



NOVA

University of Newcastle Research Online

nova.newcastle.edu.au

Jones, R. A.; Lubans, D. R.; Morgan, P. J.; Okely, A. D.; Parletta, N.; Wolfenden, L.; de Silva-Sanigorski, A.; Gibbs, L.; Waters, E. " School-based obesity prevention interventions: practicalities and considerations". Originally published in Obesity Research and Clinical Practice Vol. 8, Issue 5, p. e497-e510 (2013)

Available from: <http://dx.doi.org/10.1016/j.orcp.2013.10.004>

©2013. This manuscript version is made available under the CC-BY-NC-ND 4.0 license  
<http://creativecommons.org/licenses/by-nc-nd/4.0>

**Accessed from:** <http://hdl.handle.net/1959.13/1325199>

**Title: School-based obesity prevention interventions: Practicalities and considerations**

**Citation:** Jones RA, Lubans DR, Morgan PJ, Okely AD, Parletta N, Wolfenden L, de Silva-Sanigorski A, Gibbs L, Waters E (2013). School-based obesity prevention interventions: Practicalities and considerations. *Obesity Research and Clinical Practice*, <http://dx.doi.org/10.1016/j.orcp.2013.10.004>

**Type of manuscript:** Original Article

## **Authors and Affiliations**

Jones RA, PhD, Interdisciplinary Educational Research Institute, University of Wollongong, Australia, 2522 (rachelj@uow.edu.au)

Lubans DR, PhD, Priority Research Centre in Physical Activity and Nutrition, Faculty of Education & Arts, University of Newcastle, Callaghan Campus, Australia, 2038. (David.Lubans@newcastle.edu.au)

Morgan PJ, PhD, Priority Research Centre in Physical Activity and Nutrition, Faculty of Education & Arts, University of Newcastle, Callaghan Campus, Australia, 2038. (Philip.Morgan@newcastle.edu.au)

Okely AD, DEd, Interdisciplinary Educational Research Institute, University of Wollongong, Australia, 2522 (tokely@uow.edu.au)

Parletta N, PhD, Sansom Institute for Health Research, School of Health Sciences, University of South Australia, Adelaide South Australia 5000. (Natalie.Parletta@unisa.edu.au)

Wolfenden L, PhD, School of Medicine and Public Health, University of Newcastle, Newcastle, New South Wales, 2308 (Luke.Wolfenden@hnehealth.nsw.gov.au)

de Silva-Sanigorski A, PhD, Jack Brockhoff Child Health and Wellbeing Program, McCaughey VicHealth Centre, Melbourne School of Population Health, University of Melbourne, Parkville, Victoria, 3010 (andreams@unimelb.edu.au)

1 Gibbs L, PhD, Jack Brockhoff Child Health and Wellbeing Program, McCaughey VicHealth  
2 Centre, Melbourne School of Population Health, University of Melbourne, Parkville, Victoria,  
3 3010 (lgibbs@unimelb.edu.au)

4

5 Waters E, PhD, Jack Brockhoff Child Health and Wellbeing Program, McCaughey VicHealth  
6 Centre, Melbourne School of Population Health, University of Melbourne, Parkville, Victoria,  
7 3010 (ewaters@unimelb.edu.au)

8

9 **Corresponding Author:**

10 Dr Rachel Jones

11 Interdisciplinary Educational Research Institute, University of Wollongong, Australia, 2522,  
12 Northfield Ave, Wollongong NSW 2522, Australia

13 Email: rachelj@uow.edu.au

14 Phone: +61 2 42213321

15 Facsimile: +61 2 42 213892

16

17 **Conflict of Interest:** There were no conflicts of interest.

18

19 **Acknowledgements**

20 ADO is supported by a National Heart Foundation of Australia Career Development

21 Fellowship (CR11S 6099)

22 NP is supported by National Health and Medical Research Council Program Grant funding (#  
23 320860 and 631947).

24

25 **Disclosure statement**

26 No competing financial interests exist

27

28

1    **ABSTRACT**

2    Pediatric obesity continues to be a major public health concern. Once established it is difficult  
3    to treat, therefore well-designed and evaluated prevention interventions are vitally important.  
4    Schools have an important role in the prevention of childhood obesity, however, their  
5    involvement can be limited by a number of constraints and barriers, which need to be  
6    considered when designing interventions. Members of the Prevention Stream of the  
7    Australasian Child and Adolescent Obesity Research Network have extensive experience in  
8    implementing and evaluating school-based obesity prevention initiatives. Based on their  
9    collective experience and evidence from implementation research, the aim of this paper was  
10   to highlight six areas to consider when designing, implementing and evaluating obesity  
11   prevention initiatives in schools. Further, this paper aimed to provide guidance for  
12   overcoming some of the challenges and barriers faced in school-based obesity prevention  
13   research. The six key areas discussed include: design and analysis; school-community  
14   engagement; planning and recruitment; evaluation; implementation; and feedback and  
15   sustainability.

