AIM framework to form summary measures for decision making involving complex issues. *Health Education Research*. 2006;21(5):688-694.
- 45 Jaime PC, Lock K. Do school based food and nutrition policies improve diet and reduce obesity? *Preventive Medicine*. 2009;48(1):45-53.
- 46 Reilly K, Nathan N, Wolfenden L, et al. Validity of four measures in assessing school canteen menu compliance with state-based healthy canteen policy. *Health Promotion Journal of Australia*. 2017;27(3):215-21.

- 47 Olstad DL, Lieffers JR, Raine KD, McCargar LJ. Implementing the Alberta Nutrition Guidelines for Children and Youth: In a Recreational Facility. *Canadian Journal of Dietetic Practice and Research*. 2011;72(4):e212-20.
- 48 Prochaska JO. Transtheoretical model of behavior change. In *Encyclopedia of Behavioral Medicine*. Springer New York; 2013 p.1997-2000.
- 49 New South Wales Department of Education and Training. 2009 DET Directory. Sydney, NSW: Department of Education and Training; 2009.
- 50 Australian Bureau of Statistics. Technical paper: census of population and housing: Socioeconomic Indexes For Australia (SEIFA). Cat. no 2039.0.55.001.Canberra: Commonwealth of Australia; 2006.
<http://www.abs.gov.au/ausstats/abs@.nsf/mf/2039.0.55.001>. Accessed 3 January 2018.
- 51 Australian Bureau of Statistics. Australian Standard Geographical Classification (ASGC). Cat. no 1216.0. Canberra: Commonwealth of Australia; 2011.
<http://www.abs.gov.au/ausstats/abs@.nsf/mf/1216.0>. Accessed 3 January 2018.
- 52 Downs SM, Farmer A, Quintanilha M, et al. Alberta nutrition guidelines for children and youth: awareness and use in schools. *Canadian Journal of Dietetic Practice and Research*. 2011;72(3):137-40.
- 53 Gottfredson DC, Cook TD, Gardner FE, et al. Standards of evidence for efficacy, effectiveness, and scale-up research in prevention science: Next generation. *Prevention Science*. 2015;16(7):893-926.
- 54 Hoelscher DM, Kelder SH, Murray N, Cribb PW, Conroy J, Parcel GS. Dissemination and adoption of the Child and Adolescent Trial for Cardiovascular Health (CATCH): a case study in Texas. *Journal of Public Health Management and Practice*. 2001;7(2):90-100.
- 55 Rohrbach LA, Graham JW, Hansen WB. Diffusion of a school-based substance abuse prevention program: Predictors of program implementation. *Preventive Medicine*. 1993;22(2):237-60.
- 56 Nathan N, Wolfenden L, Bell AC, et al. Effectiveness of a multi-strategy intervention in increasing the implementation of vegetable and fruit breaks by Australian primary schools: a non-randomized controlled trial. *BMC Public Health*. 2012;12:651.
- 57 Fagan AA, Mihalic S. Strategies for enhancing the adoption of school-based prevention programs: Lessons learned from the Blueprints for Violence Prevention replications of the Life Skills Training program. *Journal of Community Psychology*. 2003;31(3):235-53.
- 58 Erickson AS, Noonan PM, McCall Z. Effectiveness of online professional development for rural special educators. *Rural Special Education Quarterly*. 2012;31(1):22-32.
- 59 Masse LC, de Niet-Fitzgerald JE, Watts AW, Naylor PJ, Saewyc EM. Associations between the school food environment, student consumption and body mass index of Canadian adolescents. *International Journal of Behavioral Nutrition and Physical Activity*. 2014;11(1):29.
- 60 Schildmann EK, Higginson IJ. Evaluating psycho-educational interventions for informal carers of patients receiving cancer care or palliative care: strengths and limitations of different study designs. *Palliative medicine*. 2011;25(4):345-56.

CHAPTER 6

Assessing the potential impact of a front-of-pack nutritional rating system on food availability in school canteens: a randomised controlled trial

Published in:

Kathryn Reilly, Nicole Nathan, Jason H.Y. Wu, Tessa Delaney, Rebecca Wyse, Megan Cobcroft, John Wiggers, Rachel Sutherland, Kym Buffet, Sze Lin Yoong, Luke Wolfenden. Assessing the potential impact of a front-of-pack nutritional rating system on food availability in school canteens: A randomised controlled trial. **Appetite**. 2018;121:309-315. <http://doi.org/10.1016/j.appet.2017.11.103>

ABSTRACT

Background

Front-of-pack graphical nutritional rating of products is becoming an important strategy in many countries to improve healthy food purchases by consumers. Evidence of the effectiveness of such on facilitating healthy food choices by school food service providers has not been reported. The primary aim of the study was to assess the impact of providing front-of-pack nutritional rating information on school canteen managers' likely food selections. Secondary outcomes were canteen manager awareness, attitudes and reported barriers to using the front-of-pack information.

Methods

A randomised controlled trial involving primary school canteen managers was conducted in a single region in New South Wales, Australia. Eligible participants were randomized to an intervention or control group and asked in a telephone interview which of 12 common food products sold in school canteens they would sell. Both groups received product name and brand information. The intervention group also received information regarding the nutritional rating of products.

Results

Canteen managers in the intervention group were significantly more likely than those in the control group to indicate they would sell three of the six 'healthier' products ($p=0.036, 0.005, 0.009$). There was no difference between groups in the likelihood of making available for sale any of the six 'less healthy' products. The majority of canteen managers who had heard of a product nutritional rating system agreed that it was helpful in identifying 'healthier' foods (88 %, $n=31$).

Conclusions

The inclusion of product nutritional rating information has the potential to improve the availability of some 'healthier' items on canteen menus and contribute to improving child dietary intake. Further research is required to determine whether the use of product nutritional rating information actually makes a difference to canteen manager choices.

BACKGROUND

In response to the global increase in childhood overweight and obesity, addressing excessive weight gain in childhood has been identified by the World Health Organization (WHO) as one of the key public health challenges of the century.¹ Policies targeting foods provided by or available for sale in schools have considerable potential to improve child public health nutrition,² given the near universal access such settings provide to children during key developmental phases and as children consume a substantial proportion of their daily energy intake whilst at school.³

Consistent with WHO recommendations, governments across the globe have introduced school based healthy eating policies based on national dietary guidelines.^{4,5} For example, in the United States, the National School Lunch Program aligns with the Dietary Guidelines for Americans and aims to increase the availability of fruits, vegetables, whole grains, and reduced fat dairy in school meals to improve child nutrition and prevent unhealthy weight gain.⁴ Similarly, in Australia, where children can pre-order their lunch or purchase foods and beverages over the counter from a canteen or tuckshop, all states and territories have introduced policies to promote 'healthy' foods and restrict the availability of 'less healthy' foods for sale.⁶

One impediment to implementation of such nutrition policies in schools is the difficulty that food service staff experience in classifying the nutritional value of food products.^{7,8} In Australia, for example, school canteen managers are required to use and apply back-of-pack nutrition panel information to classify food and beverage products using a 'traffic light' system to determine if the item is consistent with dietary guidelines (products classified as 'green') and state school canteen policy.⁹ For canteen managers, particularly those with no formal nutrition qualifications, interpretation and application of such information can be complex and time consuming.¹⁰ As a consequence, adherence to such policies is typically poor.¹¹ For example, a recent study (2014) of the adoption of healthy eating policies in Australian schools found that the proportion of schools that complied with such policies ranged from 5-62 %, and in the majority of states ≤ 35 % of schools achieved compliance.⁶

Front-of-pack food labelling systems that provide simplified information regarding the nutritional content of packaged food items are being introduced internationally for all food products in all settings. For example, the Netherlands has introduced a 'Choices

logo', which is a single summary checkmark symbol that appears on products meeting certain standards for low levels of sodium, added sugar, saturated fat, trans fat and caloric content.¹² The United Kingdom has a multiple traffic light labelling system for products that uses 'green', 'yellow' and 'red' symbols to alert consumers to low/med/high levels of saturated, fat, sodium and sugar per serving.¹³ In Australia, a voluntary front-of-pack labelling system known as the Health Star Rating was introduced in 2014.¹⁴

The use of simple graphically presented information on the front of food products that provides an overall nutritional rating of a food or beverage is suggested to also facilitate the identification of healthy foods by school food service staff to improve the availability of such items to children.¹⁵ However, despite the potential of such food labelling systems to inform canteen manager decision making regarding canteen menu content, the impact of such a system on their selection of foods included on school canteen menus has not been assessed. Given this evidence gap, a study was undertaken to assess the impact of providing product nutrition information on canteen manager's intentions regarding products they would make available for sale in their canteen. Secondary objectives were to assess current awareness, attitudes and barriers to using the food labelling system in decisions regarding canteen food availability.

METHODS

Approval to conduct the study was obtained from Hunter New England Area Health Service Human Research Ethics Committee (no. 06/07/26/4.04) [Appendix 6.1], the University of Newcastle (H-2008-0343), the New South Wales Department of Education (#2012277); and relevant Catholic School Offices.

CONTEXT

In 2014, the Australia and New Zealand Ministerial Forum on Food Regulation agreed to a voluntary nutritional labelling system for all packaged, manufactured or processed foods known as the Health Star Rating system.¹⁶ The system was developed by the Australian, state and territory governments in collaboration with industry, public health and consumer groups. Using an algorithm designed to determine positive and risk nutrients in foods, items within a food category (e.g. fruit juices) are assigned a rating ranging from half a star to five stars, with a higher rating representing a 'healthier' food

item. The system is increasingly prevalent in the food and grocery market, where it is currently present on over 5500 packaged products across 115 companies.¹⁷

As the use of health star rating information becomes more ubiquitous, they have the potential to be used to support canteen managers to identify both 'healthier' and 'less healthy' foods within a food or drink category in a way that does not require interpretation of nutritional information. The Australian Health Star Rating system has been recommended as an appropriate tool to support identifying foods and beverages that are acceptable for inclusion on a school canteen menu,¹⁵ in particular, 'discretionary' foods with less than 3.5 stars have been identified as 'poorer choices'.¹⁵

DESIGN AND SETTING

A randomised controlled trial of primary school canteen managers from the Hunter New England (HNE) region of NSW was conducted between February 2016 and June 2016. The HNE region covers a large geographic area (more than 130,000km²) and consists of a socioeconomically and demographically diverse population of approximately 112,000 children aged 5-12 years.¹⁸

SAMPLE AND RECRUITMENT

Three-hundred-and-thirty-eight canteen managers from primary schools of all sectors (Government, Catholic and Independent schools) were invited to participate in the study via a computerised assisted telephone interview [Appendix 6.2]. Permission to contact canteen managers was sought from school principals through a separate telephone interview. Special purpose schools catering for students with special needs, juvenile justice or hospitalised, and schools already participating in other research trials or quality improvement initiatives were ineligible.

RANDOMISATION

During the telephone interview conducted by a trained interviewer [Appendix 6.3], a random number generator randomly allocated eligible participants to either an intervention or control group in a 1:1 ratio. Canteen managers, but not telephone interviewers, were blind to group allocation.

INTERVENTION

Canteen managers randomised to the intervention group during the interview were read the following statement:

“Recently developed by the Australian Government, the Health Star Rating is a front-of-pack labelling system that provides a rating on the overall nutritional profile of packaged food. Products are given between ½ a star and 5 stars to allow consumers to directly compare similar products and select healthier choices. The number of stars is determined using a calculator that assesses positive and risk nutrients in food, with healthier choices being awarded more stars. The Health Star Rating is currently being implemented on a voluntary basis with a review scheduled for 2016.”

Canteen managers were then read a list of 12 common canteen commercial products. [Table 6.2] The canteen products were selected from a data-base of commonly sold canteen products held by the research team which was developed based on the team’s experience working with school canteens, collection of nutritional information of products and the assessment of menus from over 200 schools. Six items were selected on the basis that they represented ‘healthier’ packaged products (those with a rating of 3.5 or above) and six on the basis that they represented ‘less healthy’ products (those with a rating of <3.5).

The 3.5 rating cut off used to categorise the 12 products was based on research investigating the alignment of health star ratings with the 2013 Australian Dietary Guidelines definition of ‘core’ and ‘discretionary’ foods¹⁵ which found that of approximately 11,500 products assessed, 79% of foods classified as ‘core’, using the dietary guidelines, scored 3.5 or above stars while only 14% of foods classified as ‘discretionary’ scored 3.5 or above.¹⁵

The order in which items were read to participants was fixed for all participants and ensured that no more than two ‘healthier’ / ‘less healthy’ options were presented sequentially to minimise any potential response order effects.¹⁹ The product name, brand, flavour, and health star rating information and product nutritional rating classification were read to intervention group participants. Product health star rating information was sourced during February 2016 from a publicly accessible database

(‘FoodSwitch’) of commercial products that have been assigned a nutritional rating [Appendix 6.4].²⁰

CONTROL GROUP

Canteen managers allocated to the control group were read product name, brand and flavour, but not health star rating system or product nutritional classification information for the 12 products.

DATA COLLECTION AND MEASURES

Outcome data were collected via the telephone interview described previously, following the delivery of product information to participants.

School and canteen characteristics

Information regarding school sector (Government, Catholic or Independent), number of students and school postcode was obtained from school websites. School postcodes were used to categorise schools into ‘higher’ and ‘lower socioeconomic’ regions using the Socioeconomic Indexes For Australia (SEIFA) database²¹ and to also categorise schools as rural (outer regional, remote, and very remote areas) or urban (major cities and inner regional areas) using the Accessibility/Remoteness Index of Australia (ARIA).²² During the telephone interview, canteen managers were asked to provide information regarding the canteen such as operational hours, management and staffing.

Primary outcome: food and beverage products selected for sale

Prior to information for each product being read out, canteen managers in both intervention and control groups were asked “*Which of these following foods would you sell at your school canteen*” (yes/no). After repeating for the 12 products on the products list, actual numbers of products selected by participants was recorded. Additionally, canteen managers in the intervention group were asked if they used the nutritional rating of the products in their decision to make them available at their canteen (yes/ no).

The primary outcome of the trial was the proportion of canteen managers indicating that they would sell in their canteen each of six ‘healthier’ food or beverage items (3.5 stars or more) and the proportion of canteen managers indicating that they would sell in their canteen each of six ‘less healthy’ food or beverage items (<3.5 stars).

Awareness of and attitudes toward using the nutritional rating system in decisions regarding canteen food availability

During the telephone interview, before the questions regarding selection of products for sale, all canteen managers were asked if they had heard of the health star rating system (yes, no, don't know). Canteen managers who responded 'yes' were asked, using a five-point Likert scale (1=strongly disagree to 4=strongly agree, 5=don't know), to respond to six items that assessed their perception of using the nutritional rating information in the selection of products for sale in their canteen, including; current use of the health star rating information when selecting packaged commercial foods to sell in the canteen, perceived ease of use, the helpfulness in identifying 'healthier' foods, the credibility as a measure of the 'healthiness' of foods, preference to use compared to the current traffic light classification, and support needed to use.

Perceived barriers to use of the Health Star Rating system in canteens

At the conclusion of the interview canteen managers in the intervention group were asked to identify perceived barriers to using nutritional rating information in their canteen from a list of seven potential barriers (knowledge of the star rating of specific canteen products, lack of availability of products with high star rating, lack of training or resources, lack of school executive support, lack of parent support, current recommendations to use traffic light system, and cost) (yes/no). An open-ended response option was also provided (other).

ANALYSIS

Data analyses were conducted using SAS 9.3 (SAS Institute, Cary, NC). Descriptive statistics were used to describe the characteristics of participating schools. To assess whether the provision of nutritional rating information increased the odds of selecting items with a rating 3.5 or greater, separate logistic regression models were conducted for each of the items (12 models in total). All models were adjusted for socio-economic status (SES) and geographic locality (rural or urban) of the school. Health star rating system perception data was calculated as dichotomous variables by aggregating canteen managers that reported 'strongly agree' or 'agree' to each item, and those who reported 'disagree', 'strongly disagree' and 'don't know'. Two sided p-value of <0.05 was considered as statistically significant.

RESULTS

Of 338 primary schools identified as having a canteen, 201 did not meet inclusion criteria (110 participating in other research trials, 91 involved in quality improvement initiatives by the local health district). Of the 137 schools that met inclusion criteria, 91 accepted the invitation to participate in the study (66 % participation rate), and 48 were allocated to the intervention group [Figure 6.1] .

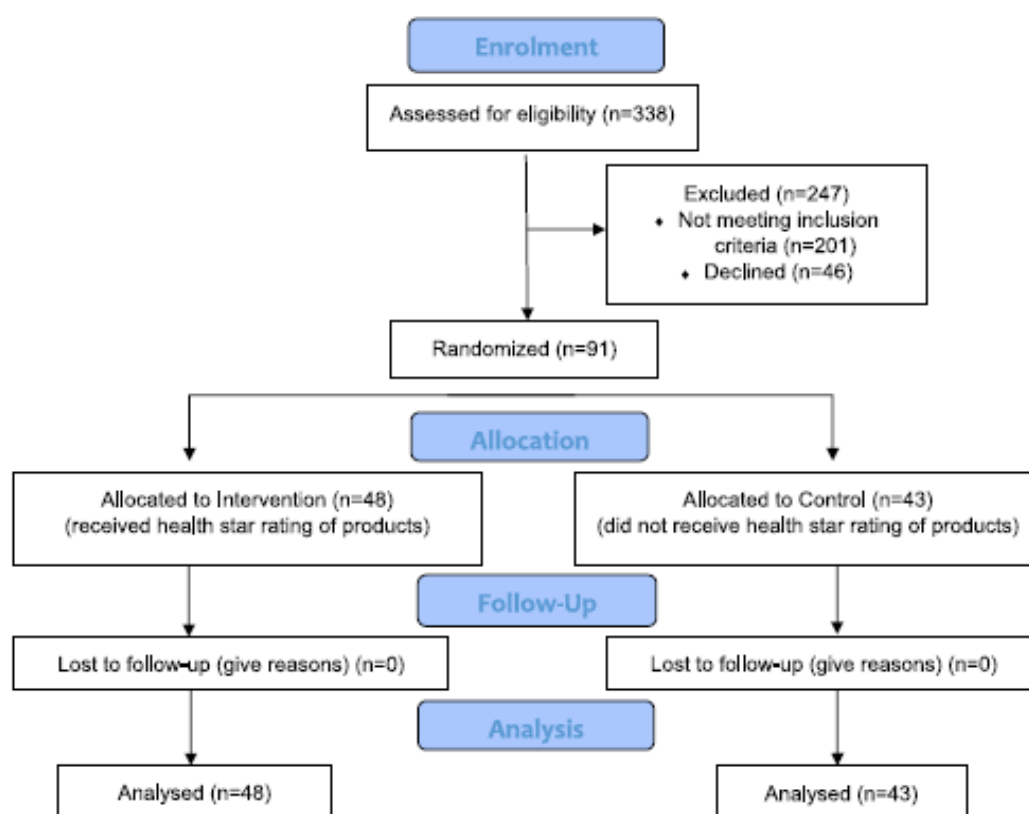


Figure 6.1: CONSORT flow chart describing progress of participants through the study

SCHOOL AND CANTEEN CHARACTERISTICS

Table 6.1 describes the characteristics of the 91 schools that participated in the study. Eighty-eight percent (n=80) were Government schools, with the average number of enrolled students being 207. The majority of schools (76 %, n=67) were located in major cities/inner regional and were located in regions classified as lower SES (68 %, n=59). Most canteens (82 %, n=75) were run by parent representative groups, 46 % (n=42) were open five days per week and the majority (51 %, n=46) were staffed by volunteers. The characteristics of intervention and control schools and canteens were similar [Table 6.1].

Table 6.1: Baseline characteristics of participating schools

CHARACTERISTICS	CONTROL GROUP		INTERVENTION GROUP	
	n=43	%	n=48	%
School type				
Government	38	88	42	88
Catholic	5	12	6	12
Independent	0	0	0	0
Average number of student enrolments^a	203	(SD=196.5)	211	(SD=189.5)
Urban/Rural region^b				
Major cities + Inner regional	32	78	35	74
Outer regional + Remote Australia	9	22	12	26
Socio-economic index^c				
Lower socio-economic areas	29	71	30	65
Higher socio-economic areas	12	29	16	35
Management of canteen				
Parent representative groups	34	79	41	85
Principal/school run	7	17	7	15
Contracted external food service	1	2	0	0
Contracted off-site caterer	1	2	0	0
Canteen staff^c (may select more than one option)				
Paid manager/supervisor	16	37	12	25
Paid assistant(s)/workers/parents	6	14	2	4
Volunteer manager/supervisor	20	47	26	54
Volunteer workers/parents	39	91	46	96
Contractor	1	2	0	0
Student help	1	2	2	4
Other	0	0	2	4
Days of operation				
5 days/week	23	53	19	40
4 days/week	5	12	1	2
3 days/week	2	5	10	21
2 days/week	2	5	5	10
1 day/week	11	26	12	25
Less than 1 day/week	0	0	1	2

^a Number of students missing from 5 schools

^b Data missing from 3 schools

^c Data missing from 4 schools

PRIMARY OUTCOME: FOOD AND BEVERAGE PRODUCTS SELECTED FOR SALE

Canteen managers in the intervention group were significantly more likely than those in the control group to report that they would make available for sale three of the six 'healthier' products (tropical fruit drink 250ml, 99 % frozen fruit sticks, 99 % apple black-currant juice 200ml, Table 6.2), with odds ratio ranging between 3.1-3.4 ($P \leq 0.036$ for each). There was no statistically significant difference between groups in the likelihood of making available for sale any of the six 'less healthy' products [Table 6.2]

AWARENESS OF AND ATTITUDES TOWARD USING THE NUTRITIONAL RATING SYSTEM IN DECISIONS REGARDING CANTEEN FOOD AVAILABILITY

Approximately a third (38 %, $n=35$) of all canteen managers (intervention and control groups) had heard of the health star rating system previously and of these, 40 % ($n=14$) said they currently use the health star rating when selecting foods to sell in the canteen [Table 6.3]. Of the canteen managers who had heard of the health star rating system ($n=35$) most agreed (88 %, $n=31$) that it was helpful in identifying 'healthier' foods and trusted the health star rating as a measure of the 'healthiness' of a food (71 %, $n=25$). Likewise, the majority (66 %, $n=23$) of the 35 canteen managers who had heard of the health star rating system stated they would be willing to use the health star rating to plan a menu in the canteen. However, when asked if they believed the health star rating was better than the traffic light system used by the current policy and if they would prefer to use the health star rating than the traffic light system, only 26 % ($n=9$) agreed to both statements, with the remainder split between disagree (37 %) and 'don't know' (37 %). The majority of canteen managers either 'agreed' or 'strongly agreed' (51 %, $n=18$) they would need support to plan menus using the health star rating system. Of canteen managers randomised to the intervention group (those that received the health star rating for all products) 40 % ($n=19$) reported that they used the health star rating in their decision to select certain products for sale in their canteen.

Table 6.2: Availability of food and beverage products

PRODUCT	HSR	CONTROL GROUP ^a		INTERVENTION GROUP ^b		OR		<i>p</i> -value
		n	%	n	%	(95% CONFIDENCE INTERVALS)*		
Products with a Health Star Rating <3.5 (less healthy)								
Chocolate coated vanilla ice cream	1.5	1	2	0	0	1		1.0
Jumbo sausage roll	2	3	7	4	6	0.8	(0.2, 4.5)	0.833
Chocolate milk 250ml	3	12	28	21	44	2.2	(0.9, 5.7)	0.096
Chocolate ice cream	3	10	12	18	38	1.6	(0.6, 4.2)	0.303
Frozen strawberry yoghurt	3	25	58	32	67	1.4	(0.6, 3.4)	0.432
Crumbed chicken nuggets	3	13	30	20	42	2.0	(0.8, 5.2)	0.157
Products with a Health Star Rating 3.5 or greater (healthier) ^c								
Plain popcorn	3.5	17	40	25	52	1.5	(0.6, 3.6)	0.344
Honey soy chicken chips	3.5	31	72	38	79	1.6	(0.6, 4.2)	0.375
Tropical fruit drink 250ml	3.5	7	16	18	38	3.1	(1.1, 9.1)	0.036**
Cheese and bacon pizza single	4	17	40	27	56	1.8	(0.8, 4.3)	0.173
99% frozen fruit sticks	4.5	16	37	32	67	3.6	(1.5, 8.8)	0.005**
99% apple black-currant juice 200ml	5	18	42	34	(71)	3.4	(1.4, 8.3)	0.009**

^a Canteen managers provided with product name, brand and where relevant, serving size only^b Canteen managers provided with product name and HSR^c Meets the proposed 3.5 minimum Health Star Rating for inclusion on school canteen menus

* Odds ratio comparing intervention to control group calculated using logistic regression, adjusted for socio-economic status and school location

Table 6.3: Canteen managers who had heard of the Health Star Rating (n=35): Awareness of and attitudes toward using the Health Star Rating system in decisions regarding canteen food availability*

TELEPHONE SURVEY QUESTIONS	AGREE/STRONGLY AGREE	
	n	%
The HSR ^a is helpful in identifying healthier foods	31	89
I currently use the HSR when selecting foods to sell in my canteen	14	40
I trust the HSR as a measure of how healthy a food product is	25	71
I believe the HSR is better than the traffic light system used by FT@S	9	26
I would be willing to use the HSR to plan a menu in my canteen	23	66
Planning a menu using star ratings would be easy	14	40
I would need support to plan menus using a HSR system	18	51
I would prefer to use the HSR system than the FT@S traffic light labelling system to plan my menu	9	26

* Canteen managers aware of the HSR were asked each question above and indicated their response on a 5-point likert scale: 'strongly agree', 'agree', 'disagree', 'strongly disagree' and 'don't know'. The number who responded 'agree'/'strongly agree' were aggregated and presented in this table.

^aHealth Star Rating

PERCEIVED BARRIERS TO USE OF THE HEALTH STAR RATING SYSTEM IN CANTEENS

The top four perceived barriers to using the health star rating system in the intervention group were: perceived lack of availability of products with a health star rating (44 %, n=21); knowledge of the health star rating of specific canteen products (40 %, n=19); perceived lack of training or resources (31 %, n=15); and perceived cost (27 %, n=13).

DISCUSSION

To our knowledge, this is the first study to assess the impact of health star rating product information on canteen manager's intentions regarding products they would select for sale in their school canteen. Canteen managers who were provided with the health star rating of products were more likely to indicate that they would in future make available for sale products with a rating 3.5 or greater, that is, 'healthier' products. Between group differences in the likelihood of canteen managers selling products was significant in three

of the six 'healthier' products listed, however there was no between group difference for the 'less healthy' products.

This study found the majority of canteen managers had not heard of the health star rating system, and therefore had not previously used the health star rating when selecting foods and beverages for sale on the canteen menu. Such findings suggest that increasing awareness of the system will be a critical first step in any efforts to use the system to promote healthy food availability in school canteens. Encouragingly, of those canteen managers who had heard of the health star rating system, most (71 %) believed it to be helpful and trustworthy in identifying 'healthier' foods and beverages and the majority (66 %) indicated they would be willing to use the health star rating to plan a canteen menu. These findings support the recommendation that a school healthy eating policy inclusive of a nutritional labelling system such as the health star rating may help influence and guide canteen manager's choices of food and beverages to include on canteen menus and thus improve the availability of 'healthier' menu items.¹⁵ As improving the availability of healthy food in school canteens is associated with significant improvements in the nutritional quality of purchased foods, such a strategy may make an important contribution to improving child diet.

To the author's knowledge, no previous studies have looked at the use of a front-of-pack labelling system to influence the availability of 'healthier' foods by food service providers. Rather, focus has been on the influence these labels have on consumer perceptions of the 'healthiness' of foods and consumer purchasing patterns.²³⁻²⁶ Findings from this study regarding canteen manager's awareness (38 %) and acceptability of the health star rating are overall lower than that seen in recent consumer research of a nationally representative sample of 1000 main/joint grocery buyers which found 59 % were aware of the Health Star Rating system,²⁷ suggesting a need for targeted communication to canteen managers to increase awareness and understanding of the health star rating system. The findings of a recent review²⁵ suggest that front-of-pack labels can help consumers make better food choices. It has been suggested that an interpretive front-of-pack nutrition labelling system such as the health star rating has the potential to help canteen managers choose products on the basis of 'healthiness' both by enabling an understanding of the nutrient data and allowing direct comparison across similar products.¹⁵

There was no difference between groups in the likelihood of selecting for sale the 'less healthy' products. The lowest health star rating products (chocolate coated vanilla ice-cream 1.5 stars and jumbo sausage roll 2 stars) were only selected by four participants in each group indicating that perhaps canteen managers in general are aware of some of the 'less healthy' products available for sale and thus resulting in no difference between groups with these particular products. Our findings that canteen managers are concerned about 'lack of availability of products with a health star rating', suggest that making health star ratings mandatory on all packaged foods (rather than voluntary) could be a significant improvement to the current front-of-pack labelling policy in Australia. Additionally, information for products not displaying the rating on front-of-pack is currently available via a mobile phone app and website.²⁰

A specific concern that has been raised regarding front of pack labelling such as health star rating is that consumers may misconstrue the presence of any visual health information as an indicator of 'healthiness' (i.e. the health halo effect').^{28,29} While this study was not designed and powered to examine this question, there was some suggestion that provision of health star rating may have made it generally more likely a product would be selected for sale, with 10 out of the 12 odds ratio estimates for selecting a product greater than one [Table 6.2]. Our findings suggest a need for future studies to investigate the potential health halo effect of the health star rating. Furthermore, the products selected in this study were mostly discretionary foods and their inclusion was based on prior school surveys indicating these were top selling products in NSW.^{6,30} Future education and promotion of health star rating use among canteen managers needs to emphasize that the use of health star ratings to select 'healthier' products within a product category must fit within the overall framework of the current Australian Dietary Guidelines, which stresses the importance to increase the overall intake of 'core' foods and reduce the consumption of 'discretionary' foods.^{15,31}

There is a number of limitations in this study worth noting. Firstly, is the hypothetical nature of the study which measured canteen manager's intention to have certain foods and beverages available for sale rather than actual availability. Further research is required to test the actual food choice behaviours of managers in a trial using the health star rating. Secondly, although participating schools were recruited from diverse SES and geographical locations, the relatively small sample size of schools from only one region within NSW means the generalizability of the findings to other school systems, or other

jurisdictions may be limited. The products listed in the survey also do not represent a comprehensive list of products that could potentially be made available for sale on canteen menus. Likewise, the survey only included commercial packaged products and did not include any canteen made items. Further research is needed to understand the applicability of the health star rating to fresh and canteen made items. It should be noted that the health star rating has changed for some of the listed products which is likely to be due to reformulation of these products to obtain a higher rating. This is a positive outcome for consumers and canteens, however, demonstrates the need for readily and publicly available up to date data on the health star rating of products.

For public health benefits of healthy eating policies such as those found in the school setting to be realised, identification of 'healthier' foods and beverages needs to be simple, consistent and reliable. The health star rating system provides one example of front-of-pack labelling that may assist canteen managers in providing 'healthier' menu item options for student purchase. The increased availability of 'healthier' items has the potential to positively impact on child dietary intake as has been demonstrated in previous research on availability and purchasing behaviour in primary school age children.³² There is however a need for access to the health star rating for a wide range of products commonly sold in canteens and for education and support in interpreting the health star rating of potential canteen menu items. Future research is also warranted in identifying the impact a policy utilising the health star rating system has on the availability of foods and beverages in school canteens, student purchases and their subsequent dietary intake.

CONCLUSION

For childhood overweight and obesity improvements at a population level, the identification of 'healthier' foods and beverages needs to be simple, consistent and reliable. The inclusion of a front-of-pack labelling system such as the health star rating as part of a school healthy eating policy has the potential to improve the availability of 'healthier' foods and beverages on canteen menus and thus improve child dietary intake. Further research is required regarding the effect of health star ratings on actual food menu behaviour.

