

BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email info.bmjopen@bmj.com

BMJ Open

Healthy eating and physical activity environments in out of school hours care: an observational study protocol

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2019-036397
Article Type:	Protocol
Date Submitted by the Author:	06-Jan-2020
Complete List of Authors:	<p>Crowe, Ruth; University of Wollongong Faculty of Science Medicine and Health, Probst, Yasmine; University of Wollongong, School of Medicine; University of Wollongong Illawarra Health and Medical Research Institute, Norman , Jennifer ; University of Wollongong Illawarra Health and Medical Research Institute; Illawarra Shoalhaven Local Health District, Health Promotion Service Furber , Susan ; University of Wollongong Illawarra Health and Medical Research Institute; Illawarra Shoalhaven Local Health District, Health Promotion Service Franco , Lisa ; University of Wollongong Illawarra Health and Medical Research Institute, ; Illawarra Shoalhaven Local Health District, Health Promotion Service Stanley , Rebecca; University of Wollongong Illawarra Health and Medical Research Institute; University of Wollongong School of Education, Early Start Okely, Tony; University of Wollongong School of Education, Early Start</p>
Keywords:	NUTRITION & DIETETICS, PUBLIC HEALTH, AUDIT, STATISTICS & RESEARCH METHODS

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Healthy eating and physical activity environments in out of school hours care: an observational study protocol

Ruth Crowe BScNut(Hons)^{1,2}, Yasmine Probst PhD, APD², Jenny Norman ^{2,3}, Susan Fusber^{2,3}, Lisa Franco^{2,3}, Rebecca Stanley Ph.D^{2,4}, Anthony D. Okely Ph.D., Senior Professor⁴.

¹ School of Medicine, Science Medicine and Health, University of Wollongong, Northfields Avenue, Wollongong NSW 2522, Australia

² Illawarra Health and Medical Research Institute, University of Wollongong, Northfields Avenue, Wollongong NSW 2522, Australia

³ Health Promotion Service, Illawarra Shoalhaven Local Health District, Warrawong, New South Wales, Australia

⁴ Early Start, School of Education, University of Wollongong, Northfields Avenue, Wollongong NSW 2522, Australia

Key words: healthy eating, exercise, child care, snacks, health promotion

Author contact details:

Address: Early Start, Building 21, Ring Road, Keiraville NSW 2500, Australia

Email: rc101@uowmail.edu.au,

Phone: (02) 4221 4274

Word count: 3,179 (inclusive of: title, abstract and full text)

Abstract: 247

Table number: 1

Figure number: 2

Contribution Statement

Ruth Crowe is a PhD candidate of this study, she has worked with the research team developing the study design and methodology, she will be the lead on data collection and analysis, interpretation and write up of future manuscript. Yasmine Probst and Rebecca Stanley are PhD supervisors on this project. They have contributed to the study design and provided support through the development of this study. They have both revised and edited the manuscript. Jenny Norman, Susan Fusber and Lisa Franco are a part of the Prevention Research Support Program working committee, offering valuable insight and context of local health districts. They have also revised and made significant editorial contributions to this manuscript. Anthony Okely is the chief investigator of this study, contributing to the study design and methodologies. Professor Okely is a PhD supervisor on this project and has revised and edited this manuscript. All authors have read and approved the final manuscript. This manuscript has not been submitted or published in any other journal.

Conflicts of Interest statement

The authors have declared there is no competing interests

Funding statement

This research has been conducted with the support of the Australian Government Research Training Program Scholarship. This work was supported by the Prevention Research Support Program, funded by the New South Wales Ministry of Health.

Healthy eating and physical activity environments in out of school hours care: an observational study protocol

ABSTRACT

Introduction: Healthy eating and regular physical activity are among the most modifiable risk factors for preventing overweight and obesity. Childcare settings have been widely identified as important venues for promoting healthy lifestyles to children. Out of school hours care (OSHC) care is a rapidly growing childcare service, yet there has been limited research reported on healthy eating and physical activity (HEPA) environments within the Australian OSHC setting. This research aims to describe the HEPA environments related to foods and beverages served, staff behaviours and child physical activity levels across two Local Health Districts within [Location removed]. This study will provide evidence to support future interventions and policies in Australian OSHC settings.

Methods and analysis: A cross-sectional study design will be used to describe the food and beverages provided, child activity levels and report on environmental correlates. OSHC programs will be visited on non-consecutive weekdays between 2018 and 2020. The frequency of foods and beverages offered will be observed and categorised into food groups aligned to the Australian guide to healthy eating. Children's physical activity will be measured using Actigraph GT3X accelerometers. Staff behaviour will be captured via direct observation and the Systems for Observing Staff Promotion of Physical Activity and Nutrition (SOSPAN). Short interviews with program directors will gather contextual information about OSHC practices and policies.

Ethics and dissemination: Findings will be disseminated through peer-reviewed scientific journals and conference presentations. Ethical approval was granted by the [removed for blinding].

Strengths and limitations of this study:

- This will be one of the first known Australian studies to systematically describe the healthy eating and physical activity environments within before and afterschool programs to support the development of future interventions, better policies and healthier environments for children attending OSHC programs.

- Foods observed can only provide an estimation of food groups offered, rather than actual foods consumed by the children.
- OSHC programs from the two Local Health Districts in [Location removed] may not be representative of all OSHC programs across [Location removed].

INTRODUCTION

One in four Australian primary school-aged children are classified as overweight or obese.¹ Healthy body weight in childhood supports optimal bone development, cognition and concentration at school, improved sleep patterns and reduced anxiety and depression in later life.² Healthy eating and physical activity (HEPA) are important in maintaining healthy body weights^{1,3} and are key modifiable risk factors for preventing overweight and obesity.⁴ National data indicate that no Australian children (aged 4-8 years) currently meet the vegetable intake recommendations, while most exceed discretionary food intake guidelines.⁵ Nearly half of Australian children are not meeting physical activity guidelines and nearly three quarters exceed the recommendations for recreational screen-time.⁶ The out-of-school hours' time period may be a critical window in a child's day to intervene as studies have shown children consume large amounts of snack foods⁷ and participate in long periods of screen-based sedentary activities^{8,9} during out-of-school hours.

In Australia, out-of-school hours care (OSHC) programs operate before school (6:00-9:00), after school (15:00-18:00) and during school holidays (vacation care) (9:00-18:00). OSHC programs are of growing importance for many Australian parents whose employment requires them to work outside school hours.^{10, 11} In 2018, 36% of Australian children in care attended OSHC programs (458,750 children), spending an average of 12 hours per week in these

1
2
3 programs.¹⁰ OSHC programs have the opportunity to provide positive physical and social
4 environments that can promote healthy eating and active play to children who attend.
5
6

7
8
9 Within an OSHC setting, staff can create supportive physical environments through; 1) the
10 foods and beverages available to children (provided meals, vending machines, food rewards),
11
12 2) health promoting messages^{12, 13} (via posters, nutrition education and cooking), and 3)
13 opportunities and equipment for active play. The social environment can influence behaviour
14 via staff role-modelling¹² (e.g. consumption of healthy foods and beverages and engagement
15 in physical activity opportunities) and establishing HEPA practices as a social norm within
16 these settings through the presence of strong and supportive policies.
17
18
19
20
21
22
23
24
25
26

27 While limited studies have reported on HEPA within before school care^{14, 15} and Australian
28 OSHC programs, international research has found that foods and beverages served and
29 children's physical activity levels within after school programs fell well below national
30 recommendations.^{16, 17} This research aims to describe the HEPA environments related to the
31 foods and beverages served, staff behaviours and child physical activity levels across two Local
32 Health Districts within [location removed].
33
34
35
36
37
38
39
40
41
42

43 **METHODS**

44
45 A cross-sectional, observation study will be conducted to 1) observe the foods and beverages
46 offered to children; 2) assess the level of physical activity of children; and 3) observe staff
47 behaviours on promotion and role-modelling of HEPA within OSHC programs. Data will be
48 collected during unannounced (non-specified) visits on non-consecutive weekdays to ensure
49 usual behaviour is captured. In the occurrence of unfavourable weather patterns (e.g. heavy
50 rainfall), which may lead to irregular practices or changes to the usual program, observations
51 will be rescheduled. Data collection methods are outlined in Figure 1. Data is scheduled to be
52
53
54
55
56
57
58
59
60

1
2
3 completed within the afterschool programs between March 2018 and April 2019 and within
4
5 before school care from February 2020 to December 2020.
6
7

8 9 **Study Sample**

10
11 In 2018, there were 243 OSHC providers in operation across the South Western Sydney and
12
13 Illawarra Shoalhaven Local Health Districts¹⁸, which will act as the sampling frame. Eligibility
14
15 criteria for the study are: five or more primary school-aged children (5-12 years) enrolled; the
16
17 program runs from 06:00 – 09:00 and/ or 15:00 - 18:00 during school terms; provide at least
18
19 one breakfast or afternoon meal; and the program is not exclusively advertised as a homework
20
21 or physical activity-related club (e.g. dance academy, swimming or football clubs).¹⁹ Once the
22
23 inclusion criteria were applied 204 OSHC programs were eligible to participate. A power
24
25 calculation and sample size estimation were generated with 5% precision requiring 128 OSHC
26
27 programs to be recruited. Given the large sample size required, all eligible services in the two
28
29 Local Health Districts will be invited to participate via email and telephone.
30
31
32
33
34
35
36
37

38 **Recruitment**

39
40 Written informed consent will be obtained from OSHC directors. The research methods have
41
42 been determined to be low risk,²⁰ therefore a passive consent approach will be applied for staff
43
44 and children. Staff and parents will be notified of the study via several channels, including: 1)
45
46 recruitment video, digital research posters and information sheets via OSHC internal
47
48 communication avenues; 2) research notification posters at each entrance way, notice boards
49
50 and sign in/out desk within each OSHC; and 3) participant information sheets and opt-out
51
52 forms (that provide detailed explanation of the research study, investigator contact details, and
53
54 the opportunity for participants to be excluded from the study) located at sign in/out desks.
55
56 Information relating to this study will be displayed for a minimum of two weeks prior to data
57
58 collection commencing and for the duration of the data collection period. Data collectors will
59
60

1
2
3 be on site during data collection and available to discuss the study with staff and parents as
4 required. Children will be invited to wear an accelerometer for the duration of their time at the
5 program, unless they have opted-out of the study. A child can refuse assent at any stage of the
6 research process.
7
8
9
10
11
12
13

14 **Context**

15
16 In 2010, the National Quality Framework was implemented in Australia as the overarching
17 regulatory framework for early childhood education and care, under which sit OSHC
18 services.²¹ Within this framework are seven National Quality Standards that are underpinned
19 by National Legislation and Regulations.²¹ Healthy eating and physical activity fall under the
20 National Quality Standards 2, Element 2.1.3, “*healthy eating and physical activity are*
21 *promoted and appropriate for each child*”. The Australian Children’s Education and Care
22 Quality Authority disseminated the *Guide to the National Quality Standard*²¹ to support service
23 providers in meeting the requirements of the National Quality Standards. These guidelines
24 within the National Quality Framework are not authoritative, but provide flexibility on how
25 service providers might meet the Standards.²² As demonstrated in Table 1, this guide describes
26 best practice guidelines for education and care services, recommending staff use positive role
27 modelling behaviours, engage children in healthy eating conversations, use cooking experience
28 to build knowledge, provide meals consistent with the Australian Guide to Healthy Eating
29 (AGHE), implement frequent opportunities for physical activity and role model enjoyment by
30 engaging in activities.²¹ A combination of resources designed to support OSHC programs in
31 meeting Quality Area 2, will be used to guide the criteria within this study including; 1) Heart
32 Foundations ‘*Eat Smart, Play Smart*’ manual,²³ 2) Nutrition Australia’s ‘*Healthy eating in the*
33 *National Quality Standards*’²⁴, and 3) the ‘*Food and drink checklist for outside school hours*
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

care'²⁵. For the purpose of this study we will report on whether staff behaviour relating to the best practice guidelines was observed or not observed.