16  
17    **Key words**

18    School-based, obesity, overweight, prevention, interventions  
19  
20

# 1 INTRODUCTION

2 Childhood obesity prevention is a global public health priority. An extensive body of  
3 evidence highlights the deleterious effects of obesity on both short- and long-term  
4 physiological and psychological well-being [1]. Internationally, child obesity rates have been  
5 increasing over the last 20 to 30 years, although recent evidence suggests rates are plateauing  
6 in some countries [2] whilst continuing to rise in others. As obesity is difficult to reverse [3]  
7 and has been shown to track throughout life [4] early intervention is warranted. A recent  
8 systematic review of 55 interventions for preventing obesity in children and adolescents  
9 found some beneficial effects on body mass index, with an effect size that provides  
10 confidence of the effectiveness of prevention strategies and the possibility of making a long  
11 term impact on weight status [5]. Within the review the strongest and largest body of  
12 evidence comes from research targeting children aged 6-12 years (39 of the 55 studies) with  
13 32 of those, i.e. the majority of successful studies, conducted in education settings [5].

14  
15 Education settings (i.e. preschools, primary and secondary schools; referred to as schools  
16 from here on in) represent a popular setting for interventions as most children attend them and  
17 many (but not all) have the existing infrastructure to support the implementation of  
18 interventions. Furthermore, schools generally have the necessary personnel, curriculum and  
19 facilities to promote physical activity and healthy eating [6] and teachers are generally  
20 supportive of approaches to improve the health behaviors of children [7]. Recent reviews  
21 analyzing school-based interventions [8-11] have reported the effectiveness of interventions  
22 conducted in this setting. As most of the studies are short-term, the recommendations are  
23 inevitably for short-term effectiveness. However, many challenges of school-based study  
24 designs have been identified, including issues associated with study design (e.g. cluster  
25 randomization; statistical power), evaluation (short-term follow-up; lack of process, economic  
26 or equity measures), and intervention implementation (failure to consider sustainability and  
27 generalizability) [9,11]. Therefore, the aim of this paper was twofold: (i) to make  
28 recommendations regarding the design, implementation and evaluation of school-based

interventions; and (ii) to provide insights to researchers for overcoming some of the key practical challenges faced when undertaking these activities.

## RECENT AUSTRALIAN SCHOOL-BASED TRIALS TO PREVENT OBESITY

The Prevention Stream of the Australasian Child and Adolescent Obesity Research Network (ACAORN) has collectively implemented and evaluated more than 30 school-based obesity prevention interventions across Australia. These studies have been diverse in design, sample size, theoretical framework, intervention components, implementation strategies, duration, system level interactions, and outcome measures. To highlight some of the key recommendations and practical challenges associated with school-based obesity prevention interventions, examples from six trials from ACAORN researchers are discussed. These trials include: (1) *fun 'n healthy in Moreland!* [12]; (2) *Stephanie Alexander Kitchen Garden Program* [13]; (3) *Good for Kids, Good for Life* [14]; (4) *Nutrition and Enjoyable Activity for Teen Girls (NEAT Girls)* [15]; (5) *Physical Activity in Linguistically and Diverse Communities (PALDC)* [16]; and (6) *Physical Activity in Early Childhood* [17]. Table 1 details the aims, outcomes, intervention components and results of these studies. These six studies were intentionally chosen to highlight a number of key practicalities and considerations for school-based interventions: they were not necessarily chosen based on their effectiveness.

## SIX AREAS OF CONSIDERATION WHEN DESIGNING, IMPLEMENTING AND EVALUATING OBESITY PREVENTION INITIATIVES IN SCHOOLS

### (i) DESIGN AND ANALYSIS

The overall design, including randomization (if implementing a group randomized controlled trial), selection of outcome measures and theoretical frameworks and the analysis procedures must be carefully considered given the complex nature of the school environment.

Randomized controlled trials are considered to be the gold standard for evaluating obesity prevention interventions [18], however other designs such as quasi-experimental trials, single

group pre-test post-test trials or wait-list trials may be more appropriate within the school setting. If a randomized controlled trial design is employed, randomization after baseline assessments is recommended in order to reduce drop-out of schools and to minimize contamination of baseline data. However, this may be difficult due to timetabling and staffing requirements (which need to be taken into account well in advance of the intervention commencing). *Fun 'n healthy in Moreland!*, *NEAT Girls* and *Good for Kids, Good for Life* all employed a group randomized controlled trial and randomized after baseline assessments.