REFERENCES

- 1 WHO. Global status report on noncommunicable diseases. 2014.
- 2 Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: policy and environmental approaches. *Annual Review of Public Health*. 2008;29:253-272. doi:10.1146/annurev.publhealth.29.020907.090926
- 3 Bell AC, Swinburn BA. What are the key food groups to target for preventing obesity and improving nutrition in schools? *European Journal of Clinical Nutrition*. 2004;58(2):258-263. doi:10.1038/sj.ejcn.1601775
- 4 United States Department of Agriculture. Food and Nutrition Service. National School Lunch Program: Participation and Lunches Served. 2016. <http://www.fns.usda.gov/sites/default/files/pd/slsummar.pdf>. Accessed 25 February 2017.
- 5 Department of Education. The School Food Plan. 2013. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/251020/The_School_Food_Plan.pdf Accessed 25 February 2017.
- 6 Woods J, Bressan A, Langelaan C, Mallon A, Palermo C. Australian school canteens: menu guideline adherence or avoidance? *Health Promotion Journal of Australia*, 2014;25(2):110-115. doi:<http://dx.doi.org/10.1071/HE14009>
- 7 Blythe O'Hara Consulting. Healthy High School Canteens Program: literature review. Sydney: NSW Ministry of Health - Office of Preventive Health. 2014. Unpublished results.
- 8 Woolcott Research and Engagement. Enablers and potential actions for supporting healthy canteens in NSW high schools. Internal report prepared for NSW Office of Preventive Health. Sydney: NSW Ministry of Health - Office of Preventive Health. 2015. Personal communication.
- 9 NSW Department of Health. Fresh Tastes @ School NSW Healthy School Canteen Strategy: canteen menu planning guide. Sydney: NSW Department of Health, NSW Department of Education and Training. 2012
- 10 Ardzejewska K, Tadros R, Baxter D. A descriptive study on the barriers and facilitators to implementation of the NSW (Australia) Healthy School Canteen Strategy. *Health Education Journal*. 2012;72(2):136-145. doi:10.1177/0017896912437288
- 11 Wu JH, Berg J, Neeson M. Overview of development and implementation of school canteen nutrition guidelines in Australia. *Journal of the Home Economics Institute of Australia*. 2016;23(1):2.
- 12 Roodenburg AJ, Popkin BM, Seidell JC. Development of international criteria for a front of package food labelling system: the International Choices Programme. *European Journal of Clinical Nutrition*. 2011;65(11):1190-1200. doi:10.1038/ejcn.2011.101
- 13 British Heart Foundation. Food labelling. <https://www.bhf.org.uk/heart-health/preventing-heart-disease/healthy-eating/food-labelling> Accessed 25 February 2017.
- 14 Department of Health. Health Star Rating System. 2016. <http://healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/Content/About-health-stars> Accessed 25 February 2017.

- 15 Dunford E, Cobcroft M, Thomas M, Wu JH. Technical Report: Alignment of NSW Healthy Food Provision Policy with the Health Star Rating System. 2015. Unpublished results.
- 16 The Department of Health, Australian Government. Front-of-pack labelling updates. A summary of the development of the Front-of-Pack Labelling project. <http://www.health.gov.au/internet/main/publishing.nsf/content/foodsecretariat-front-of-pack-labelling-1/> Accessed 25 February 2017.
- 17 Food Regulation Secretariat. Australia and New Zealand Ministerial Forum on Food Regulation Communique 25 November 2016. 2016. <http://foodregulation.gov.au/internet/fr/publishing.nsf/Content/ministerial-forum-communiques/> Accessed 25 February 2017.
- 18 Health Stats NSW. Population growth by Local Health District. 2014. http://www.healthstats.nsw.gov.au/Indicator/dem_pop_lhnmap/dem_pop_lhn_snap. Accessed 25 February 2017.
- 19 Bowling A. Mode of questionnaire administration can have serious effects on data quality. *Journal of Public Health*. 2005;27(3):281-291.
- 20 The George Institute for Global Health. Foodswitch. <http://www.foodswitch.com.au/#/home>. Accessed 25 February 2017.
- 21 Australian Bureau of Statistics. Australian Standard Geographical Classification (ASGC). Cat. no 1216.0. Canberra: Commonwealth of Australia. 2011. <http://www.abs.gov.au/ausstats/abs@.nsf/mf/1216.0> Accessed 25 February 2017.
- 22 Australian Bureau of Statistics. Technical paper: census of population and housing: Socioeconomic Indexes For Australia (SEIFA). Cat. no 2039.0.55.001. Canberra: Commonwealth of Australia. 2006. <http://www.abs.gov.au/ausstats/abs@.nsf/mf/2039.0.55.001>. Accessed 25 February 2017.
- 23 Cowburn G, Stockley L. Consumer understanding and use of nutrition labelling: a systematic review. *Public Health Nutrition*, 2007;8(01). doi:10.1079/phn2004666
- 24 Draper AK, Adamson AJ, Clegg S, Malam S, Rigg M, Duncan S. Front-of-pack nutrition labelling: are multiple formats a problem for consumers? *European Journal of Public Health*. 2013;23(3):517-521. doi:10.1093/eurpub/ckr144
- 25 Hersey JC, Wohlgenant KC, Arsenault JE, Kosa KM, Muth MK. Effects of front-of-package and shelf nutrition labeling systems on consumers. *Nutrition Reviews*. 2013;71(1):1-14. doi:10.1111/nure.12000
- 26 Mejean C, Macouillard P, Peneau S, Hercberg S, Castetbon K. Consumer acceptability and understanding of front-of-pack nutrition labels. *Journal of Human Nutrition and Dietetics*. 2013;26(5):494-503. doi:10.1111/jhn.12039
- 27 Parker G, Frith R. Health Star Rating System: Campaign Evaluation Report. 2016
- 28 Hawley KL, Roberto CA, Bragg MA, Liu PJ, Schwartz MB, Brownell KD. The science on front-of-package food labels. *Public Health Nutrition*. 2013;16(3):430-439. doi:10.1017/S1368980012000754
- 29 Chandon P, Wansink B. The biasing health halos of fast-food restaurant health claims: lower calorie estimates and higher side-dish consumption intentions. *Journal of Consumer Research*. 2007;34(3):301-314.
- 30 Lawlis T, Knox M, Jamieson M. School canteens: A systematic review of the policy, perceptions and use from an Australian perspective. *Nutrition & Dietetics*. 2016. doi:10.1111/1747-0080.12279
- 31 Department of Health, Australian Government. Australian Dietary Guidelines. Canberra: National Health and Medical Research Council. 2013

<https://www.eatforhealth.gov.au/guidelines/about-australian-dietary-guidelines>
Accessed 25 February 2017.

- 32 Wolfenden L, Nathan N, Janssen L, Wiggers J, Reilly K, Delaney T, Williams CM, Bell, C, Wyse R, Sutherland R, Campbell L, Lecathelinais C, Oldmeadow C, Freund M, Yoong S. Multi-strategic intervention to enhance implementation of healthy canteen policy: A randomised controlled trial. *Implementation Science*. 2017;12(1):6.

CHAPTER 7

A summary of findings and future directions for policy, practice and research.

A SUMMARY OF FINDINGS AND FUTURE DIRECTIONS FOR POLICY, PRACTICE AND RESEARCH.

This thesis sought to address identified gaps in evidence regarding the implementation of strategies to increase school compliance of healthy canteen policies at scale. The aims of the thesis were to:

- 1) Assess the effectiveness of a theoretically designed multi-strategy intervention in increasing the implementation of a healthy canteen policy in Australian primary schools;
- 2) Evaluate the effectiveness and cost-effectiveness of interventions of varying intensity to enhance the implementation of a state-based school healthy eating policy;
- 3) Describe the validity of four canteen menu assessment methods , including the direct cost and time to administer of each;
- 4) Assess the effectiveness of an intervention to support implementation, at scale, of a healthy canteen policy in Australian primary schools;
- 5) Assess the impact of a new state-based school healthy eating policy (incorporating the Health Star Rating) on school canteen manager's product sale intentions; their awareness of, attitudes and perceived barriers.

This Chapter provides an overview of the key findings of this thesis and the studies undertaken to address its aims. The Chapter concludes with the implications of the study findings for future policy, practice and research.

1 THESIS FINDINGS

Chapter 1: Thesis Introduction

Chapter 1 presented evidence to show the considerable contribution overweight and obesity makes to the overall burden of disease. The Global Burden of Disease 2013 study reported that high body-mass accounted for 3.4 million deaths and 3.8 % (>93 million) of global disability-adjusted life years (DALYs) annually.¹ While overweight and obesity rates for adults are a concern, the Chapter's focus was on the increase in and stability of overweight and obesity in children. In Australia in 2011–12, the ABS Australian Health Survey, estimated that 26 % of children aged 5–14 were either overweight (19 %) or obese (7 %).² A poor diet, defined as incorporating energy-dense, high fat, low fibre foods, was found to be a key driver of excessive weight gain in children.³⁻⁵

Chapter 1 also provided an overview of dietary behaviours recommended in guidelines to prevent excessive weight gain in childhood⁶ and evidence that children globally do not meet these guidelines.⁷⁻⁹ In many countries child obesity prevention policies, plans and strategies recommend schools as key setting for improving children's dietary intake, with most high income countries having school nutrition policies that support the provision of food in line with national dietary guidelines.¹⁰⁻¹² Despite such policies, Chapter 1 presented evidence of poor implementation of such policies by schools¹³⁻¹⁷ and of the reported barriers to implementation.^{12, 18} Apart from three randomized control trials recently conducted in the NSW, Australia,¹⁹⁻²¹ little research was found that investigated the effectiveness of strategies to support schools to implement nutrition policies generally and policies governing the availability of food in school canteens and food service settings specifically. While the three trials described successful models to support school implementation of such policies, all were limited in terms of the small number of schools involved (n=70,²⁰ n= 72,¹⁹ n=53²¹). To ensure that the benefits of finite health resources return the greatest health benefits to the community, policy implementation support strategies that are both feasible to be implemented at scale (across an entire population of schools), and are cost-effective in doing so are required. The Chapter reported the findings of studies describing challenges to scaling-up of effective interventions and identified a number of theories and frameworks to support such an objective.²²⁻²⁶ Finally, the Chapter described the new NSW Healthy School Canteen Strategy and identified potential benefits of such a policy on improving the availability of healthy items in school canteens.

Based on this evidence the Chapter concluded that a need existed for further research in the areas addressed in the following chapters as outlined in the thesis aims above.;

Chapter 2: Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomized controlled trial.

To ensure the potential benefits of school healthy eating policies are realised, identification of strategies that are effective in implementing healthy school canteen or nutrition policies is required. A parallel group randomized controlled trial was conducted in primary schools in one region in NSW, Australia. Schools randomized to the intervention arm received a 9-month multicomponent intervention including ongoing support, provision of resources, performance monitoring and feedback, executive support and recognition. The intervention was developed using the Theoretical Domains Framework (TDF).²⁷ Potential barriers and enablers were identified through a rigorous process involving literature reviews, surveys with canteen managers and discussions with experienced health promotion practitioners in the study region. The identified barriers were then mapped to the TDF and the relevant implementation strategies were included.

The primary outcomes were the proportion of the schools with a canteen menu that: i) did not include 'red' or 'banned' items according to the healthy canteen policy; and ii) had more than 50 % 'green' items. The primary outcome was assessed via menu audit at baseline and follow up by dietitians blinded to group allocation. Fifty-three eligible schools were randomized to either the intervention or control group (28 intervention; 25 control). Analyses with 51 schools who returned school menus found that intervention schools were significantly more likely relative to control schools to have a menu without 'red' or 'banned' items (RR = 5.78 (1.45–23.05); $p = 0.002$) and have at least 50 % of menu items classified as green (RR = 2.03 (1.01–4.08); $p = 0.03$). The study found that a multi-component intervention was effective in improving primary schools' compliance with a healthy canteen policy. The trial demonstrated the effectiveness of a level of intervention intensity that has the potential to be delivered at scale. However, the extent to which each intervention strategy was effective in improving policy implementation remains unknown and warrants further investigation. A further

limitation of the study was the lack of reporting of costs and cost-effectiveness of the intervention suggesting further research exploring the cost-effectiveness of implementation strategies is warranted.

Chapter 3: Economic analysis of three interventions of different implementation intensity of healthy school canteen policies in Australia: costs and incremental cost effectiveness.

No evaluations of the cost or cost effectiveness of interventions to increase school implementation of food availability policies have been reported. Government and non-government agency decisions regarding the extent of investment required to enhance school implementation of such policies are therefore unsupported by such published evidence. To address this evidence gap, Chapter 3 described a study that sought to i) Determine cost and incremental cost-effectiveness of three interventions in improving school implementation of an Australian government healthy canteen policy and; ii) Determine the relative cost-effectiveness of the interventions in improving school implementation of such a policy. The economic analysis was based on the cost of delivering the interventions by health service delivery staff to increase the proportion of schools 'compliant' with the policy. The 'high intensity' intervention incurred the greatest costs per school (AUD\$4,771/ school), followed by the 'medium intensity' intervention (AUD\$2,216/school) and the 'low intensity' intervention (AUD\$2,102/school). The comparison between the 'high' and 'medium intensity' interventions showed no statistically significant difference between the two in either incremental or relative cost-effectiveness.

Such findings provide previously unavailable evidence to inform policy and practice decisions regarding the nature and extent of investment required to achieve the intended public health benefits of school food availability policies. Whether such findings are achieved when the strategies are implemented at scale warrants further research to ensure the benefits of finite health resources return the greatest health benefits to the community.

Chapter 4: Validity of four different measures to assess compliance of school canteen menus with a State-based healthy canteen policy.

To address recommendations that monitoring of compliance with policies is required to ensure the intended benefits of policies are realised,²⁸ and that such monitoring should be both valid and feasible,²⁸ Chapter 4 described the validity and cost of four school canteen policy compliance assessment methods; 1) principal and 2) canteen manager self-report via a computer-assisted telephone interview; and 3) comprehensive and 4) quick menu audits by dietitians, compared with observations. The cross-sectional study included a sample of 38 primary schools that provided a current canteen menu. Percentage agreement, kappa, sensitivity and specificity compared with observations was calculated together with the direct time taken and costs of each method. The study found that agreement with observations was substantial for the quick menu audit (kappa = 0.68), and moderate for the comprehensive menu audit (kappa = 0.42). Principal and canteen manager self-report resulted in poor agreement and low specificity with the gold standard. The self-reported measures had the lowest cost, followed by the quick menu audit and lastly the comprehensive menu audit.

Findings from this study indicated that self-reported measures were unlikely to provide an accurate representation of policy compliance. The quick menu audit represented an inexpensive, relative to a gold standard approach, and valid method that can be used to accurately assess healthy canteen policy compliance on a large scale.

Chapter 5: Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy: healthy food@school.

To address the findings identified in Chapter 1 of sub-optimal implementation of school food availability policies, and based on the results of the studies in Chapters 2 (implementation support trial) and 3 (cost-effectiveness analysis), Chapter 5 described the effectiveness of '*healthy food@school*', a multi-strategy implementation trial to increase schools' implementation of a healthy canteen policy at scale. '*Healthy food@school*' was conducted in primary schools (n = 173) in the Hunter New England region of NSW, Australia and involved the development and provision of a range of evidence-based implementation strategies including: leadership support; consensus processes; education; tools and resources; provision of implementation support; reinforcement; audit and feedback; and a canteen product data base. The primary trial outcome was the proportion of canteen menus that were compliant with the state policy, measured through menu audits at baseline and follow up. At follow-up, 35 % (55/157) of schools compared to 17 % (29/168) at baseline (OR= 2.7 (1.6-4.7), p=0.0003) had menus compliant with the state healthy canteen policy, with similar results six months post intervention (33 % OR = 2.4 (1.4-4.0), p=0.001 compared to baseline). Sub-group analysis of compliance rates at follow-up based on school and canteen characteristics identified government schools as significantly more likely to have menus compliant with the policy than Catholic or Independent schools (p=0.049). There was no other statistically significant difference between characteristics such as school size, geographical location, socio-economic, canteen management, or days of operation.

Findings of the study indicated that a multi-strategic implementation intervention can improve policy compliance at a population level with equivalent effectiveness across different school and canteen characteristics. The study did not however assess the cost-effectiveness of the intervention nor the impact of individual strategies on improving policy compliance.

Chapter 6: Assessing the potential impact of a front-of-pack nutritional rating system on food availability in school canteens: A randomised controlled trial.

One of the barriers to school healthy canteen policy implementation identified in the development of the trial outlined in Chapter 2, was the difficulty canteen managers have in correctly classifying menu items according to policy criteria using the nutrition information panel on product packaging. For canteen managers, particularly those with no formal nutrition qualifications, interpretation and application of such information can be complex and time consuming.¹⁸ During the thesis period, the NSW healthy school canteen strategy was reviewed and a new method of food and beverage nutritional quality classification was identified that involved replacement of the previous traffic light system.²⁹ The Australian Dietary Guidelines³⁰ and the national labelling system that provides Health Star Ratings on the front of packaged food and drinks³¹ formed the basis of the new food and drink classification for school canteens.²⁹ In the context of this changed policy environment, Chapter 6 sought to assess the possible impact of the new policy by assessing the effect of providing product nutrition information to canteen managers on their product selection intentions and by assessing their awareness, attitudes and perceived barriers to using the new food labelling system in their food product selection for sale.

A randomized controlled trial involving primary school canteen managers was conducted in a single region in NSW, Australia. Eligible participants were randomized to an intervention or control group and asked in a telephone interview about their intention of selling 12 specified common food products in their canteens. Both groups received product name and brand information whilst the intervention group also received information regarding the nutritional rating of products (based on the Health Star Rating system). Canteen managers in the intervention group were found to be significantly more likely than those in the control group to indicate they would sell three of the six 'healthier' products ($p= 0.036, 0.005, 0.009$). There was no difference between groups in the likelihood of making available for sale any of the six 'less healthy' products. The majority of canteen managers who had heard of the product nutritional rating system agreed that it was helpful in identifying 'healthier' foods (88 %, $n=31$).

The study found that the inclusion of product nutritional rating information has the potential to improve the availability of some 'healthier' items on canteen menus and so

may contribute to improving child dietary intake. However, further research is required to determine whether the use of product nutritional rating information influences actual canteen manager choices and improves the availability of 'healthier' items on canteen menus.

Significance

The development, implementation and monitoring of cost-effective strategies to address childhood obesity generally, and to improve child dietary intake in particular, are public health priorities. The studies conducted for this thesis have made a contribution to the need for evidence in this area.

The trials included in this thesis found that multi-strategy interventions were effective in improving schools' implementation of a healthy school canteen policy, and can be delivered successfully at scale, across a population of schools. If proven to be cost-effective, the scaled up '*healthy food@school*' program has the potential to have a significant public health impact on improving child dietary intake and the fight against childhood obesity.

In addition, the thesis further added to the evidence base in this area by reporting new evidence regarding a number of suggested key determinants of successful policy and practice implementation³² including acceptability, adoption, appropriateness, costs, feasibility, fidelity, penetration and to some extent sustainability of policy, implementation and implementation support strategies.

Together, the thesis findings provide a significant enhancement to the evidence base regarding the prevention of child obesity, enhancement of child nutrition and implementation science in these previously under researched areas.

Strengths

This thesis was based on a number of rigorous scientific methods not previously applied to the assessment of implementation strategies to enhance school canteen policy adherence, including;

- i) the conduct of serial controlled implementation trials using common designs and methods;¹⁹⁻²¹
- ii) the conduct of cost, incremental and relative cost effectiveness analysis of different implementation support strategies; and
- iii) the validation of a policy implementation assessment tool for evaluation at scale.

The studies within this thesis were based on previous systematic review evidence of effective healthy eating policies and/or practices and subsequent recommendations for future research.³³⁻⁴⁵ Further, '*healthy food@school*' is one of a few trials conducted at scale, in over 150 schools, with the aim of improving healthy food availability in the school setting.⁴⁶ Finally, the studies within this thesis were conducted according to recommended best practice guidelines, including prospective trial registration and the reporting of results using reporting criteria such as CONSORT.

2 LIMITATIONS AND OPPORTUNITIES FOR FUTURE RESEARCH

There are a number of limitations of the studies included in this thesis which are outlined in each of the chapters. Addressing these limitations represents opportunities for future research. Specifically research opportunities exist with regard to a need for;

- (i) identification of specific support strategies that increase the implementation of healthy food availability policies in schools;
- (ii) the evaluation of the cost-effectiveness of the support strategies when delivered at scale including opportunity costs to canteen managers, principals and schools; and
- (iii) the identification of specific strategies to sustain the implementation of healthy food availability policies in schools.

i) **Identification of specific strategies that increase implementation of healthy food availability policies**

If the potential public health benefits of school-based healthy food availability policies are to be realised, enhancement of their implementation on a population-wide basis is required. While the findings of Chapter 2 provide evidence of an effective method of improving implementation of a healthy canteen policy in schools and Chapter 5 (*healthy food@school*) found these improvements were achievable at scale, little is known of the mechanism by which the intervention facilitated policy implementation. Understanding mechanisms enables the identification of specific implementation strategies that are most effective, and those strategies which do not contribute to improvements in policy implementation. Such information is important for improving the effectiveness and efficiency of implementation approaches.

The use of methods such as a) mediation analysis and b) trial designs that involve comparison of multiple combinations of strategies, have the potential to address this issue.

a) Mediation Analysis

Recent methodological advances have developed robust analytical techniques to quantify the proportion of intervention effects that are attributed to selected mediating variables ('mediation analyses').⁴⁷ These new methods are based on clearly outlined counterfactual definitions of causal effects along with explicit assumptions for making causal inference. Mediation analysis has been identified as fundamental to advancing our understanding of implementation science as it allows identification of causal relationships between implementation strategies and outcomes.⁴⁷ Despite recommendations for its inclusion in all behaviour change trials,⁴⁸ rarely has it been included in evaluations of public health interventions broadly⁴⁹ or in the field of public health nutrition implementation specifically. To the best of our knowledge there are no systematic reviews of mediation studies in the field of implementation science. Selected mediation studies we identified through a literature search however, are discussed below.

A recent (2013) randomised trial in the U.S of 50 high school teachers from 43 high schools examined the impact of a strategy on the implementation fidelity of a substance abuse prevention program in schools.⁵⁰ As part of the trial, authors also investigated mediation effects of changes in teacher self-efficacy and beliefs about the value of the program on program implementation.⁵⁰ The analysis identified teacher self-efficacy as a mediator for increasing the effectiveness of the training intervention on implementation fidelity.⁵⁰ These findings identified the importance of training methods that focus on strengthening teachers' self-efficacy to increase teacher implementation fidelity of research based programs.⁵⁰

Another example of mediation analyses applied to program implementation challenges is a 2011 cross-sectional survey of 1,358 midwives from northeast England.⁵¹ The study investigated the perceived implementation difficulties of midwives, working in different roles and locations, in providing smoking-cessation advice to pregnant women.⁵¹ Mediation analyses in this study investigated the indirect effects of main place of work, length of time practiced as a midwife and training as a specialist, on referring to a smoking-cessation service.⁵¹ The analysis found midwives' implementation of recommended smoking-cessation referral guidelines for pregnant women was directly related to the context of their work environment and provided further understanding of the difficulties midwives face in implementation of smoking cessation guidelines.⁵¹

To address this evidence gap in the field of public health nutrition, a study assessing mechanisms by which implementation strategies improved schools and childcare services' adherence to nutrition guidelines was undertaken as part of this candidature (Appendix 7.1). The study used causal mediation analysis to estimate the average indirect and direct effects the implementation strategies on measures of compliance with nutrition guidelines for the setting.⁵² The study pooled aggregated organisation level data from three randomised trials in the school and child care setting including implementation strategies that targeted Theoretical Domains Framework (TDF) constructs (knowledge, skills, professional role and identity, environmental context and resources) including data from Chapter 2.⁵² The study found that whilst the interventions improved nutrition policy compliance, the intervention effect was not mediated by any of the four TDF constructs targeted in the analysis. The lack of effect was suggested to be due to imprecise measurements of the mediators or alternative mechanisms not captured by the limited number of constructs explored.⁵² For example other contextual factors, such as self-efficacy identified in previous mediation analyses to be causally related to implementation and may have been driving the large implementation effects reported in Chapter 2.

The limited use of mediation analyses is of concern. Without an understanding of mechanisms of implementation, testing implementation theory is challenging, and attempts to improve the efficiency and effectiveness of implementation initiatives will likely be haphazard. While greater application of mediation analysis as part of randomised trials is therefore warranted, a lack of valid measures for the most common implementation theories and frameworks may impede such research. For example, in a systematic review of tools to assess implementation of public health interventions in non-clinical settings, McHarg and colleagues, found that just 6 % of measures of constructs of the Consolidated Framework for Implementation Research adequately assessed test-retest reliability, 16 % adequately assessed criterion validity and 2 % adequately assessed convergent validity.⁵³ Furthermore, many implementation studies are not theoretically informed, or do not specify linkages between strategies and mechanisms of effects (e.g no conceptual model of effect) hindering mechanistic evaluations.⁵⁴ New reporting guidelines for mediation studies may go some way to improving the conduct of trials and future mediation studies to address these issues.⁵⁵

b) Trial designs: Factorial Designs

A range of study designs may be appropriate to evaluate policy or guideline implementation strategies.⁵⁶ While the use of randomised evaluation designs to assess the impacts of implementation strategies can be challenging they are widely considered the 'gold standard' for evaluation of intervention effectiveness⁵⁶ and as demonstrated in this thesis are possible, particularly when integrated into health service models of intervention delivery.⁵⁷ Factorial randomised trial designs are particularly useful for understanding the mechanism by which implementation strategies exert their effects as they allow comparison of multiple combinations of strategies.⁵⁶

Factorial designs allow the comparison of more than one intervention within the same trial. For example, in a 2 x 2 factorial design evaluating two different interventions against a control group, participants are randomized into four groups: no intervention, intervention A only, intervention B only, and both intervention A and B.⁵⁶ Factorial designs are appealing as they allow not only the comparison of independent variables separately but additionally, how they combine to influence the outcome of interest.⁵⁶ Essentially, factorial designs allow two randomized trials, or more, to be conducted for the same sample size as a two-arm trial.⁵⁶

Factorial designs have been under used in the past⁵⁸ and their existence in implementation studies is limited.⁴⁶ One example where such designs have been employed is in a study of a school-based substance abuse prevention program. The trial involved 60 teachers in 25 schools, where a 2 x 2 factorial design was employed to test the effectiveness of two strategies (intensive teacher training and principal intervention) to improve implementation of a prevention program in schools.⁵⁹ The study found that the principal intervention strategy increased implementation rates however the intensive teacher training strategy did not, suggesting that the involvement of principals may increase the likelihood of implementation of prevention programs.⁵⁹

Given the number of strategies employed in the '*healthy food@school*' trial, a factorial study design could potentially identify which of those strategies, or which combination of strategies are most effective in increasing implementation of the healthy canteen policy and thus guide future implementation support. Rather than a sequential approach, as taken in this thesis, factorial designs may have been a more efficient evaluation option as multiple strategies are tested simultaneously in factorial trials (rather than sequentially)

enabling disaggregation of implementation effects, and identification of the most effective strategy earlier. Also, sequential trials only enable indirect comparison of strategies across research phases, whereas factorial trials allow direct and more robust comparison. As such, greater use of factorial designs may accelerate the generation of new knowledge and research translation in the field.

ii) Cost-effectiveness of implementation support strategies

delivered at scale: including opportunity costs

By analyzing costs and benefits together in an economic evaluation, information is gained regarding which strategies provide more benefits per unit of resource (e.g dollar).⁶⁰ The analysis also provides information regarding whether extra benefits are obtained from a more-costly strategy and whether they are worth the extra resource, in other words, are they more cost-effective.⁶⁰ As such policy makers consider cost effectiveness evaluations particularly important to aid decision making. A review assessing the quality of economic evaluations undertaken as part of evaluations of guideline implementation strategies, however, found that study quality overall was poor, most evaluations did not consider all relevant costs and methodological limitations such as potential unit of analysis errors, inappropriate analyses and misleading reporting of economic evaluations were common.⁶⁰ The authors report that while 63 of 235 eligible studies reported economic evaluations and cost analyses, the majority failed to report resource use or costs of guideline development and implementation – key costs that represent actual investments required by health services or other agencies interested in translating evidence into practice.⁶⁰

Likewise a recent systematic review (2015) of reviews (including 91 reviews) of the evidence on the effectiveness of strategies for improving implementation of complex interventions in primary care found that data on costs of different intervention strategies and evidence on cost-effectiveness were limited and of poor quality.⁶¹ For example, one included review of 235 studies by Grimshaw and colleagues (2004) reported less than 30% of studies reported any economic data, the majority of which only reported costs of treatment and only 25 studies reported data on the costs of guideline development or guideline dissemination and implementation.⁶² Further, a review by Van Herck and colleagues (2010) found only 8 out of 128 studies included in the review applied any economic modeling.⁶³

As reported in Chapter 3, the multi-strategic intervention described in Chapter 2, appears to be one of two cost-effective levels of support to improve school implementation of a healthy canteen policy according to the health service delivery perspective. Whilst the results of Chapter 3 indicate a cost effective approach from a health service perspective, opportunity costs to canteen managers, principals or schools were not included in the study. Cost effectiveness studies are recommended to have the most inclusive perspective possible to ensure potential benefits, harms and costs for all stakeholders are included and that transparency in cost-effectiveness analyses is important to demonstrate the effects on all individual stakeholders.⁶⁴ Whilst a health service delivery perspective would appear legitimate in terms of identifying the best use of limited health service resources, it could be argued that an evaluation of such limited scope is not as thorough as an economic evaluation from a societal perspective that is, taking into all stakeholders regardless of their characteristics.

The study in Chapter 5 demonstrated that intervention effectiveness was maintained when delivered at scale, however, the cost-effectiveness of delivery of the intervention at this level was not in the capacity of this thesis. It is uncertain whether cost effectiveness would potentially increase or decrease as intervention delivery is expanded across an entire region. It is hypothesized that if effectiveness is maintained across a greater reach and sample size of schools, then overall costs per school would reduce, however a cost-effectiveness analysis of the '*healthy food@school*' program is warranted to confirm this assumption. In addition to measuring cost-effectiveness from the health service delivery perspective as in Chapter 3, opportunity costs to canteen managers, principals and schools should be included to ensure a more thorough and accurate analysis of costs to all stakeholders.⁶⁰

iii) Identification of specific strategies that sustain implementation of healthy food availability policies

As reported in Chapter 5, the '*healthy food@school*' trial achieved a significant increase in implementation of the state-based healthy canteen policy at scale. In order to achieve long-term benefits in child dietary intake and subsequent improvements in childhood obesity rates of such an intervention, it is important that these effects are maintained following completion of the intervention. Additionally, understanding which intervention

components contribute to program sustainability and the challenges to continued implementation may enhance the likelihood that a program will continue as intended. Answering these challenges and developing strategies to address them prior to commencement of an intervention has been suggested to increase program and outcome sustainability.⁶⁵

Whilst sustainability of evidence-based interventions is essential to public health impact,⁶⁶ it is one of the most under-reported aspects of implementation research.⁶⁷ A recent systematic review (2012) of the sustainability of evidence-based programs and practices in the healthcare setting, found that in the 125 included studies, relatively few were considered rigorous, most did not provide an operational definition of sustainability, and few appeared to be guided by a model, theory or framework.⁶⁸ In the context of such limitations, the review identified workforce stability, workforce skills and attitudes, stakeholder support and leadership, and the ability for an innovation to be modified, as key influences to sustainability of evidence-based programs or practices in this setting.⁶⁸

A study by Keshavarz and colleagues (2010) investigating the challenges of implementing and sustaining health promotion programs in Australian primary schools using the 'complex adaptive systems' concept, found the following factors to be barriers to the sustainability of school implementation of health promotion programs:⁶⁹

- (i) poor understanding by the program provider of the complexity of schools;
- (ii) lack of acknowledgement of the diversity of and differences between schools;
- (iii) lack of effective interactions between schools and the program providers, and between schools and parents;
- (iv) inadequate guidelines to support schools; and
- (v) lack of feedback loops to schools regarding their program performance.⁶⁹

Based on such findings, it has been suggested that to improve program implementation and sustainability thereof in schools, a better understanding of schools as 'systems' and how those systems operate is needed.⁶⁹

Descriptive research in the school setting in Canada, exploring opportunities and challenges for sustaining health promotion programs, report leadership and staff buy-in as important influences on program sustainability.⁷⁰ A qualitative study of 24 participants including principals, teachers, counsellors and other school staff, found that school leadership staff, including champions and executive staff are considered to play important roles in program sustainability.⁷⁰ Ownership and belief in a program by school staff were identified as important factors in continued use and sustainability of a program.⁷¹ Another key theme identified was the program fit with school culture and priorities and the need to keep it on the school agenda.⁷⁰

Challenges to sustainability identified in the study were the high rates of staff turnover, transferring responsibility of implementation from person-to-person and re-engaging with multiple stakeholders over time.⁷⁰ Challenges such as staff stability are likely to be similar in the sustainability of healthy eating policies in schools, for example, as canteen managers, who are typically parents of children attending the school, change regularly over time. In order to overcome potential problems such as staff turnover, it has been suggested that embedding healthy eating policies and practices into the school culture is an important strategy.⁷⁰

Schell and colleagues (2013) developed a conceptual framework for enhancing public health program sustainability based on a comprehensive literature review, an expert panel of scientists, funders and practitioners, and concept mapping.⁷¹ The framework identified the following organisational and contextual characteristics considered necessary for successful program sustainability, characteristics which are similar to those reported by the systematic review above and Keshavarz (2010);⁶⁹ funding stability; the internal and external political environment; partnerships with community; organisational capacity; the ability to adapt the program and maintain effectiveness; program monitoring and evaluation; the dissemination of program outcomes; program public health impacts and strategic planning.⁷¹ Whilst the '*healthy food@school*' trial included strategies such as leadership, training, audit and feedback and consensus processes, to address some of these domains, more focus on areas such as the internal political environment of the school and partnerships with the community may be warranted.

Whilst positive results were found in short-term maintenance of the '*healthy food@school*' trial, measured six-months post intervention, true sustainability of effects require a longer follow-up period.⁶⁹ The '*healthy food@school*' program addressed some of the issues highlighted in this section regarding sustainability, such as leadership and staff buy-in, however, the true success of the program will only be known when policy implementation is measured again over a longer timeframe.

3 IMPLICATIONS FOR POLICY AND PRACTICE

The findings of this thesis have a number of implications for policy makers and practitioners.