Table 1: Best-practice guidelines, selected from the *Guide to the National Quality Standards* for the reporting of HEPA promotion behaviours in OSHC.

National Quality Standards	Direct observation	SOSPAN ^b	Accel ^c	HAAND ^d
Healthy Eating Environment				
Engage children in experiences and conversations that promote mealtimes to be enjoyable and promote healthy, balanced lifestyles	✓			
Use cooking experiences to further children's understanding of food and nutrition	✓			
Never use food to reward children	✓	✓		
Sit and eat with children and model, healthy eating and nutrition practices during mealtimes	✓			
Provide food and beverages consistent with the Australia dietary guidelines	✓			✓
Provide foods and drinks consistent with the menu	✓	✓		✓
Access to water throughout the day	✓	✓		
Physical Activity Environment				
Implement physical games and activities as part of the program and encourage children to participate		✓		
Become involved and demonstrate enjoyment in children's physical activity		✓		
Children should have frequent opportunities to engage in active play		✓		✓
Children should lead physical play activities with peers		✓		
Opportunity for dance, creative movement and drama and respond to music		✓		✓
Provide resources and equipment to support children participate in physical activity		✓		
Additional Measures^a				
Nutrition and physical activity policies				✓

Children accumulate 30 minutes MVPA in the hours before and afterschool			✓	
Annual nutrition and physical activity staff training				✓

Note: This is not an exhaustive list of best-practice behaviours, only those that could be reported on by the selected tools used within this study. Some of the descriptions have been summarised within this table.

^aAdditional measures are not found within the *Guide to the National Quality Standards*

^bSOSPAN: System for observing staff promotion of activity and nutrition

^cAccel: Accelerometer

^dHAAND: Healthy Afterschool Activity and Nutrition Document

Healthy eating and physical activity measures were selected from the AGHE²⁶ and the Australian Physical Activity and Sedentary Behaviour Guidelines for Children and Young People, respectively.²⁷ The AGHE provides the recommended ‘serves’ individuals should consume, adjusted by age and gender, however, due to the observational nature of this study, the frequency of food groups offered/ served to children will be reported. National physical activity guidelines state that children should accumulate a minimum of 60-minutes of moderate-to-vigorous physical activity (MVPA) across an entire day.²⁷ For the current study, a measure of 30 minutes of MVPA has been selected as half of the time recommended in the current physical activity guidelines for children.²⁷ This measure has been used in studies conducted in similar settings in the United States.^{19, 28, 29}

Healthy Eating Environment

Food and beverages offered to children will be captured via direct observation and digital images. Food labels, branding, packaging and serving methods (individual portion sizes or “family style”, characterised by a shared platter) will be systematically observed and recorded.³⁰ Digital photography will be used to capture descriptive data on the provided foods, including the types of foods offered as well as waste and leftovers. Digital images will be taken

1
2
3 pre- and post-meals being served, including multiple camera angles and using common objects
4 (e.g. fork, spoon, hand) to assist as a point of reference for size estimation.²⁶ Water will be
5
6 recorded as available if cups of water or designated water stations are available to children
7
8 during the snack time or throughout the program.³⁰
9
10
11
12

13
14 Observations of the healthy eating environment will be made during the scheduled mealtime
15 including: staff healthy eating promotion behaviours; staff sitting and eating with children;
16
17 staff promotion / discouragement of healthy foods and beverages; staff engaging children in
18
19 healthy eating discussions or nutrition education during the meal time; provision of food
20
21 knowledge and skill development (including children's involvement in the food preparation
22
23 activities, and food clean-up); rewarding of good behaviour with discretionary food items²³
24
25 (e.g. sweets and confectionary); and food waste management (e.g. use of a compost or worm
26
27 farm). Weekly food menus will be observed and recorded including if they are displayed for
28
29 parents, whether menus were consistent with foods served and if they met the requirements of
30
31 the 'Food and drink checklist for outside school hours care'²⁵. Types of food preparation
32
33 (kitchen) facilities will be observed and documented including food storage, cooking
34
35 equipment, preparation areas and washing up facilities.
36
37
38
39
40
41
42
43
44

45 **Physical Activity Environments**

46
47 Prior to data collection, all OSHC programs will be visited to record the physical characteristics
48
49 of the program environment, including indoor (non-physical activity enrichment or snack
50
51 areas) and outdoor spaces (physical activity spaces). These spaces will be divided and
52
53 identified as zones during the data collection period. Available space accessible to children
54
55 during the OSHC program will be mapped and measured in metres using a CRAFT.RIGHT
56
57
58
59
60

1
2
3 measuring wheel (Figure 2). Permanent facilities (e.g. basketball courts, fixed equipment and
4
5 sandpits) will be measured and identified as zones.
6
7
8
9

10 Child physical activity will be measured via ActiGraph accelerometers (wGT3X-BT models).
11 Accelerometers are widely used to provide an objective estimate of physical activity in free-
12 living research.^{28, 31, 32} Accelerometers are small, unobtrusive devices that sit around a child's
13 waist, attached using adjustable elastic belts. As children arrive at a program, the
14 accelerometers will be fitted around their waist by trained data collectors, ensuring the unit is
15 sitting on the right hip. The time-on and demographic data of each child (school grade and sex)
16 will be recorded. As children depart from the program accelerometers will be removed and
17 time-off recorded.³³
18
19
20
21
22
23
24
25
26
27
28
29
30

31 **System for Observing Staff Promotion of Activity and Nutrition**

32 Staff promotion of HEPA behaviours will be measured by direct observation and momentary
33 time sampling using the System for Observing Staff Promotion of Activity and Nutrition
34 (SOSPAN) instrument.³⁴ SOSPAN is a validated observation tool created and used within
35 afterschool programs in the United States.³³ The tool is designed to capture 13 physical activity
36 and six healthy eating behaviours of staff as described in detail elsewhere.³³ Staff behaviours
37 captured by SOSPAN include staff encouragement of physical activity (e.g. leading physical
38 activity, verbally promoting physical activity, staff engagement in physical activity with
39 children and providing children with multiple physical activity options) or discouragement of
40 physical activity (e.g. idle time, providing elimination games, children standing or waiting for
41 a turn and withholding physical activity). SOSPAN captures the context of the program,
42 documenting the duration of scheduled activities (physical activity, indoor enrichment
43 activities, homework/ academics and mealtime). Other contextual activities recorded by
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 SOSPAN include the identification of organised activity (structured activity set up by OSHC
4 staff) versus physical activity free-play (unstructured activity time that was child-led and not
5 organised by staff in the afterschool programs).
6
7
8

9
10 Staff promotion and modelling of healthy eating behaviours are captured in SOSPAN via staff
11 verbally promoting healthy eating, educating children on healthy eating and consuming healthy
12 food and beverage options or discouraging healthy eating by staff consuming inappropriate
13 foods or drinks.
14
15
16
17

18
19 Systematic SOSPAN scans will be continually completed throughout the duration of the
20 program or until there are less than five children remaining at the program.³⁴ Data collectors
21 will move systematically between zones (Figure 2) where both staff and children are present,
22 completing five scans before moving to the next area.^{33, 34} Data collectors will be required to
23 meet greater than 80% interrater-reliability agreement via an interval-by-interval agreement on
24 two consecutive data collection days.²⁶ Interrater reliability will be continuously monitored
25 throughout the data collection process, completing a minimum of five reliability scans per day.
26
27
28
29
30
31
32
33
34
35
36
37

38 **HEPA Policy Environment: Healthy After school Activity and Nutrition Documentation**

39
40 Written HEPA policies, that use clear-language to guide staff practices have been shown to
41 improve the HEPA environments within child care services.^{35, 36} The Healthy After school
42 Activity and Nutrition Documentation (HAAND) instrument is a validated tool that will be
43 used to guide and collect information on HEPA policies within each OSHC program. Detailed
44 information on this tool has been published elsewhere.³⁷ HAAND explores 11 healthy eating
45 and ten physical activity policy characteristics captured through a short, structured interview
46 conducted on-site with the OSHC Directors by trained data collectors. In short, HAAND
47 evaluates the level at which program policies support HEPA characteristics through written
48 policies, staff training, use of HEPA resources, time allocations and types of physical activity,
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 healthy eating practices and screen-time availability. In addition, a copy of the nutrition and
4 physical activity policies, as well as weekly food receipts, will be requested from each OSHC
5 program. For the purpose of collecting healthy eating and physical activity policy information,
6 the HANND will be applied to both before and afterschool OSHC programs.
7
8
9
10
11
12
13

14 **Data Analysis**

15
16 Foods and beverages will be categorised by a dietitian or nutritionist into the five core food
17 groups according to the AGHE: fruit, vegetables, lean meats, dairy and grains (whole grains).
18 Additional categories of discretionary items, refined grains, water and 'extra' drinks (fruit
19 juice, cordial, soft drinks and flavoured milk) will also be recorded. Food categorisation will
20 be guided by the AUSNUT 2011-13 database developed by Food Standards Australian New
21 Zealand, for the Australian Health Survey food classification system³⁸ and the Discretionary
22 food listing³⁹ developed by the Australian Bureau of Statistics. Food categories will be checked
23 by a researcher independent of the OSHC observations. The frequency of food groups and
24 beverages offered across observation days will be calculated and expressed as a percentage,
25 mean and standard deviation, for normally distributed data and median and interquartile ranges
26 for skewed data. Data transformation is not deemed relevant to this study.
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44

45 Accelerometer-derived physical activity data will be calculated for minutes per day spent in
46 sedentary, total physical activity and MVPA. For this study the Evenson cut points will be
47 used: sedentary behaviour <26 counts/ 15 seconds, light-to-moderate activity 26-573 counts/
48 15 seconds, moderate activity 574-1002 counts/ 15 seconds, and vigorous activity >1002
49 counts/ 15 seconds.³² The Evenson cut points have been recognised as accurate cut points for
50 measuring the time spent in different physical activity intensities for children aged five to eight
51 years.³¹ Within afterschool programs, physical activity data will be considered valid if a total
52
53
54
55
56
57
58
59
60

1
2
3 wear time of accelerometers is equal to or greater than 60 minutes¹⁷ and 30 minutes within
4 before school care. Total time active will be reported on for the before school care programs.
5
6 All accelerometry data will be analysed using ActiLife software⁴⁰ and STATA.⁴¹
7
8
9