The selection of primary and secondary outcomes and implementation measures also need to be considered. Adiposity outcomes (BMI, BMI  $z$ -score, percentage body fat, waist circumference) are typical primary outcomes for school-based obesity prevention interventions; however secondary outcomes, such as cardiorespiratory fitness, psychosocial constructs, physical activity, dietary behaviors and academic achievement are often measured. For example, in *NEAT Girls* secondary outcomes included muscular fitness, self-esteem, physical activity and dietary behaviors and in *PALDC* secondary outcomes included fundamental movement skills proficiency. Furthermore, changes to school level policies, procedures and physical environment are important outcomes to collect. In *fun 'n healthy in Moreland!* a number of strategies were used to assess change at a school level, for example, pre and post school level questionnaires, economic evaluations and exit interviews with school principals and program champions. Irrespective of the quantity of data collected, the quality of the data collect is paramount and should not place unnecessary burden on schools and their staff.

One of the most important areas where evidence has been lacking is an understanding of what went on within the intervention. Without carefully detailed implementation data, it is not possible to determine intervention fidelity and/or effectiveness of adaptation versus non-fidelity due to obstacles and barriers. Data such as student/teacher satisfaction, student/teacher engagement, reflective dairies of project officers, document analysis (e.g. project

1 implementation plans), attendance and direct observations of adherence will assist in  
2 determining the intervention fidelity. Furthermore, assessment of other similar programs that  
3 have been implemented or normally occurred over the course of the intervention should also  
4 be considered in control schools to gauge the degree of contamination, compensatory rivalry  
5 or resentful demoralisation [18].

6  
7 Obesity prevention interventions should be guided by a relevant and appropriate theoretical  
8 framework. Arguably, the most important theoretical framework is that of the WHO Health  
9 Promoting Schools (HPS) framework, which is currently being examined in detail for its  
10 effectiveness and outcomes [19]. HPS aligns with the principles of health promotion as  
11 outlined in the Ottawa Charter and involves multi-level strategies addressing changes in  
12 environments as well as individual skills and behaviours [20]. However, there are a number of  
13 other relevant theories; for example, if the intervention is focusing on achieving changes in  
14 behavior (physical activity, food choices, for example) the selection of a health behavior  
15 theory and recognition of the importance of environmental and cultural change (e.g.  
16 Organizational Development Theory) is essential. More recently, the importance of exploring  
17 the mechanisms of behavior change in obesity prevention interventions has been highlighted  
18 [21,22]. Interventions are typically designed in reference to a theory of health behavior  
19 change (e.g. Social Cognitive Theory, Theory of Planned Behaviour) and researchers are  
20 encouraged to measure potential behavioral mediators (e.g. self-efficacy, social support) and  
21 test them in a mediating variable framework. *Fun 'n healthy in Moreland!* was underpinned  
22 by Socio-Environmental Theory of Health which accounts for social and environmental  
23 influences on health behaviors and outcomes. Additionally, the HPS framework guided  
24 implementation using a community based participatory approach [23] which incorporated  
25 principles of cultural competence in recognition of the cultural diversity of the participating  
26 school communities [24].



A program and economic evaluation and a data analysis plan should be established *a priori* and in collaboration with a biostatistician and health economist. In regards to the latter, a number of key questions should be considered, for example: (1) What is the most appropriate unit of analysis (i.e. number of schools rather or number of individuals)? (2) What effect does clustering have? Interclass correlations need to be calculated for the primary outcome to determine the amount of clustering that may take place; (3) How many schools will be randomized to the intervention and control groups? At least two schools in each condition (i.e. multiple groups nested with conditions) are needed to avoid group effects (i.e. no between group variation within each condition). Further, at least two groups in each condition are needed to calculate a F-statistic and accompanying P Value or confidence intervals: all of which are generally required for publications; (4) How will missing data be addressed? It is inevitable that data will be missing, thus researchers need to consider the most appropriate method to compensate for missing data (i.e. last observation carried forward, imputation, intention-to-treat analysis etc.); (5) What covariates should be adjusted for and when should they be adjusted?

