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Evidence Check

Short survey instruments for children's diet and physical activity: the evidence

An **Evidence Check** rapid review brokered by the Sax Institute for the NSW Ministry of Health. March 2016.

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September 2016.

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Evidence on existing, validated short-form survey instruments for children's diet, physical activity, and sedentary behaviour.

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Contents

1 Glossary

ABS	Australian Bureau of Statistics
ACAORN	Australian Child and Adolescent Obesity Research Network
APARQ	Adolescent Physical Activity Recall Questionnaire
CAPANS	Child and Adolescent Physical Activity and Diet Survey
CAPANS-PA	Child and Adolescent Physical Activity and Diet Survey-Physical Activity
CDQ	Children's Dietary Questionnaire
CI	Confidence interval
CLASS	Children's Leisure Activities Study Survey
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DIAT	Dietary Intake Assessment Tool
ICC	Intra-class correlation co-efficient
LHD	Local Health District
MEND	Mind, Exercise, Nutrition, Do It!
MET	Metabolic equivalent of task
MOH	Ministry of Health
MRSFFQ	Many Rivers Short Food Frequency Questionnaire
MVPA	Moderate to vigorous physical activity
NATSINPAS	National Aboriginal and Torres Strait Islander Diet and Physical Activity Survey
OPAQ	Oxford Physical Activity Questionnaire
OPH	Office of Preventive Health
PA	Physical activity
PDPAR-24	Previous Day Physical Activity Recall-24
QAPAQ	Quality Assessment of Physical Activity Questionnaire
SALSA	Students as Lifestyle Activists
SNAP	Synchronised Diet and Activity Program™
SPANS	NSW Schools Physical Activity and Diet Survey

2 Executive summary

Go4Fun is a targeted obesity treatment (secondary prevention) program that aims to improve the health, fitness and self-esteem of children aged 7–13 years old who are above a healthy weight, and their families. It is a key initiative of the NSW Healthy Eating and Active Living Strategy: Preventing overweight and obesity in NSW 2013–2018 [1], and the NSW Premier's Priority to reduce overweight and obesity rates of children by 5% over the next 10 years.[2]

This review will inform changes to the existing pre/post survey instruments used within the Go4Fun program. The pre/post survey instruments that are the focus of this review are those on diet, physical activity and sedentary behaviour, and which are used within the mainstream and Aboriginal programs. The NSW Ministry of Health (MOH) and Office of Preventive Health (OPH) are seeking recommendations regarding instruments that: do not impose a high burden on the participants; use language that is appropriate for a population that is culturally and linguistically diverse who may have low literacy and health literacy; are either validated or that could be validated; and are most relevant and optimal for the measurement of diet, physical activity and sedentary behaviours pre- and post-implementation of Go4Fun.

A rapid review has been conducted to address the following questions included in the brief provided by the NSW MOH:

1a. What is the evidence regarding existing validated short-form diet, physical activity and sedentary behaviour instruments for the pre/post monitoring of programs that promote healthy eating and physical activity among children over the ideal weight range, such as the mainstream Go4Fun?

1b. What is the evidence regarding best practice in developing short-form nutrition, physical activity and sedentary behaviour instruments for the pre/post monitoring of programs such as the mainstream Go4Fun?

2. How should the evidence identified in the response to Question 1 be adapted for the Aboriginal Go4Fun program?

The literature scan was conducted of relevant electronic databases including Medline, CINAHL, EMBASE and ATSIhealth. The search focused on diet and physical activity measures validated among children aged 7–13 years old (either reported by children or parent proxy) and on research conducted within Australia, with additional reference to international literature as deemed appropriate by the review team. Decisions with regard to the inclusion of literature outside of the search process were discussed within the review team.

The final number of papers reviewed on the topic were:

- Six validity and/or repeatability studies on short diet questions
- Twelve validity and/or repeatability studies on physical activity measures
- Three validity and/or repeatability studies on diet and physical activity among Aboriginal and Torres Strait Islander children
- Six papers on the development/assessment of diet and/or physical activity, and national monitoring reports were additionally referred to about this topic.