10
11
12 Staff behaviours captured through direct observation, SOSPAN and responses from the
13 structured interview (i.e. HAAND) will be quantified and reported as a percentage of
14 observations and responses completed using SPSS software 'IBM SPSS Statistics for
15 windows, version 25.0. (IBM Corp., Armonk, N.Y., USA)'.
16
17
18
19
20
21

22
23
24 The relationship between serving healthy snack foods and variables such as: socio-economic
25 index for areas (SEIFA), availability of kitchen facilities and healthy eating training of staff
26 will be explored.
27
28
29
30

31
32
33 To explore the relationships between the physical activity environment and child activity
34 levels, correlations between time spent in MVPA, total physical activity and sedentary
35 behaviour will be assessed against: physical activity policy, staff engagement in physical
36 activity, available space for physical activity (m²), ratio of number of children to staff, physical
37 activity equipment and sex of child.
38
39
40
41
42
43
44
45
46

47 **ETHICS AND DISSEMINATION**

48 Ethical approval has been provided by the [removed for blinding]. Results from this study will
49 be disseminated through peer-reviewed scientific journals, conference presentations, scientific
50 reports, service reports (providing findings to participating OSHC care providers) and will
51 form part of student dissertations.
52
53
54
55

56 **PATIENT AND PUBLIC INVOLVEMENT**

57
58
59
60

1
2
3 Although this research was completed without public involvement, it did incorporate key
4 public health stakeholders in the governance and management of the study. These stakeholders
5 did contribute to the research priorities, defining research question and outcome measures and
6 providing input into the study design. Members of the public were not invited to comment on
7 the study design and were not consulted to ensure a true benchmark was achieved. Members
8 of the public were not invited to contribute to the writing or editing of this document for
9 readability or accuracy.
10
11
12
13
14
15
16

17 **FUNDING STATEMENT**

18
19 This research has been conducted with the support of the [location removed] Government
20 Research Training Program Scholarship. This work was supported by the Prevention
21 Research Support Program, funded by the [location removed].
22
23
24
25

26 **ACKNOWLEDGMENTS**

27
28 We acknowledge [name removed] for her valuable contribution to the research study. We
29 would also like to recognise [name removed] and [name removed] for their on-going role in
30 technical and administration support.
31
32
33
34

35 **REFERENCES**

- 36
37
38 1. Australian Institute of Health and Welfare. Overweight & obesity 2019.
39 [www.aihw.gov.au/reports-data/behaviours-risk-factors/overweight-](http://www.aihw.gov.au/reports-data/behaviours-risk-factors/overweight-obesity/overview)
40 [obesity/overview](http://www.aihw.gov.au/reports-data/behaviours-risk-factors/overweight-obesity/overview) (accessed 19 July 2019).
41
42 2. Engle P, Huffman SL. Growing Children's Bodies and Minds: Maximizing Child Nutrition
43 and Development. *Food Nutr Bull* 2010;31(2_suppl2):S186-S97. doi:
44 10.1177/15648265100312s211
45
46 3. Australian Institute of Health and Welfare. Physical activity 2019.
47 www.aihw.gov.au/reports-data/behaviours-risk-factors/physical-activity/overview
48 (accessed 19 July 2019).
49
50 4. Candeias V, Armstrong TP, Xuereb GC. Diet and physical activity in schools: Perspectives
51 from the implementation of the WHO global strategy on diet, physical activity and
52 health. *Can J Public Health* 2010;101(SUPPL. 2):S28-S30.
53
54 5. Australian Bureau of Statistics. Australian Health Survey: Consumption of food groups
55 from the Australian Dietary Guidelines, 2011-12. Canberra, ACT, 2016.
56 [www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4364.0.55.012~2011-](http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4364.0.55.012~2011-12~Main%20Features~Vegetables,%20legumes%20and%20beans~10)
57 [12~Main%20Features~Vegetables,%20legumes%20and%20beans~10](http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4364.0.55.012~2011-12~Main%20Features~Vegetables,%20legumes%20and%20beans~10) (accessed July
58 2019).
59
60 6. Australian Bureau of Statistics. Australian Health Survey: Physical Activity, 2011-12.
Canberra, 2013.

- 1
2
3
4 www.abs.gov.au/ausstats/abs@.nsf/Lookup/4364.0.55.004Chapter1002011-12
5 (accessed July 2019)
- 6 7. Wang D, Van der Horst K, Jacquier EF, et al. Snacking Patterns in Children: A Comparison
7 between Australia, China, Mexico, and the US. *Nutrients* 2018;10(2):198. doi:
8 10.3390/nu10020198
 - 9 8. Arundell L, Fletcher E, Salmon J, et al. A systematic review of the prevalence of sedentary
10 behavior during the after-school period among children aged 5-18 years. *Int J Behav*
11 *Nut Phys Act* 2016;13(1) doi: 10.1186/s12966-016-0419-1
 - 12 9. Arundell L, Hinkley T, Veitch J, et al. Contribution of the after-school period to children's
13 daily participation in physical activity and sedentary behaviours. *PLoS ONE*
14 2015;10(10) doi: 10.1371/journal.pone.0140132
 - 15 10. Department of Education and Training. Early Childhood and Child Care in Summary: June
16 quarter 2018. In: Australian Government, ed., 2018:2 - 18.
 - 17 11. Australian Institute of Health and Welfare. Children in child care and preschool
18 programs. In: Australian Government, ed. Canberra, 2017.
19 www.aihw.gov.au/reports/australias-welfare/childcare-and-early-childhood-education
20 (accessed May 2019)
 - 21 12. Story M, Kaphingst KM, Robinson-O'Brien R, et al. Creating healthy food and eating
22 environments: Policy and environmental approaches. *Annu Rev Public Health*,
23 2008:253-72.
 - 24 13. French S, Stables G. Environmental interventions to promote vegetable and fruit
25 consumption among youth in school settings. *Prev Med.* 2003;37:593 - 610.
 - 26 14. Maher C, Virgara R, Okely T, et al. Physical activity and screen time in out of school hours
27 care: an observational study. *BMC Pediatrics* 2019;19(1):283. doi: 10.1186/s12887-
28 019-1653-x
 - 29 15. Thompson E, Cooper C, Flanagan C, et al. Food and activity in out of school hours care in
30 Victoria. *Nutr Diet* 2006;63(1):21-27. doi: 10.1111/j.1747-0080.2006.00018.x
 - 31 16. Beets MW, Weaver RG, Tilley F, et al. Salty or sweet? Nutritional quality, consumption,
32 and cost of snacks served in afterschool programs. *J Sch Health.* 2015;85(2):118-24.
33 doi: 10.1111/josh.12224
 - 34 17. Beets MW, Rooney L, Tilley F, et al. Evaluation of policies to promote physical activity in
35 afterschool programs: Are we meeting current benchmarks? *Prev Med* 2010;51(3-
36 4):299-301. doi: 10.1016/j.ypmed.2010.07.006
 - 37 18. Australian Children's Education & Care Quality Authority. National registers, 2019.
 - 38 19. Beets MW, Weaver RG, Turner-McGrievy G, et al. Making Healthy Eating Policy Practice:
39 A Group Randomized Controlled Trial on Changes in Snack Quality, Costs, and
40 Consumption in After-School Programs. *Am J Health Promot* 2016;30(7):521-31. doi:
41 10.4278/ajhp.141001-QUAN-486
 - 42 20. National Health and Medical Research Council. National Statement on Ethical Conduct in
43 Human Research In: Government A, ed., 2018.
 - 44 21. Australian Children's Education & Care Quality Authority. Guide to the National Quality
45 Framework. Sydney, 2018:138 - 60.
 - 46 22. McGuire J, Gallegos D, Irvine S. Infant feeding nutrition policies in Australian early
47 childhood education and care services: a content and qualitative analysis.
48 *International Journal of Child Care and Education Policy* 2018;12(1) doi:
49 10.1186/s40723-018-0053-2
- 50
51
52
53
54
55
56
57
58
59
60

- 1
 - 2
 - 3
 - 4
 - 5
 - 6
 - 7
 - 8
 - 9
 - 10
 - 11
 - 12
 - 13
 - 14
 - 15
 - 16
 - 17
 - 18
 - 19
 - 20
 - 21
 - 22
 - 23
 - 24
 - 25
 - 26
 - 27
 - 28
 - 29
 - 30
 - 31
 - 32
 - 33
 - 34
 - 35
 - 36
 - 37
 - 38
 - 39
 - 40
 - 41
 - 42
 - 43
 - 44
 - 45
 - 46
 - 47
 - 48
 - 49
 - 50
 - 51
 - 52
 - 53
 - 54
 - 55
 - 56
 - 57
 - 58
 - 59
 - 60
23. Heart Foundation. Eat Smart Play Smart - A manual for Out of School Hours Care 2016:5 - 191.
24. Victoria State Government. Healthy eating in the National Quality Standard. In: Department of Education and Training, ed., 2019.
25. Healthy Eating Advisory Service. Food and drink checklist for outside school hours care. In: Government VS, ed., 2016.
<https://heas.health.vic.gov.au/early-childhood-services/menu-planning/OSHC/checklist> (accessed Feb 2019)
26. Tugault-Lafleur CN, Black JL, Barr SI. A Systematic Review of Methods to Assess Children's Diets in the School Context. *Adv Nutr*. 2017;8(1):63-79. doi: 10.3945/an.116.013144
27. Australian Government Department of Health. Australia's Physical Activity and Sedentary Behaviour Guidelines and the Australian 24-Hour Movement Guidelines,. In: Australian Government Department of Health, ed., 2019.
www1.health.gov.au/internet/main/publishing.nsf/Content/health-publhlth-strateg-phys-act-guidelines. (accessed June 2019)
28. Weaver RG, Beets MW, Hutto B, et al. Making healthy eating and physical activity policy practice: Process evaluation of a group randomized controlled intervention in afterschool programs. *Health Educ Res* 2015;30(6):849-65. doi: 10.1093/her/cyv052
29. Beets MW, Shah R, Weaver RG, et al. Physical activity in after-school programs: Comparison with physical activity policies. *Journal Phys Act Health* 2015;12(1):1-7. doi: 10.1123/jpah.2013-0135
30. Beets MW, Weaver RG, Turner-McGrievy G, et al. Compliance With the Healthy Eating Standards in YMCA After-School Programs. *J Nutr Educ Behav* 2016;48(8):555-62.e1. doi: 10.1016/j.jneb.2016.05.012
31. Trost SG, Loprinzi PD, Moore R, et al. Comparison of accelerometer cut points for predicting activity intensity in youth. *Med Sci Sports Exerc* 2011;43(7):1360-68. doi: 10.1249/MSS.0b013e318206476e
32. Evenson KR, Catellier DJ, Gill K, et al. Calibration of two objective measures of physical activity for children. *J Sports Sci* 2008;26(14):1557-65. doi: 10.1080/02640410802334196
33. Weaver RG, Beets MW, Huberty J, et al. Physical Activity Opportunities in Afterschool Programs. *Health Promot Pract* 2015;16(3):371-82. doi: 10.1177/1524839914567740
34. Weaver RG, Beets MW, Webster C, et al. System for observing staff promotion of activity and nutrition (SOSPAN). *J Phys Act Health* 2014;11(1):173-85. doi: 10.1123/jpah.2012-0007
35. Cullen KW, Watson K, Zakeri I. Improvements in middle school student dietary intake after implementation of the Texas Public School Nutrition Policy. *Am J Public Health* 2008;98(1):111-17. doi: 10.2105/AJPH.2007.111765
36. Slater SJ, Nicholson L, Chriqui J, et al. The impact of state laws and district policies on physical education and recess practices in a nationally representative sample of US public elementary schools. *Arch Pediatr Adolesc Med* 2012;166(4):311-16. doi: 10.1001/archpediatrics.2011.1133
37. Ajja R, Beets MW, Huberty J, et al. The Healthy Afterschool Activity and nutrition documentation instrument. *Am J Prev Med* 2012;43(3):263-71. doi: 10.1016/j.amepre.2012.05.020