#### *Key considerations for design and analysis*

1. *Maximize data collection by including secondary outcomes, implementation data and school-level changes*
2. *Consider use of a number of complementary theoretical frameworks*
3. *Consult a biostatistician and develop a thorough data analysis plan*

#### **(ii) SCHOOL-COMMUNITY ENGAGEMENT**

Engaging a number of stakeholders from the school community (i.e. executive and non-executive staff, parents and children, school canteen staff and wider community groups linked to schools) is critical in the design and implementation of school-based interventions. (e.g., *Good for Kids, Good for Life* engaged school staff, canteen managers and key staff from government and non-government organizations in the planning and execution of the

intervention.) School communities are more likely to embrace obesity prevention interventions if they understand the relevance and potential benefits of the study from the onset, believe that the benefits will outweigh the perceived inconveniences and have staff, including executive staff, that are motivated to bring about change. The international HPS initiative and the Australian Health Promoting Schools program [25,26] acknowledge the importance of a healthy school environment for children's learning – 'better health, better learning'. Further, state educational departments acknowledge, 'schools have a unique and important role in enabling children and adolescents to develop their capacity for healthy growth and development and healthier futures'. Therefore there is good justification, for both children and schools, for school-based health programs. Furthermore, children's cognition and behavior can also directly benefit from school-based health initiatives [27,28].

Information sessions, that provide an opportunity for all staff (teaching and general), to ask questions and have input into the project and their role in it, may assist in engaging them. Establishing quality relationships through regular interactions, consultation and networking prior to implementation and encouraging staff to take ownership of the intervention and have a sense of choice considerably enhances their engagement with the study. Other successful means of engaging school staff include: payments (following ethic approval from relevant ethic committees) to cover their release from face-to-face teaching so they can help with recruitment and organizing data collection schedules (e.g. *Good for Kids*, *Good for Life*, *NEAT Girls*); offering equipment for the school such as computers and library books, sports equipment; and encouraging a team approach where researchers are involved in school activities. For example, in the *fun 'n healthy in Moreland!* project a trained community development worker assisted with class activities and in the *Stephanie Alexander Kitchen Garden Program*, researchers offered to assist with the practical classes held within kitchens when volunteers were not available.

Engaging parents in school-based interventions is important but difficult and particularly

1 problematic in secondary schools. To engage parents, opportunities to promote and explain  
2 the intervention purpose and benefits to parents need to be initially sought. This may include  
3 provision of information at events and forums that are well attended by parents (e.g. awards  
4 presentation ceremonies, carnivals) rather than expecting parents to attend a separate  
5 information session. Additionally, providing parents with newsletters which report their  
6 child's data, and involving parents in home 'challenges' may increase parental engagement.  
7 Furthermore, using letters of support from government organizations may be helpful in  
8 promoting school-based initiatives to parents. For example, *Good for Kids, Good for Life*  
9 utilized a support letter from the Chief Health Officer of New South Wales to facilitate  
10 recruitment. This letter highlighted the importance of the study and role of parents in the  
11 research.

12  
13 Finally, identifying or fostering a site 'champion' is invaluable in facilitating engagement of  
14 the school community. In the six studies discussed, site champions included physical  
15 education staff members (*NEAT Girls Study, Girls in Sport, fun 'n healthy in Moreland!*),  
16 classroom teachers (*PALDC, fun 'n healthy in Moreland!*) or Deputy Principals (*fun 'n*  
17 *healthy in Moreland!*). The most appropriate site champion will depend upon the type of  
18 school and the nature of the intervention. Establishing a school committee (or linking with an  
19 existing 'health and wellbeing' school committee) that includes the site champion along with  
20 other members of staff including executive staff may also help facilitate intervention  
21 assessment and implementation.

### 22 23 *Key considerations for school engagement*

- 24 1. *Promote the broader benefits of the intervention (i.e. physical, psycho-social,*  
25 *educational, community benefits)*
- 26 2. *Engage both executive and non-executive staff members as program champions*
- 27 3. *Communicate clearly expectations of staff and needs of research staff*
- 28 4. *Connect with school parent and student community*

### (iii) PLANNING AND RECRUITMENT

Recruitment for school-based obesity prevention interventions is often difficult and may require a substantial time commitment. Recruitment rates can be improved by first streamlining the process of obtaining parental consent. Maximizing the return of parental consents A number of reasons have been cited for parents not wanting to consent, including: parents not receiving the forms, parents forgetting to sign them, or parents assuming that their child is not interested. Further, parents may choose not to consent because of research fatigue, inconvenience, feeling that the study is not relevant or would distract their child from their academic pursuits, or due to their wariness regarding potential negative impact on their child's body image. The consenting process can be even more challenging when parental English language skills are limited or literacy is low.