This thesis provides a comprehensive suite of implementation-focused research addressing strategies and procedures for improving implementation of a state based healthy canteen policy with the aim of child dietary intake. The thesis provides a specific set of implementation strategies proven to improve policy implementation across a population of schools. Whilst further research is warranted as mentioned above, there now is evidence available for governments and local health services to utilise to translate these results into practice. The stability of low policy implementation over time has been documented,⁷² suggesting previous implementation methods have not been successful in achieving intended policy and practice benefits for children. This thesis provides the evidence base for levels of implementation support required to assist schools to implement healthy eating policies; a valid, efficient and acceptable approach for monitoring such compliance; and an understanding of school responses to the introduction of new policies in this area.

The findings may be particularly salient in NSW given the newly released Healthy Canteen Strategy. Implementation of the policy may be particularly challenging as the strategy requires a higher percentage of 'healthier' menu items for policy compliance. The previous healthy canteen strategy required schools to have at least 50 % of menu items classified as 'green', or 'healthier' menu items.⁷³ The new strategy requires 75 % of menu items to be classified as 'everyday' foods and beverages which is a significantly higher percentage than the previous policy.²⁹ The review of policy implementation evidence in this thesis and the results from the trials in Chapters 2 and 5, demonstrate that implementation support, including pro-active practice change support strategies, is essential to assist schools' implementation of healthy eating policies. We suggest that this support may be even more relevant in order for schools to meet the higher percentage of 'everyday' items in their menus under the new policy.

4 RECOMMENDATIONS

Based on the evidence in this thesis, to ensure schools' implementation of healthy eating and food availability policies, a need exists for relevant policymakers and practitioners to consider the use of multiple implementation support strategies at both the state and local level. In this regard, consideration should be given to the following strategies:

- **On-going implementation support and staff training for canteen managers in menu item classification, marketing and canteen profitability:** Passive dissemination strategies have previously failed to improve school's implementation of healthy canteen policies.^{12,72} The studies in this thesis demonstrate that implementation support and training provided by the research team in the form of school support officers contributed to greater policy adherence. The level of support provided in the '*healthy food@school*' trial in Chapter 5 was comparable in relation to cost-effectiveness to a previous medium intensity support trial.²¹ The '*healthy food@school*' trial provided initial face-to-face support through training workshops, however the remaining support was predominately via telephone, SMS text messages or emails. We suggest this combination of initial face-to-face contact with canteen managers followed by remote support delivery allowed the research team to develop relationships with canteen managers that could then continue even when face-to-face contact had ceased. The workshops provided canteen managers with training in menu item classification and financial management, both of which have been identified as potential barriers to policy implementation.^{12, 18}
- **Provision of menu audit and feedback to canteen managers and principals:** Audit and feedback has been shown to produce significant practice change.⁷⁴ The provision of a canteen menu report to canteen managers provided them with tailored feedback and recommendations regarding policy adherence. Acceptability and usefulness of menu reports was reported as high by participants of the trials in Chapters 2 and 5. Additionally, it should be noted that due to the nature of canteen menus changing across the seasons, receipt of more than one report would appear to be warranted to sustain positive changes over time. The establishment of an area wide service that assesses and provides feedback regarding canteen menus would not only assist school's implementation of the policy but provide the opportunity to evaluate implementation across entire jurisdictions over time.

- **Provision of an online canteen product database for easy access to menu item classification according to the policy guidelines and menu build tool:** Whilst the inclusion of Health Star Ratings as part of the new Healthy Canteen Strategy criteria has the potential to facilitate menu item classification, it may present unique challenges for canteen managers. As the presence of Health Star Ratings on products in Australia is at this stage voluntary, one such challenge may be the lack of products displaying a Health Star Ratings. If canteen managers do not have access to Health Star Ratings of potential canteen items, then classification of products may be limited and the effectiveness of the policy diminished. Providing canteen managers with an online database of products, assigned with Health Star Ratings is a strategy recommended to overcome this potential barrier to item classification. Additionally, an online menu build tool that calculates percentage of 'everyday' versus 'occasional' items would reduce the time and skill required for canteen managers to develop a menu according to the strategy.

- **A method of accountability / accreditation for schools adhering to the policy guidelines:** Individuals are motivated to follow policies or guidelines either through external regulation or internal motivations.⁷⁵ External regulation may involve the use of incentives or rewards for following the policy, or alternatively repercussions for not. Whilst it is acknowledged that this form of accountability can have a positive impact on policy adherence, it can rely heavily on the availability of resources and is potentially not sustainable.⁷⁵ Alternatively, internal motivation or self-regulation has the potential to motivate individuals to follow policies or guidelines if their ethical values align. Failing more formal and senior levels of accountability, we suggest that school accountability of implementing the Healthy Canteen Strategy should lie with the school principal, as school leader. In a recent study (2014) assessing the compliance of Australian school canteens with state based guidelines or policies, Western Australian schools had the highest level of compliance (62 %) across the country.¹² The authors suggest this is due to the requirement of school principals in this state to perform a mandatory assessment and report of their canteen menu each year to the relevant government department.¹² This study indicates that including an assessment of policy adherence in the principal's annual reporting system, could provide a formal mechanism for regulating the policy and an evaluation of policy implementation across entire jurisdictions.

- **Development of an online assessment tool that provides instant feedback on policy implementation:** In order to achieve monitoring and feedback to schools on a large scale, it is recommended that an online assessment tool is developed. This tool would provide government agencies with ongoing implementation monitoring capabilities, and also provide canteen managers and principals with instant feedback on how they are tracking with implementation of the policy. The tool could potentially be developed linking to the online canteen product database and using the principles of the Quick Menu Audit tool developed in Chapter 5. The tool could potentially provide schools with recommendations/suggestions to improve policy implementation and provide recognition for those who have been successful at implementation through a certification or accreditation system.

5 CONCLUSIONS

The evidence presented in this thesis suggests that a significant proportion of schools fail to implement healthy food availability policies and practices internationally, increasing children's exposure to energy-dense nutrient-poor foods and increasing the risk of unhealthy weight gain, potentially leading to long-term chronic disease. This thesis identified that whilst multi-component school-based food availability policies and practices can significantly improve children's dietary intake, schools report a number of barriers to the implementation of such. Furthermore, this thesis demonstrated that, with implementation support, increases in schools' implementation of healthy canteen policies can be achieved at a population level. However, further understanding of the mechanisms for enhancing the effectiveness of implementation interventions, the identification of strategies and/or resources to support the sustainability of such efforts, and exploration of the challenges in transitioning to a new healthy canteen policy are required if we are to enhance the future impact of school-based healthy food availability policies on child public health nutrition. The thesis does however, provide substantial evidence on the level of implementation support required to make significant improvements in policy adherence. Thus, the work encompassed in this thesis has contributed to advancing implementation research and practice.

REFERENCES

- 1 Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*. 2014 Aug 30;384(9945):766-81.
- 2 Australian Institute of Health and Welfare 2014. Australia's health 2014. Australia's health series no. 14. Cat. no. AUS 178. Canberra: AIHW.
- 3 Ambrosini GL. Childhood dietary patterns and later obesity: a review of the evidence. *Proc Nutr Soc*. 2014;73(1):137-46.
- 4 Rosenheck R. Fast food consumption and increased caloric intake: a systematic review of a trajectory towards weight gain and obesity risk. *Obesity Reviews*. 2008;9(6):535-47.
- 5 Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. *American Journal Public Health*. 2007;97(4):667-75.
- 6 World Health Organisation. Report of the commission on ending childhood obesity. Geneva: World Health Organisation, 2016.
- 7 Australian Bureau of Statistics. National Health Survey First Results Australia 2014-15. Canberra: 2015.
- 8 Public Health England. National diet and nutrition survey. Results from years 1, 2, 3 and 4 (combined) of the rolling program (2008/2009 - 2011/2012). 2014.
- 9 Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. *Journal of Nutrition*. 2010;140(10):1832-8.
- 10 United States Department of Agriculture. Food and Nutrition Service. Nutrition Standards in the National School Lunch and School Breakfast Programs. Federal Register. 2012;77(17):4087-4167.
- 11 Dimpleby H, Vincent J. The School Food Plan 2013. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/251020/The_School_Food_Plan.pdf.
- 12 Woods J, Bressan A, Langelan C, Mallon A, Palermo C. Australian school canteens: menu guideline adherence or avoidance? *Health Promotion Journal of Australia*. 2014;25(2):110-5.
- 13 Dobbs R, Sawers C, Thompson F, Manyika J, Woetzel J, Child P, et al. How the world could better fight obesity. McKinsey Global Institute, 2014.
- 14 Lawlis T, Knox M, Jamieson M. School canteens: A systematic review of the policy, perceptions and use from an Australian perspective. *Nutrition & Dietetics*. 2016.
- 15 Masse LC, Naiman D, Naylor PJ. From policy to practice: implementation of physical activity and food policies in schools. *International Journal of Behavioral Nutrition and Physical Activity*. 2013;10:71.
- 16 U.S. Department of Health and Human Services Centers for Disease Control and Prevention. Results from the School Health Policies and Practices Study 2014. 2015; https://www.cdc.gov/healthyyouth/data/shpps/pdf/shpps-508-final_101315.pdf.
- 17 Green Party of Aotearoa New Zealand. Annual tuckshop survey shows pies, chips still staples. 2007. Available from: <https://home.greens.org.nz/press-releases/annualtuckshop-survey-shows-pies-chips-still-staples>
- 18 Ardzejewska K, Tadros R, Baxter D. A descriptive study on the barriers and facilitators to implementation of the NSW (Australia) Healthy School Canteen Strategy. *Health Education Journal*. 2012;72(2):136-45.
- 19 Yoong SL, Nathan N, Wolfenden L, Wiggers J, Reilly K, Oldmeadow C, et al. CAFÉ: a multicomponent audit and feedback intervention to improve implementation of healthy food policy in primary school canteens: a randomised controlled trial.

- International Journal of Behavioral Nutrition and Physical Activity. 2016 Dec;13(1):126.
- 20 Wolfenden L, Nathan N, Janssen LM, Wiggers J, Reilly K, Delaney T, et al. Multi-strategic intervention to enhance implementation of healthy canteen policy: a randomised controlled trial. *Implementation Science*. 2017 Dec;12(1):6.
- 21 Nathan N, Yoong S, Sutherland R, Reilly K, Delaney T, Janssen L, et al. Effectiveness of a multicomponent intervention to enhance implementation of a healthy canteen policy in Australian primary schools: a randomised controlled trial. *The International Journal of Behavioral Nutrition and Physical Activity* 2016 Dec;13(1):106.
- 22 Rogers EM. Diffusion of preventive innovations. *Addictive Behaviors*. 2002;27:989–993.
- 23 Greenhalgh T, Robert G, Bate P, Macfarlane F, Kyriakidou O. Diffusion of innovations in health service organisations: a systematic literature review. John Wiley & Sons; 2008 Apr 15.
- 24 Barker PM, Reid A, Schall MW. A framework for scaling up health interventions: lessons from large-scale improvement initiatives in Africa. *Implementation Science*. 2016;11:12.
- 25 Milat AJ, Bauman A, Redman S. Narrative review of models and success factors for scaling up public health interventions. *Implementation Science*. 2015;10:113.
- 26 Milat AJ, King L, Newson R, Wolfenden L, Rissel C, Bauman A, et al. Increasing the scale and adoption of population health interventions: experiences and perspectives of policy makers, practitioners, and researchers. *Health Research Policy and Systems*. 2014;12:18.
- 27 Michie S, Johnston M, Francis J, Hardeman W, Eccles M. From Theory to Intervention: Mapping Theoretically Derived Behavioural Determinants to Behaviour Change Techniques. *Applied Psychology*. 2008;57(4):660-80.
- 28 World Health Organisation Global Action Plan for non communicable diseases 2013-2020. Geneva: World Health Organization, 2013.
- 29 NSW Government. Healthy School Canteens 2017. Available from: <https://healthyschoolcanteens.nsw.gov.au/>.
- 30 National Health and Medical Research Council. Australian Dietary Guidelines. Canberra: National Health and Medical Research Council; 2013.
- 31 Department of Health. Health Star Rating System: Commonwealth of Australia; Available from: <http://healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/Content/About-health-stars>.
- 32 Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, et al. Outcomes for Implementation Research: Conceptual Distinctions, Measurement Challenges, and Research Agenda. *Administration and Policy in Mental Health and Mental Health Services Research*. 2010;38(2):65-76.
- 33 Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obesity Reviews*. 2009;10(1):110-41.
- 34 Chriqui JF, Pickel M, Story M. Influence of school competitive food and beverage policies on obesity, consumption, and availability: a systematic review. *JAMA Pediatrics*. 2014;168(3):279-86.
- 35 De Bourdeaudhuij I, Van Cauwenberghe E, Spittaels H, Oppert JM, Rostami C, Brug J, et al. School-based interventions promoting both physical activity and healthy eating in Europe: a systematic review within the HOPE project. *Obesity Reviews*. 2011;12(3):205-16.

- 36 Driessen CE, Cameron AJ, Thornton LE, Lai SK, Barnett LM. Effect of changes to the school food environment on eating behaviours and/or body weight in children: a systematic review. *Obesity Reviews*. 2014;15(12):968-82.
- 37 Godin K, Leatherdale ST, Elton-Marshall T. A systematic review of the effectiveness of school-based obesity prevention programmes for First Nations, Inuit and Metis youth in Canada. *Clinical Obesity*. 2015;5(3):103-15.
- 38 Jaime PC, Lock K. Do school based food and nutrition policies improve diet and reduce obesity? *Preventive Medicine*. 2009;48(1):45-53.
- 39 Katz DL, O'Connell M, Njike VY, Yeh MC, Nawaz H. Strategies for the prevention and control of obesity in the school setting: systematic review and meta-analysis. *International Journal of Obesity (London)*. 2008;32(12):1780-9.
- 40 Mayne SL, Auchincloss AH, Michael YL. Impact of policy and built environment changes on obesity-related outcomes: a systematic review of naturally occurring experiments. *Obesity Reviews*. 2015;16(5):362-75.
- 41 Sobol-Goldberg S, Rabinowitz J, Gross R. School-based obesity prevention programs: A meta-analysis of randomized controlled trials. *Obesity* 2013 Dec;21(12):2422-8.
- 42 Van Cauwenberghe E, Maes L, Spittaels H, van Lenthe FJ, Brug J, Oppert JM, et al. Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: systematic review of published and 'grey' literature. *British Journal of Nutrition*. 2010;103(6):781-97.
- 43 Wang Y, Cai L, Wu Y, Wilson RF, Weston C, Fawole O, et al. What childhood obesity prevention programmes work? A systematic review and meta-analysis. *Obesity Reviews*. 2015;16(7):547-65.
- 44 Waters E, de Silva-Sanigorski A, Burford BJ, Brown T, Campbell KJ, Gao Y, et al. Interventions for preventing obesity in children. *The Cochrane Library*. Dec 2011.
- 45 Williams AJ, Henley WE, Williams CA, Hurst AJ, Logan S, Wyatt KM. Systematic review and meta-analysis of the association between childhood overweight and obesity and primary school diet and physical activity policies. *International Journal of Behavioral Nutrition and Physical activity*. Dec 2013;10(1):101.
- 46 Wolfenden L, Nathan NK, Sutherland R, Yoong SL, Hodder RK, Wyse RJ, et al. Strategies for enhancing the implementation of school-based policies or practices targeting risk factors for chronic disease. *The Cochrane Library*. 2017 Nov.
- 47 MacKinnon DP, Fairchild AJ, Fritz MS. Mediation analysis. *Annual Review of Psychology*. 2007;58:593-614.
- 48 Baranowski T, Cerin E, Baranowski J. Steps in the design, development and formative evaluation of obesity prevention-related behavior change trials. *International Journal of Behavioral Nutrition and Physical Activity*. 2009;6:6.
- 49 Wyse R, Wolfenden L, Bisquera A. Characteristics of the home food environment that mediate immediate and sustained increases in child fruit and vegetable consumption: mediation analysis from the Healthy Habits cluster randomised controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*. 2015;12:118.
- 50 Little MA, Sussman S, Sun P, Rohrbach LA. The Effects of Implementation Fidelity in the Towards No Drug Abuse Dissemination Trial. *Health Education (London)*. 2013;113(4).
- 51 Beenstock J, Sniehotta FF, White M, Bell R, Milne EM, Araujo-Soares V. What helps and hinders midwives in engaging with pregnant women about stopping smoking? A cross-sectional survey of perceived implementation difficulties among midwives in the North East of England. *Implementation Science*. 2012 Dec;7(1):36.
- 52 Lee H, Hall A, Nathan N, Reilly KL, Seward K, Williams CM, et al. Mechanisms of implementing public health interventions: a pooled causal mediation analysis of randomised trials. *Implementation Science*. 2018;13(1):42.

- 53 Clinton-McHarg T, Yoong SL, Tzelepis F, Regan T, Fielding A, Skelton E, Kingsland M, Ooi JY, Wolfenden L. Psychometric properties of implementation measures for public health and community settings and mapping of constructs against the Consolidated Framework for Implementation Research: a systematic review. *Implementation Science*. 2016 Dec;11(1):148
- 54 Eccles M, Grimshaw J, Walker A, Johnston M, Pitts N. Changing the behavior of healthcare professionals: the use of theory in promoting the uptake of research findings. *Journal of clinical epidemiology*. 2005 Feb 1;58(2):107-12.
- 55 Maher D. Reporting guidelines for implementation and operational research. *Public Health Action*. 2016;6(1):1. doi:10.5588/pha.16.0018.
- 56 Grimshaw J, Campbell M, Eccles M, Steen N. Experimental and quasi-experimental designs for evaluating guideline implementation strategies. *Family practice*. 2000 Feb 1;17(suppl_1):S11-6.
- 57 Wolfenden L, Yoong SL, Williams CM, Grimshaw J, Durrheim DN, Gillham K, et al. Embedding researchers in health service organizations improves research translation and health service performance: the Australian Hunter New England Population Health example. *Journal of Clinical Epidemiology*. 2017;85:3-11.
- 58 Sheikh A, Smeeth L, Ashcroft R. Randomised controlled trials in primary care: scope and application. *British Journal of General Practice*. 2002 Sep 1;52(482):746-51.
- 59 Rohrbach LA, Graham JW, Hansen WB. Diffusion of a school-based substance abuse prevention program: predictors of program implementation. *Preventive Medicine*. 1993;22(2):237-60.
- 60 Vale L, Thomas R, MacLennan G, Grimshaw J. Systematic review of economic evaluations and cost analyses of guideline implementation strategies. *The European Journal of Health Economics*. 2007 Jun 1;8(2):111-21.
- 61 Lau R, Stevenson F, Ong BN, Dziedzic K, Treweek S, Eldridge S, Everitt H, Kennedy A, Qureshi N, Rogers A, Peacock R. Achieving change in primary care—causes of the evidence to practice gap: systematic reviews of reviews. *Implementation Science*. 2015 Dec;11(1):40.
- 62 Grimshaw JM, Thomas RE, MacLennan G, et al. Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technology Assessment*. 2004;8:iii–iv, 1–72.
- 63 Van Herck P, De Smedt D, Annemans L, Remmen R, Rosenthal MB, Sermeus W. Systematic review: effects, design choices, and context of pay-for-performance in health care. *BMC Health Services Research*. 2010 Dec;10(1):247.
- 64 Cohen DJ, Reynolds MR. Interpreting the results of cost-effectiveness studies. *Journal of the American College of Cardiology*. 2008 Dec 16;52(25):2119-26.
- 65 Friend S, Flattum CF, Simpson D, Nederhoff DM, Neumark-Sztainer D. The researchers have left the building: what contributes to sustaining school-based interventions following the conclusion of formal research support? *Journal of School Health*. 2014;84(5):326-33.
- 66 Spoth R, Gyll M, Redmond C, Greenberg M, Feinberg M. Six-year sustainability of evidence-based intervention implementation quality by community university partnerships: the PROSPER study. *Am J Community Psychol*. 2011;48:412–25.
- 67 Proctor E, Luke D, Calhoun A, McMillen C, Brownson R, McCrary S, et al. Sustainability of evidence-based healthcare: research agenda, methodological advances, and infrastructure support. *Implementation Science*. 2015;10:88.
- 68 Wiltsey Stirman S, Kimberly J, Cook N, Calloway A, Castro F, Charns M. The sustainability of new programs and innovations: a review of the empirical literature and recommendations for future research. *Implementation Science*. 2012;7:17.
- 69 Keshavarz N, Nutbeam D, Rowling L, Khavarpour F. Schools as social complex adaptive systems: a new way to understand the challenges of introducing the

- health promoting schools concept. *Social Science & Medicine*. 2010 May 1;70(10):1467-74.
- 70 Leadbeater BJ, Gladstone EJ, Sukhawathanakul P. Planning for Sustainability of an Evidence-Based Mental Health Promotion Program in Canadian Elementary Schools. *American Journal of Community Psychology*. 2015;56(1-2):120-33.
- 71 Schell SF, Luke DA, Schooley MW, Elliott MB, Herbers SH, Mueller NB, Bunger AC. Public health program capacity for sustainability: a new framework. *Implementation Science*. 2013 Dec;8(1):15.
- 72 Hills A, Nathan N, Robinson K, Fox D, Wolfenden L. Improvement in primary school adherence to the NSW Healthy School Canteen Strategy in 2007 and 2010. *Health Promot Journal of Australia*. 2015.
- 73 NSW Department of Health (DoH), Department of Education and Training (DET). *Fresh Tastes @ School NSW Healthy School Canteen Strategy: canteen menu planning guide*. 3rd ed. Sydney: NSW Department of Health, NSW Department of Education and Training.; 2012.
- 74 Alvero AM, Bucklin BR, Austin J. An objective review of the effectiveness and essential characteristics of performance feedback in organizational settings (1985-1998). *Journal of Organizational Behavior Management*. 2001 Feb 1;21(1):3-29.
- 75 Tyler TR. Promoting Employee Policy Adherence and Rule following in Work Settings-The Value of Self-Regulatory Approaches. *Brooklyn Law Review*. 2004;70:1287.

Appendix 1.1 Thesis by Publication Information Sheet

Office of Graduate Studies Information Sheet Thesis by Publication



A thesis may be submitted in the form of a series of published papers and the additional rules specific to this style of thesis are presented below. It is important to note that the general rules for a University of Newcastle thesis are also applicable. Please ensure you also refer to [The Rules Governing Research Higher Degrees](#) for the full scope of applicable rules.

Rule 39.1 A thesis by publication will include:

- i. a full explanatory overview that links the separate papers and places them in the context of an established body of knowledge;
- ii. a literature review;
- iii. if detailed data and descriptions of methods are not otherwise given within the separate papers, they must be included in the body of the thesis or as appendices to the thesis;

Rule 39.2 For a thesis by publication:

- i. the separate papers provided under sub-clause 39.1(i) must be published, in press or submitted to scholarly media only, i.e. refereed publications classified by current national standards and refereed conference papers, however at least 50% of these papers must have been published. Papers published up to three years prior to enrolment may be included provided they were published in scholarly media and do not represent more than 50% of the total papers;
- ii. publications submitted by the candidate for another degree may only be referred to in the thesis literature review;
- iii. the number of papers submitted should demonstrate that the body of work meets the requirements of the degree as outlined in the relevant schedule;
- iv. the candidate must be the lead author in at least 50% of the papers written in the time of their formal Research Higher Degree candidature. Any published paper of which the candidate is a joint author may only be included in the thesis provided the work done by the candidate is clearly identified. The candidate must include in the thesis a written statement from each co-author attesting to the candidate's contribution to a joint publication included as part of the thesis. These statements must be endorsed by the Assistant Dean (Research Training).
- v. the Assistant Dean (Research Training) may seek the approval of the Dean of Graduate Studies to include a paper that is outside the scope of these rules.

Appendix 1.1 Thesis by Publication Information Sheet con't

Considerations

- Each discipline area will have different issues to consider in the decision to submit a thesis in the form of a series of published papers.
- It is essential that you discuss your options carefully with your supervisor(s). The thesis by publication must reflect a sustained and cohesive theme, an integrated whole that sits logically in the context of the available literature. Overall the material presented for examination needs to equate to that which would otherwise be presented in the traditional thesis format.
- The review process for some journals is significant resulting in lengthy waiting periods for papers to be accepted and this can delay thesis submission/completion. Time management and selection of journals/publishers is critical. Focusing on publication rather than research may lead to candidates being tempted to publish sections of their work prematurely and missing opportunities to fully capitalize on the significance of the work.
- Consider the thesis from the examiners' view point - if the publications do not have a clear cohesion and the contribution to knowledge is not clearly demonstrated, then the thesis may attract criticism and be rejected by examiners. The content of the thesis remains a matter of professional judgment for the supervisor(s) and candidate.
- Any published paper of which the candidate is a joint author may only be included in the thesis provided the work done by the candidate is clearly identified. The candidate must include in the thesis a written statement from each co-author attesting to the candidate's contribution to a joint publication included as part of the thesis. The statement/s need to be signed by the Faculty Assistant Dean (Research Training). A sample statement is provided below.
- We strongly advise that you arrange for the signatures from co-authors to be collected as soon as the paper is prepared or submitted for publication rather than trying to collect them at the time of thesis submission.
- There is no minimum or maximum requirement on the number of papers. Of equal, or perhaps more importance than quantity, is the quality of the journals. Please refer to your school or faculty for more specific guidance on the number and length of papers that would normally be expected in your discipline.

Alternative option

As discussed above, you need to consider if your publications will form a sufficient body of cohesive work to meet the requirements of thesis by publication. You may like to consider the other option of including publications within a standard thesis format, either in the body or as an appendix as supported in the rule below.

Rule 38.5. A thesis may:

- i. Include publications arising as a consequence of the research undertaken for a thesis. When the candidate includes a co-authored published paper or co-authored scholarly work, or a substantive component of a co-authored published paper or co-authored scholarly work in the body of the thesis, the candidate must include in the thesis a written statement attesting to their contribution to the joint publication. This statement must be signed by the supervisor. A statement is not required when publications are included as an appendix to the thesis.

Appendix 2.1 Ethics Variation Approval



20 May 2013

Dr L Wolfenden
Director
Population Health
Wallsend Campus

Dear Dr Wolfenden

Re: HNE Kids Healthy Eating and Physical Activity Program (06/07/26/4.04)

Thank you for submitting a request for an amendment to the above project. This amendment was reviewed by the Hunter New England Human Research Ethics Committee. This Human Research Ethics Committee is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research (2007)* (National Statement) and the *CPMP/ICH Note for Guidance on Good Clinical Practice*. Further, this Committee has been accredited by the NSW Department of Health as a lead HREC under the model for single ethical and scientific review.

I am pleased to advise that the Hunter New England Human Research Ethics Committee has granted ethical approval for the following amendment requests:

- o To provide some schools and childcare services with intensive support as previously described;
- o To provide some schools and childcare services with less intensive support

For the protocol: HNE Kids Healthy Eating and Physical Activity Program

Approval has been granted for this study to take place at the following site:

- **Hunter New England Local Health District**

Approval from the Hunter New England Human Research Ethics Committee for the above protocol is given for a maximum of **5** years from the date of the approval letter of your initial application after which a renewal application will be required if the protocol has not been completed. The above protocol is approved until **November 2016**.

The *National Statement on Ethical Conduct in Human Research (2007)* which the Committee is obliged to adhere to, include the requirement that the committee monitors the research protocols it has approved. In order for the Committee to fulfil this function, it requires:

Hunter New England Human Research Ethics Committee
(Locked Bag No 1)
(New Lambton NSW 2305)
Telephone (02) 49214 950 Facsimile (02) 49214 818
Email: hnehrec@hnehealth.nsw.gov.au
http://www.hnehealth.nsw.gov.au/research_ethics_and_governance_unit

Appendix 2.1 Ethics Variation Approval con't

- A report of the progress of the above protocol to be submitted at 12 monthly intervals. Your review date is **November 2013**. A proforma for the annual report will be sent two weeks prior to the due date.
- A final report must be submitted at the completion of the above protocol, that is, after data analysis has been completed and a final report compiled. A proforma for the final report will be sent two weeks prior to the due date.
- All variations or amendments to this protocol, including amendments to the Information Sheet and Consent Form, must be forwarded to and approved by the Hunter New England Human Research Ethics Committee prior to their implementation.
- The Principal Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including:
 - any serious or unexpected adverse events
 - Adverse events, however minor, must be recorded as observed by the Investigator or as volunteered by a participant in this protocol. Full details will be documented, whether or not the Investigator or his deputies considers the event to be related to the trial substance or procedure.
 - Serious adverse events that occur during the study or within six months of completion of the trial at your site should be reported to the Professional Officer of the Hunter New England Human Research Ethics Committee as soon as possible and at the latest within 72 hours.
 - Copies of serious adverse event reports from other sites should be sent to the Hunter New England Human Research Ethics Committee for review as soon as possible after being received.
 - Serious adverse events are defined as:
 - Causing death, life threatening or serious disability.
 - Cause or prolong hospitalisation.
 - Overdoses, cancers, congenital abnormalities whether judged to be caused by the investigational agent or new procedure or not.
 - Unforeseen events that might affect continued ethical acceptability of the project.
- If for some reason the above protocol does not commence (for example it does not receive funding); is suspended or discontinued, please inform Dr Nicole Gerrand, the Manager, Research Ethics and Governance Unit as soon as possible.

The Hunter New England Human Research Ethics Committee also has delegated authority to approve the commencement of this research on behalf of the Hunter New England Local Health District. This research may therefore commence.

Should you have any queries about your project please contact Dr Nicole Gerrand as per the contact details at the bottom of the page. The Hunter New England Human Research Ethics Committee Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the Hunter New England Local Health District website:

Internet address: http://www.hnehealth.nsw.gov.au/research_ethics_and_governance_unit

Please quote **06/07/26/4.04** in all correspondence.


Hunter New England Human Research Ethics Committee
(Locked Bag No 1)
(New Lambton NSW 2305)
Telephone (02) 49214 950 Facsimile (02) 49214 818
Email hnehrec@hnehealth.nsw.gov.au
http://www.hnehealth.nsw.gov.au/research_ethics_and_governance_unit

The Hunter New England Human Research Ethics Committee wishes you every success in your research.