- 1
2
3 38. Food Standards Australia New Zealand. AUSNUT 2011–13 – Australian Food Composition
4 Database. Canberra, 2014.
5 www.foodstandards.gov.au/science/monitoringnutrients/ausnut/Pages/default.aspx
6 (accessed April 2019)
7
8 39. Australian Bureau of Statistics. Discretionary foods. Australian Health Survey: Users'
9 Guide, 2011-12. Canberra, 2014.
10 [www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4363.0.55.0012011-](http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4363.0.55.0012011-13?OpenDocument)
11 [13?OpenDocument](http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4363.0.55.0012011-13?OpenDocument)
12
13 40. IBM SPSS Statistics for Windows, [program]. Armonk, NY: IBM Corp., 2017.
14
15 41. Stata Statistical Software [program]. College Station, TX: StataCorp LLC, 2019.
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 **Tables and Figures:**
4

5 **Figure 1: Data collection methods for observing the HEPA environments within out of**
6 **school hours care (OSHC).**

7 *HEPA -Healthy eating and physical active*

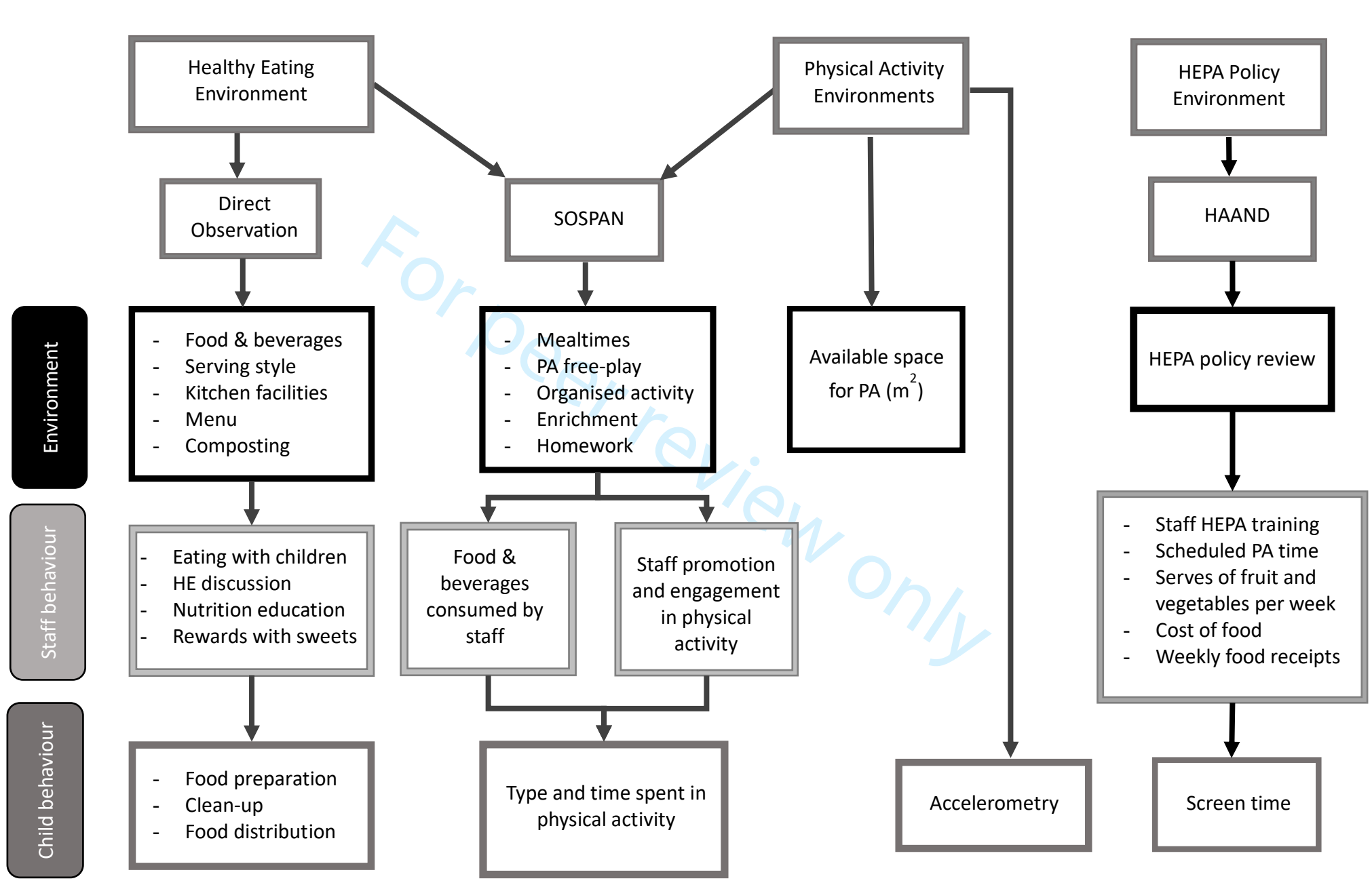
8 *SOSPAN – Systems for Observing Staff Promotion of Activity and Nutrition*

9 *HAAND – Healthy After school Activity and Nutrition Document instrument*

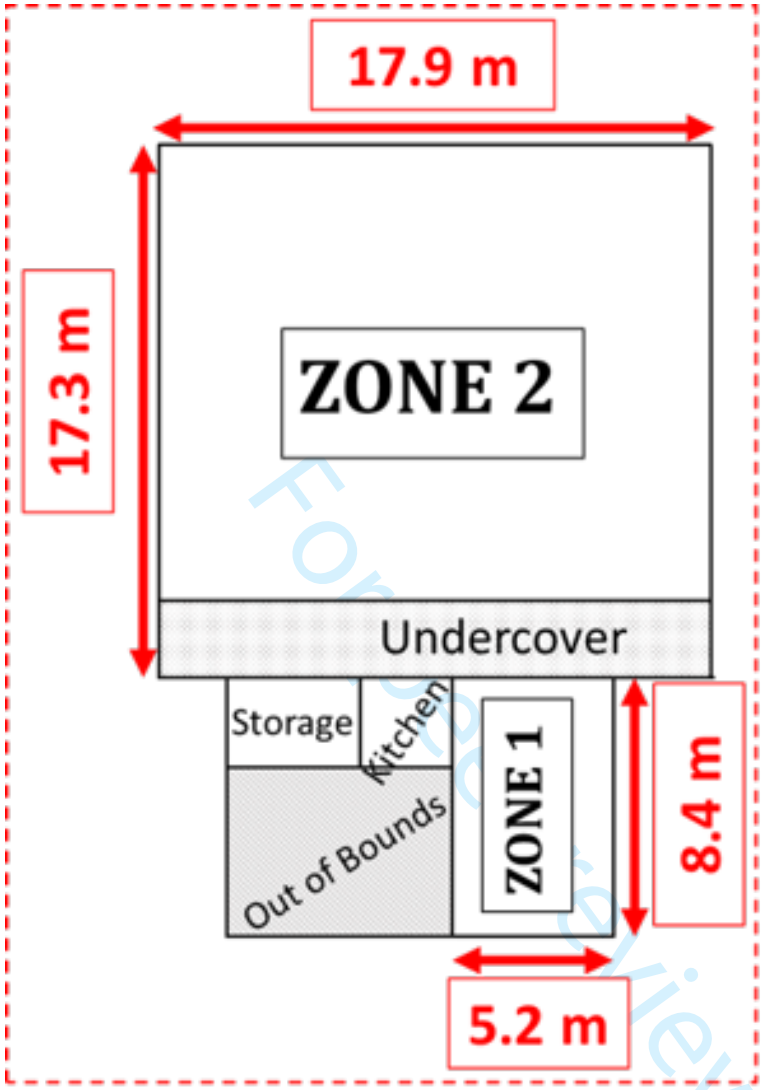
10 *PA – Physical activity*

11 *HE – Healthy eating*
12
13
14
15

16 **Figure 2: An example of the zones and the size of zones measured in metres (m) in OSHC**
17 **program**
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



STROBE (Strengthening The Reporting of OBServational Studies in Epidemiology) Checklist

A checklist of items that should be included in reports of observational studies. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

Section and Item	Item No.	Recommendation	Reported on Page No.
Title and Abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	
Introduction			
Background/Rationale	2	Explain the scientific background and rationale for the investigation being reported	
Objectives	3	State specific objectives, including any prespecified hypotheses	
Methods			
Study Design	4	Present key elements of study design early in the paper	
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	

Section and Item	Item No.	Recommendation	Reported on Page No.
Data Sources/ Measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	
Study Size	10	Explain how the study size was arrived at	
Quantitative Variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	
Statistical Methods	12	(a) Describe all statistical methods, including those used to control for confounding	
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive Data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome Data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	

Section and Item	Item No.	Recommendation	Reported on Page No.
Main Results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other Analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key Results	18	Summarise key results with reference to study objectives	
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	
Other Information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

BMJ Open

Healthy eating and physical activity environments in out of school hours care: an observational study protocol

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2019-036397.R1
Article Type:	Protocol
Date Submitted by the Author:	23-Apr-2020
Complete List of Authors:	Crowe, Ruth; University of Wollongong Faculty of Science Medicine and Health, Probst, Yasmine; University of Wollongong, School of Medicine; University of Wollongong Illawarra Health and Medical Research Institute, Norman , Jennifer ; University of Wollongong Illawarra Health and Medical Research Institute; Illawarra Shoalhaven Local Health District, Health Promotion Service Furber , Susan ; University of Wollongong Illawarra Health and Medical Research Institute; Illawarra Shoalhaven Local Health District, Health Promotion Service Franco , Lisa ; University of Wollongong Illawarra Health and Medical Research Institute, ; Illawarra Shoalhaven Local Health District, Health Promotion Service Stanley , Rebecca; University of Wollongong Illawarra Health and Medical Research Institute; University of Wollongong School of Education Okely, Tony; University of Wollongong School of Education, Early Start
Primary Subject Heading:	Research methods
Secondary Subject Heading:	Public health
Keywords:	NUTRITION & DIETETICS, PUBLIC HEALTH, EPIDEMIOLOGY

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Healthy eating and physical activity environments in out of school hours care: an observational study protocol

Crowe, Ruth ^{1,2}, Probst, Yasmine ², Norman, Jenny ^{2,3}, Furber, Susan ^{2,3}, Franco, Lisa ^{2,3}, Stanley, Rebecca. M^{2,4}, Okely, Tony⁴.