In general, there were some common themes around short dietary questions: fruit and vegetable intake, water and sugary drink consumption, discretionary food use, breakfast consumption, and eating in front of the television (TV). Generally, these questions demonstrated good repeatability. However, the validity of most was at best moderate. Frequency of intake tended to be a better measure than quantity of intake.

Most of the diet quality index tools related to longer food frequency questionnaires and therefore few of these were included in this review. None of the literature on the validation of short diet questionnaires assessed the responsiveness of the tool to an intervention, compared to an alternative diet assessment.

The physical activity questions tended to perform poorly for validation of activity, reflecting the difficulty in assessing activity in children well. Short physical activity questions have been recommended for national monitoring, drawn from research in the US, and these demonstrate moderate repeatability and validity.[3] Longer questionnaires such as the Adolescent Physical Activity Recall Questionnaire (APARQ) and Children's Leisure Activities Study Survey (CLASS) were considered but pose substantial challenges to complete due to their complexity and length. The literature consistently discusses the value of employing objective measures of physical activity.

Sedentary behaviour questions should differentiate between a range of sedentary activities and screen time. Recreational screen time is the most common sedentary activity among children and national guidelines first published in 2004 recommended limiting children's electronic media use to less than two hours a day and reflect the most recent iteration of the guidelines.[4] Go4Fun has an objective to reduce sedentary pastimes and includes education on sedentary behaviour, referring to the Australian Government recommendations on time children spend in front of screens. The Adolescent Sedentary Activities Questionnaire (ASAQ) has reliability and face validity[5] and is suitable for collecting screen time information, however its length is not ideal for the Go4Fun setting. A single question assessing children's screen time was considered to be suitable in this setting; however given the evidence that screen time differs between week and weekend days, a single item question is not ideal and would require further validation in this group. Further, screen time is only one domain of inactive behaviour and Go4Fun targets multiple forms of sedentary behaviour, so a global assessment of sedentary behaviour is required to evaluate the program accurately.

Very few dietary intake and physical activity questions have been validated with Australian Aboriginal and Torres Strait Islander populations. The short food questions recommended by this review can be used to monitor and/or evaluate population-wide health programs, which include Aboriginal and Torres Strait Islander children. Only two physical activity instruments have been validated with Aboriginal and Torres Strait Islander populations, and both demonstrate a modest correlation with the objective measures. This review recommends neither of these instruments should be used due to the length of time required to complete them.

The recommendations described in this report primarily concern questions most suitable for the objectives of Go4Fun and other similar child obesity prevention programs, and have considered a range of factors, including the questions' validity and reliability, suitability to address the objectives of the program, and potential to be administered in different ways, and among different population groups. The review team has considered the mode of administration (including the use of technology), whether a child or parent/carer proxy responds to the questions, the age of the child (if he or she is self-reporting) and the use of visual prompts.

Recommendations

Based on evidence and expert opinion for the administration of questions on diet, physical activity and sedentary behaviour within the Go4Fun program, we make the following recommendations to the NSW MOH:

1. It is preferable that children under 10 years old do not self-complete diet or physical activity questions.

2. For children under 10 years old, only collect information about diet and physical activity if a parent is able to provide a proxy report.
3. For children aged 10–12 years old, consider either the use of child or parent proxy report.
4. For children aged over 12 years, child report is preferred.
5. Include a mechanism to identify the person who fills in the report at the point of survey completion. Variations of questionnaire forms could also be used with wording reflective of whether the child or parent/carer is the respondent e.g. "How many serves of fruit does your child usually eat each day?" rather than "How many serves of fruit do you usually eat each day?"
6. Pay attention to mode of administration and make use of technology as a mode of data collection where feasible.
7. Make use of good visual prompts within the questionnaires; diet assessment tools in particular lend themselves to visual prompts.
8. Staff administering these measures should receive thorough training in how to support children and parents to complete the questionnaires in group settings. A manual must be developed for staff to use in the field to assist them adhering to the administration protocol.
9. Questionnaires should be completed and checked for completeness during the first and last session of Go4Fun. While questionnaires should be undertaken as a group activity to standardise their administration, facilitators should ensure that each participant prepares their responses individually. Parents who proxy report for their child should discuss the question and their responses with the child.
10. Aboriginal children who are completing the questionnaires in the group setting require the presence of an Aboriginal staff member to support completion of the survey. This staff member should preferably be from the children's community and preferably occupy the lead position in the team.