Yours faithfully

For: Professor M Parsons
Chair
Hunter New England Human Research Ethics Committee

Appendix 2.2 Trial Registration



ANZCTR
Australian New Zealand Clinical Trials Registry

Questions in **bold text** are mandatory. (*)

Request Number:	
Current Page:	Review

Trial from ANZCTR

Trial ID	ACTRN12614001148662
Trial Status:	Registered
Date Submitted:	9/10/2014
Date Registered:	30/10/2014
	Retrospectively registered

Page 1

Public title	The effect of multi-component school-based nutrition and canteen intervention on implementation of a government healthy canteen policy in primary schools
Study title in 'Participant- Intervention- Comparator- Outcome (PICO)' format	Are primary schools that receive a multi-component intervention of school-based nutrition and canteen support more likely than primary schools that receive usual support to implement a canteen menu consistent with a government healthy canteen policy?
Secondary ID [1]	Nil
UTN	
Trial acronym	SNACS

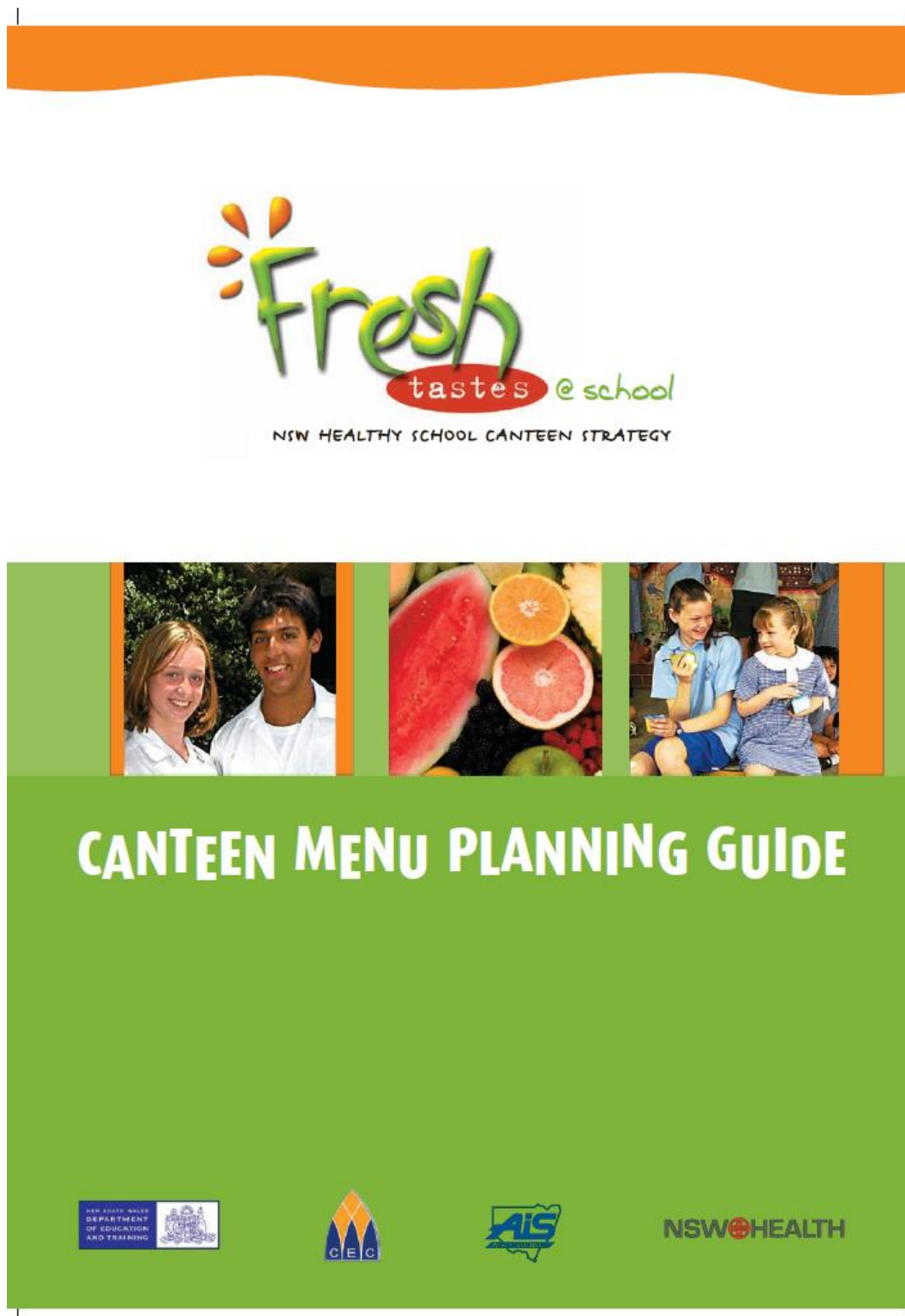
Page 2

Health condition(s) or problem(s) studied:	
Obesity Prevention	
Condition category:	Condition code:
Public Health	Health promotion/education
Diet and Nutrition	Obesity

Page 3

Descriptions of intervention(s) / exposure	<p>The intervention will include the following evidence based components over a 9-month period (three school terms):</p> <ol style="list-style-type: none"> 1. Executive support- The Principal will be encouraged to communicate their support for the healthy canteen intervention to Canteen Managers and P&C group by encouraging their participation in a professional development workshop and consent to receiving ongoing support. 2. Consensus processes-Consensus processes with the Canteen Manager and canteen staff will be conducted to reach agreement regarding the implementation of the healthy canteen strategy. Support staff will assist Canteen Managers to develop a local Canteen Action Plan (CAP) to co-ordinate implementation tasks. 3. Staff training – A one day (5 hour) training workshop will be provided to Canteen Managers and parent representatives will provide education and skill development in nutrition, canteen stock and financial management, pricing and promotion, and change management. Training will combine didactic and interactive components including opportunities for self-assessment, role play and facilitator provided feedback. The training will be facilitated by Dietitians experienced in delivering this training to canteen managers. 4. Tools and resources - Printed instructional materials, sample policies/menus, planning templates, pricing guides, product lists of policy compliant menu items, supplier contacts and menu assessment feedback will be provided to all school Canteen Managers. Such resources will be sourced from the Department of Education and Communities, Nutrition Australia, and the Healthy Kids Association. 5. On-going support- Following training, canteen managers will receive two support contacts per school term (via email, telephone, text message or in person) for 9 months to continue to help them with assessing and categorising menu item and pricing and promotion strategies. These contacts will also be used to encourage canteen managers to review progress, discuss deficits identified from self-monitoring, and facilitate problem solving to policy implementation. 6. Recognition- Schools assessed during intervention period as compliant with the canteen policy will be sent a congratulatory letter and telephoned from the Project Co-ordinator. Menu compliant schools will also be promoted to other intervention schools using marketing strategies (see below). 7. Performance monitoring and feedback- two menu reviews will be used to compile written feedback report to the Canteen Manager, P&C and School Principal. The reports will include graphs comparing progress
---	---

Appendix 2.3 FT@S Canteen Menu Planning Guide



Appendix 2.4 Theoretical Domains and Constructs

Theoretical domains and Constructs	Term 3 Weeks 7-10 2014	School holidays	Term 4 Weeks 1-3	Term 4 Weeks 4-6	Term 4 Weeks 7-11	School Holidays	Term 1 2015 Weeks 1-5	Term 1 Weeks 6-11	Term 2 2014
- Social Influences	Planning	Letter to Principal Letter to BAC							
- Knowledge - Beliefs about capabilities - Motivation and goals - Skills - Memory, attention and decision making processes - Behavioral regulation			Recruitment and registrations for workshops VC training session 1 held	Face to Face workshops are held	VC training session 2 held				
- Environmental context and resources - Feedback	Menu feedback reports are generated	Workshop resource/ VC resources are developed and assembled Menu feedback reports are generated Equipment incentives are purchased	Workshop resources/ VC resources are developed and assembled Menu feedback reports are generated Equipment incentives are purchased				Promotion posters are sent to schools Menu report sent to the School Principal and congratulations newsletter snippet		
- Environmental context and resources – Conflict – competing demands, conflicting roles - Feedback - Negotiation - Behavioural regulation – - Goal/target setting - Feedback - Barriers and facilitators			VC training held	Workshops are held	VC training held Phone call to all schools 2 weeks after workshop to offer support and confirm preferred mode of contact	Targeted text message regarding menu development and request to receive new menu	Tailored support continues for all schools through preferred mode of contact Promotion posters are disseminated Offer of a face to face visit if a new CM or if schools requires additional support	Tailored support continues	Post copy of their compliant winter menu Continue to provide tailored support to school with action plan and menu development

Appendix 2.4 Theoretical Domains and Constructs con't

<ul style="list-style-type: none"> - Motivation and goals - Skills - Memory, attention and decision making processes - Behavioural regulation 			VC training session 1 held						
<ul style="list-style-type: none"> - Environmental context and resources - Feedback 	Menu feedback reports are generated	Workshop resources/ VC resources are developed and assembled Menu feedback reports are generated Equipment incentives are purchased	Workshop resources/ VC resources are developed and assembled Menu feedback reports are generated Equipment incentives are purchased				Promotion posters are sent to schools Menu report sent to the School Principal and congratulatory newsletter snippet		
<ul style="list-style-type: none"> - Environmental context and resources = Conflict = competing demands, conflicting roles - Feedback - Negotiation - Behavioural regulation = - Goal/target setting - Feedback - Barriers and facilitators 			VC training held	Workshops are held	VC training held Phone call to all schools 2 weeks after workshop to offer support and confirm preference of mode of contact	Targeted text message regarding menu development and request to receive new menu	Tailored support continues for all schools through preferred mode of contact Promotion posters are disseminated Offer of a face-to-face visit if a new CMI or if schools requires additional support	Tailored support continues	Post copy of their compliant winter menu (continue to provide tailored support to school with action plan and menu development)

Appendix 2.5 Sample Canteen Manager Training – Registration Flyer

Good for Kids good for life

CANTEEN MANAGER TRAINING

Good For Kids are inviting canteen managers, volunteers and P&C representatives to attend a one day canteen manager training workshop in Term 4. This workshop will provide free canteen resources including some new equipment for your canteen, opportunities for networking and professional development covering the following areas:

- The Fresh Tastes @ School strategy
- Recipes and ideas for healthy menu items
- How to make a healthy profit in the canteen
- Marketing and Promotion
- Recruiting volunteers

Workshops will be held in one of the following locations from **10am-2pm**.

WHERE	WHEN	VENUE
Wallsend	Monday 27th October	Wallsend Health Campus
Tamworth	Monday 27th October	Tamworth Population Health
Wallsend	Wednesday 29th October	Wallsend Health Campus
Inverell	Wednesday 29th October	Inverell District Hospital
Taree	Monday 3rd November	Club Taree

To register, please complete the attached registration form and fax to 4924 6490 or email Katie.Robertson@hnehealth.nsw.gov.au



Health
Hunter New England
Local Health District

PHONE 1300 657 197

Appendix 2.6 Sample Canteen manager Training – Registration Letter

Hunter New England Local Health District
Hunter New England Population Health
Direct Contact Details
Phone: (02) 4924 6381 Fax: (02) 4924 6490
Email: lisa.janssen@hnehealth.nsw.gov.au



23 October 2014

Dear _____,

Thank you for registering for the Canteen Manager Training on **Monday 27 October at Wallsend.**

VENUE LOCATION

The training will take place in the Elsie Grahame Building, Wallsend Health Campus, Longworth Avenue, [Wallsend](#).

PARKING

Car parking on the streets around Wallsend Health Campus is limited however free parking is available in the Nash Street Car Park (Please refer to Car Park 4 on the attached campus map).

ON THE DAY

The workshop will commence at 10.00am and finish by 2.00pm. The registration desk will be open from 9.30am. Morning Tea and Lunch will be provided. Please find attached an Agenda for the workshop.

WHAT DO YOU NEED TO BRING

You will need to bring along the following:

- A copy of your current menu (as this will be used in one of the activities)
- Recipes and ideas you would like to share with other canteen managers

If you have any questions, please don't hesitate to contact myself or your School Project Officer.

Yours sincerely

Good ~~For~~ Kids Team

Hunter New England Local Health District
ABN [63 598 010 203](#)

Hunter New England Population Health
Locked Bag 10
[Wallsend, NSW 2287](#)
Phone (02) 4924 6477, Fax (02) 4924 6490
Email HNELHD-PHEnquiries@hnehealth.nsw.gov.au
www.hnehealth.nsw.gov.au/hnep

Appendix 2.7 Canteen Manager Training Agenda



CANTEEN MANAGER TRAINING

- AGENDA -


The Registration Desk will be open from 9.30am (Morning Tea provided).

10.00 am	Welcome
10.05 am	Fresh Tastes @ School
11.15 am	Implementing Fresh Tastes in your Canteen
11.35 am	Making a Healthy Profit (Part 1)
12.00 noon	LUNCH
12.45 pm	Making a Healthy Profit (Part 2)
1.05 pm	Volunteers – Recruiting and Retaining
1.20 pm	Where to from here – Action Planning
1.35pm	Evaluation / Gifts
2.00 pm	Close

Good for kids
good for life




Appendix 2.8 Sample Canteen Manager Training Presentation

 **Health**
Hunter New England
Local Health District

CANTEEN MANAGER TRAINING


Presented by Tessa Delaney, Kathryn Reilly & Lisa Janssen
School Project Officers
Healthy Children's Initiative Schools Team



Acknowledgement of Country


"I would like to acknowledge the traditional owners of the land we are meeting on today and pay my respects to Elders past and present."


2




Welcome

- Housekeeping
- Introduction
- Overview of day
- Evaluation



 **Health**
Hunter New England
Local Health District



 **Health**
Hunter New England
Local Health District

FRESH TASTES @ SCHOOL

(NSW HEALTHY SCHOOL
CANTEEN STRATEGY)

 **Fresh**
tastes @ school
NEW HEALTHY SCHOOL CANTEEN STRATEGY



Overview

- Background
- Fresh Tastes @ School
- What are **GREEN**, **AMBER** and **RED** foods.
- Activities:
 - Best Sellers
 - Label reading

 **Health**
Hunter New England
Local Health District

5

What do we know about our Students? SPANS 2010


22.8% of NSW students 5-16 years were overweight or obese


Obese children have a 25% - 50% chance of going on to be obese adults

>80% Year K, 2, 4, 6 students consuming recommended amount of fruit per day

Between 6% - 18% of students drink one or more cups of soft drink per day

50% K & Yr 2
70% of Yr 4 & Yr 6
NOT consuming the recommended serves of vegetables per day



 **Health**
Hunter New England
Local Health District

Source: SPANS 2010

Appendix 2.9 Sample Canteen Manager Training Evaluation Form

Location:	Date:
Canteen Manager Training	
- Evaluation Form -	

1. Overall, was attending today's workshop beneficial to you?

☐ YES

☐ NO

COMMENTS: _____

2. Was the date and time of the workshop suitable?

☐ YES

☐ NO

COMMENTS: _____

3. Was the catering and venue appropriate?

☐ YES

☐ NO

COMMENTS: _____

4. Was the videoconferencing appropriate?

☐ YES

☐ NO

☐ Not Applicable

COMMENTS: _____

5. For each of the following sessions, answer the following questions:

Fresh Tastes @ School

a. How useful was the session?

☐ Very Useful

☐ Somewhat useful

☐ Not at all useful

b. Was the presentation clear and easy to understand? ☐ YES ☐ NO

c. COMMENTS: _____

Good for kids
good for life



Appendix 2.10 Action Plan Template

Good for kids
good for life

PHONE 1300 657 197

----- PUBLIC SCHOOL

CANTEEN MANAGER TRAINING - WHERE TO FROM HERE....

Goal/Action	Steps to take	Timeframe

Health
Hunter New England
Local Health District

Appendix 2.11 Canteen Manager Training Resource List

USB Contents

Folder 1 – Canteen Resource Kit

- All fact sheets and recipes from Canteen Resource Kit

Folder 2 – Fresh Tastes @ School

- Fresh Tastes @ School Presentation (PDF)
- Fresh Tastes @ School Canteen Menu Planning Guide
- Fresh Tastes Tool Kit – Developing a Healthy School Canteen

Folder 3 – Menu Planning

- **TEMPLATE:** Portrait Menu with Pricing Column (WORD TEMPLATE)
- **TEMPLATE:** Landscape Menu with Pricing Column (WORD TEMPLATE)

Folder 4 – Financial Management

- Making a Healthy Profit Presentation (PDF)
- **TEMPLATE:** Mark-Up Table (EXCEL DOC)
- **SAMPLE:** Mark-Up Table (PDF)
- **TEMPLATE:** Work Procedure Card (PUBLISHER DOC)
- **TEMPLATE:** Wastage Sheet (EXCEL DOC)
- **SAMPLE:** Wastage Sheet (PDF)
- **TEMPLATE:** Stock Ordering Form (EXCEL DOC)
- **SAMPLE:** Stock Ordering Form (PDF)
- **TEMPLATE:** Stocktake Record (EXCEL DOC)
- **SAMPLE:** Stocktake Record (PDF)

Folder 5 – Recipe Card Templates

- Recipe Card Template – Green Hot Foods
- Recipe Card Template – Green Snack Foods and Drinks
- Recipe Card Template – Amber Hot Foods
- Recipe Card Template – Amber Snack Foods and Drinks

Appendix 2.12 Sample Canteen Menu

SAMPLE CANTEEN MENU		2014
MENU ITEMS	GREEN	AMBER
	BEST CHOICE	SELECT CAREFULLY
SANDWICHES, WRAPS AND ROLLS * For rolls and wraps, add \$0.20 * For LF cheese, add \$0.40 * For pineapple, add \$0.50	LF Cheese \$1.30 LF Cheese & Tomato \$1.60 Egg \$1.50 Egg & Lettuce \$1.70 Chicken or Tuna \$1.80 Salad \$1.90 LF Cheese, Ham & Tom \$2.20 Ham & Salad \$2.70 Chicken or Tuna & Salad \$2.90	Vegemite \$1.10 Jam \$1.20 Honey \$1.20 Ham \$1.50 Ham & LF Cheese \$2.10
	SALAD BOXES Salad Box \$3.00 * Add LF cheese \$0.40 * Add egg \$0.70 * Add ham, chicken, tuna \$1.00	
	HOT FOOD Corn on the Cob \$0.80 CM Garlic Bread \$0.40 CM Pizza \$2.30 <i>Hawaiian, Chicken & Cheese</i> Toasted Sandwiches <i>See sandwich options above. Please specify "toasted" on order.</i>	Lasagne \$3.00 LF Pie \$2.50 LF Sausage Roll \$1.50 <i>½ Sausage Roll available for 80c</i> Chicken Breast Nugget(3) \$1.30 Hot Chicken & Salad Roll \$3.20 <i>Three nuggets on a roll with salad</i>
	SNACKS Fruit \$0.80 <i>Apple, Banana, Orange, Grapes</i> Crackers & LF Cheese \$0.60 CM Popcorn \$0.30 LF Flavoured Yoghurt \$1.10 <i>Strawberry, Fruit Salad</i> CM Pikelets (2) with Jam \$0.50	Potato Chips \$1.20 <i>Honey Soy, Sea Salt</i> Finger Bun \$1.30 LF Choc Chip Muffin \$1.40
	DRINKS Water \$1.00 LF Plain Milk \$1.00 LF Flavoured Milk \$1.20 <i>Chocolate, Strawberry</i> 99% Fruit Juice (200 mL) \$1.50 <i>Apple, Orange, Apple & Blackcurrant</i>	
	FROZEN TREATS CM Milky Bites \$0.30 <i>Chocolate, Strawberry</i> Frozen Fruit Pieces (3) \$0.20 <i>Seasonal – Select at canteen</i> Quelch Fruit Sticks \$0.50 <i>Apple, Blackcurrant, Tropical, Orange, Mango</i>	Paddle Pop \$1.30 <i>Chocolate, Banana</i> Frozen Yoghurt \$1.80 <i>Strawberry</i> LF Vanilla Cups \$1.20 Icy Pole \$1.10 <i>Lemonade</i>
	Add some notes about your canteen here (eg. Days of operation, when orders are due etc).	
	LF = Low Fat CM = Canteen Made	

Good for kids
good for life



Appendix 2.13 Sample Canteen Recipe Card



HAWAIIAN PIZZA

GREEN HOT FOODS

SUMMARY

Number of Serves	12
Total Cost of Ingredients	\$ 17.25
Cost per Serve	\$ 1.45
Retail price per Serve	\$ 2.30
Source of recipe	Good for Kids Team
Last reviewed	April 2014



INGREDIENTS

	QTY	COST
Tortilla Wraps	6	\$ 1.80
Tomato Paste	4 tbsp	\$ 0.20
Ham, chopped	500g	\$ 7.00
Pineapple pieces, canned, drained	800g	\$ 3.15
Reduced Fat Cheese, shredded or grated	500g	\$ 5.10

METHOD

1. Preheat oven to 200°C.
2. Spread tomato paste on wraps.
3. Spread ham and pineapple evenly over wraps.
4. Sprinkle over cheese.
5. Bake in oven for 8-10 minutes or until base is crispy and cheese has melted.

NUTRITION (PER 100 GRAMS)

Energy (kJ) 609 Saturated Fat (g) 3.0 Sodium (mg) 555

NOTES

- One serve equals ½ a wrap.
- Pizzas can also be cooked in a pie oven with an increased cooking time.

Good for kids
good for life



Appendix 2.14 SMS Text Communication Support Schedule

SNACS targeted/tailored communication schedule term 1, 2015

The following targeted/tailored communication schedule has been developed as part of the SNACS protocol as a standardised approach to ongoing support following attendance at Canteen Manager training. The proposed schedule aims to improve self-efficacy and increase program reach, acceptability and results using Smartphone technology (SMS/MMS) to engage Canteen Managers.

Time	Targeted/Tailored	Purpose	Sample Content	TOF Link/Barrier											
School holidays (19-23 Jan)	Tailored	Reminder to submit T1 menu	"Hi [CM Name], this is a reminder to send in a copy of your Term 1 canteen menu to Good for Kids for review. Please get in touch if you would like any assistance planning your school's summer menu. [PO's name] Good for Kids [PO's ph & email]"	Prompt, triggers, cues shown to enhance memory, attention, decision processes and action planning											
<div>Reply RECEIVED</div> <div>No REPLY RECEIVED</div> <div>COMPLIANT MENU RECEIVED</div>															
Check preferred communication method with CM															
Time	Targeted/Tailored	Purpose	Sample Content	TOF Link/Barrier	Time	Targeted/Tailored	Purpose	Sample Content	TOF Link/Barrier	Time	Targeted/Tailored	Purpose	Sample Content	TOF Link/Barrier	
Y1 Wk1-4	Tailored	Ongoing tailored communication with CMs regarding self-monitoring, action plan goals, and providing product	N/A	Will vary based on tailored messaging Knowledge of FTOSS Policy, Food classification skills, accessing suitable products		T1 Wk 3 (9-13 Feb)	Tailored	Prompt to review canteen action plan	"Hi [CM Name], how is your term 1 menu going? Please send in a copy of your canteen menu to Good for Kids for an updated menu report. [PO's name] Ph: 0437 305 075 [PO's email]"	Prompt, triggers, cues shown to enhance action planning behaviours	Y1	Tailored	Recognition of compliance	"Hi [CM Name], I have assessed your menu & it is Fresh Tastes compliant, well done! Will email through School Executive Support - letter sent to Principal	

Date Saved: 22 March 2018

K:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\4_RCT in Schools\5_Canteens SNACS\Planning\Text Communication Schedule_V3.docx

		information as required.		(Supplier info)											your menu report. Congratulations from Good for Kids [PO's name]"	
--	--	--------------------------	--	-----------------	--	--	--	--	--	--	--	--	--	--	---	--

Reply RECEIVED / No REPLY RECEIVED					NEW COMPLIANT MENU RECEIVED				
Time	Targeted/Tailored	Purpose	Sample Content	TOF Link/Barrier	Time	Targeted/Tailored	Purpose	Sample Content	TOF Link/Barrier
Y1 Wk 5 (23-27 Feb)	Targeted	Demonstration of FTS compliance by others - aim to highlight uptake, acceptability and enhance pressure to become reach FTS status Encourages self-monitoring	"Congratulations to schools now meeting Fresh Tastes & who have received recognition letters. Need help with the profitability of your canteen? Visit goodforkids.nsw.gov.au [PO's name] Good for Kids"	Modelling behaviour by others enhances social pressure to meet guidelines Canteen profitability	Y1	Tailored	Recognition of compliance	"Hi [CM Name], I have assessed your menu & it is Fresh Tastes compliant, well done! Will email through your menu report. Congratulations from Good for Kids [PO's name]"	School Executive Support - letter sent to Principal

Appendix 2.15 Menu Feedback Template



ID: <Insert ID Number>

<Insert school name>

Term <Insert Term Number>, <Insert Year>

Canteen Menu Feedback

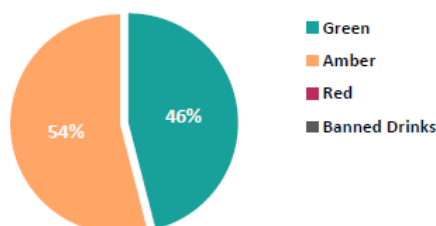
Dear <Insert Canteen Manager Name>,

Good for Kids is available to support your school in working towards a Fresh Tastes @ School Canteen. We have reviewed your school canteen menu and the results are summarised below.

Goals of 'Fresh Tastes @ School'

School canteen menus should aim to have >50% GREEN, <50% AMBER, 0% RED and 0% BANNED items. Further information regarding 'Fresh Tastes @ School' can be found at the back of this report.

How GREEN is Your School Menu? <Populate from the menu analysis data>



	Number of Menu Items	Percentage of Menu
GREEN Items		%
AMBER Items		%
RED Items		%
BANNED Items		%

Appendix 2.16 Sample Recognition Letter

Hunter New England Local Health District
Hunter New England Population Health
Direct Contact Details
Phone: (02) **PO Phone** Fax: (02) 49246209
Email: **PO email**



Health
Hunter New England
Local Health District
Good for Kids
good for life

Date

Principal name
Principal
School name
Address
Suburb NSW **Postcode**

Dear **Principal name**,

I am writing to congratulate your school on the great efforts it has made in moving towards a healthy canteen menu consistent with the Fresh Tastes @ School NSW Healthy School Canteen Strategy. I have been working with your school over recent months and am thrilled to report that based on the current menu for **Term and Year** your school canteen has not only removed all RED items but has produced a menu which is predominantly GREEN.

I understand the difficulties schools face when trying to make any change to their menu so please pass my thanks onto your canteen manager, **Canteen manager name** and the other canteen volunteers and parents who have helped make this happen, it is a great achievement. We are looking forward to continuing to work with your school this year.

Yours sincerely

PO Name
Project Officer
Good for Kids. Good for Life.

Hunter New England Local Health District
ABN **63** 598 010 203

Hunter New England Population Health
Locked Bag 10
Wallsend, NSW 2287
Phone (02) 4924 6477 Fax (02) 4924 6490
Email **HNELHD-PH**Enquiries@hnehealth.nsw.gov.au
0233333333 www.hnehealth.nsw.gov.au/hneph

Appendix 2.17 Sample Menu Assessment Tool



1.1 MENU ASSESSMENT PROCEDURE

1. Receive menu either from project officer (PO), Evaluation Manager or from direct contact with the school.
2. Make a second copy of the menu and ensure a blank copy is saved in the school's folder
3. Conduct an initial menu assessment:

Colour code as many items as possible. Follow the [1.2 GFK Menu analysis flow chart](#) and refer to:

- a) [Fresh Tastes @ Canteen Menu Planning Guide \(Occasional food criteria table p13, Ready Reckoner p19-24\)](#)
- b) [1.3 Good for Kids menu analysis assumptions](#)
- c) [1.4 Counting Rules](#)

4. Is additional information required to complete assessment?

Yes - Determine what additional information is required to accurately assess menu by prefilling the additional information template (Appendix 2).

No - If all information available – go to step 6

5. A blinded dietitian is to collect additional information from canteen manager (see appendix 1 –[ISBAR](#)) using additional information template which is to be emailed to school OR emailed and then collected by phone call

6. Determine total number of items and the number and % of GREEN, AMBER, [RED](#) & BANNED products. See colour coding flow chart.

7. Assessment to be provided to a second dietitian for verification. Is there difference in opinion?

Yes – go to step 8

No – go to step 9

8. A third dietitian to be provided assessment. Dietitians to reach consensus on menu assessment.

9. Populate the 2015 menu analysis cover sheet (N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\HCL Canteen Menu Review\2015 Canteen Menu assessment tools), colour code and include tally count on the spare blank menu printed in step 2. Scan both documents and save to the school's file.

12. Complete canteen menu feedback report

Appendix 2.17 Sample Menu Assessment Tool con't

When a menu has an item where the product is unknown and we were not able to accurately determine food category or make an assumption then a list of 'unknown items' was created to record the item, how it was classified and the decision making process for classification. The file is located at N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\HCI Canteen Menu Review\2015 Canteen Menu assessment tools\Consensus - ambiguous items.xlsx or

N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\4_RCT in Schools\menu_status_all schools23_6_14.

If a menu item has a RED item in it – it automatically becomes RED (except for some items containing confectionary)

Examples:

1. A salad wrap that contains a chicken tenderloin that is over the 'Occasional' Food Criteria Limits (i.e. >1000kJ energy, >5g saturated fat or >700mg of sodium) would be classified as RED.
2. A choc chip muffin that is under the 'Occasional' Food Criteria Limits for muffins is AMBER (even though choc chips by themselves are RED)

Definitions and abbreviations:

Significant AMBER filling - fillings that can potentially be RED and need to be assessed against the 'Occasional' Food Criteria Table e.g. crumbed chicken. If a sandwich, burger or wrap contains a significant amber filling then this product will remain amber regardless of other fillings e.g. salad

Table 1. Menu Analysis Assumptions for participating schools

Note: You should be able to collect all additional product information from 'participating schools'

Item	Assumed Colour	Reasoning
Drinks		
Milk	GREEN	All Reduced fat varieties- All sizes of low fat milk are GREEN according to ETQS
	AMBER	All Full fat varieties - All sizes
Milo, hot choc etc.	GREEN	If made with reduced fat milk or predominately on water.
	AMBER	If made with full fat milk
All 99% fruit juice including, poppers, pop tops and frozen tubes	GREEN	If 99% fruit and serve size is less than or equal to 200ml. Frozen juice tubes are approximately 70 ml, therefore if 99% fruit juice they are classified as GREEN.
	AMBER	If 99% fruit and serve size > 200ml item.
Fruit juices less than 99% fruit	Verify brand and serve size. Compare against the SSDB . Item is BANNED if it has more than 300kJ and/or 100mg sodium per serve.	
Slushies	GREEN	If based on 99% fruit juice and serve size is less than or equal to 200ml
	AMBER	If 99% fruit and serve size > 200ml item.
	Assess against SSDB	If <99% fruit juice compare against the SSDB . Item is BANNED if it has more than 300kJ and/or 100mg sodium per serve.
Spring or unflavoured mineral water	GREEN	All plain water is GREEN.
Diet soft drinks	AMBER	As per ETQS Ready Reckoner

Appendix 2.18 Sample Canteen Observational Tool

Table 1: Menu and food information – do not fill shaded columns

Menu/food item description (brand)	Number of Ingredients	Energy (kj) *	Saturated fat (g) *	Sodium (mg) *	Sugar (g) *	Item promoted** Record all relevant codes	Menu item tagged	Prominent display Y/N (at counter, canteen entrance or eye level of children)	Food category Red Amber Green

* Total nutrient content per serve provided

Table 1: Menu information - do not fill shaded columns

Menu item	Number of Ingredients	Energy (kj) *	Saturated fat (g) *	Sodium (mg) *	Sugar (g) *	Menu item promoted** Circle at least one for each menu item:	Menu item tagged 1 = yes (traffic light) 2 = energy labelling 3 = symbols (e.g. Smiley face) 4 = Other (specify)	Food category ^a Red Amber Green
						0 1 2 3 4 5 6 7 8		
						0 1 2 3 4 5 6 7 8		
						0 1 2 3 4 5 6 7 8		
						0 1 2 3 4 5 6 7 8		

Appendix 2.19 Example of Intervention Project Records

School	Canteen Manager training (date)	Training delivery method (W- workshop, visit, TC- telecon)	Person who received training (CM- canteen manager, P&C)	Canteen resource kit delivered (date)	Canteen Action Plan follow up (date)	Formal menu feedback (date)	Targetted message 1 - sent (date)	Reply received (date)	Mode of Reply (Txt - message, E- mail, Ph - phone call)	Tailored message 2 - sent to non responders (date)	Reply received (date)	Mode of Reply (Txt - message, E- mail, Ph - phone)	Targetted message 2 - sent (date)	Reply received (date)	Mode of Reply (Txt - message, E- mail, Ph - phone)	Targetted message 3 - sent (date)
St Colu	29/10/2014 W		CM	29/10/2014	10/11/2014	10/11/2014	23/01/2015	28/01/2015	Ph	NA			3/03/2015			11/03/2015
St Jose	2/12/2014 SV		PR, P&C	2/12/2014		2/12/2014	10/02/2015									
St Jose				10/02/2015						9/03/2015						
St Kevi	29/10/2014 W		CM	29/10/2014	10/11/2014	10/11/2014	23/01/2015	3/02/2015	Ph	NA			3/03/2015			11/03/2015
Hillsbo	29/10/2014 W		P&C	29/10/2014	11/11/2014	11/11/2014	23/01/2015	23/01/2015	Txt	NA			3/03/2015			11/03/2015
Inverel	3/12/2014 SV		CM	3/12/2014	18/11/2014	18/11/2014	23/01/2015			11/02/2015	11/02/2015	Txt, Fax	3/03/2015			11/03/2015
Mannir	3/11/2014 W		CM	3/11/2014	18/11/2014	18/11/2014	23/01/2015			11/02/2015			3/03/2015			11/03/2015
Oxley I	3/11/2014 W		CMPC	3/11/2014	18/11/2014	18/11/2014	23/01/2015			11/02/2015	12/02/2015	email	3/03/2015			11/03/2015
Tingha	2/12/2014 SV		ADMIN	2/12/2014		2/12/2014	10/02/2015									
St Jose	3/11/2014 W		CM	3/11/2014	18/11/2014	18/11/2014							3/03/2015			11/03/2015
St Jose	26/11/2014 SV		CMPC	26/11/2014			23/01/2015			11/02/2015	11/02/2015	Ineligible due to no regular canteen menu				
St Nich	8/12/2014 SV		CM	8/12/2014		11/12/2014	23/01/2015			11/02/2015			4/03/2015			13/03/2015
Rosary	4/12/2014 SV		CM	4/12/2014	5/12/2014	5/12/2014	23/01/2015			11/02/2015			4/03/2015			13/03/2015
Barring	2/12/2014 SV		P&C	2/12/2014	5/12/2014	5/12/2014	23/01/2015	3/02/2015	E	NA			4/03/2015	6/03/2015	E	13/03/2015
Bobin Declined Intv																
Nundie	15/12/2014 SV		CM	15/12/2014	17/12/2014	17/12/2014	23/01/2015	2/02/2015	Ph	NA			4/03/2015			13/03/2015
Sandy f No canteen																
Stanfor	9/12/2014 SV		CMPC	9/12/2014	12/12/2014	12/12/2014	23/01/2015	27/01/2015	Ph	NA			4/03/2015			13/03/2015
Stroud	1/12/2014 SV		CM	1/12/2014	5/12/2014	5/12/2014	23/01/2015			11/02/2015	11/02/2015	Txt, Fax	4/03/2015			13/03/2015
Werris	8/12/2014 SV		CMPC	8/12/2014	11/12/2014	11/12/2014	23/01/2015	29/01/2015	Ph	NA			4/03/2015			13/03/2015
Wirrea	18/11/2014 SV		CM	18/11/2014	5/12/2014	18/11/2014										
Our Lax	19/11/2014 SV		CM	19/11/2014	20/11/2014	19/11/2014	23/01/2015			11/02/2015	11/02/2015		3/03/2015			13/03/2015
Blacksr	25/11/2014 SV		CMPC	25/11/2014	10/12/2014	25/11/2014	23/01/2015	23/01/2015	E	NA			3/03/2015			13/03/2015
Burren	12/03/2015 TC		CM	10/02/2015		12/03/2015				NA			NA			
Karuah	29/10/2014 W		CMPC	29/10/2014	13/11/2014	13/11/2014	23/01/2015	23/01/2015	Txt	NA			3/03/2015	3/03/2015	Ph	13/03/2015
Maitar	29/10/2014 W		CM	29/10/2014	18/11/2014	18/11/2014	23/01/2015			11/02/2015	11/02/2015		3/03/2015	3/03/2015	Ph	13/03/2015
North S				10/02/2015									NA			
Redhe	29/10/2014 W		CM	29/10/2014	31/10/2014	10/11/2014	29/01/2015	29/01/2015	Ph				NA			
Ruther	29/10/2014 W		CM	29/10/2014	18/11/2014	18/11/2014	23/01/2015	23/01/2015	Txt	NA			3/03/2015	5/03/2015	Ph	13/03/2015

Appendix 3.1 Sample LLW@S Action Plan



Progress list

- Before sending your completed Action Plan to DEC, ensure that you have completed all tasks listed below.
- Place an X beside each task you have completed.