¹ School of Medicine, Science Medicine and Health, University of Wollongong, Northfields Avenue, Wollongong NSW 2522, Australia

² Illawarra Health and Medical Research Institute, University of Wollongong, Northfields Avenue, Wollongong NSW 2522, Australia

³ Health Promotion Service, Illawarra Shoalhaven Local Health District, Warrawong, New South Wales, Australia

⁴ Early Start, School of Education, University of Wollongong, Northfields Avenue, Wollongong NSW 2522, Australia

Key words: healthy eating, exercise, child care, snacks, health promotion

Author contact details:

Address: Early Start, Building 21, University of Wollongong, Northfields Avenue, Wollongong, NSW 2500, Australia

Email: rc101@uowmail.edu.au,

Phone: (02) 4221 4274

Word count: 3,087 (inclusive of: title, abstract and full text)

Abstract: 247

Table number: 1

Figure number: 2

Contribution Statement

Ruth Crowe is a PhD candidate of this study, she has worked with the research team developing the study design and methodology, she will be the lead on the data collection and analysis, interpretation and drafting of future manuscripts. Yasmine Probst and Rebecca Stanley are PhD supervisors on this project. They have contributed to the study design and provided support through the development of this study and both revised and edited the manuscript. Jenny Norman, Susan Furber and Lisa Franco are a part of the Prevention Research Support Program working committee, offering insight and context of local health districts. They have also revised and made significant editorial contributions to this manuscript. Anthony Okely is the chief investigator of this study, contributing to the study design and methodologies. He is a PhD supervisor on this project and has revised and edited this manuscript. All authors have read and approved the final manuscript. This manuscript has not been submitted or published in any other journal.

Conflicts of Interest statement

The authors have declared there is no competing interests

Funding statement

This work was supported by the Prevention Research Support Program, funded by the New South Wales Ministry of Health.

1 **ABSTRACT**

2 **Introduction:** Childcare settings have been widely identified as important venues for
3 promoting healthy lifestyles to children. Out of school hours care (OSHC) is a rapidly growing
4 childcare service, yet there has been limited research reported on healthy eating and physical
5 activity (HEPA) environments within the Australian OSHC setting. This research aims to
6 describe the HEPA environments related to foods and beverages served, staff behaviours and
7 child physical activity levels across two Local Health Districts within New South Wales
8 (NSW), Australia. This study will provide evidence to support future interventions and policies
9 in Australian OSHC settings.

10 **Methods and analysis:** A cross-sectional study design will be used to describe the food and
11 beverages provided, child activity levels and report on environmental correlates. OSHC
12 programs will be visited on non-consecutive weekdays between 2018 and 2020. The frequency
13 of foods and beverages offered will be observed and categorised into food groups aligned to
14 the Australian Dietary Guidelines. Children's physical activity will be measured using
15 Actigraph GT3X accelerometers. Staff behaviour will be captured via direct observation and
16 the Systems for Observing Staff Promotion of Physical Activity and Nutrition (SOSPAN).
17 Short interviews with program directors will gather contextual information about OSHC
18 practices and policies.

19 **Ethics and dissemination:** Findings will be disseminated through peer-reviewed scientific
20 journals, conference presentations and individualised feedback to each participating service.
21 Ethical approval was granted by the University of Wollongong Human Research Ethics
22 Committee (HE17/490).

23 24 **Strengths and limitations of this study:**

- 25 • This will be one of the first known Australian studies to systematically describe the
26 healthy eating and physical activity environments within before and afterschool
27 programs to support the development of future interventions, better policies and
28 healthier environments for children attending OSHC programs.

- 29 • Foods observed can only provide an estimation of food groups offered, rather than
30 actual foods consumed by the children.
- 31 • OSHC programs from the two Local Health Districts in NSW may not be
32 representative of all OSHC programs across NSW or Australia.

34 INTRODUCTION

35 Healthy body weight in childhood supports optimal bone development, cognition and
36 concentration at school, improved sleep patterns and reduced anxiety and depression in later
37 life.¹ Healthy eating and physical activity (HEPA) are important in maintaining a healthy
38 weight status.^{2, 3} National data indicate that no Australian children (aged 4-8 years) currently
39 meet the vegetable intake recommendations, while most exceed discretionary food intake
40 guidelines.⁴ Nearly half of Australian children are not meeting physical activity guidelines and
41 nearly three quarters exceed the recommendations for recreational screen-time.⁵ The out-of-
42 school hours' time period may be a critical window in a child's day to intervene as studies have
43 shown children consume large amounts of snack foods⁶ and participate in long periods of
44 screen-based sedentary activities^{7, 8} during out-of-school hours.

45
46 In Australia, out-of-school hours care (OSHC) programs operate before school (6:00-9:00),
47 after school (15:00-18:00) and during school holidays (vacation care) (9:00–18:00). OSHC
48 programs are of growing importance for many Australian parents whose employment requires
49 them to work outside school hours.^{9, 10} In 2018, 36% of Australian children in care attended
50 OSHC programs (458,750 children), spending an average of 12 hours per week in these
51 programs.⁹ OSHC programs have the opportunity to provide positive physical and social
52 environments that can promote healthy eating and active play to children who attend.

53

1
2
3 54 Within an OSHC setting, staff can create supportive physical environments through; 1) the
4
5 55 foods and beverages available to children (provided meals, vending machines, food rewards),
6
7
8 56 2) health promoting messages^{11, 12} (via posters, nutrition education and cooking), and 3)
9
10 57 opportunities and equipment for active play. The social environment can influence behaviour
11
12 58 via staff role-modelling¹¹ (e.g. consumption of healthy foods and beverages and engagement
13
14 59 in physical activity opportunities) and establishing HEPA practices as a social norm within
15
16
17 60 these settings through the presence of strong and supportive policies.
18
19
20 61

21 62 While limited studies have reported on HEPA within before school care^{13, 14} and Australian
22
23 63 OSHC programs, international research has found that foods and beverages served and
24
25
26 64 children's physical activity levels within after school programs fell well below national
27
28 65 recommendations.^{15, 16} This research aims to describe the HEPA environments related to the
29
30
31 66 foods and beverages served, staff behaviours and child physical activity levels across two Local
32
33 67 Health Districts within New South Wales (NSW), Australia.
34
35
36 68

37 69 **METHODS**

38
39
40 70 A cross-sectional, observation study will be conducted to 1) observe the foods and beverages
41
42 71 offered to children; 2) assess the level of physical activity of children; and 3) observe staff
43
44 72 behaviours on promotion and role-modelling of HEPA within OSHC programs. Data will be
45
46 73 collected during unannounced (non-specified) visits on non-consecutive weekdays to ensure
47
48 74 usual behaviour of staff is captured. In the occurrence of unfavourable weather patterns (e.g.
49
50 75 heavy rainfall), which may lead to irregular practices or changes to the usual program,
51
52 76 observations will be rescheduled. Data collection methods are outlined in Figure 1. Data are
53
54 77 scheduled to be completed within the afterschool programs between March 2018 and April
55
56 78 2019 and within before school care from February 2020 to December 2020.
57
58
59
60

79
80 **Study Sample**

81 In 2018, there were 243 OSHC providers in operation across the South Western Sydney and
82 Illawarra Shoalhaven Local Health Districts,¹⁷ which will act as the sampling frame. Of these,
83 204 OSHC programs are eligible to participate based on the following criteria: five or more
84 primary school-aged children (5-12 years) enrolled; the program runs from 06:00 – 09:00 and/
85 or 15:00 - 18:00 during school terms; provide at least one breakfast or afternoon meal; and the
86 program is not exclusively advertised as a homework or physical activity-related club (e.g.
87 dance academy, swimming or football clubs).¹⁸ A power calculation and sample size estimation
88 were generated with 5% precision requiring 128 OSHC programs to be recruited. Given the
89 large sample size required, all eligible services in the two Local Health Districts will be invited
90 to participate via email and telephone.

91
92 **Recruitment**

93 Written informed consent will be obtained from OSHC directors. Data collected from a service
94 will primarily consist of observing a) staff behaviour, interactions and involvement during
95 OSHC programs, b) food and beverages provided and c) physical activity opportunities. Due
96 to the observational nature of this research, methods have been determined as low risk.¹⁹ A
97 passive consent approach, however, will be applied for collecting accelerometry data.
98 Children will be invited to wear an accelerometer for the duration of their time at the program,
99 unless parents/ guardians have opted their child out of wearing an accelerometer. A child can
100 refuse assent at any stage of the research process. Staff and parents will be notified of the study
101 via several channels, including: 1) recruitment video, digital research posters and information
102 sheets shared via OSHC internal communication avenues; 2) research notification posters at
103 each entrance way, notice boards and sign in/out desk within each OSHC; and 3) participant
104 information sheets and opt-out forms (that provide detailed explanation of the research study,

1
2
3 105 investigator contact details, and the opportunity for participants to be excluded from the study)
4
5 106 located at sign in/out desks. Information relating to this study will be displayed for a minimum
6
7 107 of two weeks prior to data collection commencing and for the duration of the data collection
8
9 108 period. Data collectors will be on site during data collection and available to discuss the study
10
11 109 with staff and parents as required.
12
13
14
15 110

17 111 **Context**

18
19 112 In 2010, the National Quality Framework was implemented in Australia as the overarching
20
21 113 regulatory framework for early childhood education and care, under which sit OSHC
22
23 114 services.²⁰ Within this framework are seven National Quality Standards that are underpinned
24
25 115 by National Legislation and Regulations.²⁰ Healthy eating and physical activity fall under the
26
27 116 National Quality Standards 2, Element 2.1.3, “*healthy eating and physical activity are*
28
29 117 *promoted and appropriate for each child*”. The Australian Children’s Education and Care
30
31 118 Quality Authority disseminated the *Guide to the National Quality Standard*²⁰ to support service
32
33 119 providers in meeting the requirements of the National Quality Standards. These guidelines
34
35 120 within the National Quality Framework are not authoritative, but provide flexibility on how
36
37 121 service providers might meet the Standards.²¹ As demonstrated in Table 1, this guide describes
38
39 122 best practice guidelines for education and care services, recommending staff use positive role
40
41 123 modelling behaviours, engage children in healthy eating conversations, use cooking experience
42
43 124 to build knowledge, provide meals consistent with the Australian Guide to Healthy Eating
44
45 125 (AGHE), implement frequent opportunities for physical activity and role model enjoyment by
46
47 126 engaging in activities.²⁰ A combination of resources designed to support OSHC programs in
48
49 127 meeting Quality Area 2, will be used to guide the criteria within this study including; 1) Heart
50
51 128 Foundations ‘*Eat Smart, Play Smart*’ manual,²² 2) Nutrition Australia’s ‘*Healthy eating in the*
52
53 129 *National Quality Standards*,²³ and 3) the ‘*Food and drink checklist for outside school hours*
54
55
56
57
58
59
60

1
2
3 130 care'.²⁴ For the purpose of this study we will report on whether staff behaviour relating to the
4
5 131 best practice guidelines was observed or not observed.
6
7
8 132

9
10 133 **Table 1:** Best-practice guidelines, selected from the *Guide to the National Quality Standards*
11 134 for the reporting of HEPA promotion behaviours in OSHC.