The following are recommended items to include as diet questions for use with children aged 7–13 years old and their parents or carers within the mainstream Go4Fun program. These recommendations also apply to Aboriginal children aged 7–13 years old and their parents or carers within the Aboriginal Go4Fun program[6, 7], with a parent proxy report preferable for children less than 10 years old and also potentially for children 10–12 years old:

1. Vegetable intake (serves)
2. Fruit intake (serves)
3. Soft drinks (cups)
4. Water (cups)
5. Hot chips (frequency)
6. Take away foods (frequency)
7. Eating dinner in front of the TV (times per week).

The full set of recommended diet questions for use within the Go4Fun pre/post survey instruments are detailed in the Recommendations section of this report (p.28).

The following are recommendations on questions concerning physical activity and sedentary behaviour among children aged 7–13 years old and their parents or carers within the mainstream Go4Fun program. They also apply to Aboriginal children aged 7–13 years old and their parents or carers within the Aboriginal Go4Fun program. Again, it is preferable that a parent or carer proxy answers these questions on behalf of children under 10 years old, and potentially also children aged 10–12 years old:

1. Use a short question that can reveal a child's engagement in physical activity (moderate and vigorous) for 60 minutes per day during the last seven days and their engagement in physical activity during a typical week.[3, 8]

2. The review team have examined the evidence, and cannot recommend an evidence-based short question for measurement of sedentary behaviour for inclusion in the Go4Fun program. The review team did identify a short question[7] which may address the sedentary behaviour in the Go4Fun program however it is limited to weekdays and the screen time is limited to TV viewing.
3. There would be value in including an objective measure to assess physical activity among the Go4Fun participants. Consideration may be given to using technology to support this goal, such as the development of a smartphone application capable of assessing physical activity. However, few have been validated with this population.[9] Additionally, use of such applications may not be feasible for all vulnerable and/or rural/remote populations for reasons related to mobile phone access (including cost and availability) and internet connectivity. We recommend further investigation regarding feasibility and acceptability of this method among these population groups followed by validation if the method is found to be viable in the proposed settings.

The full set of recommended physical activity and sedentary behaviour questions for use in the Go4Fun pre/post survey instruments are detailed in the Recommendations section of this report (p.28).

Gaps in the evidence

1. Validation of diet quality index tools using short diet questions is required among children 7–13 years old across cultural groups. As children under 10 years old should not self-report, this would involve both proxy and self-reporting measures.
2. The suggested physical activity questions need to be tested for reliability and validity among children 7–13 years old across cultural groups. As children under 10 years old should not self-report, this would involve both proxy and self-reporting measures.
3. Development and validity/reliability testing of a short question as a proxy measure for sedentary behaviour covering all aspects of screen time in which children in this age group would typically participate. As children under 10 years old should not self-report, this would involve testing both proxy and self-reporting measures.
4. Inclusion of qualitative measures on other dimensions of physical activity, such as the Paediatric Quality of Life Inventory[10, 11], measures of self-esteem and self-efficacy.
5. The availability of relevant visual prompts to support the completion of the recommended questionnaires. For example, visual prompts were used with the Many Rivers APARQ tool.[12] These were developed with the participating communities, are available in poster format and are suitable for both Aboriginal and Torres Strait Islander and non-Indigenous children based in rural areas. These posters could be reviewed for use with the recommended questionnaires in collaboration with representatives from participating communities.