<input checked="" type="checkbox"/>	2 day LLW@S workshop attended	Date: 8-9/11/12
<input type="checkbox"/>	Staff LLW@S in-service session delivered	Date:
<input type="checkbox"/>	Staff FMS in-service delivered	Date:
<input type="checkbox"/>	Principal's module completed	Date:
<input type="checkbox"/>	\$2000 expenditure clearly outlined	Date:
<input type="checkbox"/>	The Principal has viewed and approved this Action Plan	Name: Date:

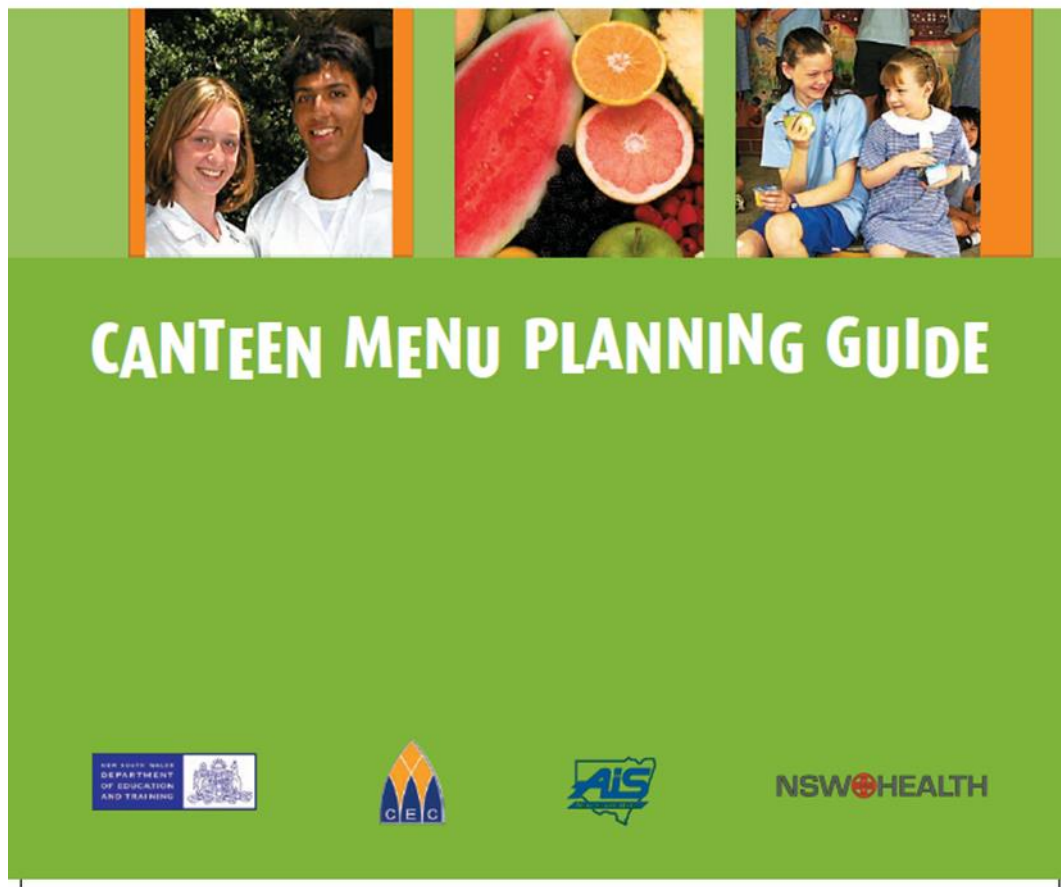
Contact names	
Local health promotion contact person	LLW@S contact person at your school
Name:	Name:
Phone:	Phone:
Email:	Email:

Action Plan funding process	
<ul style="list-style-type: none"> • Email your completed Action Plan to NSW Curriculum and Learning Innovation Centre -- llwats@det.nsw.edu.au • The Principal will receive correspondence from DEC confirming approval of your Action Plan • \$2000 will then be sent your school 	

XX Public School Action Plan

Curriculum					
Objectives	What will you do?	Who will do it?	Timeframe	Expenditure	Progress notes
Nutrition Improve the food and nutrition knowledge of students Improve availability and use of nutrition resources for teachers	Nutrition Order relevant nutrition resources (refer to LLW@S) thumb drive and website)	Karen & Antony	Term 4, Week 6 2012	Nil	
	Complete the Staff in-service module Establish a working group to oversee the re-introduction of Crunch & Sip. Include in Kinder orientation	Antony & Karen Sue Gandy	Term 4, Week 11 2012 Term 1, 2013	Nil	
	Review and update nutrition units on the school scope and sequence.	Team Champions & RFF teacher	Term 4, 2012	\$350 casual	
	Work with Stage coordinators, and canteen supervisor to plan and run LLW@S challenges - Stage 2: Q4:H20, Stage 3: LOTB	RFF teacher	Term 1, 2013	Nil	

Appendix 3.2 FT@S Canteen Menu Planning Guide



Appendix 3.3 Wolfenden et al Implementation Science 2017

Wolfenden et al. *Implementation Science* (2017) 12:6
DOI 10.1186/s13012-016-0537-9

Implementation Science

RESEARCH

Open Access



Multi-strategic intervention to enhance implementation of healthy canteen policy: a randomised controlled trial

Luke Wolfenden^{1,2*}, Nicole Nathan¹, Lisa M. Janssen^{1,2}, John Wiggers^{1,2}, Kathryn Reilly¹, Tessa Delaney¹, Christopher M. Williams^{1,2}, Colin Bell³, Rebecca Wyse², Rachel Sutherland¹, Libby Campbell¹, Christophe Lecathelinais¹, Chris Oldmeadow⁴, Megan Freund¹ and Sze Lin Yoong^{1,2}

Abstract

Background: Internationally, governments have implemented school-based nutrition policies to restrict the availability of unhealthy foods from sale. The aim of the trial was to assess the effectiveness of a multi-strategic intervention to increase implementation of a state-wide healthy canteen policy. The impact of the intervention on the energy, total fat, and sodium of children's canteen purchases and on schools' canteen revenue was also assessed.

Methods: Australian primary schools with a canteen were randomised to receive a 12–14-month, multi-strategic intervention or to a no intervention control group. The intervention sought to increase implementation of a state-wide healthy canteen policy which required schools to remove unhealthy items (classified as 'red' or 'banned') from regular sale and encouraged schools to 'fill the menu' with healthy items (classified as 'green'). The intervention strategies included allocation of a support officer to assist with policy implementation, engagement of school principals and parent committees, consensus processes with canteen managers, training, provision of tools and resources, academic detailing, performance feedback, recognition and marketing initiatives. Data were collected at baseline (April to September, 2013) and at completion of the implementation period (November, 2014 to April, 2015).

Results: Seventy schools participated in the trial. Relative to control, at follow-up, intervention schools were significantly more likely to have menus without 'red' or 'banned' items (RR = 21.11; 95% CI 3.30 to 147.28; $p \leq 0.01$) and to have at least 50% of menu items classified as 'green' (RR = 3.06; 95% CI 1.64 to 5.68; $p \leq 0.01$). At follow-up, student purchases from intervention school canteens were significantly lower in total fat (difference = -1.51 g; 95% CI -2.84 to -0.18; $p = 0.028$) compared to controls, but not in energy (difference = -132.32 kJ; 95% CI -280.99 to 16.34; $p = 0.080$) or sodium (difference = -46.81 mg; 95% CI -96.97 to 3.35; $p = 0.067$). Canteen revenue did not differ significantly between groups.

Conclusion: Poor implementation of evidence-based school nutrition policies is a problem experienced by governments internationally, and one with significant implications for public health. The study makes an important contribution to the limited experimental evidence regarding strategies to improve implementation of school nutrition policies and suggests that, with multi-strategic support, implementation of healthy canteen policies can be achieved in most schools.

(Continued on next page)

* Correspondence: Luke.Wolfenden@hnehealth.nsw.gov.au

¹Hunter New England Population Health, Locked Bag 10 Longworth Ave, Wallsend, New South Wales 2289, Australia

²The University of Newcastle, C/O Hunter New England Population Health, Locked Bag 10 Longworth Ave, Wallsend, New South Wales 2289, Australia

Full list of author information is available at the end of the article



© The Author(s). 2017 **Open Access** This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.

Appendix 3.4 Yoong et al International Journal of Behavioral Nutrition and Physical Activity 2016

Yoong et al. *International Journal of Behavioral Nutrition and Physical Activity* (2016) 13:126
DOI 10.1186/s12966-016-0453-z

International Journal of Behavioral
Nutrition and Physical Activity

RESEARCH

Open Access



CAFÉ: a multicomponent audit and feedback intervention to improve implementation of healthy food policy in primary school canteens: a randomised controlled trial

Sze Lin Yoong^{1,2,3,4*}, Nicole Nathan^{1,2,3,4}, Luke Wolfenden^{1,2,3,4}, John Wiggers^{1,2,3,4}, Kathryn Reilly^{1,2,3,4}, Christopher Oldmeadow^{1,2}, Rebecca Wyse^{1,2,3,4}, Rachel Sutherland^{1,2,3,4}, Tessa Delaney^{1,2,3,4}, Peter Butler^{1,2,3,4}, Lisa Janssen^{1,2,3,4}, Sarah Preece⁴ and Christopher M. Williams^{1,2,3,4}

Abstract

Background: The implementation of nutrition policies in schools has been recommended as a strategy to improve child dietary intake. Internationally, research suggests that the majority of schools do not implement these policies. In New South Wales (NSW), Australia, the NSW Healthy School Canteen Policy requires that school canteens prohibit the sale of 'red' foods (i.e. foods that are typically nutrient poor and high in energy, such as confectionary and deep-fried foods) and 'banned' drinks (i.e. soft drinks); and that the majority of items on the menu are 'green' (i.e. foods that are good sources of nutrients, such as fruits, vegetables and lean meats). This study examined the impact of a multicomponent audit and feedback intervention on schools' implementation of the NSW Healthy School Canteen Policy. A secondary aim was to assess the impact of the intervention on menu composition.

Methods: This study was a parallel group randomised controlled trial with 72 rural and remote primary schools (36 interventions, 36 controls) located in one region within NSW, Australia. Intervention schools received an initial face to face contact and up to four cycles of audit and feedback (consisting of a menu audit, written feedback report and telephone feedback) over a 12-month period. The primary trial outcomes were the proportion of schools with a canteen menu that had: i) no 'red' foods or 'banned' drinks; and ii) >50% 'green' items, as assessed via standardised menu audits undertaken by trained dietitians. For each primary outcome, between-group differences were assessed using Fisher's exact test under an intention to treat approach.

(Continued on next page)

* Correspondence: Serene.Yoong@hnehealth.nsw.gov.au
¹School of Medicine and Public Health, University of Newcastle, Callaghan, NSW 2308, Australia
²Hunter Medical Research Institute, New Lambton, NSW 2305, Australia
Full list of author information is available at the end of the article



© The Author(s). 2016 **Open Access** This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.

Appendix 3.5 Menu Assessment Protocol



Health
Hunter New England
Local Health District



1.1 MENU ASSESSMENT PROCEDURE

1. Receive menu either from project officer (PO), Evaluation Manager or from direct contact with the school.

2. Make a second copy of the menu and ensure a blank copy is saved in the school's folder

3. Conduct an initial menu assessment:

Colour code as many items as possible. Follow the 1.2 *GFK Menu analysis flow chart* and refer to:

- Fresh Tastes @ Canteen Menu Planning Guide (Occasional food criteria table p13, Ready Reckoner p19-24)*
- 1.3 Good for Kids menu analysis assumptions*
- 1.4 Counting Rules*

4. Is additional information required to complete assessment?

Yes - Determine what additional information is required to accurately assess menu by prefiling the additional information template (Appendix 2).

No - If all information available – go to step 6

5. A blinded dietitian is to collect additional information from canteen manager (see appendix 1 – *ISBAR*) using additional information template which is to be emailed to school OR emailed and then collected by phone call

6. Determine total number of items and the number and % of GREEN, AMBER, RED & BANNED products. See colour coding flow chart.

7. Assessment to be provided to a second dietitian for verification. Is there difference in opinion?

Yes – go to step 8

No – go to step 9

8. A third dietitian to be provided assessment. Dietitians to reach consensus on menu assessment.

9. Populate the 2015 menu analysis cover sheet (N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\HCI Canteen Menu Review\2015 Canteen Menu assessment tools), colour code and include tally count on the spare blank menu printed in step 2. Scan both documents and save to the school's file.

12. Complete canteen menu feedback report

Appendix 3.5 Menu Assessment Protocol con't

When a menu has an item where the product is unknown and we were not able to accurately determine food category or make an assumption then a list of 'unknown items' was created to record the item, how it was classified and the decision making process for classification. The file is located at N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\HCI Canteen Menu Review\2015 Canteen Menu assessment tools\Consensus - ambiguous items.xlsx

N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\4_RCT in Schools\menu_status_all schools23_6_14.

If a menu item has a RED item in it – it automatically becomes RED (except for some items containing confectionary)

Examples:

1. A salad wrap that contains a chicken tenderloin that is over the 'Occasional' Food Criteria Limits (i.e. >1000kJ energy, >5g saturated fat or >700mg of sodium) would be classified as RED.
2. A choc chip muffin that is under the 'Occasional' Food Criteria Limits for muffins is AMBER (even though choc chips by themselves are RED)

Definitions and abbreviations:

Significant AMBER filling - fillings that can potentially be RED and need to be assessed against the 'Occasional' Food Criteria Table e.g. crumbed chicken. If a sandwich, burger or wrap contains a significant amber filling then this product will remain amber regardless of other fillings e.g. salad

Table 1. Menu Analysis Assumptions for participating schools

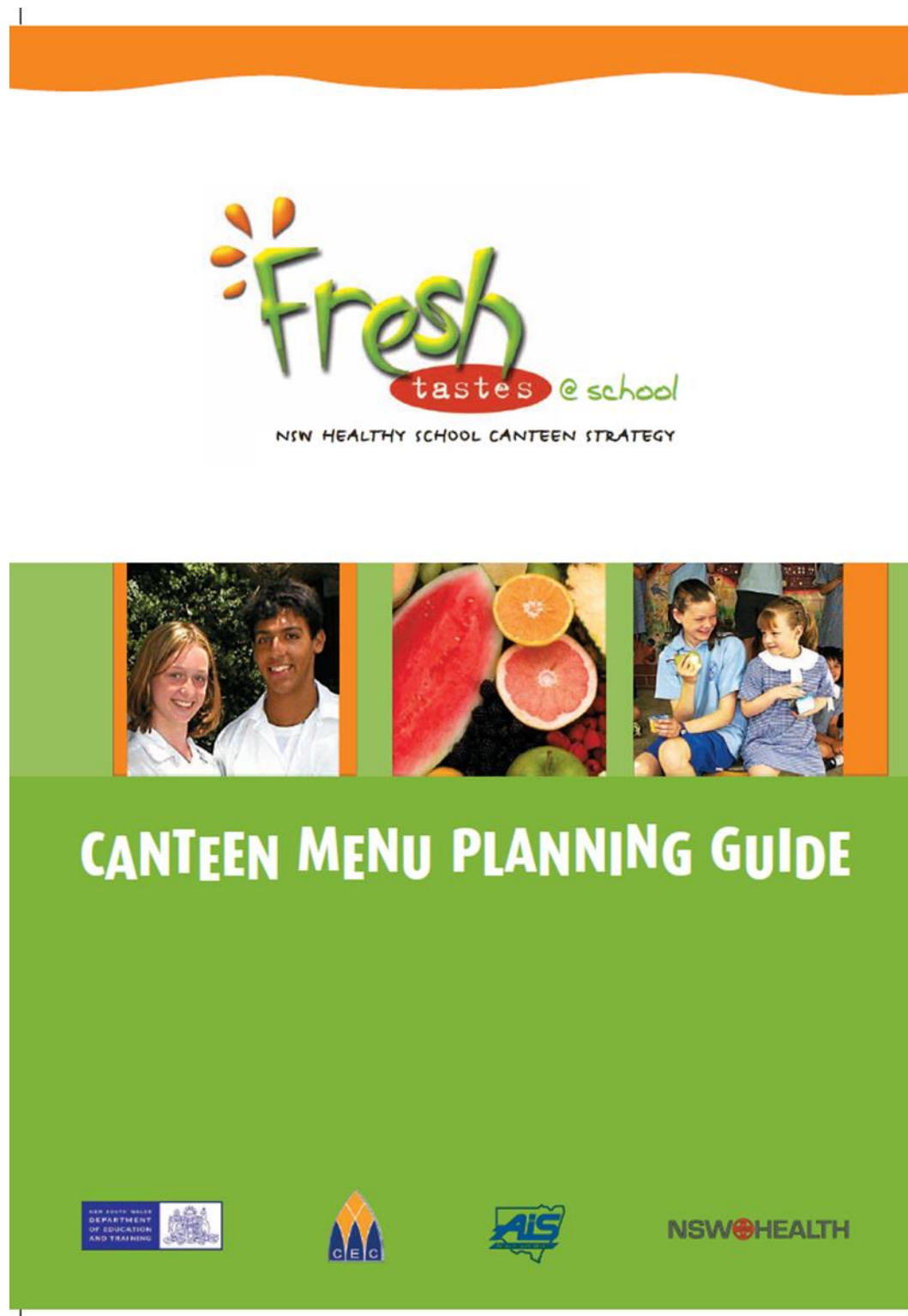
Note: You should be able to collect all additional product information from 'participating schools'

Item	Assumed Colour	Reasoning
Drinks		
Milk	GREEN AMBER	All Reduced fat varieties- All sizes of low fat milk are GREEN according to ET@S All Full fat varieties - All sizes
Milo, hot choc etc.	GREEN AMBER	If made with reduced fat milk or predominately on water. If made with full fat milk
All 99% fruit juice including, poppers, pop tops and frozen tubes	GREEN AMBER	If 99% fruit and serve size is less than or equal to 200ml, Frozen juice tubes are approximately 70 ml, therefore if 99% fruit juice they are classified as GREEN. If 99% fruit and serve size > 200ml item.
Fruit juices less than 99% fruit		Verify brand and serve size. Compare against the SSDB. Item is BANNED if it has more than 300kJ and/or 100mg sodium per serve.
Slushies	GREEN AMBER Assess against SSDB	If based on 99% fruit juice and serve size is less than or equal to 200ml If 99% fruit and serve size > 200ml item. If <99% fruit juice compare against the SSDB. Item is BANNED if it has more than 300kJ and/or 100mg sodium per serve.
Spring or unflavoured mineral water	GREEN	All plain water is GREEN.
Diet soft drinks	AMBER	As per ET@S Ready Reckoner

Appendix 3.6 Example Project Records of Intervention Costs

Strategy	Notes	POC/MC	Source	Year cost calculated	CASE	Source	Year cost calculated	SNACS	Source	Year cost calculated
Policy Implementation	Project Officer wages	\$ 103,111.50	1.5 FTE x 12 month intervention	2015	\$ 54,592.80	US FTE x 12 month intervention. Based on 2 PO's report of % time spent (Klob 20% x 1 FTE, JIC 30% x 1 FTE, assume PB similar 30% x FTE)	2015	\$ 42,794.17	0.59 FTE x 9 mth intervention. Based on 3 PO's reporting (Klob 40% x 5 FTE x 5 mths + 40% x 0.4 FTE x 4 mths, Klob 80% x 0.5 FTE x 4 mths + 20% x 0.5 FTE x 5	2015
	Manager wages		HSM 12.94 x 0.2 FTE	2015		HSM 12.94 midpoint of \$94,465.00, 0.6 FTE x 5% of work time = \$284.84	2015	\$ 9,851.60	HSM 12.94 point of \$98,535 x 0.1 FTE	2015
	SMS text messaging								\$300 to purchase mobile, \$10/month plan x 6 mths	2015
	Overheads									2015
Sub-total		\$ 18,347.38		2015	\$ 13,300.36		2015	\$ 12,107.66		2015
Executive Support		\$ 151,063.08			\$ 71,128.01			\$ 65,110.73		
Academic Detailing										
Consensus processes										
Carer manager training	Project Officer wages - workshop co-ordinator		Staff wages - based on \$40.93/hr HEW6.1 x 18 hrs						Co-ordination of workshops done by PO's therefore salary costs included in Policy implementation time.	
	Venue hire	\$ 736.24	Based on \$75 estimate x 3 workshops	Inflated from 2014						
	Catering	\$ 536.39	Based on \$15/hr x 50 people booked in for workshops + PO's = 56 x \$15 = \$840	Inflated from 2014						
	Reimbursement OLVs	\$ 4,344.64	Assumptions: Opportunity costs - 25 carer managers x 5 hours & award	Inflated from 2014					Taxes \$20, National \$175, External hire rate is \$25/hr room hire 26 attendees @ \$15 per head, real cost price	Inflated from 2014

Appendix 4.1 FT@S Canteen Menu Planning Guide



Appendix 4.2 Occasional Food Criteria Table

THE 'OCCASIONAL' FOOD CRITERIA TABLE

If the item you are considering has more than the number specified in the energy, saturated fat or sodium column, or less than the number in the fibre column, it is an 'Occasional' food.

ASSESSED PER 100g		HOT FOOD ITEMS	
CATEGORY		NUTRIENT CRITERIA	
Food or Drink	Energy (kJ) per 100g	Saturated Fat (g) per 100g	Sodium (mg) per 100g
Savoury pastries, pasta, pizzas, oven baked potato products, dim sims, spring rolls, fried rice and noodles.	>1000kJ	>5g	>400mg
Crumbed & coated foods (eg patties, ribs, chicken products), frankfurters, sausages.	>1000kJ	>5g	>700mg

Note: All foods **DEEP FRIED** on the premises fit into the **RED** end of the spectrum and are limited for sale in school canteens. They are too high in kilojoules and fat (usually saturated fat).

ASSESSED PER SERVE (as sold in the school canteen)		SNACK FOODS & DRINKS		
CATEGORY		NUTRIENT CRITERIA		
Food or Drink	Energy (kJ) per serve	Saturated Fat (g) per serve	Sodium (mg) per serve	Fibre (g) per serve
Sugar sweetened drinks and ices*	>300kJ		>100mg	
Snack food bars & sweet biscuits	>600kJ	>3g		<1.0g
Savoury snack foods & biscuits	>600kJ	>3g	>200mg	
Ice creams, milk based ice confections & dairy desserts	>600kJ	>3g		
Cakes, muffins & sweet pastries etc	>900kJ	>3g		<1.5g

Note: All types of **CONFECTIONERY** fit into the **RED** end of the spectrum and are limited for sale in school canteens. They are foods of minimal nutritional value.

*The sugar sweetened drinks and ices criteria applies to: soft drinks, flavoured mineral waters, energy drinks, sports drinks, sports waters, slushies, ice blocks and ice confections.

Key: > means more than, < means less than.

Appendix 4.3 Principal Information Letter

Hunter New England Population Health

Direct Contact Details

Phone: (02) 49246477 Fax: (02) 4924 6490

Email: PHEnquiries@hnehealth.nsw.gov.au



Health

Hunter New England
Local Health District

29 May 2018

Dear Principal

**HUNTER NEW ENGLAND SCHOOL HEALTH SURVEY
INFORMATION FOR PRINCIPALS**

Version 6, dated 28/5/14

Over the past few years, your school has participated in the *Good for Kids. Good for Life* program and evaluation conducted by Dr Luke Wolfenden from Hunter New England Population Health. The aim of the project is to identify opportunities for Primary Schools to promote physical activity and healthy eating in children. The purpose of this correspondence is to invite you to participate in a survey to evaluate the ongoing effectiveness of the initiative. Over the next three years the program will continue to support all schools in the Hunter New England region to implement healthy eating and physical activity programs. The order in which schools will be offered support, however, will be randomly determined.

Why is the research being done?

We understand that schools have a number of systems and practices in place that are conducive to children developing healthy lifestyles. We would like to continue to identify if there are additional ways we can support primary schools to encourage children to consume healthy foods and drinks and participate in physical activity.

What will you be asked to do?

We would like to invite you to participate in:

1. **A paper or pencil survey OR a short telephone survey-** The purpose of this survey is to ask you about the current policies and practices relating to healthy eating and physical activity in your school, and to update our records with any new school contact details. We have attached a paper and pencil copy of the survey and invite you to complete this survey and return it to us via the reply paid envelope. If you do not receive a response from you in two weeks, we will contact you via telephone to invite you to participate in a telephone survey (similar to the attached paper and pencil survey), which can be conducted at a time convenient to you. Your school was also invited to participate in a similar survey in 2006, 2009 and 2012. The telephone survey should take approximately 20 minutes to complete. If you would like to nominate another staff member to complete the survey on your behalf that is fine, please also pass this information on to them.
2. **A canteen manager's survey-** When we call, we will also ask your permission to contact your canteen managers directly across the next 12 months. We would like to invite them to participate in surveys that can help us with identifying how to best support them with providing healthier foods. When you provide us with this permission, you are providing us with consent to contact them directly and not consent to participate in the survey. Your canteen managers will be able to choose at that time whether they would like to complete the survey. The survey with the Canteen Managers will take approximately 15 minutes and can be completed at a time convenient to the Canteen Manager and school.

What are the risks and benefits of participating?

Participation in the telephone survey will allow the research team to tailor the support we can offer your school regarding healthy eating and physical activity policies and practices. We don't anticipate there will be any risk to you or your school from participation.

Appendix 4.3 Principal Information Letter con't

How will your privacy be protected?

Any information provided during the Principals telephone survey and the Canteen Managers survey will be stored electronically in a secure facility. All information transferred electronically will be done in a file which is password protected. It will not be possible to identify individuals or schools from any publication or presentation arising from the research.

What choice you do have?

Participation in this research is entirely your choice and only schools where principals have given their explicit consent will be included in the study. If you prefer, you can choose to participate in only some of the activities listed above. Whether or not you and/or your Canteen Manager decide to participate, the decisions will not disadvantage you or your school in any way. If you do participate, you may withdraw from the research at any time without giving a reason, and you will have the option of withdrawing any information you have provided.

How will the information collected be used?

Information provided during in both the surveys will be provided back to your school. A report summarising the results of the Primary Schools across the region will be made available to your school following program completion. The summary report will not identify any individuals or primary schools. Data from the study may also be presented at scientific conferences, be published within scientific journals or form part of student theses, or provided to the NSW Ministry of Health as part of usual reporting purposes. Data collected from the Good for Kids staff when they meet with schools to discuss and support adoption of healthy eating and physical activity practices may also be provided to NSW Health and recorded on a ministry approved electronic database. De-identified, aggregate data from the NSW Ministry of Health may be used to monitor the implementation of health promotion activities in NSW. No other primary school or organisation will be able to find out the results of your school and no individuals or primary schools will be able to be identified in any report or publication by the program. Over the three years of the program we will contact you periodically to invite you to participate in future surveys.

What do you need to do to participate?

If you would like to participate, you can do so by returning the paper and pencil survey via the reply paid envelope, fax (02) 4924 6490 (att Serene Yoong) or via email (Serene.Yoong@hnehealth.nsw.gov.au) OR indicating this to our trained interviewer when they call. If you could also please let your administration staff know to expect our call, and who will be completing the survey, this will help us complete the survey quickly. Alternatively, if you would like to schedule a time for us to call you please send an e-mail to Serene.Yoong@hnehealth.nsw.gov.au with your school's name and suburb/ town or ring <insert admin number> and we will arrange to call you at that time. If there is anything that you do not understand, or you would like more information, please contact Serene Yoong on (02) 4924 6413.

Thank you for considering this invitation

Yours sincerely

Dr Luke Wolfenden
Program Manager
Hunter New England Population Health

This project has been approved by the Hunter New England Human Research Ethics Committee of Hunter New England Health, Reference: 06/07/26/4.04 and Department of Education and Training, Reference:

Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to Dr Nicole Gerrard, Professional Officer (Research Ethics), Hunter New England Human Research Ethics Committee, Hunter New England Health, Locked Bag 1, New Lambton NSW 2305, telephone (02) 49214950, email Nicole.Gerrard@hnehealth.nsw.gov.au

Appendix 4.4 Canteen Manager Information Statement

Hunter New England Population Health

Direct Contact Details

Phone: (02) 49246477 Fax: (02) 4924 6490

Email: PHEnquiries@hnehealth.nsw.gov.au



Health
Hunter New England
Local Health District

28th May, 2014

Dear Canteen Manager

HUNTER NEW ENGLAND SCHOOL CHILDREN HEALTH SURVEY
School Canteen Questionnaire
Version 5, dated 28th May 2014

INFORMATION FOR CANTEEN MANAGERS

Over the past few years, your school has participated in the Good for Kids. Good for Life program and evaluation conducted by Dr Luke Wolfenden from Hunter New England Population Health. The purpose of the project is to identify opportunities for Primary Schools to promote physical activity and healthy eating in children.

Why is the research being done?

Schools have an important role to play in promoting physical activity and healthy eating to children. Canteens in particular play an important role in providing children with healthy food and drinks whilst at school. As such, we are seeking information about school canteens from school canteen staff within Hunter New England and the rest of NSW.

We understand that schools have a number of systems and practices in place that are conducive to children developing healthy lifestyles. However, we would like to identify if there are more ways in which we can enhance schools' capacity to encourage children's consumption of healthy food and drinks. As part of this process we recently contacted your school Principal to conduct a survey to identify current school organisational policies and practices. Your school Principal provided us with your contact details as he/she felt you would be the best person to provide information on the school canteen's policies and practices.

What will you be asked to do?

We would like to ask you to consent to:

1. **Complete a survey-** The survey asks about your school canteen practices and the products it sells. It should take approximately 15-20 minutes to complete. We have attached a paper and pencil copy of the survey and invite you to complete this survey. If we do not receive a response in two weeks, we will be contacting you via telephone to invite you to participate in a telephone survey. If you would prefer to complete the paper survey please return the survey by faxing it to (02) 4924 6490 (att: Serene Yoong), via email (Serene.Yoong@hnehealth.nsw.gov.au) or returning it in the enclosed reply paid envelope.
2. **Provide us with a copy of your school canteen menu**
3. **Provide us with a copy of your school profit and loss statement** This will allow us to assess whether any changes you may have made to your school canteen could have impacted on your school canteen's profit
4. **Participate in a school canteen visit-** Your school has been randomly selected from schools in the Hunter New England region to participate in a canteen visit. The purpose of this is for Good for Kids. Good for Life team members to see how school canteens operate and to collect information about the foods sold during recess and lunch. This would involve one or two team members being present at your school canteen on a day of your choosing, from opening until close. You would not have to prepare anything or do anything different on the day of the visit. You will be asked to complete the survey again in approximately 12 months. If you and your Principal consent to your school being part of this observation please sign the attached consent form (your Principal will also have a copy of this consent form).

Appendix 4.4 Canteen Manager Information Statement con't

What are the risks and benefits of participating?

Completion of the survey will assist us in planning further services for school canteens and allow the research team to tailor the support we can offer your school regarding healthy canteen practices. We don't anticipate there will be any risk to you or your school from participation.

How will your privacy be protected?

Any information provided from the Canteen Managers survey will be stored electronically in a secure facility. All information transferred electronically will be done in a file which is password protected. It will not be possible to identify individuals or schools from any publication or presentation arising from the research.

What choice do you have?

Participation in this research is entirely your choice and only schools where principals have given their explicit consent will be included in the study. If you prefer, you can choose to participate in only some of the activities listed above. Whether or not you decide to participate, the decisions will not disadvantage you or your school in any way. If you do participate, you may withdraw from the research at any time without giving a reason, and you will have the option of withdrawing any information you have provided.

How will the information collected be used?

A report summarising the results of the survey across the region will be made available to your school following program completion. The summary report will not identify any individuals or primary schools. Data from the study may also be presented at scientific conferences, be published within scientific journals or form part of student theses, or provided to the NSW Ministry of Health as part of standard reporting procedures. Data collected from the Good for Kids staff when they meet with schools to discuss and support adoption of healthy eating and physical activity practices may also be provided to NSW Health and recorded on a ministry approved electronic database. De-identified, aggregate data from the NSW Ministry of Health may be used to monitor the implementation of health promotion activities in NSW. No other primary school or organisation will be able to find out the results of your school and no individuals or primary schools will be able to be identified in any report or publication by the program. Over the three years of the program we will contact you periodically to invite you to participate in future surveys.