Maximizing the return of parental consents can be achieved by utilizing multiple strategies [29]. For example, in the preschool physical activity intervention researchers met face-to-face with childcare educators to solicit their support, distributed promotional flyers to parents two weeks prior to dissemination of the formal letters of participation, printed the information and consent sheets on brightly colored paper, disseminated information and consent sheets face-to-face to the parents and sent a number of reminders to parents who did not return their consent forms. The recruitment process was managed by one researcher which ensured conformity of recruitment procedures between all study sites. A consent rate of more than 70% as a result of employing multiple recruitment strategies. In *PALDC* information sheets and consent forms were translated into several languages and handed to parents as they entered the school to drop off or pick up their child. As many parents were not literate in their own language, staff at each school explained the consent form to their students and showed them how to explain it to their parents. A response rate of over 84% was achieved in *PALDC*. Children's and parents' perceived risk of embarrassment, stigmatization and/or teasing also curtails recruitment. To overcome these concerns, positive aspects of study participation (such

as healthy behavior or possible academic improvements), rather than weight gain prevention, should be promoted. In *NEAT Girls* and *PALDC*, the information and consent letters did not focus on obesity or weight gain, rather they focused on positive health behaviors, such as enjoyable physical activity and healthy eating. Although body fat, height and weight were measured, these outcomes were not emphasized in any part of the interventions.

#### *Key considerations for recruitment*

1. *Plan for a long recruitment period*
2. *Use multiple strategies to engage parents and children*
3. *Think outside the box (although within the confines of ethical conduct) to maximise recruitment rates*

#### **(iv) EVALUATION**

Collecting study data within schools is also challenging. The busyness of executive, staff and students makes the school environment difficult to work within. To optimise data collection, external personnel, such as research assistants, should collect data and should work closely with school staff to ensure appropriate timing and location of assessments. Exam periods and the first and last weeks of the school term should be avoided, as these are often crowded with activities and administrative issues and, with respect to the latter, a larger than normal proportion of students are away from school. Further, enlisting the support of home room/roll call or a site champion to motivate and follow-up students is highly beneficial: their knowledge of the school environment and students is invaluable.

Research assistants should be blinded to group allocation at follow-up periods. However, this may not always be possible if allocation occurs at the school level as project related materials and social marketing displayed throughout the school environment (eg posters, newsletters) will provide an indication of group allocation. Detailed assessment protocols should be prepared and all research assistants should be rigorously trained to conduct assessments, as

1 lack of consistency may result in measurement errors and data variability [30]. Furthermore,  
2 research teams are encouraged to calculate intra- and inter-rater reliability values for all  
3 measures, as this information is often required in publications and may assist researchers in  
4 future projects. Finally, it is usually a requirement for all research assistants to obtain police  
5 criminal background and/or working with children checks before collecting data (or doing  
6 any activities) in schools – for research conducted in Australia these checks are mandatory.

7  
8 All assessments, especially adiposity measures, should be conducted in a sensitive manner for  
9 all students. Gibbs et al. [31] recently published a body image sensitivity protocol for data  
10 collection in primary schools, which addressed key issues such as: conducting height, weight  
11 and body composition measures individually rather than in group contexts; screening  
12 instrument displays and not releasing individual students' results to remove the potential for  
13 comparison with others. If possible, research assistants should be matched by sex for  
14 assessments (i.e. female researchers should conduct assessments with girls).

15  
16 There are a number of strategies to improve data quality during collection and to minimize  
17 incomplete data sets. For example, interviewer-led completion of questionnaires for primary  
18 school children (e.g. *Stephanie Alexander Kitchen Garden Program*) and/or participants from  
19 non-English speaking backgrounds, or administering questionnaires using school computer  
20 labs and online survey tools may maximize data collection. Irrespective of the collection  
21 process, questionnaires should always be visually checked immediately on completion to  
22 ensure all questions have been clearly answered. With studies that have follow-up, incomplete  
23 data sets can also occur with students away on the day of data collection, due to illness, sports  
24 events etc. It can add considerable costs to the study to have to return to a school on several  
25 occasions to collect data from a handful of children who were absent on the day and this cost  
26 should be factored in to budgets and planning.

1 Requesting email addresses and/or phone numbers from teachers and students assists in the  
2 organization of assessments and helps locate students who have not attended assessments or  
3 returned monitoring devices (e.g. activity monitors). Teachers are generally willing to provide  
4 their phone numbers and most secondary school students have their own phone. In addition,  
5 offering small inexpensive incentives (e.g. stickers, water bottles) will improve study  
6 compliance and encourage the return of activity monitors or participation in assessments.  
7 Further, the use of technology can improve data collection. In NEAT Girls text messages were  
8 sent to participants each morning using a web-based text messaging service reminding them  
9 to wear their activity monitors. Regular reminders increased compliance rates in these studies.