3 Main review

Background and introduction

Go4Fun is a targeted healthy lifestyle program that aims to improve the health, fitness and self-esteem of children aged 7–13 years who are above a healthy weight and their families. It is a key initiative of the *NSW Healthy Eating and Active Living Strategy: Preventing overweight and obesity in NSW 2013-2018*[1] and the NSW Premier's Priority to reduce overweight and obesity rates of children by 5% over the next 10 years.[2]

The evidence-based Go4Fun program is based on the MEND program (Mind, Exercise, Nutrition… Do it!) originally developed in the UK.[13, 14] It has since been translated as a community-based program for the Australian context.[15-17] Go4Fun is an effective multi-disciplinary programme that incorporates family involvement, practical education in nutrition and diet, and increasing physical activity and behaviour change.[17, 18]

The NSW Office of Preventive Health (OPH) is currently undertaking a routine review of the survey instruments it uses to assess physical activity, sedentary behaviour and nutrition among children with the intent of decreasing the burden on participants and making these instruments more accessible to low literacy families.

In 2015, the NSW OPH also commissioned a cultural review of Go4Fun and adapted the program's content, leader training, leader support and its delivery model with the intent of producing a version of it suitable for Aboriginal children and families. In Term 4, 2015, a pre-pilot study was undertaken to evaluate the acceptability and feasibility of the culturally adapted program among four Aboriginal communities (two metropolitan and two regional) in NSW. It is anticipated that new instruments may also be suitable for inclusion in this adapted program.

The objective of this review was to inform the NSW OPH and Ministry of Health (MOH) of the best available evidence for:

1. Existing validated short-form diet, physical activity and sedentary behaviour survey instruments for the pre/post monitoring of programs that promote healthy eating and physical activity among children over the ideal weight range, such as the mainstream Go4Fun.
2. Best practice for the development of such survey instruments.
3. The adaptation of these survey instruments for the Aboriginal Go4Fun program.

This review will inform changes to the current pre/post survey instruments for diet, physical activity and sedentary behaviour, for both the mainstream and the Aboriginal programs. The NSW OPH wishes to design instruments that: do not impose a high burden on the participants; uses language that is appropriate for a population that is culturally and linguistically diverse with low literacy and health literacy; are either validated or that could be validated; and are most relevant and optimal for the measurement of diet, physical activity and sedentary behaviours pre- and post-implementation of Go4Fun.

Currently, there are a number of challenges with the Go4Fun pre/post questionnaire packs, which may prevent parents/carers from completing the questionnaire, or in worst cases, present a barrier to participation in the program. The lengthiest questions within the current pre/post questionnaire pack are the diet, physical activity and sedentary behaviour questions. These questions were originally from the MEND UK survey instruments and have subsequently been adapted to include questions from the NSW

Schools Physical Activity and Diet Survey 2010[19] for relevance to the Australian context. The SPANS survey questions are indicators of weight-related behaviours and are designed for population surveillance and may not necessarily all be appropriate for individual and program related monitoring. Feedback from local staff (Program Managers and Go4Fun leaders) from NSW Local Health Districts (LHDs) has suggested that the questions around organised and unorganised sport during weekdays, weekend days and so on, are difficult for families and perhaps could be simplified within fewer questions to reduce participant burden. Physical activity and sedentary behaviour are complex behaviours and self-report questions, which require participants to recall numerous activities and estimations of time spent engaged in these activities, are barriers for completion of questionnaires, especially among population groups with low literacy.

Review questions

Question 1a: What is the evidence regarding existing, validated short-form diet, physical activity and sedentary behaviour instruments for the pre/post monitoring of programs such as the mainstream Go4Fun program?

Question 1b: What is the evidence regarding best practice in developing short-form diet, physical activity and sedentary behaviour instruments for the pre/post monitoring of programs such as the mainstream Go4Fun program?

Question 2: How should the evidence from Question 1 be adapted for the Aboriginal Go4Fun program?