National Quality Standards	Direct observation	SOSPAN ^b	Accel ^c	HAAND ^d
Healthy Eating Environment				
Engage children in experiences and conversations that promote mealtimes to be enjoyable and promote healthy, balanced lifestyles	✓			
Use cooking experiences to further children's understanding of food and nutrition	✓			
Never use food to reward children	✓	✓		
Sit and eat with children and model, healthy eating and nutrition practices during mealtimes	✓			
Provide food and beverages consistent with the Australia dietary guidelines	✓			✓
Provide foods and drinks consistent with the menu	✓	✓		✓
Access to water throughout the day	✓	✓		
Physical Activity Environment				
Implement physical games and activities as part of the program and encourage children to participate		✓		
Become involved and demonstrate enjoyment in children's physical activity		✓		
Children should have frequent opportunities to engage in active play		✓		✓
Children should lead physical play activities with peers		✓		
Opportunity for dance, creative movement and drama and respond to music		✓		✓
Provide resources and equipment to support children participate in physical activity		✓		
Additional Measures^a				
Nutrition and physical activity policies				✓
Children accumulate 30 minutes MVPA in the hours before and afterschool			✓	

Annual nutrition and physical activity staff training				✓
---	--	--	--	---

135 **Note:** This is not an exhaustive list of best-practice behaviours, only those that could be reported on by
 136 the selected tools used within this study. Some of the descriptions have been summarised within this
 137 table.

138 ^aAdditional measures are not found within the *Guide to the National Quality Standards*

139 ^bSOSPAN: System for observing staff promotion of activity and nutrition

140 ^cAccel: Accelerometer

141 ^dHAAND: Healthy Afterschool Activity and Nutrition Document

142

143 Healthy eating and physical activity measures were selected from the Australian Dietary
 144 Guidelines²⁵ and the Australian Physical Activity and Sedentary Behaviour Guidelines for
 145 Children and Young People, respectively.²⁶ Due to the observational nature of this study, the
 146 frequency of food groups offered/ served to children will be reported. National physical activity
 147 guidelines state that children should accumulate a minimum of 60-minutes of moderate-to-
 148 vigorous physical activity (MVPA) across an entire day.²⁶ For the current study, a minimum
 149 measure of 30 minutes of MVPA has been selected as the criterion.²⁶ This amount of time is
 150 half of the daily recommendation. It is also recognised internationally as an achievable goal
 151 specifically within the afterschool period²⁷ and has been used in studies conducted in similar
 152 settings in the United States.^{18, 28, 29}

153

154 **Healthy Eating Environment**

155 Food and beverages offered to children will be captured via direct observation and digital
 156 images. Digital images will capture descriptive data for the provided foods, including food
 157 labels, branding, packaging and serving methods (individual portion sizes or “family style”,
 158 characterised by a shared platter).^{30 31} Trained nutritionists or final year nutrition and dietetics
 159 graduate students will collect all food and nutrition behavioural observation data. Water will

1
2
3 160 be recorded as available if cups of water or designated water stations are available to children
4
5 161 during the snack time or throughout the program.³¹
6
7
8 162

9
10 163 Observations of the healthy eating environment will be made during the scheduled mealtime
11
12 164 including: staff healthy eating promotion behaviours; staff sitting and eating with children;
13
14 165 staff promotion / discouragement of healthy foods and beverages; staff engaging children in
15
16 166 healthy eating discussions or nutrition education during the meal time; provision of food
17
18 167 knowledge and skill development (including children's involvement in the food preparation
19
20 168 activities, and food clean-up); rewarding of good behaviour with discretionary food items²²
21
22 169 (e.g. sweets and confectionary); and food waste management (e.g. use of a compost or worm
23
24 170 farm). Weekly food menus will be observed and recorded including if they are displayed for
25
26 171 parents, whether menus were consistent with foods served and if they met the requirements of
27
28 172 the 'Food and drink checklist for outside school hours care'.²⁴ Types of food preparation
29
30 173 (kitchen) facilities will be observed and documented including food storage, cooking
31
32 174 equipment, preparation areas and washing up facilities.
33
34
35
36
37
38
39

40 176 **Physical Activity Environments**

41
42 177 Prior to data collection, all OSHC programs will be visited to record the physical characteristics
43
44 178 of the program environment, including indoor (non-physical activity enrichment or snack
45
46 179 areas) and outdoor spaces (physical activity spaces). These spaces will be divided and
47
48 180 identified as zones during the data collection period. Available space accessible to children
49
50 181 during the OSHC program will be mapped and measured in metres using a CRAFT.RIGHT
51
52 182 measuring wheel (Figure 2). Permanent facilities (e.g. basketball courts, fixed equipment and
53
54 183 sandpits) will be measured and identified as zones.
55
56
57
58
59
60

1
2
3 185 Child physical activity will be measured via ActiGraph accelerometers (wGT3X-BT models).
4
5 186 Accelerometers are widely used to provide an objective estimate of physical activity in free-
6
7 living research.^{28, 32, 33} Accelerometers are small, unobtrusive devices that sit around a child's
8
9 waist, attached using adjustable elastic belts. As children arrive at a program, the
10
11 188 accelerometers will be fitted around their waist by trained data collectors, ensuring the unit is
12
13 189 sitting on the right hip. The time-on and demographic data of each child (school grade and sex)
14
15 190 will be recorded. As children depart from the program accelerometers will be removed and
16
17 191 time-off recorded.³⁴
18
19 192
20
21
22 193

23 194 **System for Observing Staff Promotion of Activity and Nutrition**

24
25 195 Staff promotion of HEPA behaviours will be measured by direct observation and momentary
26
27 196 time sampling using the System for Observing Staff Promotion of Activity and Nutrition
28
29 (SOSPAN) instrument.³⁵ SOSPAN is a validated observation tool created and used within
30
31 197 afterschool programs in the United States.³⁴ The tool is designed to capture 13 physical activity
32
33 198 and six healthy eating behaviours of staff as described in detail elsewhere.³⁴ Staff behaviours
34
35 199 captured by SOSPAN include staff encouragement of physical activity (e.g. leading physical
36
37 200 activity, verbally promoting physical activity, staff engagement in physical activity with
38
39 201 children and providing children with multiple physical activity options) or discouragement of
40
41 202 physical activity (e.g. idle time, providing elimination games, children standing or waiting for
42
43 203 a turn and withholding physical activity). SOSPAN captures the context of the program,
44
45 204 documenting the duration of scheduled activities (physical activity, indoor enrichment
46
47 205 activities, homework/ academics and mealtime). Other contextual activities recorded by
48
49 206 SOSPAN include the identification of organised activity (structured activity set up by OSHC
50
51 207 staff) versus physical activity free-play (unstructured activity time that was child-led and not
52
53 208 organised by staff in the afterschool programs).
54
55
56
57
58
59
60

1
2
3 210 Staff promotion and modelling of healthy eating behaviours are captured in SOSPAN via staff
4
5 211 verbally promoting healthy eating, educating children on healthy eating and consuming healthy
6
7 212 food and beverage options or discouraging healthy eating by staff consuming inappropriate
8
9 213 foods or drinks.

10
11
12 214 Systematic SOSPAN scans will be continually completed throughout the duration of the
13
14 215 program or until there are less than five children remaining at the program.³⁵ Data collectors
15
16 216 will move systematically between zones (Figure 2) where both staff and children are present,
17
18 217 completing five scans before moving to the next area.^{34, 35} Data collectors will be required to
19
20 218 meet greater than 80% interrater reliability agreement via an interval-by-interval agreement on
21
22 219 two consecutive data collection days.³⁵ Interrater reliability will be continuously monitored
23
24 220 throughout the data collection process, completing a minimum of five reliability scans per day.
25
26 221

222 **HEPA Policy Environment: Healthy After school Activity and Nutrition Documentation**

223 Written HEPA policies, that use clear-language to guide staff practices have been shown to
224 improve the HEPA environments within child care services.^{36, 37} The Healthy After school
225 Activity and Nutrition Documentation (HAAND) instrument is a validated tool that will be
226 used to guide and collect information on HEPA policies and practices through a short interview
227 with Directors from each OSHC program. Detailed information on this tool has been published
228 elsewhere.³⁸ HAAND explores 11 healthy eating and ten physical activity policy characteristics
229 captured through a short, structured interview that is conducted on-site with the OSHC
230 Directors by trained data collectors. In short, HAAND evaluates the level at which program
231 policies support HEPA characteristics through written policies, staff training, use of HEPA
232 resources, time allocations and types of physical activity, healthy eating practices and screen-
233 time availability. In addition, a copy of the nutrition and physical activity policies, as well as
234 weekly food receipts and menus, will be requested from each OSHC program. For the purpose

1
2
3 235 of collecting healthy eating and physical activity policy information, the HAAND will be
4
5 236 applied to both before and afterschool OSHC programs. To minimise potential response bias,
6
7 237 all staff will be reminded at the commencement of the interview that all data collected will be
8
9 238 deidentified and the importance of not modifying any of their behaviours.
10
11

12 239

14 240 **Training**

16 241 Data collectors will be extensively trained in all data collection methods prior to data collection
17
18 242 commencing. This will occur via a combination of classroom simulation and practical on-site
19
20 243 training at local, non-participating OSHC programs. Theoretical classroom training will
21
22 244 include the review of study protocols, memorising observational codes and watching video
23
24 245 clips depicting the out of school hours environment and coding scenarios using observational
25
26 246 tools, developed by Weaver et al (2015). Data collection will be primarily conducted by PhD
27
28 247 candidates, nutrition and dietetics final year graduate students and research assistants.
29
30

31 248

33 249 **Data Analysis**

35
36 250 Foods and beverages will be categorised by a dietitian or nutritionist into the five core food
37
38 251 groups according to the AGHE: fruit, vegetables, lean meats, dairy and grains (whole grains).
39
40 252 Additional categories of discretionary items, refined grains, water and 'extra' drinks (fruit
41
42 253 juice, cordial, soft drinks and flavoured milk) will also be recorded. Food categorisation will
43
44 254 be guided by the AUSNUT 2011-13 database developed by Food Standards Australian New
45
46 255 Zealand, for the Australian Health Survey food classification system³⁹ and the Discretionary
47
48 256 food listing⁴⁰ developed by the Australian Bureau of Statistics. Food categories will be checked
49
50 257 by a researcher independent of the OSHC observations. The frequency of food groups and
51
52 258 beverages offered across observation days will be calculated and expressed as a percentage,
53
54 259 mean and standard deviation, for normally distributed data and median and interquartile ranges
55
56 260 for skewed data. Data transformation is not deemed relevant to this study.
57
58
59
60