#### 10 11 *Key considerations for data collection*

- 12 1. Plan data collection to align with school schedules
- 13 2. Provide rigorous training for research assistants
- 14 3. Plan for additional data collection times or procedures

#### 15 16 **(v) IMPLEMENTATION**

17 Successful implementation relies on committed school staff who ascribe to a theory driven  
18 approach to ensure the intervention is consistent with the original purpose and parameters of  
19 the research. However, flexibility is also required to ensure contextual relevance and  
20 responsiveness to changing school circumstances. This involves consideration of the school  
21 culture, resources, constraints and capacity. For example, schools which participated in the  
22 fun 'n healthy in Moreland! project were ethnically and socioeconomically diverse. The study  
23 allowed for schools to customise their intervention activities in recognition of this diversity.  
24 Some schools were assisted in the development of health promotion guidelines for the  
25 Ramadan period of fasting. In these schools parents were informed of breakfast foods that  
26 were more likely to sustain energy throughout the day. Further, these schools allowed  
27 children fasting to have regular rest periods throughout the day. However, regardless of the  
28 degree of customisation of the health promoting strategies, all schools were required to

1 develop strategies across the three domains of healthy eating, physical activity and wellbeing.  
2 They were also asked to develop strategies that were ongoing and for all year levels. Finally,  
3 they were encouraged to include changes in policy, programs, curriculum, and physical  
4 environment to support sustainability of changes.

5  
6 The *NEAT Girls* intervention was targeted toward adolescent girls living in low-income  
7 communities in the Hunter Region and Central Coast, New South Wales, Australia. Although  
8 the study sample was relatively homogenous and predominately European Australian, the  
9 study schools were located in both rural and urban environments. Therefore, the types of  
10 activities promoted were guided by their local environments. For example, beach walking and  
11 fitness was a viable activity for the coastal schools, but not appropriate for the rural schools.

12  
13 An important consideration in the implementation phase is that teaching staff are often  
14 expected to have an active role in developing and implementing health promotion programs  
15 without access to supporting education or extensive professional development [32]. A critical  
16 factor in successful implementation is therefore professional development, capacity building  
17 and ongoing support for school staff to ensure the effective implementation, acceptability and  
18 sustainability of intervention strategies. The degree and nature of support required by schools  
19 can be identified through engaging early with school staff and the 'implementation team', as  
20 well as implementation monitoring processes that track the level of implementation activity,  
21 the nature of the activity, and the resource use. Using objective tools of this type and  
22 maintaining a close relationship with the 'site champions' within each school can assist with  
23 identifying and overcoming implementation barriers as they arise. For example, use of a  
24 mapping monitoring tool for the five year *fun 'n healthy in Moreland!* study, identified  
25 midway through the study that the implementation strategies were characterized by school  
26 awareness raising activities (which are unlikely to produce sustainable change) and some  
27 school based changes, but that there had been very little engagement of families. The support



being provided to schools was adjusted accordingly to provide a greater emphasis on sustainable changes within the schools and extension of health promotion strategies to families and community partners.

In *PALDC*, each school developed their own action plan according to school and community needs. Schools nominated a team of 4-5 teachers (four generalist teachers plus an executive staff member) to be involved in the project. School teams developed and implemented an action plan for initiating a sustainable change in physical activity and fundamental movement skills programs in the school context. A researcher was assigned to each school and acted as a ‘critical friend.’ This involved helping identify relevant research and resources for the development and implementation of the school’s action plan, explaining the rationale for the project to other school staff at staff meetings, and providing feedback on the implementation process to the school-based team. School teams also participated in workshops supported by personnel from the Department of Education. Finally, intervention schools also worked as part of a cluster group on this project. This provided opportunities for the schools to network and share ideas and to work towards the overarching goals of the study.

#### *Key considerations for implementation*

1. *Ensure contextual relevance and responsiveness to changing school circumstances*
2. *Support staff throughout implementation phase*
3. *Monitor intervention fidelity throughout implementation*

#### **(vi) FEEDBACK AND SUSTAINABILITY**

To foster the collaboration between the school and research communities it is important to provide feedback to the school community and external stakeholders. This feedback should be provided throughout the implementation phase, as well as at the conclusion of the intervention and follow-up assessments. School communities are interested in both objective

changes (i.e. changes in outcome measures) and subjective changes (i.e. changes in formative components of the intervention, e.g., enjoyment rating of participants).