Methods

This review was conducted by a research team with expertise in: diet and physical activity interventions with Aboriginal and Torres Strait Islander children and with non-Indigenous children; the development and interpretation of relevant measurement instruments; and in associated validity/reliability studies.

Brief description of the search and selection criteria

The following electronic databases were searched to identify relevant studies: Medline, CINAHL, EMBASE, and ASTIhealth. Other materials such as reports from Local Health Districts (LHDs) and government and agency reports were also included where deemed relevant. These searches were limited to English language studies published between 1 January 2005 and 18 April 2016 as agreed during discussions with the Sax Institute and the NSW MOH.

The search strategy was developed by the review team and designed to capture literature regarding validity/reliability studies on diet, physical activity, and sedentary behaviour measurement instruments suitable for Australian children and adolescents aged 7–13 years old. Australian papers were the focus of the search as it was deemed that these would be of most relevance for the Go4Fun target population and a specific search for instruments suitable for Aboriginal and Torres Strait Islander children was also conducted. The literature predominately comprised peer-reviewed journal articles. However it also included systematic reviews and reports on public health programs if they met the inclusion criteria. Additional selected publications known to the review team as well as via review of systematic literature reviews known to the review team, were drawn from the international literature Diet, physical activity and sedentary behaviour questions were also accessed from known childhood obesity programs in Australia and New Zealand: the Parenting, Eating and Activity for Child Health[20] and GRx Active Families.[21]

The search terms are presented in Table 1.

Table 1: Search terms for Questions 1a and 2

Field 1	Field 2	Field 3	Field 4	Field 5
(diet OR diet* OR food) OR ("physical activity" OR exercise OR sedentary OR inactivity)	child* OR teen* OR adolescen*	Survey OR FFQ OR food frequency questionnaire OR questionnaire OR screening OR checklist OR diet quality OR diet index OR physical activity index	Valid* OR reprod* OR reliab*	Austral* ((Aborigin* OR Torres Strait Islander OR Indigenous) AND Austral*)

[†]For Question 1a, "Austral*" was used for Field 5, for Question 2, the Indigenous-specific terms were utilised for Field 5

Literature was included where it described:

- Diet, physical activity or sedentary behaviour questions relevant to current diet/diet and physical activity/sedentary behaviour policies (for 5–12 and 13–17 year olds). Examples include Dietary Guidelines for Children and Adolescents, Australian Guide to Healthy Eating, Australian Physical Activity and Sedentary Behaviour Guidelines. The policies in these publications reflect diet and activity issues concerning children and adolescents.
- Short questionnaires with ≤50 items for dietary questionnaires and ≤15 items for physical activity questionnaires (not including sub items). The latter was based on feedback regarding the existing Go4Fun physical activity/sedentary behaviour questions (9 items not including sub items) which indicated these are burdensome and difficult to complete. The number was to allow for similar length questionnaires of different format which may be completed more easily. These criteria were not applied for the articles retrieved for Indigenous children due to the paucity of dietary literature about this population.
- Foods/food groups that make a significant contribution to the nutrients or food components of concern (for diet) identified in diet policy documents OR for physical activity, have a focus on activity/inactivity that make a significant contribution to components of concern identified in physical activity guidelines.
- Specific information about an instrument's validity or reliability in the population of interest (7–13 year old Australians) along with information about the validity of similar or additional questions that could be included.
- Questionnaires completed either by the child or a parent proxy for their child.

After duplicates were eliminated, a reviewer screened the titles and abstract of articles from the searches. The same reviewer excluded any articles not meeting inclusion criteria. Full text of the remaining articles was retrieved for clarification and the same inclusion/exclusion criteria were applied. Additional validity/reliability articles meeting the inclusion criteria from the reference lists of relevant intervention articles and systematic reviews; these articles may have had a publication date prior to 2005 but were included based on expert opinion.