What do you need to do to participate?

If you would like to participate, you can do so by returning the paper and pencil survey, canteen menu and copy of school canteen profit and loss statement via the reply paid envelope, fax (02) 4924 6490 (att Serene Yoong) or email (Serene.Yoong@hnehealth.nsw.gov.au) OR indicating this to our trained interviewer when they call. Alternatively, if you would like to schedule a time for us to call you please send an e-mail to Serene.Yoong@hnehealth.nsw.gov.au with your school's name and suburb/ town or ring <insert admin number> and we will arrange to call you at that time. If there is anything that you do not understand, or you would like more information please contact Serene Yoong on (02) 4924 6413.

Thank you for considering this invitation

Yours sincerely

Dr Luke Wolfenden
Program Manager
Hunter New England Population Health

Appendix 4.5 Principal Survey

School ID/Name _____

GOOD FOR KIDS. GOOD FOR LIFE

School Principal Survey 2014

Version 5 25/05/2014

This survey is being conducted by Hunter New England Local Health District as part of the

Good for Kids. Good for Life Program.

Note: Individual schools will not be identified in any way in the reporting of results.

- All instructions are in *Italics*
- Please answer the questions to the best of your capacity. This survey will ask you about the systems and processes present in your school to help increase children's physical activity and diet.
- ******Only principals randomised to the information statement group will receive this statement*
- Accuracy of the information is important to us and will be used to help us plan the support we provide to your schools.
- There are no right or wrong answers. The information will be used to develop strategies to further support schools.
- Some of the questions you may find difficult to answer, but please take your time and answer to the best of your knowledge.

PLEASE CIRCLE/RECORD ALL RELEVANT ANSWERS WERE INDICATED.

Please contact Serene Yoong

Hunter New England Local Health District for enquires:

Phone: 02 4924 6413

Email: Serene.Yoong@hnehealth.nsw.gov.au

Appendix 4.5 Principal Survey con't

School ID/Name _____

SCHOOL CANTEENS SECTION 1

21. Does your school have an operational canteen? (tick one box only)	
1. Yes	2. No (Go to School canteen section Q27)
22. Does your school usually sell or provide any of the following in the school canteen? (Please provide your best estimate if not sure)	
1. Fruit	
2. Vegetables (including those in sandwiches or hot meals)	
3. Water	
4. Regular soft drinks (i.e. not diet)	
5. Reduced fat milk drinks	
6. Other sugar sweetened drinks i.e. not diet (this includes cordials, energy drinks, flavoured mineral waters, sports drinks, iced teas, sweetened waters, sports waters)	
7. 99% fruit juice – less than 200ml	
8. Confectionary e.g. lollies, chocolate	
9. Deep fried foods	
10. Ice creams covered in chocolate	
11. High salt snacks (including chips)	
12. Other low fat dairy products (custard, yoghurt)	
13. None of the above	

The Fresh Tastes @ School NSW Healthy School Canteen Strategy was introduced to government primary and high schools at the start of 2005. The initiative aims to support students to make healthier food choices by providing foods that are high in nutritional value and restricting the sale of food high in saturated fats, salt and sugar in schools canteen and school events.

23. Have you heard of the Fresh Tastes @ School Strategy? (tick one box only)	
1. Yes	
2. No	
3. Don't know	
24. Does your school provide healthy food options consistent with the Fresh Tastes and School Menu Guidelines (DEC schools) or equivalent (other schools) in (tick all boxes that apply)	
1. The school canteen	
2. Activities that involve providing food & drink to students	
3. Activities involving food & drink to wider school community	
4. No	
5. Don't know	

Appendix 4.6 Canteen Manager Survey

ID _____

Good for Kids. Good for Life

School Canteen Manager Survey 2014

Version 4 28/05/2014

This survey is being conducted by Hunter New England Local Health District as part of the

Good for Kids. Good for Life Program.

Note: Individual schools will not be identified in any way in the reporting of results.

All instructions are in *Italics*

Please answer the questions to the best of your capacity. The information will be used to develop strategies to further support schools.

Please circle/record all relevant answers where indicated.

Please contact Serene Yoong

Hunter New England Local Health District for enquires:

Phone: 02 4924 6413

Email: Serene.Yoong@hnehealth.nsw.gov.au

Once ethical approval has been granted the survey will be formatted appropriately for CATI survey. All item numbers and skip instruction will be amended if needed. Additional introduction script based on previously approved versions of CATI scripts will be included.

Appendix 4.6 Canteen Manager Survey con't

ID _____

15. In the last 12 months, have you used any of the resources or materials provided by this program? *(tick one box only)*
1. ☐ Yes
 2. ☐ No
 3. ☐ Don't know
16. In the last 12 months, have you received any other support from other organisations, individuals or schools to assist you with implementing The Fresh Tastes @ School NSW Healthy School Canteen Strategy? *(tick one box only)*
1. ☐ Yes *Please specify what resource you received* _____

 2. ☐ No
 3. ☐ Don't know
17. In the position description for your current role, are you required to have any knowledge of The Fresh Tastes @ School NSW Healthy School Canteen Strategy? *(tick one box only)*
1. ☐ Yes
 2. ☐ No
 3. ☐ Do not have a job description
 4. ☐ Not sure
 5. ☐ Started my position before Fresh Tastes @ Schools was introduced
18. During your orientation to this position, were you provided with any information on how to implement The Fresh Tastes @ School NSW Healthy School Canteen Strategy? *(tick one box only)*
1. ☐ Yes
 2. ☐ No
 3. ☐ Not sure
 4. ☐ Did not have an orientation
 5. ☐ Started my position before Fresh Tastes @ Schools was introduced
19. Is your canteen currently compliant with Fresh Tastes @ School?
1. ☐ Yes *go to Q20*
 2. ☐ No
 3. ☐ Not sure

Please indicate how strongly you agree with the following statements regarding The Fresh Tastes @ School NSW Healthy School Canteen Strategy (1= strongly disagree; and 5= strongly agree). *Please select only ONE response. If these statements are not applicable to you please select 6.*

Statement	Strongly Disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly Agree 5	Not applicable/ did not receive this 6
20. It is easy to have a healthy school canteen that meets the Fresh Tastes @ School Healthy Canteen guidelines.	1	2	3	4	5	6
21. The executive staff at my school are supportive of the Fresh Tastes @ School Healthy Canteen guidelines.	1	2	3	4	5	6
22. The P&C in my school is supportive of the Fresh Tastes	1	2	3	4	5	6

Appendix 4.7 Comprehensive Menu assessment Protocol



1.1 MENU ASSESSMENT PROCEDURE

1. Receive menu either from project officer (PO), Evaluation Manager or from direct contact with the school.

2. Make a second copy of the menu and ensure a blank copy is saved in the school's folder

3. Conduct an initial menu assessment:

Colour code as many items as possible. Follow the [1.2 GFK Menu analysis flow chart](#) and refer to:

- a) *Fresh Tastes @ Canteen Menu Planning Guide (Occasional food criteria table p13, Ready Reckoner p19-24)*
- b) *1.3 Good for Kids menu analysis assumptions*
- c) *1.4 Counting Rules*

4. Is additional information required to complete assessment?

Yes - Determine what additional information is required to accurately assess menu by prefilling the additional information template (Appendix 2).

No - If all information available – go to step 6

5. A blinded dietitian is to collect additional information from canteen manager (see appendix 1 –~~ISBAR~~) using additional information template which is to be emailed to school OR emailed and then collected by phone call

6. Determine total number of items and the number and % of GREEN, AMBER, ~~RED~~ & BANNED products. See colour coding flow chart.

7. Assessment to be provided to a second dietitian for verification. Is there difference in opinion?

Yes – go to step 8

No – go to step 9

8. A third dietitian to be provided assessment. Dietitians to reach consensus on menu assessment.

9. Populate the 2015 menu analysis cover sheet (N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\HCI Canteen Menu Review\2015 Canteen Menu assessment tools), colour code and include tally count on the spare blank menu printed in step 2. Scan both documents and save to the school's file.

12. Complete canteen menu feedback report

Appendix 4.7 Comprehensive Menu assessment Protocol con't

1.3 MENU ANALYSIS ASSUMPTIONS

The menu analysis assumptions outlines the colour code for common menu items where the colour code has not been clearly defined in the Fresh Tastes @ School Canteen Menu Planning Guide or when preferred nutrition information is unavailable. This document was created to improve consistency in menu analysis between all HCI team members. The assumptions were created based on nutrition guidelines; experience in canteens through implementing Fresh Tastes @ School and our professional judgment.

When a menu has an item where the product is unknown and we were not able to accurately determine food category or make an assumption then a list of 'unknown items' was created to record the item, how it was classified and the decision making process for classification. The file is located at N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\HCI Canteen Menu Review\2015 Canteen Menu assessment tools\Consensus - ambiguous items.xlsx or

N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\4_RCT in Schools\menu_status_all schools23_6_14.

If a menu item has a RED item in it – it automatically becomes RED (except for some items containing confectionary)

Examples:

1. A salad wrap that contains a chicken tenderloin that is over the 'Occasional' Food Criteria Limits (i.e. >1000kJ energy, >5g saturated fat or >700mg of sodium) would be classified as RED.
2. A choc chip muffin that is under the 'Occasional' Food Criteria Limits for muffins is AMBER (even though choc chips by themselves are RED)

Definitions and abbreviations:

Significant AMBER filling - fillings that can potentially be RED and need to be assessed against the 'Occasional' Food Criteria Table e.g. crumbed chicken. If a sandwich, burger or wrap contains a significant amber filling then this product will remain amber regardless of other fillings e.g. salad

Table 1. Menu Analysis Assumptions for participating schools

Note: You should be able to collect all additional product information from 'participating schools'

Item	Assumed Colour	Reasoning
Drinks		
Milk	GREEN	All Reduced fat varieties- All sizes of low fat milk are GREEN according to ET@S
	AMBER	All Full fat varieties - All sizes
Milo, hot choc etc.	GREEN	If made with reduced fat milk or predominately on water.
	AMBER	If made with full fat milk
All 99% fruit juice including, poppers, pop tops and frozen tubes	GREEN	If 99% fruit and serve size is less than or equal to 200ml, Frozen juice tubes are approximately 70 ml, therefore if 99% fruit juice they are classified as GREEN.
	AMBER	If 99% fruit and serve size > 200ml item.
Fruit juices less than 99% fruit		Verify brand and serve size. Compare against the SSDR. Item is BANNED if it has more than 300kJ and/or 100mg sodium per serve.
Slushies	GREEN	If based on 99% fruit juice and serve size is less than or equal to

Appendix 4.8 Standard Additional Information Template

Canteen Menu Data Collection Table

Item	Questions
FOOD	
Fresh Fruit	Number of different types, if more than one?
Mini Salad	Is the cheese used full fat/ light?
Garlic toast	Is it homemade or commercially bought? If homemade, please provide ingredients and amounts? If bought, which brand and product name?
Finger bun	Is it iced?
Muffins	Are they homemade or commercially bought? If bought, which brand? If homemade, please type and amount of ingredients.
Pikelets	Homemade or commercially bought? If bought, which brand? If homemade, please provide list and amount of ingredients.
Chip varieties	Number of varieties, and brands?
Ice creams/ice blocks	Number of varieties, and brands?
Chicken goujons	Homemade or commercially bought? If bought, which brand? If homemade, please provide list of ingredients only.
Potato wedges	Homemade or commercially bought? If bought, which brand? If homemade, please provider list of ingredients.
Chicken burger	Is the chicken used commercially bought? If so, which brand and product name? If not bought, is the chicken fillet skinless or crumbed/coated?
Mac/cheese	Homemade or commercially bought? If homemade, please provide a list of ingredients If bought, which brand and product name?
Spag bol	Homemade or commercially bought?

Appendix 4.8 Standard Additional Information Template con't

	If homemade, please provide a list of ingredients If bought, which brand and product name?
Lasagne	Homemade or commercially bought? If homemade, please provide a list of ingredients If bought, which brand and product name?
Cheese in sandwiches	Is it full-fat/light?
Chicken wedges	Homemade or commercially bought? If homemade, is the chicken skinless or crumbed/coated? If bought, which brand and product name?
Small pie	What brand and product name is the pie? How big is the serve?
Sausage roll	What brand and product name is the pie? How big is the serve?
Drinks	
Milks	Reduced fat or full fat milk?
Fruit juice poppas	What flavours, and how big are the serves?
Quench mineral waters	Which flavours?

Appendix 4.9 Quick Menu Audit Assumptions Guide



Quick Assessment Tool: Menu analysis assumptions

The menu analysis assumptions outlines the colour code for common menu items where the colour code has not been clearly defined in the Fresh Tastes @ School Canteen Menu Planning Guide or when preferred nutrition information is unavailable. This document was created to improve consistency in menu analysis between all HCL team members. The assumptions were created based on nutrition guidelines; experience in canteens through implementing Fresh Tastes @ School and our professional judgment.

A barrier to assessing menus is collecting detailed brand and product information from canteen managers.

The aim of this tool is to enable a HCL team member to complete a quick menu assessment without having to collect additional brand/product information. Additional assumptions about brand and product category have had to be made (see below). These assumptions are only to be used if school has refused to supply additional information or has not provided additional information to allow a complete menu assessment.

Table 2. Menu Analysis Assumptions for non-participating schools

Item and examples	Assumed color	Reasoning
Drinks		
Juice NFS, including slushies'	GREEN	Assume 99% and in serve 200ml
	AMBER	If stated as 'large' serve i.e. >200ml
Cans	BANNED	Assumed to be soft drink or similar which is likely to be over the SSDB criteria.
Flavoured mineral waters	AMBER	The majority of flavored mineral waters supplied to schools are classified as AMBER eg. Quench, Focus Water
Frozen Juice eg Juicies, Quelch, juice cups	GREEN	Assume 99% fruit juice and <200mL
Milkshakes	AMBER	Assume 'Fruit tubes' or similar are "Quelch Fruit Sticks"
	AMBER	Assume contains ice-cream therefore AMBER
Spreads & Dips		
Biscuits with cheese/dip/ tuna	GREEN	Assume GREEN – this is considered a healthier snack alternative
Biscuits with spread such as jam, vegemite	AMBER	If Biscuit type stated is AMBER then code as AMBER. Spreads are AMBER as per ET@S
Dairy Foods & Frozen Treats		
Milk and yoghurt NFS	GREEN	Assume reduced fat
Frozen Yoghurt	AMBER	Assume reduced fat
Cheese and custard NFS	GREEN	Assume reduced fat
Ice cream cups and icy poles (brand/flavor unknown)	AMBER	Menu items listed as 'icy pole', ice cream cup etc then assume AMBER
Chocolate coated ice-creams	RED	RED as per ET@S Ready Reckoner
Snack Foods		
Chips (brand/flavor unknown)	AMBER	If brand/variety not specified assume AMBER
Chips (known RED flavours) e.g. St/V jumpies, BBQ JJs, twisties, kettle chips etc	RED	If menu specifies flavor of chips and known flavor is RED
Pikelets	GREEN	Assume GREEN – this is considered a healthier snack alternative
Mousse	AMBER	Canteens predominately sell a commercial mousse mix which is an AMBER product.
Jelly products: Jelly NFS, jelly cup, Lite Jelly	AMBER	Assume below SSDB criteria and AMBER
Jelly sticks, tube, wobbli or pouch	RED	If item is labelled/marketed like confectionary eg 'jelly stick/pouch/wobbli' then assume RED
Popcorn, rice cakes, rice wheels, salted Popcorn	GREEN	Assume GREEN – this is considered a healthier snack alternative

Appendix 4.9 Quick Menu Audit Assumptions Guide con't



Flavoured Popcorn	AMBER	
Rice sticks/noodle snacks	AMBER	AMBER as per ET@S Ready Reckoner
Tinned Spaghetti/ Baked Beans	GREEN	As per Healthy Kids Association assumptions- assumed tinned in tomato sauce.
Cookie	AMBER	Assume school variety
Banana Bread/ Cakes/ Lamingtons/ Apple Pies	RED	Assume RED as unlikely to meet QECT
Cupcakes	RED	Cupcakes low in fiber and in some cases high in saturated fat and energy, unlikely to meet QECT
Muffins: Brand/Flavor unknown Homemade	AMBER RED	Assume it is commercial and 'school range' therefore AMBER If menu states 'homemade' assume RED as most are low in fibre and in some cases high in saturated fat and energy
Cereal	GREEN	Assume GREEN (no added sugar, high fibre) unless states type which is refined and therefore AMBER
Confectionary e.g. jelly stix, smiley faces, sunfruits, yoghurt bars, yoghurt lollies, ovalteensies, liquorice, cough lollies	RED	All confectionary is RED
Sandwiches		
Sandwiches: <ul style="list-style-type: none"> If product contains salad or low fat dairy item eg. ham and low fat cheese, ham and tomato, vegemite and low fat cheese, chicken and gravy roll, corned beef, low fat cheese and tomato sauce Spreads (vegemite, jam, pickles) Processed meats such as ham, chicken roll and devon. Significant AMBER item, regardless of other salad fillings eg. chicken tender sandwich 	GREEN AMBER AMBER AMBER	Increases vegetable and dairy intake therefore assume GREEN Assume cheese is low fat and GREEN therefore ham and cheese s/w, and vegemite and cheese is GREEN Spreads are AMBER as per ET@S Processed meats in small amounts are AMBER as per ET@S Significant AMBER fillings: Fillings that need to be assessed against the QECT and can potentially be RED which outweighs the addition of GREEN fillings
Salads & Sushi		
Salads: All salads e.g., Ham and salad, Caesar salad Those that contain a significant AMBER filling eg. salad with chicken tenders	GREEN AMBER	
Sushi	GREEN	Assume served with skinless chicken or vegetables
Meat/fish/poultry & alternatives		
Lean meat – Egg, roast beef, salmon, tuna, turkey	GREEN	Lean meat is GREEN per ET@S
Chicken on sandwiches & salads	GREEN	Assume skinless and uncoated because this variety is the most common in canteens.
Hot Food		
Pizzas: Homemade Commercial/NFS	GREEN AMBER	If the menu states or indicates homemade assume green. If not specified then assume commercial and AMBER variety Note to assessor: use own discretion to determine if pizza is commercial or homemade eg. if pizza appears in 'specials' and daily specials appear homemade then assume pizza is homemade; if pizza had been named eg. 'South Pizza' then assume homemade. If no further information and not able to determine difference eg. if pizza listed in hot meals and no further description given then assume commercial.

Appendix 4.9 Quick Menu Audit Assumptions Guide con't



Crumbed chicken products		
Homemade	GREEN	If the menu states or indicates homemade assume green (skinless and bread crumb, oven baked)
Commercial/NFS	AMBER	If not specified then assume commercial and AMBER variety
Hot dogs	RED	Most hot dogs are above the OECT therefore RED
Beef burger patties:		
Homemade	GREEN	If the menu states or indicates homemade assume low fat mince is used.
Commercial/NFS	AMBER	If not specified then assume commercial and AMBER variety
Meatballs:		
Homemade	GREEN	If the menu states or indicates homemade assume low fat mince is used.
Commercial/NFS	RED	Most commercial meatballs are above the OECT therefore RED
Soups	GREEN	Likely to have added vegetables and less kJ than other hot items therefore GREEN
Potatoes:		
Baked potato and skins	GREEN	If listed as 'baked potato' assume GREEN
Commercial potato products (including potato bake)	AMBER	The majority of commercial potato products on the market e.g. wedges, chips are AMBER and oven baked (not fried).
Pasta products e.g. lasagna, spag. bgl, mac and cheese	GREEN	Assume commercial and homemade are green as per Healthy Kids Association criteria.
Fried rice	GREEN	Commercial or homemade – assume green as has added vegetables as per Healthy Kids Association criteria.
Nachos		
Homemade	GREEN	If menu indicates homemade and lean mince then classify as GREEN
Commercial/NFS	AMBER	If commercial or not specified 'lean mince' then classify as AMBER
Other rice, noodle and ready to eat products		
Homemade	GREEN	If menu indicates homemade then assume green
Commercial/NFS	AMBER	If menu does not indicate homemade then assume commercial and AMBER
Garlic Bread		
Homemade	GREEN	If menu does not state homemade or commercial then classify as GREEN
Commercial/NFS	AMBER	If menu specifically states commercial then AMBER
Savoury pies and sausage rolls		
Not further specified	AMBER	If no further information provided on menu assume it is below OECT and AMBER
If listed as sourced from local 'pie shop'	RED	If school lists it is sourced through local bakery/pie shop then assume RED
All other savoury pastries e.g. quiches, spinach & ricotta rolls	RED	Product information is not available therefore assume the product to be in excess of the OECT.
Fish products and spring rolls	AMBER	Assume below OECT and AMBER
Hot noodle cups	AMBER	Hot Noodle Cups are AMBER or GREEN as per ET@S Ready Reckoner. Due to the high sodium content and lack of nutritional quality assume AMBER
Deep fried foods	RED	All deep fried foods are RED
Meal deal	Variable	Classify based on significant main meal item

Key: NFS= not further specified, ET@S= Fresh tastes @ school health canteen Strategy, SSDR =Sugar Sweetened Drink Ban, HKRG= Healthy Kids Buyers Guide, OECT= Occasional Food Criteria Table

Appendix 4.10 Sample Colour Coded Menu

CANTEEN		PRICE LIST – TERM 2 2015	
<u>Breakfast – available every day</u>		<u>New items Available</u>	
1 Raisin Toast (thick sliced)	\$0.70	1 Cheese Rolls	\$1.50
1 2 slices Plain Toast	\$0.70	1 Garlic Bread	\$1.20
1 Hot Milo	\$0.50	<u>Snack Foods – lunch every day</u>	
1 Cold Milo	\$1.00	<u>Price</u>	
1 Mini Cheese Rolls	\$1.00	11 Muffin – Choc Chip / Blueberry / Apple	\$1.20
<u>Lunch – to order every day</u>		1 Finger Bun	\$1.20
<u>Sandwiches</u>		11 Zombies – BBQ / Cheese / Chicken	\$0.70
1 Buttered Bread (White/Wholemeal)	\$0.70	1 Popcorn	\$0.50
1 Banana	\$2.00	1 Pretzels	\$0.80
1 Cheese	\$2.00	1 Red Rock Chips– Honey Soy / Plain	\$1.00
1 Chicken Meat	\$2.50	<u>Fruit – lunch every day</u>	
1 Egg & Lettuce	\$2.20	1 Fresh Fruit in Season	\$0.70
1 Ham	\$2.50	1 Carrot Sticks	\$0.20
1 Salad (No Meat)	\$3.00	Take apples to the canteen to have them made into a slinky	
1 Tomato	\$2.00	FREE	
1 Vegemite	\$1.20	<u>Frozen Treats – lunch every day</u>	
1 Cucumber	\$1.20	1 Tubes	\$0.70
1 Toasted	\$0.20	1 Juicie	\$0.50
1 Cheese – extra	\$0.50	1 Moosie	\$1.00
11 Chicken or Ham – extra	\$0.50	1 Icy Poles	\$1.00
11 Chicken or Ham Salad Wrap	\$3.50	1 Freeze Pop	\$0.50
<u>Salad Box</u>		<u>Drinks – lunch every day</u>	
1 Small round – Plain Salad	\$2.50	1 Water – 350ml	\$0.80
1 Large rectangle – Plain Salad	\$3.50	1 Water – 600ml	\$1.00
11 Chicken Meat – extra	\$0.60	11 Milk – Choc / Strawberry	\$1.40
1 Egg – extra	\$0.60	11 Juice – Apple / Apple & Blackcurrant / Orange	\$1.20
11 Ham – extra	\$0.60	11 Quench / OKF Flavoured Water – Assorted Flavours	\$1.40
Plain salad for Salad Box has Beetroot, Carrot, Cheese, Cucumber, Lettuce, Pineapple and Tomato		11 Pop Tops – Apple / Apple & Blackcurrant / Orange	\$1.40
<u>Hot Lunch Items – Monday to Thursday</u>		<u>Hot Lunch Items – FRIDAYS ONLY</u>	
1 Chicken Burgers	\$3.00	Spaghetti Bolognaise	\$2.50
Served with full salad and choice of sauce		Lasagne	\$2.50
Chicken Crackle Pack – full serve	\$3.00	Macaroni Cheese	\$2.50
1 4 crackles + 10 wedges		Fried Rice	\$2.50
Chicken Crackle Pack – half serve	\$2.00	Potato bake	\$2.50
1 2 crackles + 5 wedges		Pizza – H&P / Cheese / Meat Lovers	\$2.20
13 Cocktail Fish and Wedges	\$3.00	Pie – Large	\$2.00
1 Gluten Free Chicken Tenders	\$1.00ea	Pie – Party	\$1.30
1 Chicken Nuggets – 3 pack	\$1.50	Sausage Roll	\$1.70
1 Chicken Nuggets – 6 pack	\$2.50	Sauce – Tomato / BBQ / Sweet & Sour/ Tartare	\$0.30
1 Chicken Nuggets – 9 pack	\$3.50	<u>REMEMBER, NO HOT CHICKEN ON FRIDAYS</u>	
1 Mini Spring Rolls – 3 pack	\$1.50	<u>Stationery</u>	
1 Cocktail Fish x 3	\$1.50	Eraser	\$0.20
11 Fried Rice / Lasagne / Macaroni Cheese	\$2.50	Pencil	\$0.20
11 Spaghetti Bolognaise/Potato Bake	\$2.50	Sharpener – Large	\$0.50
11 Pizza – H&P / Cheese / Meat Lovers	\$2.20	Tissues	\$0.50
1 Pie – Large	\$2.00	Canola margarine is used on sandwiches and where possible light sauces	
1 Pie – Party	\$1.30		
1 Sausage Roll	\$1.70		
1 Meatballs & Sauce on Long Roll	\$2.30		
1 Sauce – Tomato / BBQ / Sweet & Sour/Tartare	\$0.30		
Total: 84			
Green: 45/54%			
Amber: 38/45%			
Red: 1/1%			

Appendix 5.1 Ethics Variation Approval 5 November 2015



5 November 2015

Dr L Wolfenden
Population Health
Wallsend Campus

Dear Dr Wolfenden,

Re: HNE Kids Healthy Eating and Physical Activity Program (06/07/26/4.04)

Thank you for submitting a request for an amendment to the above project. This amendment was reviewed by the Hunter New England Human Research Ethics Committee. This Human Research Ethics Committee is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research (2007)* (National Statement) and the *CPMP/ICH Note for Guidance on Good Clinical Practice*. Further, this Committee has been accredited by the NSW Department of Health as a lead HREC under the model for single ethical and scientific review.

I am pleased to advise that the Hunter New England Human Research Ethics Committee has granted ethical approval for the following amendment requests:

- To randomise schools to receive various strategies implemented within online canteen systems;
- To collect de-identified sales, demographic and usage data from the online canteen system;
- To collect and analyse canteen menus;
- To conduct a survey with canteen managers and conduct observations of canteen purchases to assess the impact of various online canteen strategies;
- For the Information Statement – observations (Version 7a dated 14 August 2015);
- For the Information Statement – no observations (Version 7b dated 14 August 2015);
- For the Consent Form – observations (Version 1 dated 14 August 2015);
- For the Consent Form – no observations (Version 1 dated 14 August 2015);
- For the Canteen Manager Survey (Version undated);
- For the Principal Information Statement – canteen support (Version 7c dated 8 October 2015);
- For the addition of Ms Tessa Delaney as student researcher; and
- For the addition of Ms Kathryn Reilly as student researcher

For the study: HNE Kids Healthy Eating and Physical Activity Program

Approval has been granted for this study to take place at the following site:

- **Hunter New England Local Health District**

Hunter New England Research Support & Development Office

Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214950 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 5.1 Ethics Variation Approval 5 November 2015 con't

Approval from the Hunter New England Human Research Ethics Committee for the above study is given for a maximum of 5 years from the date of the approval letter of your initial application after which a renewal application will be required if the study has not been completed. The above study is approved until **November 2016**.

The *National Statement on Ethical Conduct in Human Research (2007)* which the Committee is obliged to adhere to, include the requirement that the committee monitors the research protocols it has approved. In order for the Committee to fulfil this function, it requires:

- A report of the progress of the above study to be submitted at 12 monthly intervals. Your review date is **November 2015**. A proforma for the annual report will be sent two weeks prior to the due date.
- A final report must be submitted at the completion of the above study, that is, after data analysis has been completed and a final report compiled. A proforma for the final report will be sent two weeks prior to the due date.
- All variations or amendments to this study, including amendments to the Information Sheet and Consent Form, must be forwarded to and approved by the Hunter New England Human Research Ethics Committee prior to their implementation.
- The Principal Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including:
 - any serious or unexpected adverse events
 - Adverse events, however minor, must be recorded as observed by the Investigator or as volunteered by a participant in this study. Full details will be documented, whether or not the Investigator or his deputies considers the event to be related to the trial substance or procedure.
 - Serious adverse events that occur during the study or within six months of completion of the trial at your site should be reported to the Ethics Officer of the Hunter New England Human Research Ethics Committee as soon as possible and at the latest within 72 hours.
 - Copies of serious adverse event reports from other sites should be sent to the Hunter New England Human Research Ethics Committee for review as soon as possible after being received.
 - Serious adverse events are defined as:
 - Causing death, life threatening or serious disability.
 - Cause or prolong hospitalisation.
 - Overdoses, cancers, congenital abnormalities whether judged to be caused by the investigational agent or new procedure or not.
 - Unforeseen events that might affect continued ethical acceptability of the project.
- If for some reason the above study does not commence (for example it does not receive funding); is suspended or discontinued, please inform Dr Nicole Gerrand, the Manager, Research Support & Development Office as soon as possible.

Hunter New England Research Support & Development Office

Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214850 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 5.1 Ethics Variation Approval 5 November 2015 con't

The Hunter New England Human Research Ethics Committee also has delegated authority to approve the commencement of this research on behalf of the Hunter New England Local Health District. This research may therefore commence.

Should you have any queries about your project please contact Dr Nicole Gerrand as per the contact details at the bottom of the page. The Hunter New England Human Research Ethics

Committee Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the Hunter New England Local Health District website.

Please quote 06/07/264.04 in all correspondence.

The Hunter New England Human Research Ethics Committee wishes you every success in your research.

Yours faithfully

For: Ms M Hunter
Acting Chair
Hunter New England Human Research Ethics Committee

Hunter New England Research Support & Development Office

Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214950 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 5.2 Ethics Variation Approval 8 February 2016



8 February 2016

Dr L Wolfenden
Population Health
Wallsend Campus

Dear Dr Wolfenden

Re: HNE Kids Healthy Eating and Physical Activity Program (06/07/26/4.04)

Thank you for submitting a request for an amendment to the above project. This amendment was reviewed by the Hunter New England Human Research Ethics Committee. This Human Research Ethics Committee is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research (2007)* (National Statement) and the *CPMP/ICH Note for Guidance on Good Clinical Practice*. Further, this Committee has been accredited by the NSW Department of Health as a lead HREC under the model for single ethical and scientific review.

I am pleased to advise that the Hunter New England Human Research Ethics Committee has determined the variation meets the requirements of the National Statement on Ethical Conduct in Human Research and has granted ethical approval for the following amendment requests:

- To conduct a survey with canteen managers during attendance at canteen manager training;
- For the Canteen Managers' Information Sheet (Version 1 dated 29 January 2016); and
- For the Canteen Manager Survey 2016 (Version 1 dated January 2016); and
- For the Principal CATI (Version 6 dated 29 January 2016)

For the study: HNE Kids Healthy Eating and Physical Activity Program

Approval has been granted for this study to take place at the following site:

- **Hunter New England Local Health District**

Approval from the Hunter New England Human Research Ethics Committee for the above study is given for a maximum of 5 years from the date of the approval letter of your initial application after which a renewal application will be required if the study has not been completed. The above study is approved until **November 2016**.

The *National Statement on Ethical Conduct in Human Research (2007)* which the Committee is obliged to adhere to, include the requirement that the committee monitors the research protocols it has approved. In order for the Committee to fulfil this function, it requires:

Hunter New England Research Support & Development Office
Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214950 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 5.2 Ethics Variation Approval 8 February 2016 con't

- A report of the progress of the above study to be submitted at 12 monthly intervals. Your review date is **November 2016**. A proforma for the annual report will be sent two weeks prior to the due date.
- A final report must be submitted at the completion of the above study, that is, after data analysis has been completed and a final report compiled. A proforma for the final report will be sent two weeks prior to the due date.
- All variations or amendments to this study, including amendments to the Information Sheet and Consent Form, must be forwarded to and approved by the Hunter New England Human Research Ethics Committee prior to their implementation.
- The Principal Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including:
 - any serious or unexpected adverse events
 - Adverse events, however minor, must be recorded as observed by the Investigator or as volunteered by a participant in this study. Full details will be documented, whether or not the Investigator or his deputies considers the event to be related to the trial substance or procedure.
 - Serious adverse events that occur during the study or within six months of completion of the trial at your site should be reported to the Ethics Officer of the Hunter New England Human Research Ethics Committee as soon as possible and at the latest within 72 hours.
 - Copies of serious adverse event reports from other sites should be sent to the Hunter New England Human Research Ethics Committee for review as soon as possible after being received.
 - Serious adverse events are defined as:
 - Causing death, life threatening or serious disability.
 - Cause or prolong hospitalisation.
 - Overdoses, cancers, congenital abnormalities whether judged to be caused by the investigational agent or new procedure or not.
 - Unforeseen events that might affect continued ethical acceptability of the project.
- If for some reason the above study does not commence (for example it does not receive funding); is suspended or discontinued, please inform Dr Nicole Gerrand, the Manager, Research Support & Development Office as soon as possible.