A number of reporting strategies can be used and the type of strategy employed will be dependent on the school type. Thus, it is important that the research team works with the school to determine the most appropriate strategies for disseminating information. Some strategies include presentations at staff meetings, award nights and parent and citizen meetings, inserts in school newsletters and information sheets for staff and parents. For example, in *PALDC*, baseline data were presented to staff in each intervention school during staff meetings. This highlighted the prevalence of each of the outcomes in the specific school and compared then with state-wide data. Many staff were motivated to bring about change in their school when they saw the poorer outcomes for their students and understood the consequences of these. Baseline data reports were also used by the *fun 'n healthy in Moreland!* schools to target their intervention strategies to areas of particular relevance to their students.

Long-term implementation and evaluation of school-based obesity prevention interventions is critically important [33]. However, few school-based obesity prevention interventions have objective measures in place to assess sustainability. At the very least, sustainable changes should be encouraged at a school-level through changes in policies and procedures and the physical environment. Providing regular professional development for staff and investigating external funding options could foster ongoing implementation and evaluation.

#### *Key considerations for feedback and sustainability*

1. *Provide regular study information to the school community and key stakeholders*
2. *Provide summaries of findings related to both outcome and process measures*
3. *Plan for long-term evaluation and identify sustainability measures*

1 Table 2 summarizes the six areas of consideration and highlights a number of key questions to  
2 be asked by researchers when designing, implementing and evaluating obesity prevention  
3 initiatives in schools.

4

## 5 **CONCLUSIONS**

6 There is currently no identified single, school-based intervention that can be implemented  
7 universally to prevent childhood obesity. The education system however has an important role  
8 in obesity prevention and schools represent one mechanism to bring about societal change.

9 This paper presents six areas for consideration for future school-based obesity prevention  
10 interventions. Ensuring strong engagement between schools and researchers, the selection of  
11 appropriate study designs, the collection and reporting of implementation details and program  
12 fidelity/adaptation and utilizing suitable data collection and implementation procedures will  
13 strengthen future school-based obesity prevention interventions and their associated  
14 outcomes. Given the need for more high quality studies that engage the entire school  
15 community and have long-term follow up, this paper attempts to provide guidance for  
16 overcoming some of the challenges and barriers faced in school-based research.

17

18

19

## 1 REFERENCES

- 2 1. [Lobstein T, Baur L, Uauy R. Obesity in children and young people: A crisis in public](#)  
3 [health. Obes Rev 2004; 5: 4-85.](#)
- 4 2. [Olds TS, Tomkinson GR, Ferrar KE, et al. Trends in the prevalence of childhood](#)  
5 [overweight and obesity in Australia between 1985 and 2008. Int J Obes 2010; 34: 57-](#)  
6 [66.](#)
- 7 3. Oude Luttikhuis H, Baur L, Jansen H et al. Interventions for treating obesity in  
8 children. Cochrane Database Syst Rev 2009, Issue 1. Art. No.: CD001872. DOI:  
9 10.1002/14651858.CD001872.pub2.
- 10 4. Whitaker RC, Wright JA, Pepe MS et al. Predicting obesity in young adulthood from  
11 childhood and parental obesity. N Engl J Med 1997; 337: 869 - 873.
- 12 5. Waters E, de Silva-Sanigorski A, Hall BJ et al. Interventions for preventing obesity in  
13 children. Cochrane Database Sys Rev 2011, Issue 12. Art. No.: CD001871. DOI:  
14 10.1002/14651858.CD001871.pub3.
- 15 6. [Story, M. School-based approaches for preventing and treating obesity. Int J Obes](#)  
16 [Relat Metab Disord 1999; 23: S43-S51.](#)
- 17 7. [Morgan, PJ, Hansen V. Physical Education in primary schools: classroom teachers'](#)  
18 [perceptions of benefits and outcomes. Health Ed 2008; 67: 196-207.](#)
- 19 8. [Budd GM, Volpe SL. School-Based Obesity Prevention: Research, Challenges, and](#)  
20 [Recommendations. J Sch Health 2006; 76: 485-495.](#)
- 21 9. [Kropski JA, Keckley PH, Jensen GL. School-based obesity prevention programs: an](#)  
22 [evidence-based review. Obes 2008; 16: 1009-1018.](#)
- 23 10. Katz DL, O'Connell M, Nijke VY et al. Strategies for the prevention and control of  
24 obesity in the school setting: systematic review and meta-analysis. Int J Obes 2008;  
25 32: 1780-1789.
- 26 11. Brown T, Summerbell C. Systematic review of school-based interventions that focus  
27 on changing dietary intake and physical activity levels to prevent childhood obesity:

1 an update to the obesity guidance produced by the National Institute for Health and  
2 Clinical Excellence. *Obes Rev* 2009; 10: 110-141.