Data were extracted in standardised tables that included: author, year and country of study, program setting and name (if applicable), design, characteristics of the participants (sample size, ethnicity, age, gender, weight status, literacy details, comparison group), tool type and number of items, response variables, recall period, administration method, respondent (child or parent), respondent burden, duration to complete, period between administration (for reliability), reliability statistics, reference method (for validity), and validity statistics. Flow diagrams for both searches are included in Appendix 2.

Best practice for the development of short-form diet, physical activity, and sedentary behaviour instruments (Question 1b) would be determined via a narrative review of journal articles and book chapters on the

assessment of these behaviours with self-report methods. An initial search was conducted with search terms as listed in Table 1 except Field 4 was replaced with "best practice or recommend*", and Field 5 was replaced with "develop* OR evaluat* or design". The searches proved ineffective for this question; however two reviews on physical activity measurement in children and adolescents were identified. Additional hand searching included relevant journal articles and texts known to the review team.

4 Results

The data extraction tables are included in Appendix 3.

Analysis of the evidence is presented according to the three key research questions posed by the NSW Ministry of Health (MOH) to the University of Sydney.

Question 1a. What is the evidence regarding existing, validated short-form diet, physical activity and sedentary behaviour instruments for the evaluation of programs such as the mainstream Go4Fun program?

Dietary Intake instruments

The review team identified six dietary intake publications that met the inclusion criteria for the literature review. A compilation of the dietary intake instruments included in this review that is publicly available (or for which permission to be included has been sought) is found in Appendix 1.

The paper by Finch et al[7] focuses on general food and lifestyle habits associated with school. There are 35 questions, 28 related to diet. Most are specific to behaviours associated with school eating habits and for the purposes of assessing the Go4Fun program, are likely to have too narrow a focus. However, there are two general diet related questions that may be useful as part of a broader set of diet related diet questions:

- Do you usually eat breakfast on school mornings?
- How many times a week do you usually eat your meal at night in front of the television (TV)?

Both of these questions had a moderate to good high kappa statistic, indicating moderate repeatability: 0.58 and 0.63 respectively.[22] Watching TV during meals may negatively impact diet quality and Body Mass Index (BMI) of children and adolescents.[23, 24] Consumption of one or more dinner meals in front of the TV is associated with higher BMI in children, with the effect on diet worsening with increasing frequency of meals eaten in front of the TV.[25] TV watching is associated with increased energy intake[23] and children's exposure to advertising about processed foods and high-energy beverages[23], and both factors are associated with sedentary behaviour.[24] Such advertisements target children in these age groups[26] and may lead to their increased consumption of these foods.[27]

The publication by[12] reports on the reproducibility and validity of 28 short diet questions among both non-Indigenous and Indigenous children in regional NSW (the Many Rivers Short Food Frequency Questionnaire – MRSFFQ), and is based on a food and diet questionnaire previously developed in Queensland (Dietary Intake Assessment Tool (DIAT).[28] The DIAT tool was referred to in the previous report conducted for the NSW MOH[28] and from which a set of recommended questions was developed (and some validated) for use in population monitoring. These questions are largely the diet questions for which the current Go4Fun program is based. In 2005, these questions had not all been validated but the publication by Gwynn et al[12] provides important information about the use of these questions particularly among the vulnerable population groups with whom the Go4Fun program is conducted. The full set of these questions is included in Appendix 1. From a repeatability perspective the questions, which perform the best, relate to: type of bread, type of milk, butter/margarine (note that the question does not attempt to distinguish between fat types), hot chips, traditional foods and soup. The questions, which performed the best from the validity perspective, were: breakfast cereal, salty snack foods (e.g. crisps), fruit juice, butter/margarine, and milk. Some questions were better able to indicate frequency of consumption rather than weight or volume and

that may be a more realistic expectation about interpretation of short questions in general; particularly in the questions related to vegetables and to a lesser extent, fruit.