The Hunter New England Human Research Ethics Committee also has delegated authority to approve the commencement of this research on behalf of the Hunter New England Local Health District. This research may therefore commence.

Should you have any queries about your project please contact Dr Nicole Gerrand as per the contact details at the bottom of the page. The Hunter New England Human Research Ethics Committee Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the Hunter New England Local Health District website.

Please quote 06/07/26/4.04 in all correspondence.

Hunter New England Research Support & Development Office

Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214950 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 5.2 Ethics Variation Approval 8 February 2016 con't

The Hunter New England Human Research Ethics Committee wishes you every success in your research.

Yours faithfully

For: Ms M Hunter
Acting Chair
Hunter New England Human Research Ethics Committee

Hunter New England Research Support & Development Office
Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214950 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 5.3 Ethics Variation Approval 22 February 2016



Health
Hunter New England
Local Health District

22 February 2016

Dr L Wolfenden
Population Health
Wallsend Campus

Dear Dr Wolfenden,

Re: HNE Kids Healthy Eating and Physical Activity Program (06/07/26/4.04)

Thank you for submitting a request for an amendment to the above project. This amendment was reviewed by the Hunter New England Human Research Ethics Committee. This Human Research Ethics Committee is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research (2007)* (National Statement) and the *CPMP/ICH Note for Guidance on Good Clinical Practice*. Further, this Committee has been accredited by the NSW Department of Health as a lead HREC under the model for single ethical and scientific review.

I am pleased to advise that the Hunter New England Human Research Ethics Committee has determined the variation meets the requirements of the National Statement on Ethical Conduct in Human Research and has granted ethical approval for the following amendment requests:

Document	Version	Date
Canteen Manager Survey	Version 2	February 2016

For the study: **HNE Kids Healthy Eating and Physical Activity Program**

Approval has been granted for this study to take place at the following site:

- **Hunter New England Local Health District**

Approval from the Hunter New England Human Research Ethics Committee for the above study is given for a maximum of 5 years from the date of the approval letter of your initial application after which a renewal application will be required if the study has not been completed. The above study is approved until **November 2016**.

The *National Statement on Ethical Conduct in Human Research (2007)* which the Committee is obliged to adhere to, include the requirement that the committee monitors the research protocols it has approved. In order for the Committee to fulfil this function, it requires:

- A report of the progress of the above study to be submitted at 12 monthly intervals. Your review date is **November 2016**. A proforma for the annual report will be sent two weeks prior to the due date.

Hunter New England Research Support & Development Office

Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214950 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 5.3 Ethics Variation Approval 22 February 2016 con't

- A final report must be submitted at the completion of the above study, that is, after data analysis has been completed and a final report compiled. A proforma for the final report will be sent two weeks prior to the due date.
- All variations or amendments to this study, including amendments to the Information Sheet and Consent Form, must be forwarded to and approved by the Hunter New England Human Research Ethics Committee prior to their implementation.
- The Principal Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including:
 - any serious or unexpected adverse events
 - Adverse events, however minor, must be recorded as observed by the Investigator or as volunteered by a participant in this study. Full details will be documented, whether or not the Investigator or his deputies considers the event to be related to the trial substance or procedure.
 - Serious adverse events that occur during the study or within six months of completion of the trial at your site should be reported to the Ethics Officer of the Hunter New England Human Research Ethics Committee as soon as possible and at the latest within 72 hours.
 - Copies of serious adverse event reports from other sites should be sent to the Hunter New England Human Research Ethics Committee for review as soon as possible after being received.
 - Serious adverse events are defined as:
 - Causing death, life threatening or serious disability.
 - Cause or prolong hospitalisation.
 - Overdoses, cancers, congenital abnormalities whether judged to be caused by the investigational agent or new procedure or not.
 - Unforeseen events that might affect continued ethical acceptability of the project.
- If for some reason the above study does not commence (for example it does not receive funding); is suspended or discontinued, please inform Dr Nicole Gerrand, the Manager, Research Support & Development Office as soon as possible.

The Hunter New England Human Research Ethics Committee also has delegated authority to approve the commencement of this research on behalf of the Hunter New England Local Health District. This research may therefore commence.

Should you have any queries about your project please contact Dr Nicole Gerrand as per the contact details at the bottom of the page. The Hunter New England Human Research Ethics Committee Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the Hunter New England Local Health District website.

Please quote 06/07/26/4.04 in all correspondence.

Hunter New England Research Support & Development Office

Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214650 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 5.3 Ethics Variation Approval 22 February 2016 con't

The Hunter New England Human Research Ethics Committee wishes you every success in your research.

Yours faithfully

For: Ms M Hunter
Acting Chair
Hunter New England Human Research Ethics Committee

Hunter New England Research Support & Development Office

Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214850 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 5.4 Principal Information Statement

Hunter New England Population Health

Direct Contact Details

Phone: (02) 49246477 Fax: (02) 4924 6490

Email: PHEnquiries@hnehealth.nsw.gov.au



Health
Hunter New England
Local Health District

January 2015

The Principal

«School»

«Address»

«State» «Postcode»

Dear Principal

HUNTER NEW ENGLAND SCHOOL CANTEEN SUPPORT INFORMATION FOR PRINCIPALS

Version 7C, dated 08/10/2015

Over the past few years, your school has participated in the *Good for Kids. Good for Life* program and evaluation conducted by Dr Luke Wolfenden from Hunter New England Population Health. The aim of the project is to identify opportunities for Primary Schools to promote physical activity and healthy eating in children. The purpose of this correspondence is to inform you of the canteen support available to your school over the next 12 months. *Good for Kids. Good for Life* will be conducting Canteen Managers Training Workshops and providing further support and resources to schools throughout the HNE region from Term 1 next year. The training and support aims to help schools implement the *Fresh Tastes@School* NSW Healthy Canteen Strategy and improve the financial management for canteens. We will be sending out workshop information in 2016 and would appreciate Principals support for Canteen Managers and parent group representatives to attend.

Most schools will be provided canteen support over the next 12 months, however some schools may have to wait until 2017. The order in which canteen support is provided to schools may be randomised. In order to assess the effectiveness of support we provide, we will invite schools to provide copies of their canteen menus. Principals and canteen managers will also have the opportunity to participate in surveys before support is provided and again in 12 months' time.

Why is the research being done?

We understand that schools have a number of systems and practices in place that are conducive to children developing healthy lifestyles. We would like to identify if there are any additional ways to support primary schools to encourage children to consume healthy foods and drinks from their school canteen.

What will you be asked to do?

We would like to invite you to participate in;

1. **A healthy canteen initiative** – Commencing with a Canteen Managers Training Workshop followed by on-going support for the remainder of 2016.
 2. **A canteen menu assessment** – We will be contacting your school to gain a copy of the canteen menu during Term 4 2015 and periodically throughout 2016.
 3. **A paper or pencil survey OR a short telephone survey**– The purpose of this survey is to ask you about the current policies and practices relating to healthy eating in your school, and to update our records with any new school contact details. We will contact you via telephone to invite you to participate in a telephone survey which can be conducted at a time convenient to you. Your school was also invited to participate in a similar survey in 2006, 2009, 2012 and 2014. The telephone survey should take approximately 20 minutes to complete. If you would like to nominate another staff member to complete the survey on your behalf that is fine, please also pass this information on to them.
-

Appendix 5.4 Principal Information Statement con't

4. **A canteen manager's survey-** When we call, we will also ask your permission to contact your canteen managers directly across the next 12 months. We would like to invite them to participate in surveys that can help us with identifying how to best support them with providing healthier foods. When you provide us with this permission, you are providing us with consent to contact them directly and not consent to participate in the survey. Your canteen managers will be able to choose at that time whether they would like to complete the survey. The survey with the Canteen Managers will take approximately 15 minutes and can be completed at a time convenient to the canteen manager and school.

What are the risks and benefits of participating?

Participating in the menu collection and telephone survey will allow the research team to tailor the support we can offer your school regarding healthy eating policies and practices. We don't anticipate there will be any risk to you or your school from participation.

How will your privacy be protected?

Any information provided from the menu assessment will be stored electronically in a secure facility. All electronic data records will be password protected and only accessed by authorised members of the research team. It will not be possible to identify individuals or schools from any publications or presentations arising from the research.

What choice do you have?

Participation in this research is entirely your choice. Whether or not you and/or your Canteen Manager decide to participate, the decisions will not disadvantage you or your school in any way. If you do participate, you may withdraw from the research at any time without giving a reason, and you will have the option of withdrawing any information you have provided.

How will the information collected be used?

Information provided from the menu collection will be fed back to your school in a report summarising the results of the menu assessment. Data from the study may also be presented at scientific conferences, published within scientific journals or form part of student theses, or provided to the NSW Ministry of Health as part of usual reporting purposes. De-identified, aggregate data from the NSW Ministry of Health may be used to monitor the implementation of health promotion activities in NSW. No other schools or organisations will be able to find out the results of your school and no individuals or schools will be able to be identified in any report or publication by the program. Data collected from the Good for Kids staff when they meet with schools to discuss and support adoption of healthy eating practices may also be provided to NSW Health and recorded on a ministry approved electronic database. Over the coming years of the program we will contact you periodically to invite you to participate in future surveys.

What do you need to do to participate?

If you would like to participate in the canteen support and research you do not have to do anything further. We will contact your school in the near future to collect a copy of the canteen menu and to invite you and your canteen manager to complete a brief survey. If there is anything that you do not understand, or you would like more information, please contact Kathryn Reilly on (02) 4924 6393.

Thank you for considering this invitation

Yours sincerely

Dr Luke Wolfenden
Program Manager
Hunter New England Population Health

This project has been approved by the Hunter New England Human Research Ethics Committee of Hunter New England Health, Reference: 06/07/26/4.04 and Department of Education and Training, Reference:

Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to Dr Nicole Gerrand, Professional Officer (Research Ethics), Hunter New England Human Research Ethics Committee, Hunter New England Health, Locked Bag 1, New Lambton NSW 2305, telephone (02) 49214950, email Nicole.Gerrand@hnehealth.nsw.gov.au

Appendix 5.5 Canteen Manager Information Statement

Hunter New England Population Health

Direct Contact Details

Phone: (02) 49246477 Fax: (02) 4924 6490
Email: PHEnquiries@hnehealth.nsw.gov.au



February 2016

Dear Canteen Manager

HUNTER NEW ENGLAND SCHOOL CANTEEN SUPPORT
School Canteen Workshop Questionnaire
Version 1.1, dated 29/01/2016

INFORMATION FOR CANTEEN MANAGERS

Over the past few years, your school has participated in the Good for Kids. Good for Life program and evaluation conducted by Assoc. Professor Luke Wolfenden from Hunter New England Population Health. The purpose of the project is to identify opportunities for Primary Schools to promote physical activity and healthy eating in children. The purpose of this correspondence is to inform you of the canteen support available to your school over the next 9 months. *Good for Kids. Good for Life* will be conducting Canteen Managers Training Workshops and providing further support and resources to schools throughout the HNE region from Term 1 this next year. The training and support aims to help schools implement the *Fresh Tastes@School* NSW Healthy Canteen Strategy and improve the financial management for canteens. You should have already received workshop information and registration forms in the mail.

In order to assess the effectiveness of support we have invited schools to provide copies of their canteen menus. We will also invite you to participate in a survey at the Canteen Managers Training Workshop.

Why is the research being done?

Schools have an important role to play in promoting physical activity and healthy eating to children. Canteens in particular play an important role in providing children with healthy food and drinks whilst at school. As such, we are seeking information about school canteens from school canteen staff. We understand that schools have a number of systems and practices in place that are conducive to children developing healthy lifestyles. However, we would like to identify if there are more ways in which we can enhance schools' capacity to encourage children's consumption of healthy food and drinks.

What will you be asked to do?

We would like to ask you to:

1. **Complete a survey-** The survey asks about your school canteen practices and the products it sells. It should take approximately 15 minutes to complete. All canteen managers will be invited to complete the survey during attendance at the canteen managers training workshop.

What are the risks and benefits of participating?

The data we collect will assist us in planning further services for school canteens and allow the research team to tailor the support we can offer your school regarding healthy canteen practices. We don't anticipate there will be any risk to you or your school from participation.

How will your privacy be protected?

Any information provided from the Canteen Managers survey will be stored electronically in a secure facility. All information transferred electronically will be done in a file which is password protected. It will not be possible to identify individuals or schools from any publication or presentation arising from the research.

Appendix 5.5 Canteen Manager Information Statement con't

What choice you do have?

Participation in this research is entirely your choice. Whether or not you decide to participate, the decisions will not disadvantage you or your school in any way. If you do participate, you may withdraw from the research at any time without giving a reason, and you will have the option of withdrawing any information you have provided.

How will the information collected be used?

Data from the study may be presented at scientific conferences, be published within scientific journals or form part of student theses, or provided to the NSW Ministry of Health as part of standard reporting procedures. No individual or primary school will be able to be identified in any report or publication by the program. Over the next 2 years we may contact you periodically to invite you to participate in future surveys.

What do you need to do to participate?

If you would like to participate simply complete the survey at the workshop. A survey return box will be available to place completed surveys at the workshop. If there is anything that you do not understand, or you would like more information, please contact Kathryn Reilly on (02) 4924 6393.

Thank you for considering this invitation

Yours sincerely

Dr Luke Wolfenden
Program Manager
Hunter New England Population Health

This project has been approved by the Hunter New England Human Research Ethics Committee of Hunter New England Health, Reference: 06/07/26/4.04 and Department of Education and Training, Reference: 2012277

Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to Dr Nicole Gerrand, Professional Officer (Research Ethics), Hunter New England Human Research Ethics Committee, Hunter New England Health, Locked Bag 1, New Lambton NSW 2305, telephone (02) 4921 4950, or email Nicole.Gerrand@hnehealth.nsw.gov.au

Appendix 5.6 Sample Online Canteen Product Database



The screenshot displays the Good for Kids Good for Life website. At the top, a banner image shows two young boys in school uniforms smiling and eating. Below the banner is a navigation bar with links: HOME, EARLY CHILDHOOD SERVICES, PRIMARY SCHOOLS, HIGH SCHOOLS, PARENTS & CARERS, ABOUT US, and a SEARCH button. A secondary navigation bar lists: LIVE LIFE WELL, PHYSICAL ACTIVITY, NUTRITION, CANTEENS, and CRUNCH&SIP®. The main content area is titled 'How we work with Primary Schools' and includes a paragraph about the school environment and a 'Canteen Product Search' button. A sidebar on the right lists 'IN PRIMARY SCHOOLS' with links to LIVE LIFE WELL, PHYSICAL ACTIVITY, NUTRITION, CANTEENS, and CRUNCH&SIP®.

Good for kids
good for life

HOME EARLY CHILDHOOD SERVICES PRIMARY SCHOOLS HIGH SCHOOLS PARENTS & CARERS ABOUT US SEARCH

LIVE LIFE WELL PHYSICAL ACTIVITY NUTRITION CANTEENS CRUNCH&SIP®

[PRIMARY SCHOOLS](#)

How we work with Primary Schools

Schools provide a unique environment in which children can develop learned behaviours conducive to a healthy lifestyle. Children five to fifteen years of age spend a large proportion of their time at school which provides an opportunity for teachers to role model, teach and provide opportunities for healthy eating and physical activity messages. School canteens are also an integral part of the food environment by providing food services to students and opportunities for them to make informed consumer choices that cement messages taught in the classroom.

Good for Kids Good for Life provides support for Primary Schools consistent with the NSW Ministry of Health's Live Life Well @ School Program, and are in line with National nutrition and physical activity guidelines and NSW Curriculum outcomes. Good for Kids aims to support best practice for healthy eating and physical activity in Primary Schools across our area.

IN PRIMARY SCHOOLS

- ▶ LIVE LIFE WELL
- ▶ PHYSICAL ACTIVITY
- ▶ NUTRITION
- ▶ CANTEENS
- ▶ CRUNCH&SIP®

Canteen Product Search
click here

Appendix 5.7 Sample Canteen Manager Training – Registration Flyer



Good for kids
good for life



CANTEEN MANAGER TRAINING

Canteen staff, volunteers and P&C/P&F representatives are invited to attend one of the following FREE Canteen Manager training workshops:

DATE	LOCATION
Monday 7th March	Muswellbrook District Hospital
Tuesday 22nd March	Tamworth Population Health
Tuesday 29th March	Club Taree
Tuesday 5th April	Wallsend Health Campus

These free workshops will run from 10.00am to 1.45pm (morning tea and lunch included) and will provide opportunities for networking, professional development and distribution of Good for Kids canteen resources/equipment.

To register, please complete the attached registration form and fax to 4924 6490 or email to katie.robertson@hnehealth.nsw.gov.au

For further information, please contact your Good for Kids Support Officer: Kathryn Reilly on 4924 6393



Health
Hunter New England
Local Health District

PHONE: 0437305075

Appendix 5.8 Sample Canteen Manager Training – Registration Letter

Hunter New England Local Health District
Hunter New England Population Health
Direct Contact Details
Phone: (02) 4924 6381 Fax: (02) 4924 6490
Email: lisa.janssen@hnehealth.nsw.gov.au



Date

Dear _____,

Thank you for registering for the Canteen Manager Training on **Date at Venue**. The following people from your school have also registered:

Can you please share the information regarding venue location and parking with them?

VENUE LOCATION

The training will take place in the **??** Room at **??**, Address. Details of access.

PARKING

???

REIMBURSEMENT OF TRAVEL COSTS OR WAGES

To support your attendance at this workshop, The Good for Kids Project will either:

1. Reimburse salary costs, if you are a paid canteen manager; or
2. Reimburse travel costs;

up to a maximum of \$150 per school.

To access these funds, you will need to forward a Tax Invoice from your School or P&C detailing these costs. The invoice needs to state "Tax Invoice" and include the Company ABN, a date and the total cost (indicating a GST amount). The invoice needs to be addressed to:

Hunter New England Local Health District
Population Health
Locked Bag 10
[Wallsend NSW 2287](#)
ATTN: Kathryn Reilly

Appendix 5.9 Action Plan Template



_____ School action plan

Canteen manager training – where to from here....


Goal/Action	Steps to take	Timeframe

Appendix 5.10 Training Workshop Agenda




		Term 1, 2016
<h1>Canteen Manager Training</h1> <h2>- Agenda -</h2>		
The Registration Desk and morning tea will be available from 9.30am.		
10.00 am	Welcome	
10.05 am	Survey	
10.15 am	Fresh Tastes @ School	
10.50 am	Menu Feedback Reports	
11.05 am	Good for Kids Website and Database	
11.40 am	Making a Healthy Profit (Part 1)	
12.10 pm	LUNCH	
12.40 pm	Making a Healthy Profit (Part 2)	
12.55 pm	Volunteers – Recruiting and Retaining	
1.10 pm	Where to from here – Action Planning	
1.25 pm	Evaluation	
1.45 pm	Close	


Appendix 5.11 Sample Canteen Manager Training Presentation – FT@S




Overview

- Background
- Fresh Tastes @ School
- What are **GREEN**, **AMBER** and **RED** foods
- Activities:
 - Best Sellers,
 - Label reading,
 - Categorising your menu





What do we know about our Students? SPANS 2010



>90% Year K,2,4,6 students consuming recommended amount of fruit per day





Between 9% -18% of students drink one or more cups of soft drink per day



50% K & Yr 2
70% of Yr 4 & Yr 6
NOT consuming the recommended serves of vegetables per day.

22.8% of NSW students 5-16 years were overweight or obese

Obese children have a 25% - 50% chance of going on to be obese adults

Source: SPANS 2010





Health
Hunter New England
Local Health District

FRESH TASTES @ SCHOOL



(NSW HEALTHY SCHOOL CANTEEN STRATEGY)




NSW HEALTHY SCHOOL CANTEEN STRATEGY



BACKGROUND







Appendix 5.12 Sample Canteen Manager Training Presentation – Making a Healthy Profit



Overview



1. Know exactly what items cost
2. Know how items are priced
3. Manage portions
4. Stocktake regularly
5. Order efficiently
6. Monitor waste
7. Know your market
8. Promote to your market



What is your profit target?

- Will vary from school to school
- Depend on the aims of the canteen within the school
 - Provide healthy food at the lowest price possible?
 - Fundraiser for the school?
- How much to aim for and what to spend it on should be outlined in the canteen policy.




MAKING A HEALTHY PROFIT





What is Financial Management?

"...is not about turning the school canteen into a ruthless money making venture that puts profit ahead of children's health. It's about managing the canteen's financial resources effectively to meet the goals set out in the canteen policy" (Management Sense, Food Sense, 1997)

- In practice:
 - Knowing what the canteen spends
 - Planning for the canteen's obligations
 - Accounting for all the canteen's money and stock
 - Setting profit goals and setting selling prices to meet these goals.




Appendix 5.13 Training Workshop Resource Contents page



usb contents

Folder	contents
1. Fresh Tastes @ School	<ul style="list-style-type: none"> - Fresh Tastes @ School Tool Kit - Fresh Tastes @ School Presentation - Fresh Tastes @ School Canteen Menu Planning Guide - FACTSHEET: What is Fresh Tastes @ School - FACTSHEET: Red Sneakers - Good for Kids Case Studies <ul style="list-style-type: none"> • Charlestown Public School • Jesmond Public School • Metford Public School • Wiripunga Public School
2. Menu Planning	<ul style="list-style-type: none"> - FACTSHEET: Good for Kids Canteen Database - FACTSHEET: Good for Kids Small School Resource - Good for Kids Common Canteen Drinks - Good for Kids Sample Menu - TEMPLATE: Good for Kids Landscape Menu - TEMPLATE: Good for Kids Portrait Menu
3. Financial Management	<ul style="list-style-type: none"> - FACTSHEET: Marketing Healthy Food - Making a Healthy Profit Presentation - Good for Kids SAMPLES/TEMPLATES: <ul style="list-style-type: none"> • Mark-Up Table • Stock Ordering Form • Stocktake Record • Wastage Sheet
4. Canteen Operations	<ul style="list-style-type: none"> - Canteen Managers Volunteer Information Pack - FACTSHEET: End of Term Checklist - FACTSHEET: Food Safety in the School Canteen - FACTSHEET: 4 R's of Volunteering - TEMPLATE: Good for Kids Run Sheet
5. Recipes	<ul style="list-style-type: none"> - Good for Kids Canteen Recipes - Good for Kids Procedure Cards - TEMPLATES: Amber/Green Recipe Cards - TEMPLATE: Procedure Card

PHONE/SMS: 0437 305 075

Appendix 5.14 Sample Canteen Recipe Card



HEALTHY LASAGNE RECIPE

GREEN HOT FOODS

SUMMARY	
Number of Serves	6
Total Cost of Ingredients	\$12.50
Cost price per Serve	\$2.10
Selling price per Serve	\$3.50 (66% mark up)
Source of recipe	Good For Kids
Last reviewed	2014



INGREDIENTS	QTY	COST
Lean mince	500g	6.00
Carrot, grated	1	0.34
Brown onion, diced	1	0.54
Cloves garlic, crushed	2	0.25
Tin diced tomatoes, salt reduced	400g	0.80
Classic tomato pasta sauce, salt reduced	375g	1.50
Lasagne sheets	280g or approx. 7 sheets	2.02
Cheddar cheese, low fat, grated	¼ cup	0.60
Cornflour	2 tbsp.	0.02
Milk, low fat	1 ¾ cups	0.43

METHOD

1. To make the cheese sauce: Combine cornflour with ¼ cup of milk and stir until smooth, then set aside. Heat the remaining milk in a saucepan until boiling. Add the cornflour mixture, stirring until sauce boils and thickens. Stir through tasty cheese.
2. Preheat oven to 180°C (160°C fan forced). Lightly grease a shallow 26 x 18cm ovenproof dish with cooking spray. Heat olive oil in a large non-stick pan over medium-high heat. Add the onion and garlic to the pan and cook for 3 minutes, stirring regularly. Add carrot and stir for a further 2 minutes.
3. Add beef mince into the pan and cook, stirring and breaking up any large lumps, for 4 minutes, or until browned.
4. Stir in diced tomatoes and pasta sauce. Bring mixture to the boil then reduce heat to low. Simmer, uncovered, for 15 minutes until vegies are tender (you can add more vegies if you wish).
5. To assemble lasagne, cover bottom of dish with 2-3 Tbsp. of meat sauce (to prevent pasta from burning) and place sheets on top. Layer one-third of meat sauce on the top of sheets and one-third cheese mixture on top of meat sauce. Repeat and layer twice more. Bake in the oven for 40 minutes or until golden and tender.

Appendix 5.15 Sample Canteen Menu







	BEST CHOICE		SELECT CAREFULLY	
SANDWICHES, WRAPS and ROLLS	LF Cheese	\$1.30	Vegemite	\$1.10
	LF Cheese & Tomato	\$1.60	Jam	\$1.20
	Egg	\$1.50	Honey	\$1.20
	Egg & Lettuce	\$1.70	Ham	\$1.50
	Chicken or Tuna	\$1.80		
	Salad	\$1.90		
	Ham & LF Cheese	\$2.10		
	LF Cheese, Ham & Tom	\$2.20		
	Ham & Salad	\$2.70		
	Chicken or Tuna & Salad	\$2.90		
* For rolls and wraps, add \$0.20 * For LF cheese, add \$0.40 * For pineapple, add \$0.50				
SALAD BOXES	Salad Box	\$3.00		
	* Add LF cheese	\$0.40		
	* Add egg	\$0.70		
	* Add ham, chicken, tuna	\$1.00		
HOT FOOD	Corn on the Cob	\$0.80	LF Pie	\$2.50
	CM Garlic Bread	\$0.40	LF Sausage Roll	\$1.50
	Lasagne	\$3.00	½ Sausage Roll available for 80c	
	CM Pizza	\$2.30	Chicken Breast Nugget(3)	\$1.30
	Hawaiian, Chicken & Cheese		Hot Chicken & Salad Roll	\$3.20
	Toasted Sandwiches		Three nuggets on a roll with salad	
	See sandwich options above. Please specify "toasted" on order.			
SNACKS	Fruit	\$0.80	Potato Chips	\$1.20
	Apple, Banana, Orange, Grapes		Honey Soy, Sea Salt	
	Crackers & LF Cheese	\$0.60	Finger Bun	\$1.30
	CM Popcorn	\$0.30	LF Choc Chip Muffin	\$1.40
	LF Flavoured Yoghurt	\$1.10		
	Strawberry, Fruit Salad			
DRINKS	CM Pikelets (2) with Jam	\$0.50		
	Water	\$1.00		
	LF Plain Milk	\$1.00		
	LF Flavoured Milk	\$1.20		
	Chocolate, Strawberry			
FROZEN TREATS	99% Fruit Juice (200 mL)	\$1.50		
	Apple, Orange, Apple & Blackcurrant			
	CM Milky Bites	\$0.30	Paddle Pop	\$1.30
	Chocolate, Strawberry		Chocolate, Banana	
	Frozen Fruit Pieces (3)	\$0.20	Frozen Yoghurt	\$1.80
	Seasonal – Select at canteen		Strawberry	
	Quelch Fruit Sticks	\$0.50	LF Vanilla Cups	\$1.20
Apple, Blackcurrant, Tropical, Orange, Mango			Icy Pole	\$1.10
			Lemonade	

Appendix 5.16 Resource Common Canteen Drinks



Common Canteen Drinks

Drink	Manufacturer	Supplier	Flavours	Serving Sizes	Picture	GREEN	AMBER	BANNED
Milks								
Mighty Cool <i>Reduced Fat</i>	Norco	D & R Goodwin, Supermarket	Chocolate, Banana, Strawberry	250ml- Pop Top		×		
Moove <i>Reduced Fat</i>	Lion Co	Lion Dairy & Drinks, Supermarket	Chocolate, Strawberry, Banana	300ml- Bottle		×		
Big M UHT <i>Reduced Fat</i>	Lion Co	Lion Dairy & Drinks, Kaytering Supplies, Mayco	Chocolate, Strawberry	250ml- Popper		×		
Breaka UHT <i>Full Cream</i>	Parmalat	Parmalat, NCD, PFD Newcastle, PFD Inverell	Chocolate, Strawberry, Vanilla	250ml- Popper			×	

Appendix 5.17 Small Schools Resource



Smaller schools can face additional challenges when trying to provide a healthy and profitable canteen menu. Below are some suggestions you may find helpful;

- Keep the menu small and manageable – students often order the same lunch repeatedly and don't need a huge variety.
- *Large number of choices* = Large amount of money tied up as stock = More staff and volunteers to prepare food
- VS**
- *Small number of choices* = Small amount of money tied up as stock = Less staff and volunteers to prepare food
- As a general rule, canteens are more manageable if they are open 1 day per week per every 100 students at the school. That is, if your school has less than 100 students then it might function best open 1-2 days per week. Many schools struggle finding enough volunteers to staff 5 days of operation each week, therefore reducing the days the canteen is open places less strain on volunteer numbers.
- If the canteen is open 2-3 days per week, have those days consecutive to avoid unnecessary wastage of food and therefore financial losses.
- If there is a concern that some children come to school without lunch on days the canteen is not open, have some vegemite sandwiches in the canteen freezer for emergencies.
- If getting access to fresh fruit or vegetables is difficult, use frozen or tinned varieties. Likewise if access to fresh bread is limited, freeze loaves on delivery day.
- Have some menu items that are freezable.
- Pre-ordering meals reduces unnecessary waste so utilise this system as much as possible.
- Utilise your local supermarket if needed. Just keep in mind that products will cost more when not bought directly from a supplier.
- Find out the suppliers of your local store/supermarket and see if they have a range of products appropriate for schools that you could order from.
- Try some of the *Good for Kids* easy GREEN recipes in the resource folder such as Milky Bites, Yoghurt Stars, Pikelets, Chicken and Cheese Pizza.

Appendix 5.18 Sample Recognition Letter

Hunter New England Local Health District
Hunter New England Population Health
Direct Contact Details
Phone: (02) 49246257 Fax: (02) 49246209
Email: Nicole.Nathan@hnehealth.nsw.gov.au



Date

Principal name

Principal

School name

Address

Dear Cathy,

I am writing to congratulate your school on the great efforts it has made in moving towards a healthy canteen. After speaking with Kathryn Reilly, who has been working with your school, I was so thrilled to learn that your school canteen not only has no RED items but has also made significant progress towards a menu which is 50% GREEN. I understand the difficulties schools face when trying to make any change to their menu so please pass my thanks onto your canteen manager, **Canteen manager name** and the other canteen volunteers and parents who have helped make this happen, it is a great achievement. We are looking forward to continuing to work with your school this year.

Yours sincerely

Nicole

Nicole Nathan
Program Manager
Good for Kids. Good for Life.



Hunter New England Local Health District
ABN 83 598 010 203

Hunter New England Population Health
Locked Bag 10
Wallsend, NSW 2287
Phone (02) 4924 6477 Fax (02) 4924 6490
Email ~~HNELHD~~-PHEnquiries@hnehealth.nsw.gov.au
www.hnehealth.nsw.gov.au/hneph

Appendix 5.19 Sample Menu Feedback Report



ID: «ID»

«School» Canteen Menu Feedback Report Term 4 2016

Good for Kids have reviewed your school canteen menu and provided some suggestions for achieving a healthier menu that meets the 'Fresh Tastes @ School' NSW Healthy School Canteen Strategy. This review was based on your written menu alone, with no additional product information collected. As a result, certain assumptions have been made regarding the items on the menu based on *Good for Kids* product knowledge and experience working with school canteens. A copy of the assumptions guide can be found in Appendix 2 to enable you to identify which assumptions were applied to your canteen menu items. It is encouraged to compare your product information with the assumptions guide or visit the *Good for Kids* Canteen Product Database at www.goodforkids.nsw.gov.au/primary-schools/canteens

What is 'Fresh Tastes @ School'?

'Fresh Tastes @ School' is a NSW government endorsed strategy to support schools to encourage and promote the purchase of healthy foods and drinks from the canteen. The strategy classifies menu items as GREEN, AMBER, RED or BANNED drinks based on their nutritional value.

Goals of 'Fresh Tastes @ School'

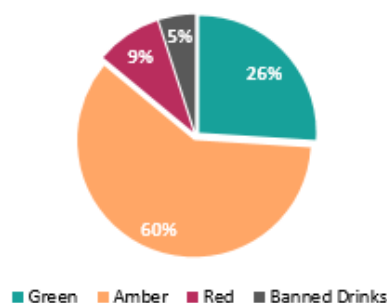
'Fresh Tastes @ School' recommends that school canteen menus should aim to have:
0% RED and >50% GREEN

Benefits of 'Fresh Tastes @ School'

'Fresh Tastes @ School' is all about giving students a taste for healthy foods and encouraging them to make healthier food choices. Encouraging healthy eating can also improve children's concentration, behaviour in class and can establish healthy eating habits that reduce the risk of chronic disease in later life.

Does your menu meet 'Fresh Tastes @ School'?