3 12. Waters E, Ashbolt R, Gibbs L, et al. Double disadvantage: the influence of ethnicity  
4 over socioeconomic position on childhood overweight and obesity: findings from an  
5 inner urban population of primary school children. *Int J Pediatr Obes* 2008; 1-9.

6 13. Gibbs L, Staiger PK, Johnson B, et al. Expanding children's experience of food: the  
7 impact of a school-based kitchen garden program. *J Nutr Educ Behav* 2013; 45: 137-  
8 146.

9 14. Good for kids, Good for life [www.goodforkids.nsw.gov.au](http://www.goodforkids.nsw.gov.au)

10 15. Lubans DR, Morgan PJ, Dewar D, et al. The Nutrition and Enjoyable Activity for  
11 Teen Girls (NEAT girls) randomized controlled trial for adolescent girls from  
12 disadvantaged secondary schools: rationale, study protocol, and baseline results.  
13 *BMC Public Health* 2010; 10: 652.

14 16. Okely AD, Hardy LL, Batterham M, et al. Promoting motor skill proficiency in low-  
15 income, culturally diverse schools: The Physical Activity in Linguistically Diverse  
16 Communities non-randomized cluster trial. *J Teach Phys Educ*. Under review

17 17. Finch M, Wolfenden L, Morgan PJ, et al. A cluster randomised trial to evaluate a  
18 physical activity intervention among 3-5 year old children attending long day care  
19 services: Study protocol. *BMC Public Health* 2010; 10: 534.

20 18. Murray DH. Design and Analysis of Group-Randomized Trials. New York, Oxford:  
21 Oxford University Press; 1998.

22 19. Langford R, Campbell R, Magnus D, et al. TheWHO Health Promoting School  
23 framework for improving the health and well-being of students and staff (Protocol)  
24 The Cochrane Library 2011

25 20. World Health Organisation 1986. Ottawa Charter for Health Promotion. Ottawa:  
26 Department of Health and Welfare, World Health Organisation

- 1 21. Cerin E, Barnett A, Baranowski T. Testing theories of dietary behavior change in  
2 youth using the mediating variable model with intervention programs. *J Nutr Educ*  
3 *Behav* 2009; 41: 309-318.
- 4 22. Lubans DR, Foster C, Biddle SJH. A review of mediators of behavior in interventions  
5 to promote physical activity among children and adolescents. *Prev Med* 2008; 47:  
6 463-470.
- 7 23. Israel BA, Schulz AJ, Parker EA, et al. Review of community-based research:  
8 assessing partnership approaches to improve public health. *Annu Rev Publ*  
9 *Health* 1998; 19: 173-202.
- 10 24. Gibbs L, Waters E, St Leger L, et al. A settings-based theoretical framework for  
11 obesity prevention community interventions and research. *Aust N Z J Public Health*  
12 2011; 35: 104-106.
- 13 25. International Health Promoting Schools initiative  
14 [www.who.int/school\\_youth\\_health/gshi/hps/en/index.html](http://www.who.int/school_youth_health/gshi/hps/en/index.html)
- 15 26. Australian Health Promoting Schools Program [www.ahpsa.org.au/](http://www.ahpsa.org.au/)
- 16 27. Bellisle F. Effects of diet on behavior and cognition in children. *Brit J Nutri* 2004; 92:  
17 S227-S232.
- 18 28. Sallis JF, McKenzie TL, Kolody B, et al. Effects of health-related physical education  
19 on academic achievement: Project SPARK. *Res Q Exerc Sport* 1999; 70: 127-134.
- 20 29. Wolfenden L, Kypri K, Hodder R, et al. Obtaining active parental consent for school  
21 based research: a guide for researchers. *Aust N Z J Public Health* 2009; 33: 270-275.
- 22 30. Stevens J, Taber DR, Murray DM et al. Advances and controversies in the design of  
23 obesity prevention trials. *Obes* 2007; 15: 2163-2170.
- 24 31. Gibbs L, O'Connor T, Waters E et al. Addressing the potential adverse effects of  
25 school-based BMI assessments on children's wellbeing. *Int J Pediatr Obes* 2008; 3:  
26 52-57.

- 1 32. Jourdan D, Samdal O, Diagne et al. The future of health promotion in schools goes  
2 through the strengthening of teacher training at a global level. *Promot Educ* 2008; 15:  
3 36-38.
- 4 33. Jones RA, Sinn N, Campbell K, et al. The importance of long-term follow-up in child  
5 and adolescent obesity prevention interventions. *Int J Pediatr Obes* 2011; 6: 178-181.