1
2
3 261
4
5
6 262 Accelerometer-derived physical activity data will be calculated for minutes per day spent in
7
8 263 sedentary, total physical activity and MVPA. For this study the Evenson cut points will be
9
10 264 used: sedentary behaviour <26 counts/ 15 seconds, light-to-moderate activity 26-573 counts/
11
12 265 15 seconds, moderate activity 574-1002 counts/ 15 seconds, and vigorous activity >1002
13
14 266 counts/ 15 seconds.³³ The Evenson cut points have been recognised as accurate cut points for
15
16 267 measuring the time spent in different physical activity intensities for children aged five to eight
17
18 268 years.³² Within afterschool programs, physical activity data will be considered valid if a total
19
20 269 wear time of accelerometers is equal to or greater than 60 minutes¹⁶ and 30 minutes within
21
22 270 before school care. Total time active will be reported on for the before school care programs.
23
24 271 All accelerometry data will be analysed using ActiLife software ⁴¹ and STATA.⁴²
25
26 272

27
28
29
30 273 Staff behaviours captured through direct observation, SOSPAN and responses from the
31
32 274 structured interview (i.e. HAAND) will be quantified and reported as a percentage of
33
34 275 observations and responses completed using SPSS software 'IBM SPSS Statistics for
35
36 276 windows, version 25.0. (IBM Corp., Armonk, N.Y., USA)'.
37
38
39

40 277
41
42 278 The relationship between serving healthy snack foods and variables such as: socio-economic
43
44 279 index for areas (SEIFA), availability of kitchen facilities and healthy eating training of staff
45
46 280 will be explored.
47
48

49 281
50
51 282 To explore the relationships between the physical activity environment and child activity
52
53 283 levels, correlations between time spent in MVPA, total physical activity and sedentary
54
55 284 behaviour will be assessed against: physical activity policy, staff engagement in physical
56
57
58
59
60

1
2
3 285 activity, available space for physical activity (m²), ratio of number of children to staff, physical
4
5 286 activity equipment and sex of child.
6
7

8 287

9
10 288 **ETHICS AND DISSEMINATION**

11
12 289 Ethical approval has been provided by the University of Wollongong, Australia Human
13 290 Research Ethics Committee (approval HE17/490). Results from this study will be disseminated
14 291 through peer-reviewed scientific journals, conference presentations, scientific reports, service
15 292 reports (providing findings to participating OSHC care providers) and will form part of student
16 293 dissertations.
17
18
19
20

21 294

22
23 295 **PATIENT AND PUBLIC INVOLVEMENT**

24 296 Although this research was completed without public involvement, it did incorporate key
25 297 public health stakeholders in the governance and management of the study. These stakeholders
26 298 did contribute to the research priorities, defining research question and outcome measures and
27 299 providing input into the study design. Members of the public were not invited to comment on
30 300 the study design and were not consulted to ensure a true benchmark was achieved. Members
31 301 of the public were not invited to contribute to the writing or editing of this document for
32 302 readability or accuracy.
33
34
35
36
37

38 303

39 304 **FUNDING STATEMENT**

40 305 This work was supported by the Prevention Research Support Program, funded by the New
41 306 South Wales Ministry of Health.
42
43

44 307

45
46 308 **ACKNOWLEDGMENTS**

47
48 309 We acknowledge Julie Parkinson for her valuable contribution to the research study. We
49 310 would also like to recognise Sarah Ryan and Maria Nacher Espuig for their on-going role in
50 311 technical and administration support. This research has been conducted with the support of
51 312 the Australian Government Research Training Program Scholarship.
52
53
54

55 313

56
57 314 **REFERENCES**
58
59
60

- 1
2
3 315 1. Engle P, Huffman SL. Growing Children's Bodies and Minds: Maximizing Child Nutrition
4 316 and Development. *Food Nutr Bull* 2010;31(2_suppl2):S186-S97. doi:
5 317 10.1177/15648265100312s211
- 6
7 318 2. Australian Institute of Health and Welfare. Overweight & obesity 2019.
8 319 [www.aihw.gov.au/reports-data/behaviours-risk-factors/overweight-](http://www.aihw.gov.au/reports-data/behaviours-risk-factors/overweight-obesity/overview)
9 320 [obesity/overview](http://www.aihw.gov.au/reports-data/behaviours-risk-factors/overweight-obesity/overview) (accessed 19 July 2019).
- 10
11 321 3. Australian Institute of Health and Welfare. Physical activity 2019.
12 322 www.aihw.gov.au/reports-data/behaviours-risk-factors/physical-activity/overview
13 323 (accessed 19 July 2019).
- 14
15 324 4. Australian Bureau of Statistics. Australian Health Survey: Consumption of food groups
16 325 from the Australian Dietary Guidelines, 2011-12. Canberra, ACT, 2016.
17 326 [www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4364.0.55.012~2011-](http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4364.0.55.012~2011-12~Main%20Features~Vegetables,%20legumes%20and%20beans~10)
18 327 [12~Main%20Features~Vegetables,%20legumes%20and%20beans~10](http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4364.0.55.012~2011-12~Main%20Features~Vegetables,%20legumes%20and%20beans~10) (accessed July
19 328 2019).
- 20
21 329 5. Australian Bureau of Statistics. Australian Health Survey: Physical Activity, 2011-12.
22 330 Canberra, 2013.
23 331 www.abs.gov.au/ausstats/abs@.nsf/Lookup/4364.0.55.004Chapter1002011-12
24 332 (accessed July 2019)
- 25
26 333 6. Wang D, Van der Horst K, Jacquier EF, et al. Snacking Patterns in Children: A Comparison
27 334 between Australia, China, Mexico, and the US. *Nutrients* 2018;10(2):198. doi:
28 335 10.3390/nu10020198
- 29
30 336 7. Arundell L, Fletcher E, Salmon J, et al. A systematic review of the prevalence of sedentary
31 337 behavior during the after-school period among children aged 5-18 years. *Int J Behav*
32 338 *Nut Phys Act* 2016;13(1) doi: 10.1186/s12966-016-0419-1
- 33
34 339 8. Arundell L, Hinkley T, Veitch J, et al. Contribution of the after-school period to children's
35 340 daily participation in physical activity and sedentary behaviours. *PLoS ONE*
36 341 2015;10(10) doi: 10.1371/journal.pone.0140132
- 37
38 342 9. Department of Education and Training. Early Childhood and Child Care in Summary: June
39 343 quarter 2018. In: Australian Government, ed., 2018:2 - 18.
- 40
41 344 10. Australian Institute of Health and Welfare. Children in child care and preschool
42 345 programs. In: Australian Government, ed. Canberra, 2017.
43 346 www.aihw.gov.au/reports/australias-welfare/childcare-and-early-childhood-education
44 347 (accessed May 2019)
- 45
46 348 11. Story M, Kaphingst KM, Robinson-O'Brien R, et al. Creating healthy food and eating
47 349 environments: Policy and environmental approaches. *Annu Rev Public Health*,
48 350 2008:253-72.
- 49
50 351 12. French S, Stables G. Environmental interventions to promote vegetable and fruit
51 352 consumption among youth in school settings. *Prev Med*. 2003;37:593 - 610.
- 52
53 353 13. Maher C, Virgara R, Okely T, et al. Physical activity and screen time in out of school hours
54 354 care: an observational study. *BMC Pediatrics* 2019;19(1):283. doi: 10.1186/s12887-
55 355 019-1653-x
- 56
57 356 14. Thompson E, Cooper C, Flanagan C, et al. Food and activity in out of school hours care in
58 357 Victoria. *Nutr Diet* 2006;63(1):21-27. doi: 10.1111/j.1747-0080.2006.00018.x
- 59
60 358 15. Beets MW, Weaver RG, Tilley F, et al. Salty or sweet? Nutritional quality, consumption,
359 and cost of snacks served in afterschool programs. *J Sch Health*. 2015;85(2):118-24.
360 doi: 10.1111/josh.12224

- 1
2
3 361 16. Beets MW, Rooney L, Tilley F, et al. Evaluation of policies to promote physical activity in
4 362 afterschool programs: Are we meeting current benchmarks? *Prev Med* 2010;51(3-
5 363 4):299-301. doi: 10.1016/j.ypmed.2010.07.006
6
7 364 17. Australian Children's Education & Care Quality Authority. National registers, 2019.
8 365 18. Beets MW, Weaver RG, Turner-McGrievy G, et al. Making Healthy Eating Policy Practice:
9 366 A Group Randomized Controlled Trial on Changes in Snack Quality, Costs, and
10 367 Consumption in After-School Programs. *Am J Health Promot* 2016;30(7):521-31. doi:
11 368 10.4278/ajhp.141001-QUAN-486
12
13 369 19. National Health and Medical Research Council. National Statement on Ethical Conduct in
14 370 Human Research In: Government A, ed., 2018.
15 371 20. Australian Children's Education & Care Quality Authority. Guide to the National Quality
16 372 Framework. Sydney, 2018:138 - 60.
17
18 373 21. McGuire J, Gallegos D, Irvine S. Infant feeding nutrition policies in Australian early
19 374 childhood education and care services: a content and qualitative analysis.
20 375 *International Journal of Child Care and Education Policy* 2018;12(1) doi:
21 376 10.1186/s40723-018-0053-2
22
23 377 22. Heart Foundation. Eat Smart Play Smart - A manual for Out of School Hours Care 2016:5 -
24 378 191.
25 379 23. Victoria State Government. Healthy eating in the National Quality Standard. In:
26 380 Department of Education and Training, ed., 2019.
27
28 381 24. Healthy Eating Advisory Service. Food and drink checklist for outside school hours care.
29 382 In: Government VS, ed., 2016.
30 383 <https://heas.health.vic.gov.au/early-childhood-services/menu-planning/OSHC/checklist>
31 384 (accessed Feb 2019)
32
33 385 25. National Health and Medical Research Council. Australian Dietary Guidelines. Canberra,
34 386 Australia: National Health and Medical Research Council; 2013.
35 387 <https://www.eatforhealth.gov.au/guidelines>. (accessed March 2020)
36 388 26. Australian Government Department of Health. Australia's Physical Activity and
37 389 Sedentary Behaviour Guidelines and the Australian 24-Hour Movement Guidelines,.
38 390 In: Australian Government Department of Health, ed., 2019.
39 391 [www1.health.gov.au/internet/main/publishing.nsf/Content/health-publth-strateg-](http://www1.health.gov.au/internet/main/publishing.nsf/Content/health-publth-strateg-phys-act-guidelines)
40 392 [phys-act-guidelines](http://www1.health.gov.au/internet/main/publishing.nsf/Content/health-publth-strateg-phys-act-guidelines). (accessed June 2019)
41
42 393 27. California Department of Education. California Afterschool Physical Activity Guidelines.
43 394 California Department of Education, Sacramento, CA. p29-30. 2009
44
45 395 28. Weaver RG, Beets MW, Hutto B, et al. Making healthy eating and physical activity policy
46 396 practice: Process evaluation of a group randomized controlled intervention in
47 397 afterschool programs. *Health Educ Res* 2015;30(6):849-65. doi: 10.1093/her/cyv052
48 398 29. Beets MW, Shah R, Weaver RG, et al. Physical activity in after-school programs:
49 399 Comparison with physical activity policies. *Journal Phys Act Health* 2015;12(1):1-7.
50 400 doi: 10.1123/jpah.2013-0135
51
52 401 30. Tugault-Lafleur CN, Black JL, Barr SI. A Systematic Review of Methods to Assess
53 402 Children's Diets in the School Context. *Adv Nutr*. 2017;8(1):63-79. doi:
54 403 10.3945/an.116.013144
55
56 404 31. Beets MW, Weaver RG, Turner-McGrievy G, et al. Compliance With the Healthy Eating
57 405 Standards in YMCA After-School Programs. *J Nutr Educ Behav* 2016;48(8):555-62.e1.
58 406 doi: 10.1016/j.jneb.2016.05.012
59
60