The publication by Hendrie et al[29] reports on a 38-item short food survey completed online and validated for use among parents of children 4–11 years old. This paper provides a diet index score, which is designed to provide an indication of overall diet quality. The intra-class correlation co-efficient (ICC) for the repeatability of this diet index was very good at 0.92 (95% CI 0.88, 0.95 — the survey was administered one week apart), which does suggest it may be a suitable instrument to be able to measure change over the course of a program, which is appealing. However, the validity of the index, compared to the 3x24 hour recalls, shows less promise in relation to the extent it reflects true food consumption, with an overall ICC of 0.44 (95% CI 0.22, 0.62), and percentage agreement between tertiles of the two methods was only 43%, kappa statistic of 0.143 (indicating a poor agreement).

So while there is some promise with this survey instrument, its length and poor validity results in relation to the index indicate it may not be a preferred instrument for the Go4Fun program. There may however be individual sets of questions which could be considered for use from this survey, which are also reported on in the paper. For example, in the beverages section, there is a question about sugary drinks and also about water consumption, and rather than using the data for each question individually, maximum points are awarded for the index where water makes up 100% of the responses (as frequency), and 0 points when no water is consumed. Other questions about water consumption have been notoriously difficult to answer well.[12, 30]Water consumption is a key element in the 2013 Australian Dietary Guidelines[31] and indeed this is one of the Go4Fun nutrition targets, so it would be valuable to consider how a question about water consumption compared with soft drink could be applied.

The current beverage questions included by Hendrie et al[29] are:

- How many times does your child usually have soft drink, cordial or sports drinks (per time frame)?
- How many cups of water does your child usually drink (per time frame)?

Magarey et al[32] reports on the reliability and validity of a 28-item short diet questionnaire for use among the parents of Australian children aged 4–16 years old, assessed in a variety of different cohorts, and known as Children's Dietary Questionnaire (CDQ). Four main domains assess fruit and vegetables, fat from dairy foods, sweetened beverages, and non-core foods. In most of the sub-studies the parent completed the CDQ and in some by the researcher as an interview. The fruit and vegetable and non-core foods had good internal consistency, but this was not the case for the fat from dairy foods and sweetened beverages questions. One of the sub-studies investigated the questionnaire's ability to detect change following a community based weight management intervention, which is of relevance for consideration for the Go4Fun program. There was reported change in the expected direction for all four subscales of the CDQ, which would indicate promise in its ability to detect change, especially when considered alongside good repeatability measures in another of the sub-studies. However, it is possible the change that is reported is related to the participants wanting to self-report a shift in a positive behaviour direction following the intervention. This assessment of change was only conducted by the short tool, and not by a double assessment of the relative dietary assessment tool. In terms of the validity of these domains, at an individual level the food domains did not perform well, however the authors of the paper report that at a group level the sub-domains of fruit and vegetables and non-core foods were acceptable. If this group of questions were considered for the Go4Fun program, it would be important to ensure that interpretation of results was reported only at a group level and that change for an individual would not be considered reliable or valid.

Wilson et al[33] report the validity and reliability of a child diet questionnaire, which includes components about food behaviours, attitudes, knowledge and environments associated with healthy eating. While it

identified as a 14-item questionnaire, many components have several sub-questions increasing the length of the questionnaire considerably (see Appendix 1). It was validated among children aged 10–12 years against a seven-day food frequency diary (n=141). This form of relative validity does not actually report on quantity of food but is simply a record of whether those foods were consumed and the frequency of their consumption, so interpretation of results need to be considered in this light. In general, the ICC scores for the food domains were moderately good between repeats of the survey (0.47-0.66), and a Wilcoxin signed rank test found no evidence of difference between the means for 3/7 validity scores (water, vegetables and healthy behaviours), but did for 4/7 domains (non-core foods, sweetened beverages, diet beverages and fruit). Given the longer questionnaire and the poor validation in 4/7 domains this questionnaire is not recommended for use in the Go4Fun program. However, it is noted that the questions used in this survey are similar to questions used in other surveys and at times they appear to have performed better.