No – As shown in the pie chart, based on the assumptions guide, your canteen menu has «M__RED_items»% RED, «M__BANNED_items_»% BANNED and «M__GREEN_items»% GREEN



Note: A colour coded copy of your menu can be found at the back of this report

Appendix 5.19 Sample Menu Feedback Report con't



How can you meet 'Fresh Tastes @ School'?

It can be hard to figure out what change to make first. Here are some suggestions:

1. Removing RED items and BANNED drinks – items classified RED/BANNED are based on the attached assumptions guide.

If 0 RED – Congratulations your school has no RED items or BANNED drinks! If you are thinking of introducing a new menu item make sure you consider how it compares against the 'Fresh Tastes @ School' criteria by visiting the Good for Kids Canteen Product Database (see link below) to ensure it is not Red/Banned. Common RED products include cough lollies, sunfruits, jelly lollies, jelly puddings, jelly sticks, yogurt frogs and ovalteenies and fruit drinks with less than 99% fruit juice are BANNED.

If >0 RED - It can be hard to work out what 'RED or BANNED items' are. Common RED products include cough lollies, sunfruits, jelly lollies, jelly puddings, jelly sticks, yoghurt frogs, ovalteenies and fruit drinks with less than 99% fruit juice are BANNED. The RED/BANNED foods on your current menu are listed below with some recommendations.

RED/BANNED item	Assumption made	Recommendations:
Hot dogs - RED	Most hot dogs are above the occasional food criteria and are therefore RED	<ul style="list-style-type: none"> Remove hot dogs from regular sale Save hot dogs for 'RED food days'
Confectionary - RED	All confectionary is RED	<ul style="list-style-type: none"> Remove confectionary from sale and consider replacing with an alternative listed below Small serves of frozen fruit (pineapple rings, orange wedges, grapes) Frozen low fat milky bites or yoghurt bites (freeze in ice cube trays or small plastic cups) Rice crackers or air-popped popcorn

2. Increasing the proportion of GREEN items.

If >50% GREEN – You already have >50% GREEN – well done!

You might like to consider:

Remove any suggestions school is already doing

- Adding GREEN snack foods to the menu such as fruit (frozen, tinned or fresh), low fat yoghurt, frozen low fat milk or low fat yoghurt bites, air-popped popcorn, pikelets, 99% fruit juice ice blocks and lunch items such as egg or baked bean sandwiches and salad boxes
- Removing less popular AMBER foods and drinks
- Reducing the flavours and variety of AMBER snack foods - every flavour is counted separately so decreasing the number of flavours of AMBER chips, ice blocks etc will increase your GREEN percentage
- Replacing AMBER or RED items with GREEN alternatives. For example replace icy poles (AMBER) with Quelch 99% fruit juice ice blocks (GREEN)

Appendix 5.19 Sample Menu Feedback Report con't



Good for kids
good for life



3. Provide more information on the healthier items on your menu.

- This helps parents and children identify healthier menu items
- For example stating 'reduced fat', 'lean', 'home made', or 'Good for Kids' recipe on the actual menu
- Use a *Good for Kids* menu template (found on the *Good for Kids* USB) to separate and identify GREEN and AMBER foods

Additional Assumptions **Remove if no additional assumptions applied**

The following assumptions have been applied specifically to your school's menu as the menu item/product did not fit within the assumptions guide in Appendix 2.

Menu item/product	Assumed colour	Reasoning

Further information

If you have any questions regarding this Canteen Menu Feedback Report or would like to supply further information for the reclassification of a product, please contact;

Kathryn Reilly

Project Officer (Dietitian)

Phone: (02) 49246 393

Email: kathryn.reilly@hnehealth.nsw.gov.au

Alternatively, visit the Good for Kids Canteen Product Database at
www.goodforkids.nsw.gov.au/primary-schools/canteens



Health
Hunter New England
Local Health District

Good for Kids 0437305075

Appendix 5.20 Principal Baseline Survey

Principal **CATI**

School ID

School Name: _____ Suburb: _____

DEMOGRAPHICS

1. Approximately, how many students attend your school?	
2. Which best describes your current role? (tick one box only)	
1. Principal	
2. Deputy Principal	
3. Assistant Principal	
4. Acting Principal	
5. Other (please specify):	
3. How long have you been in this role at this school?	
_____ years _____ months	

SCHOOL CANTEENS – FRESH TASTES @ SCHOOL POLICY

4. Does your school have an operational canteen? (tick one box only)			
1. Yes		2. No	(GO TO Q28)
5. Have you heard of the Fresh Tastes @ School Strategy? (tick one box only)			
1. Yes		2. No	3. Don't know
6. Which one of the following statements do you think is consistent with the FT@S Strategy? (please tick one option only)			
1. Foods high in saturated fat, salt or excess kilojoules should not be available for regular sale in school canteens.			
2. Foods high in saturated fat, salt or excess kilojoules can be sold regularly but must not comprise more than 10% of items listed on canteen menus.			
3. Foods high in saturated fat, salt or excess kilojoules can be sold regularly but schools must have 2 days per term where such foods are not available.			

Appendix 5.20 Principal Baseline Survey

Principal CATI

School ID

The Fresh Tastes @ School NSW Healthy School Canteen Strategy (to be referred as "Fresh Tastes @ School") was introduced to government primary and high schools at the start of 2005. Since then, it has been mandatory for all public schools in the state and strongly encouraged for adoption in Catholic and Independent schools. The initiative aims to support students to make healthier food choices by providing foods that are high in nutritional value and by restricting the sale of foods that are high in saturated fats, salt and sugar. A range of practical resources have been developed to support schools to implement Fresh Tastes @ School.

7. Which of the following statements best represents your school's intent to use the FT@S guidelines? *Please tick one response only.*

Statement	<i>Please tick one option only</i>
a. We have not thought about using the Fresh Tastes guidelines in the canteen.	
b. We are thinking about using the Fresh Tastes guidelines in the canteen.	
c. We are planning to or have taken some steps to using the guidelines in the canteen.	
d. We are currently using the Fresh Tastes guidelines.	
e. We have been using the Fresh Tastes guidelines for more than 6 months.	

+

In the next section we will ask you a series of questions about your experience and perceptions with implementing the FT@S guidelines.

We are aware that some of the questions we will be asking today might seem repetitive. This is to allow us to capture a broad range of factors that may be relevant to your views on applying the FT@S guidelines to your canteen specifically. Your answers will be extremely useful in helping us design resources to best support school canteens with providing healthy foods for children.

In the statements below the phrase 'people who work here...' is used to represent any of the following persons at your school that are applicable; Principal, staff, teachers, canteen managers, volunteers and/or parents.

Please indicate how strongly you agree with the following statements regarding the Fresh Tastes @ School guidelines (1= strongly disagree; and 5= strongly agree). *Please select only ONE response per statement, by circling the relevant number.*

Statement	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
8. People who work here feel confident that the school can get people invested in implementing the <u>FT@S</u> guidelines.	1	2	3	4	5
9. People who work here are committed to implementing the <u>FT@S</u> guidelines.	1	2	3	4	5
10. People who work here feel confident that they can keep track of progress in implementing the <u>FT@S</u> guidelines.	1	2	3	4	5
11. People who work here will do whatever it takes to implement the <u>FT@S</u> guidelines.	1	2	3	4	5

Appendix 5.21 Principal Follow-up CATI Script

```

MODULE SUBMODUL
CANIN1=1
Does your school have an operational canteen?
1 Yes
2 No
3 Unsure
.R Refused
OPERATIONAL CANTEEN
***** SINGLE CHOICE - CATI VERSION *****
CHCE 1 4 Freshtas1 _MAKE_ LABEL
MODULE SUBMODUL
CAN1=1
Have you heard of the Fresh Tastes @ School Strategy before today?
1 Yes
2 No
3 Unsure
.R Refused
Heard of Fresh Tastes @ School
***** SINGLE CHOICE - CATI VERSION *****
CHCE 1 7 FT1 6 _MAKE_ LABEL
MODULE SUBMODUL
Freshtas gt
Which ONE of the following statements do you think is consistent with the
Fresh Tastes @ School Strategy?
Foods high in saturated fat, salt or excess kilojoules:

INTERVIEWER NOTE:
Please read out options
1 Should not be available for regular sale in school canteens.
2 Can be sold regularly but must not comprise more than 10% of
3 [CONT] items listed on canteen menus
4 Can be sold regularly but schools must have 2 days per term
5 [CONT] where such foods are not available.
6 Don't know
.R Refused
Which statement consistent with FT&S
***** SINGLE CHOICE - CATI VERSION *****
INFO 1 FTinfo 7 NOLAB
MODULE SUBMODUL
FT1 gt

The Fresh Tastes @ School NSW Healthy School Canteen Strategy was
introduced to schools at the start of 2005. The initiative aims to
support students to make healthier food choices by providing foods
that are high in nutritional value, and by restricting the sale of foods
that are high in saturated fats, salt and sugar. A range of practical
resources have been developed to support schools to implement
Fresh Tastes @ School.
***** INFORMATION SCREEN ITEM *****
CHCE 1 7 FTuse 8 _MAKE_ LABEL
MODULE SUBMODUL
FTinfo=1
Which of the following statements best represents your school's intent to
use the Fresh Tastes @ School Strategy guidelines in your canteen?

[Interviewer note: FTGs = Fresh Tastes Guidelines]
1 We have not thought about using the FTGs.
2 We are thinking about using the FTGs.
3 We are planning to/have taken steps to using the FTGs.
4 We are currently using the FTGs.
5 We have been using the FTGs for more than 6 months.
6 Don't know
.R Refused
Intent to use FT&S Guidelines
***** SINGLE CHOICE - CATI VERSION *****
INFO 1 FTimpl 10 NOLAB
MODULE SUBMODUL
FTuse gt
In the next section we will ask you a series of questions about your
experience and perceptions about implementing the
Fresh Tastes @ School guidelines

```


Appendix 5.22 Canteen Manager Baseline Survey

6. Have you heard of the Fresh Tastes @ School NSW Healthy School Canteen Strategy? <i>(tick one box only)</i>					
1. Yes		2. No – go to Ques 8.		3. Don't know	

7. Which of the following statements do you think are consistent with the <u>FT@S</u> Strategy? <i>(tick all that apply)</i>	
1. Foods high in saturated fat, salt or excess kilojoules should not be available for regular sale in school canteens.	
2. Foods high in saturated fat, salt or excess kilojoules can be sold regularly but must not comprise more than 10% of items listed on canteen menus.	
3. Foods high in saturated fat, salt or excess kilojoules can be sold regularly but schools must have 2 days per term where such foods are not available.	

The Fresh Tastes @ School NSW Healthy School Canteen Strategy (to be referred as “Fresh Tastes @ School”) was introduced to government primary and high schools at the start of 2005. Since then, it has been mandatory for all public schools in the state and strongly encouraged for adoption in Catholic and Independent schools. The initiative aims to support students to make healthier food choices by providing foods that are high in nutritional value and by restricting the sale of foods that are high in saturated fats, salt and sugar. A range of practical resources have been developed to support schools to implement Fresh Tastes @ School.

CM C	School ID
8. Which of the following statements best represents your intent to use the <u>FT@S</u> guidelines? <i>Please tick one response only.</i>	
Statement	<i>Please tick one option only</i>
a. I have not thought about using the Fresh Tastes guidelines in the canteen.	
b. I am thinking about using the Fresh Tastes guidelines in the canteen.	
c. I am planning to or have taken some steps to using the guidelines in the canteen.	
d. I am currently using the Fresh Tastes guidelines.	
e. I have been using the Fresh Tastes guidelines for more than 6 months.	

Appendix 5.23 Canteen Manager Follow-up CATI Script

```

*** Record on log sheet as D3 ***
***** INFORMATION SCREEN ITEM *****
INFO 1          INFO4 4          NOLAB
MODULE SUBMODUL
OP name qt ''
Great thanks, if you could please answer the questions as truthfully
as possible. The information will be used to develop strategies to
further support schools. Individual schools will not be identified in
any way in the reporting of these results.
***** INFORMATION SCREEN ITEM *****
FTSG qt .
Which ONE of the following statements do you think is consistent with the
Fresh Tastes @ School Strategy?
Foods high in saturated fat, salt or excess kilojoules:

INTERVIEWER NOTE:
Please read out options
1      Should not be available for regular sale in school canteens.
2      Can be sold regularly but must not comprise more than
3      [CONT] 10% of items listed on canteen menus
4      Can be sold regularly but schools must have 2 days
5      [CONT] per term where such foods are not available.
6      Don't know
.R      Refused
Which statement consistent with FT@S
***** SINGLE CHOICE - CATI VERSION *****
INFO 1          FTinfo 7          NOLAB
MODULE SUBMODUL
FT1 qt .

The Fresh Tastes @ School NSW Healthy School Canteen Strategy was
introduced to schools at the start of 2005. The initiative aims to
support students to make healthier food choices by providing foods
that are high in nutritional value, and by restricting the sale of foods
that are high in saturated fats, salt and sugar. A range of practical
resources have been developed to support schools to implement
Fresh Tastes @ School.
***** INFORMATION SCREEN ITEM *****
CHCE 1 7          FTuse 8          MAKE          LABEL
MODULE SUBMODUL
FTinfo=1
Which of the following statements best represents your school's intent to
use the Fresh Tastes @ School Strategy guidelines in your canteen?

[Interviewer note: FTGs = Fresh Tastes Guidelines]
1      We have not thought about using the FTGs.
2      We are thinking about using the FTGs.
3      We are planning to/have taken steps to using the FTGs.
4      We are currently using the FTGs.
5      We have been using the FTGs for more than 6 months.
6      Don't know
.R      Refused
Intent to use Fresh Tastes @ School Guidelines
***** SINGLE CHOICE - CATI VERSION *****

```

Appendix 5.24 RE-AIM Framework

RE-AIM Framework

(Glasgow et al. 1999)

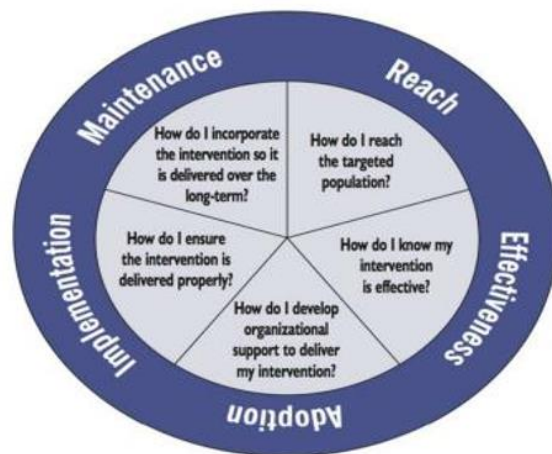
Reach

Effectiveness

Adoption

Implementation

Maintenance



Appendix 5.25 Menu Assessment Protocol



1.1 MENU ASSESSMENT PROCEDURE

1. Call schools and ask them to either fax (02 4924 6490) or email their menu to [Good for Kids](mailto:GoodForKids@hnehealth.nsw.gov.au) (HNELHD-GoodForKids@hnehealth.nsw.gov.au). The menus received will be saved in the following location: N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\10_ReACH Trial\Data Collection\T2 2017_Menu Collection

2. Prior to assessing a school's menu, save a copy to the school's folder. Delete the menu from the above location to ensure the menu does not get assessed by another dietitian or project officer.

3. Print the menu and perform a count of the menu items. Scan the tallied menu and save to the schools folder.

4. Conduct the menu assessment using Adobe Acrobat, referring to the following documents to colour code the menu items:

- a) 1.2 *Good for Kids quick menu assessment tool*
- b) 1.3 *Counting rules*
- c) 1.4 *Menu assessment using Adobe Acrobat*

5. Determine total number of items and the number and % of GREEN, AMBER, RED & BANNED products.

6. Assessments may be provided to a second dietitian for verification and to identify any difference in opinion.

If there is a difference in opinion – go to step 7

If there is no difference in opinion – go to step 8

7. A third dietitian to be provided assessment. Dietitians to reach consensus on menu assessment.

8. Populate the 2015 menu analysis cover sheet (N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\HCI Canteen Menu Review\2015 Canteen Menu assessment tools) and save to the school's folder

9. Complete canteen menu feedback report

NOTE: Some menu items may not be covered by the assumptions guide. In this case professional judgement and consensus with other dietitians will be required. Additional assumptions made in previous assessments can be found in the ReACH baseline and summer Ax results located at: N:\GFK-HCI phase 2\09 Primary Schools\11 Evaluation\10_ReACH Trial\Menu assessments ReACH School Results 9.1.17

Appendix 5.25 Menu Assessment Protocol con't



1.2 GOOD FOR KIDS QUICK MENU ASSESSMENT TOOL

The menu analysis assumptions outline the classification for common menu items where the colour code has not been clearly defined in the Fresh Tastes @ School Canteen Menu Planning Guide or when preferred nutrition information is unavailable. This document was created to improve consistency in menu analysis between all HCL team members. The assumptions were created based on nutrition guidelines; experience in canteens through implementing Fresh Tastes @ School and our professional judgment.

A barrier to assessing menus is collecting detailed brand and product information from canteen managers. As a result, the quick assessment tool was created to enable an HCL team member to complete a menu assessment without having to collect additional brand/product information. Additional assumptions about brand and product category have had to be made.

When a menu has an item where the product is unknown and we were not able to accurately determine food category or make an assumption then a list of 'unknown items' was created to record the item, how it was classified and the decision making process for classification. The file is located at N:\GFK-HCL phase 2\09 Primary Schools\11 Evaluation\HCL Canteen Menu Review\2015 Canteen Menu assessment tools\Consensus - ambiguous items.xlsx

N:\GFK-HCL phase 2\09 Primary Schools\11 Evaluation\4_RCT in Schools\menu_status_all schools23_6_14.

Table 1. Menu Analysis Assumptions for non-participating schools

Item and examples	Assumed color	Reasoning
Drinks		
Juice NFS, including slushies'	GREEN	Assume 99% and in serve 200ml
Cans	AMBER	If stated as 'large' serve ie. >200ml
Flavoured mineral waters	BANNED	Assumed to be soft drink or similar which is likely to be over the SSDB criteria.
Frozen Juice eg Juicies, Quench, juice cups	AMBER	The majority of flavored mineral waters supplied to schools are classified as amber eg. Quench, Focus Water
Milkshakes	GREEN	Assume 99% fruit juice and <200mL
Fruit based smoothies	AMBER	Assume 'Fruit tubes' or similar are "Quench Fruit Sticks"
Spreads & Dips		
Biscuits with cheese/dip/ tuna	AMBER	Assume contains ice-cream therefore AMBER
Biscuits with spread such as jam, vegemite	GREEN	Assume contains fresh fruit and reduced fat dairy.
Dairy Foods & Frozen Treats		
Milk and yoghurt NFS	GREEN	Assume GREEN – this is considered a healthier snack alternative
	AMBER	If Biscuit type stated is AMBER then code as AMBER. Spreads are AMBER as per FLOS

Appendix 5.27 Sample Training Workshop Evaluation Form

ID: 2383	
Location: Taree	Date: 29/03/2016
<h3>Canteen Manager Training</h3> <h3>- Evaluation Form -</h3>	

1. Overall, was attending today's workshop beneficial to you?

☐ YES

☐ NO

COMMENTS: _____

2. Was the date and time of the workshop suitable?

☐ YES

☐ NO

COMMENTS: _____

3. Was the catering and venue appropriate?

☐ YES

☐ NO

COMMENTS: _____

4. For each of the following sessions, answer the following questions:

Fresh Tastes @ School

a. How useful was the session?

☐ Very Useful

☐ Somewhat useful

☐ Not at all useful

b. Was the presentation clear and easy to understand? ☐ YES ☐ NO

c. COMMENTS: _____

Canteen Product Database

d. How useful was the session?

☐ Very Useful

☐ Somewhat useful

☐ Not at all useful

e. Was the presentation clear and easy to understand? ☐ YES ☐ NO

f. COMMENTS: _____



Appendix 5.27 Sample Training Workshop Evaluation Form con't

ID: 2383

Making a Healthy Profit

- g. How useful was the session? ☐ Very Useful
☐ Somewhat useful
☐ Not at all useful
- h. Was the presentation clear and easy to understand? ☐ YES ☐ NO
- i. COMMENTS: _____

Volunteers – Recruiting and Retaining

- j. How useful was the session? ☐ Very Useful
☐ Somewhat useful
☐ Not at all useful
- k. Was the presentation clear and easy to understand? ☐ YES ☐ NO
- l. COMMENTS: _____

Where to from here – Action Planning

- m. How useful was the session? ☐ Very Useful
☐ Somewhat useful
☐ Not at all useful
- n. Was the presentation clear and easy to understand? ☐ YES ☐ NO
- o. COMMENTS: _____

5. *What information would you like covered in future training session?*

Thank you for completing the evaluation form!



Appendix 6.1 Ethics Variation Approval 8 February 2016



8 February 2016

Dr L Wolfenden
Population Health
Wallsend Campus

Dear Dr Wolfenden

Re: HNE Kids Healthy Eating and Physical Activity Program (06/07/26/4.04)

Thank you for submitting a request for an amendment to the above project. This amendment was reviewed by the Hunter New England Human Research Ethics Committee. This Human Research Ethics Committee is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research (2007)* (National Statement) and the *CPMP/ICH Note for Guidance on Good Clinical Practice*. Further, this Committee has been accredited by the NSW Department of Health as a lead HREC under the model for single ethical and scientific review.

I am pleased to advise that the Hunter New England Human Research Ethics Committee has determined the variation meets the requirements of the National Statement on Ethical Conduct in Human Research and has granted ethical approval for the following amendment requests:

- To conduct a survey with canteen managers during attendance at canteen manager training;
- For the Canteen Managers' Information Sheet (Version 1 dated 29 January 2016); and
- For the Canteen Manager Survey 2016 (Version 1 dated January 2016); and
- For the Principal CATI (Version 6 dated 29 January 2016)

For the study: HNE Kids Healthy Eating and Physical Activity Program

Approval has been granted for this study to take place at the following site:

- **Hunter New England Local Health District**

Approval from the Hunter New England Human Research Ethics Committee for the above study is given for a maximum of 5 years from the date of the approval letter of your initial application after which a renewal application will be required if the study has not been completed. The above study is approved until **November 2016**.

The *National Statement on Ethical Conduct in Human Research (2007)* which the Committee is obliged to adhere to, include the requirement that the committee monitors the research protocols it has approved. In order for the Committee to fulfil this function, it requires:

Hunter New England Research Support & Development Office

Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214950 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 6.1 Ethics Variation Approval 8 February 2016 con't

- A report of the progress of the above study to be submitted at 12 monthly intervals. Your review date is **November 2016**. A proforma for the annual report will be sent two weeks prior to the due date.
- A final report must be submitted at the completion of the above study, that is, after data analysis has been completed and a final report compiled. A proforma for the final report will be sent two weeks prior to the due date.
- All variations or amendments to this study, including amendments to the Information Sheet and Consent Form, must be forwarded to and approved by the Hunter New England Human Research Ethics Committee prior to their implementation.
- The Principal Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including:
 - any serious or unexpected adverse events
 - Adverse events, however minor, must be recorded as observed by the Investigator or as volunteered by a participant in this study. Full details will be documented, whether or not the Investigator or his deputies considers the event to be related to the trial substance or procedure.
 - Serious adverse events that occur during the study or within six months of completion of the trial at your site should be reported to the Ethics Officer of the Hunter New England Human Research Ethics Committee as soon as possible and at the latest within 72 hours.
 - Copies of serious adverse event reports from other sites should be sent to the Hunter New England Human Research Ethics Committee for review as soon as possible after being received.
 - Serious adverse events are defined as:
 - Causing death, life threatening or serious disability.
 - Cause or prolong hospitalisation.
 - Overdoses, cancers, congenital abnormalities whether judged to be caused by the investigational agent or new procedure or not.
 - Unforeseen events that might affect continued ethical acceptability of the project.
- If for some reason the above study does not commence (for example it does not receive funding); is suspended or discontinued, please inform Dr Nicole Gerrand, the Manager, Research Support & Development Office as soon as possible.

The Hunter New England Human Research Ethics Committee also has delegated authority to approve the commencement of this research on behalf of the Hunter New England Local Health District. This research may therefore commence.

Should you have any queries about your project please contact Dr Nicole Gerrand as per the contact details at the bottom of the page. The Hunter New England Human Research Ethics Committee Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the Hunter New England Local Health District website.

Please quote 06/07/26/4.04 in all correspondence.

Hunter New England Research Support & Development Office

Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214950 Facsimile: (02) 49214818

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 6.1 Ethics Variation Approval 8 February 2016 con't

The Hunter New England Human Research Ethics Committee wishes you every success in your research.

Yours faithfully

For: Ms M Hunter
Acting Chair
Hunter New England Human Research Ethics Committee

Hunter New England Research Support & Development Office

Locked Bag No 1

New Lambton NSW 2305

Telephone: (02) 49214950 Facsimile: (02) 49214918

Email: HNELHD-HREC@hnehealth.nsw.gov.au

<http://www.hnehealth.nsw.gov.au/ethics/Pages/Research-Ethics-and-Governance-Unit.aspx>

Appendix 6.2 Principal Baseline Survey

24. Following the FT@S guidelines is beneficial to the students and school.	1	2	3	4	5
25. Following the FT@S guidelines is compatible with our school's policies/priorities.	1	2	3	4	5

4

Principal CATI

School ID

26. In the last 12 months, have you received any support from other organisations, individuals or schools to assist you with implementing Fresh Tastes @ School? (tick one box only)		
1. Yes		Please specify what support / resources you received: _____
2. No		
3. Don't know		

27. As part of the support we will provide in the coming years, we would also like to ask canteen managers about the practices of school canteens. Is it okay for us to contact your canteen manager or supervisors one to two times in the next 12 months? You are only providing us with permission to contact the canteen managers. Your canteen manager will be able to choose whether they would like to complete the survey at the time we contact them (tick one box only).
--

1. ☐ Yes

2. ☐ No

SCHOOL MOBILE APPS

These next questions relate to mobile applications used to communicate with parents.

28. Are you currently, or have you previously, implemented a school mobile app to assist in communication with parents? (tick one box only)
a) Yes - currently (Go to Q29)

Appendix 6.3 Canteen Manager Baseline Survey

3. Don't know	
---------------	--

HEALTH STAR RATING SYSTEM

<p>Recently developed by the Australian Government, the Health Star Rating is a front-of-pack labelling system that provides a rating on the overall nutritional profile of packaged food. Products are given between ½ a star and 5 stars to allow consumers to directly compare similar products and select healthier choices. The number of stars is determined using a calculator that assesses positive and risk nutrients in food, with healthier choices being awarded more stars. The Health Star Rating is currently being implemented on a voluntary basis with a review scheduled for 2016.</p> <p>Please indicate how strongly you agree with the following statements regarding the Health Star Rating (1=strongly agree; and 4= strongly disagree) <i>Please select only ONE response per statement, by circling the relevant number.</i></p>

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
58. The Health Star Rating is helpful in identifying healthier foods.	1	2	3	4
59. I currently use the Health Star Rating when selecting foods to sell in my canteen.	1	2	3	4
60. I trust the Health Star Rating as a measure of how healthy a food product is.	1	2	3	4
61. I believe the Health Star Rating is better than the traffic light system used by Fresh Tastes @ School	1	2	3	4
62. I would be willing to use the Health Star Rating to plan a menu in my canteen.	1	2	3	4
63. Planning a menu using star ratings would be easy.	1	2	3	4
Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
64. I would need support to plan menus using a health star rating system.	1	2	3	4

Appendix 6.3 Canteen Manager Baseline Survey con't

CM C

School ID

65. I would prefer to use the health star rating system than the Fresh Tastes @ School traffic light labelling system to plan my menu.	1	2	3	4
--	---	---	---	---

66. (NOTE FOR HNEHREC – presentation of this item will vary depending on random assignment to one of 3 groups: A, B & C)

From the list below, which of the following foods would you sell at your school canteen.

(NOTE FOR HNEHREC: Group A will receive no Health Star Rating, Group B includes Health Star Rating, Group C includes Health Star Rating plus the following addition to the survey question “...if the NSW government recommended schools mainly sell products with a Health Star Rating 3.5 and above”).

Product	Health Star Rating (included for groups B & C)	Tick yes or no for each product	
		Yes	No
a) Big M Choc School Smart 250ml Milk	3		
b) McCain Pizza Singles: Cheese & Bacon	4		
c) Streets Chocolate Paddle Pop	3		
d) Nestle Peters Drumstick Classic Vanilla	1.5		
e) Bulla Frozen Yoghurt Strawberry	3		
f) Berri <u>Quelch</u> Fruit Sticks	4.5		
g) Just Juice Apple <u>Blackcurrent</u> 200ml	5		
h) Golden Circle Tropical Punch Fruit Drink 250ml	3.5		
Product	Health Star Rating (included for groups B & C)	Yes	No
i) <u>Snackers</u> Plain Popcorn	3.5		



Appendix 6.3 Canteen Manager Baseline Survey con't

CM C			School ID
j) Steggles Chicken Nuggets Crumbed	3		
k) Four'N Twenty Jumbo Sausage Roll	2		
l) Red Rock Deli Chips Honey Soy Chicken	3.5		

67. For groups B and C:	Yes	No
67a. For the question above, did you use the health star rating information when deciding which foods you would you sell at your school canteen?		
67b. For the question above, did the health star rating information influence you decisions about which foods you would you sell at your school canteen?		
67c. for all groups: What, if any, factors may hinder you from using a health star rating system in your canteen? Please tick either yes or no for all statements	Yes	No
a) Knowledge of the star rating of specific canteen products.		
b) Lack of availability of products with high star rating.		
c) Lack of training or resources.		
d) Lack of school executive support.		
e) Lack of parent support.		
f) Current recommendations to use traffic light system.		
g) Cost.		
h) Others: please list _____		

68. We would like to contact you in the next few months to provide support to help implement a healthy canteen. All contact details are kept confidential and are not shared with any third parties. What would be your preferred contact method? (tick one box only)

Appendix 6.4 Sample Foodswitch Online Database



The George Institute
for Global Health

HOME

PRODUCT SEARCH

HOW FOODSWITCH
WORKS

VIEW MODES


SEARCH FOR A PRODUCT BELOW

Mode

Health Star Rating

Filter

Classic



ENERGY	SAT FAT	SUGARS	SODIUM
0kJ	0g	0g	0mg
PER 100g			

Search

chicken nuggets

X

SEARCH

Appendix 7.1 Hopin et al Implementation Science 2018

Lee et al. *Implementation Science* (2018) 13:42
https://doi.org/10.1186/s13012-018-0734-9


Implementation Science

RESEARCH

Open Access

Mechanisms of implementing public health interventions: a pooled causal mediation analysis of randomised trials



Hopin Lee^{1,2,3*} , Alix Hall^{2,4}, Nicole Nathan^{2,5}, Kathryn L. Reilly^{2,5}, Kirsty Seward^{2,5}, Christopher M. Williams^{2,4,5}, Serene Yoong^{2,4,5}, Meghan Finch^{2,5}, John Wiggers^{2,4,5} and Luke Wolfenden^{2,4,5}

Abstract

Background: The World Health Organization recommends that nations implement evidence-based nutritional guidelines and policies in settings such as schools and childcare services to improve public health nutrition. Understanding the causal mechanism by which implementation strategies exert their effects could enhance guideline implementation. The aim of this study was to assess the mechanisms by which implementation strategies improved schools and childcare services' adherence to nutrition guidelines.

Methods: We conducted a mechanism evaluation of an aggregated dataset generated from three randomised controlled trials conducted in schools and childcare services in New South Wales, Australia. Each trial examined the impact of implementation strategies that targeted Theoretical Domains Framework constructs including knowledge, skills, professional role and identity, environmental context and resources. We pooled aggregated organisation level data from each trial, including quantitative assessments of the Theoretical Domains Framework constructs, as well as measures of school or childcare nutrition guideline compliance, the primary implementation outcome. We used causal mediation analysis to estimate the average indirect and direct effects of the implementation strategies and assessed the robustness of our findings to varying levels of unmeasured and unknown confounding.

Results: We included 121 schools or childcare services in the pooled analysis: 79 allocated to receive guideline and policy implementation strategies and 42 to usual practice. Overall, the interventions improved compliance (odds ratio = 6.64; 95% CI [2.58 to 19.09]); however, the intervention effect was not mediated by any of the four targeted Theoretical Domains Framework constructs (average causal mediation effects through knowledge = -0.00 [-0.05 to 0.04], skills = 0.01 [-0.02 to 0.07], professional role and identity = 0.00 [-0.03 to 0.03] and environmental context and resources = 0.00 [-0.02 to 0.06]). The intervention had no significant effect on the four targeted Theoretical Domains Framework constructs, and the constructs were not associated with school or childcare nutrition guideline compliance. Potentially, this lack of effect could be explained by imprecise measurement of the mediators. Alternatively, it is likely that the interventions were operating via alternative mechanisms that were not captured by the four Theoretical Domains Framework constructs we explored.

(Continued on next page)

* Correspondence: hopinlee@ndorms.ox.ac.uk

¹Centre for Statistics in Medicine, Nuffield Department of Orthopaedics Rheumatology and Musculoskeletal Sciences, University of Oxford, Oxford, United Kingdom

²School of Medicine and Public Health, University of Newcastle, Newcastle, New South Wales, Australia

Full list of author information is available at the end of the article



© The Author(s). 2018 **Open Access** This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.