- 1
2
3 407 32. Trost SG, Loprinzi PD, Moore R, et al. Comparison of accelerometer cut points for
4 408 predicting activity intensity in youth. *Med Sci Sports Exerc* 2011;43(7):1360-68. doi:
5 409 10.1249/MSS.0b013e318206476e
6
7 410 33. Evenson KR, Catellier DJ, Gill K, et al. Calibration of two objective measures of physical
8 411 activity for children. *J Sports Sci* 2008;26(14):1557-65. doi:
9 412 10.1080/02640410802334196
10
11 413 34. Weaver RG, Beets MW, Huberty J, et al. Physical Activity Opportunities in Afterschool
12 414 Programs. *Health Promot Pract* 2015;16(3):371-82. doi: 10.1177/1524839914567740
13 415 35. Weaver RG, Beets MW, Webster C, et al. System for observing staff promotion of activity
14 416 and nutrition (SOSPAN). *J Phys Act Health* 2014;11(1):173-85. doi:
15 417 10.1123/jpah.2012-0007
16
17 418 36. Cullen KW, Watson K, Zakeri I. Improvements in middle school student dietary intake
18 419 after implementation of the Texas Public School Nutrition Policy. *Am J Public Health*
19 420 2008;98(1):111-17. doi: 10.2105/AJPH.2007.111765
20
21 421 37. Slater SJ, Nicholson L, Chriqui J, et al. The impact of state laws and district policies on
22 422 physical education and recess practices in a nationally representative sample of US
23 423 public elementary schools. *Arch Pediatr Adolesc Med* 2012;166(4):311-16. doi:
24 424 10.1001/archpediatrics.2011.1133
25
26 425 38. Ajja R, Beets MW, Huberty J, et al. The Healthy Afterschool Activity and nutrition
27 426 documentation instrument. *Am J Prev Med* 2012;43(3):263-71. doi:
28 427 10.1016/j.amepre.2012.05.020
29
30 428 39. Food Standards Australia New Zealand. AUSNUT 2011–13 – Australian Food Composition
31 429 Database. Canberra, 2014.
32 430 www.foodstandards.gov.au/science/monitoringnutrients/ausnut/Pages/default.aspx
33 431 (accessed April 2019)
34 432 40. Australian Bureau of Statistics. Discretionary foods. Australian Health Survey: Users'
35 433 Guide, 2011-12. Canberra, 2014.
36 434 www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4363.0.55.0012011-
37 435 [13?OpenDocument](http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4363.0.55.0012011-13?OpenDocument)
38
39 436 41. IBM SPSS Statistics for Windows, [program]. Armonk, NY: IBM Corp., 2017.
40 437 42. Stata Statistical Software [program]. College Station, TX: StataCorp LLC, 2019.
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 438 **Tables and Figures:**

4 439

5 440 **Figure 1: Data collection methods for observing the HEPA environments within out of**
6 **school hours care (OSHC).**

7 441 *HEPA -Healthy eating and physical active*

8 442 *SOSPAN – Systems for Observing Staff Promotion of Activity and Nutrition*

9 443 *HAAND – Healthy After school Activity and Nutrition Document instrument*

10 444 *PA – Physical activity*

11 445 *HE – Healthy eating*

12 446

13 447

14 448

15 449 **Figure 2: An example of the zones and the size of zones measured in metres (m) in OSHC**
16 **program**

17 450

18 451

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

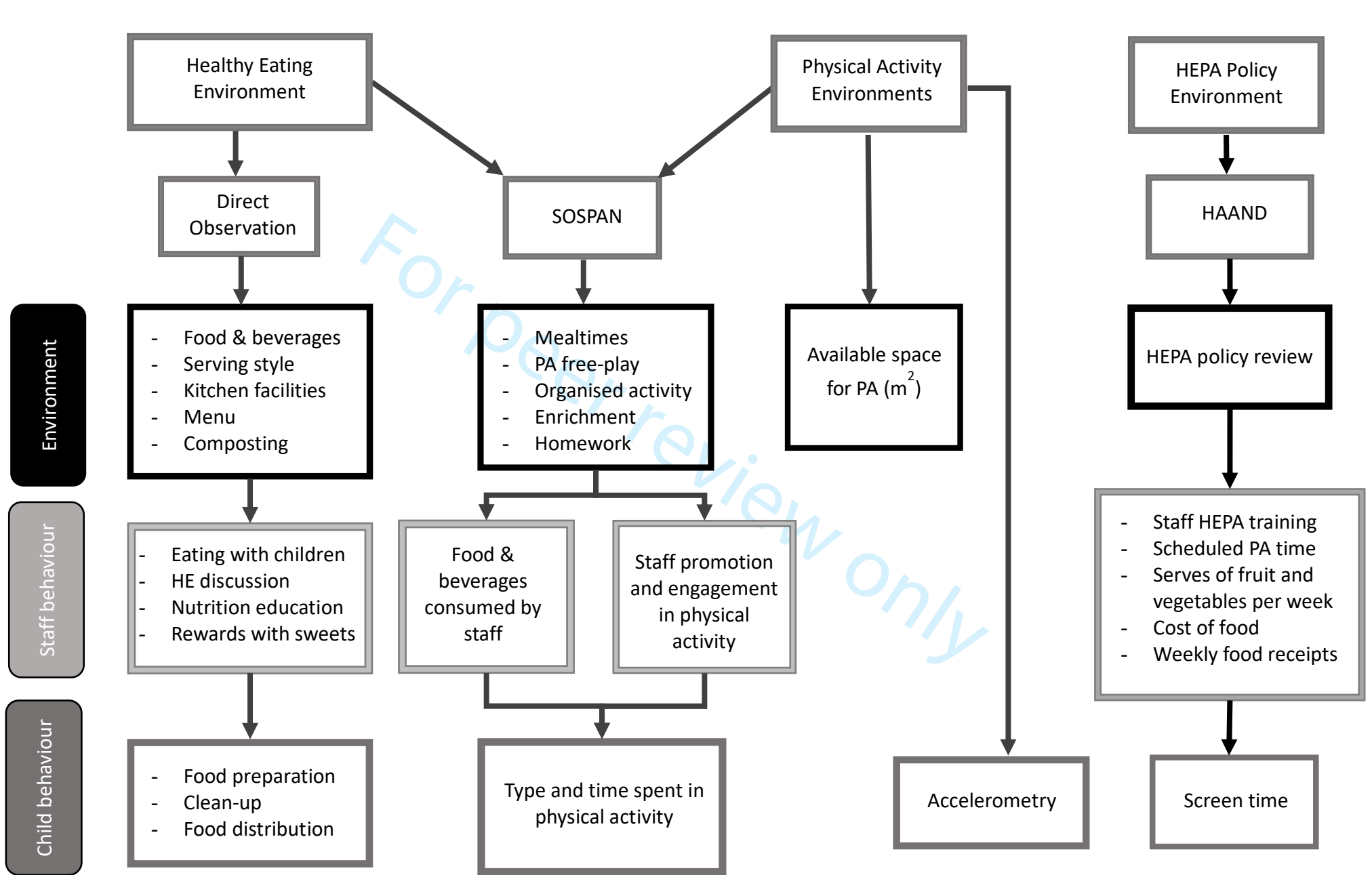
56

57

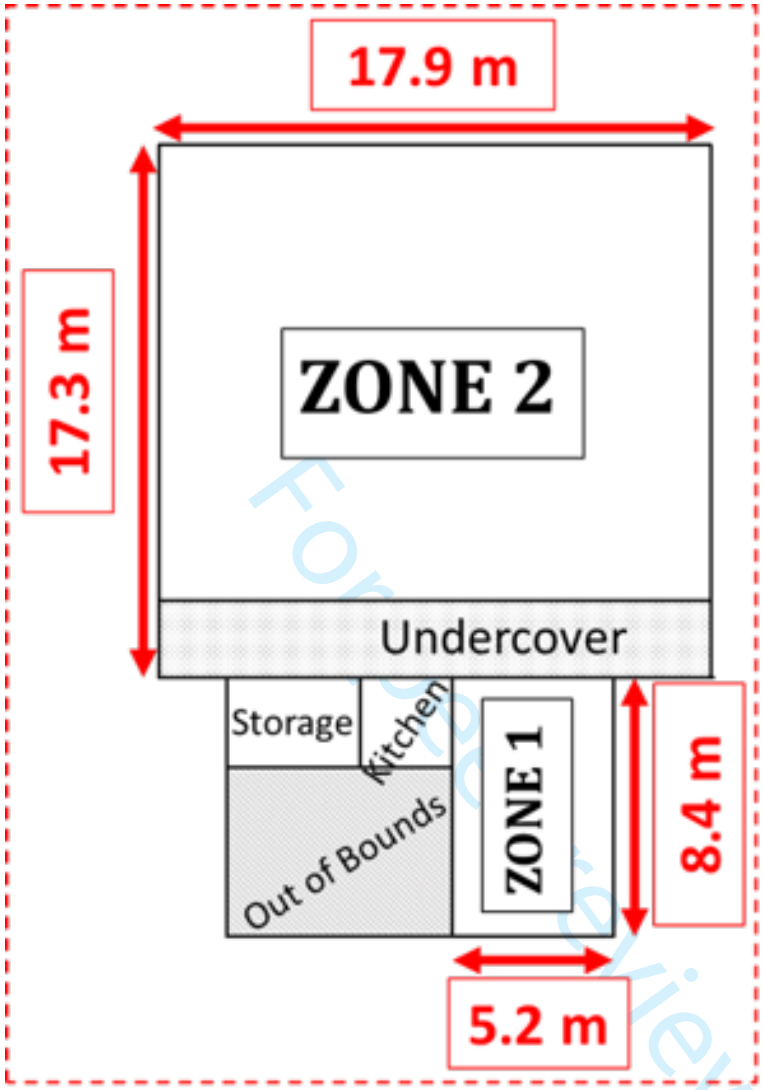
58

59

60



1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



STROBE (Strengthening The Reporting of OBServational Studies in Epidemiology) Checklist

A checklist of items that should be included in reports of observational studies. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

Section and Item	Item No.	Recommendation	Reported on Page No.
Title and Abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	
Introduction			
Background/Rationale	2	Explain the scientific background and rationale for the investigation being reported	
Objectives	3	State specific objectives, including any prespecified hypotheses	
Methods			
Study Design	4	Present key elements of study design early in the paper	
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	

Section and Item	Item No.	Recommendation	Reported on Page No.
Data Sources/ Measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	
Study Size	10	Explain how the study size was arrived at	
Quantitative Variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	
Statistical Methods	12	(a) Describe all statistical methods, including those used to control for confounding	
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive Data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome Data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	

Section and Item	Item No.	Recommendation	Reported on Page No.
Main Results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other Analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key Results	18	Summarise key results with reference to study objectives	
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	
Other Information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.