Marshall et al[34] conducted a systematic review of diet quality indices in relation to health outcomes in children and adolescents. While this study was initially included in our search strategy it does not actually include a detailed analysis of the validity of such tools. However, it is noted that many of the tools use a combination of food and nutrient data to create the index tools and many are based on either food frequency questionnaires or 24-hour recalls. The authors of this systematic review noted that few of the indices have been supported by validation studies. Further, Marshall et al[34] comment that there is a tendency to base such tools on nutrition principles, such as adherence to dietary guidelines, but without a thorough assessment from validation studies or further evaluation related to nutrition adequacy. Consequently, the authors of this systematic review recommend that such indices be treated with caution. These limitations point to a gap in the literature for the need to have index scores using short dietary assessment methods, which have been validated among sub-populations of interest. The review team are aware of other diet index scores used in Australia (such as the *CSIRO Healthy Diet Score*, *Total diet score*[35], *Healthy Eating Quiz*).[36] However, these scores use a longer list of food items than suitable for the Go4Fun program[36], and are not necessarily specific for children or adolescent population groups.[35]

In general, there were some common themes, upon which the diet short questions were based: fruit and vegetable intake, water and sugary drink consumption, discretionary food use, breakfast consumption, eating in front of the TV. Generally, the repeatability of these questions performed more highly than their validity. Also, frequency of intake tended to be a better measure than quantity of intake. Most of the quality index tools related to longer food frequency questions and therefore, few of the quality index tools were included in this rapid review. No short diet questionnaires assessed responsiveness of the tool to an intervention, compared to an alternative diet assessment at both time points, though one study did assess change in the study tool under investigation, without the comparator dietary assessment tool.[32]

Physical activity and sedentary behaviour instruments

The literature review conducted by the review team identified 12 physical activity and sedentary behaviour publications that met the inclusion criteria. A compilation of physical activity and sedentary behaviour assessment instruments that are publically available or for which permission to disseminate has been sought is included in this review and is found in Appendix 1.

Physical activity in children can be measured by self/proxy report, or objectively (e.g. accelerometers and pedometers). Children under 12 years old have difficulty recalling time and participation in non-organised physical activities in particular (e.g. walking to destinations, playing active games). For these reasons, physical activity in children under 12 years old[37] are best measured using a proxy; potentially the child's parent. However, parents may not be aware of their child's physical activity when outside of their care. Only two studies reviewed for this report included children with a mean age under 10 years old and a

recommendation for this age group would be difficult to make given the limitations. Objective measures such as *accelerometers* provide more accurate estimates of children's physical activity but are costly to purchase, may impose a considerable burden on participants, provide no contextual information, require expertise to manage the data and no standards for its reduction have been reached. *Pedometers*, while less expensive, impose a considerable burden on participants and provide little contextual information. For instance, the devices can provide information on steps taken but not the physical intensity in which they occur – such as moderate or vigorous – which are associated with better health outcomes. *Wearable motion devices* (e.g. Fitbit™, Garmon™) may impose less burden on participants but could carry higher administrative overheads including the financial cost of each unit, data management, (for example, of physical activity dimension – steps, distances, and/or intensity) and the logistics of disseminating and collecting them. *Smartphone Apps* may have potential, however this strategy assumes all participants own a smartphone. Also, the use of such Apps may not be feasible for vulnerable populations and those living in rural and remote areas for reasons related to the cost and availability mobile phone data/internet connectivity. Additionally, there are many Apps measuring a range of physical activity dimensions, and identifying and endorsing an App will require expert review and consultations. Few physical activity measurement Apps have been validated within this population.[9]

Instruments measuring physical activity

Lubans et al[38] report on the reliability and validity of the Oxford Physical Activity Questionnaire (OPAQ) in high school students (age 13.1±0.9 years old, 45% girls for reliability and 12.6±0.5 years old, 47% girls for the validity study). The OPAQ is a time-based physical activity questionnaire in a similar format to a school class timetable to help students recall their activity. It a two-page, paper-based questionnaire with questions on the first page and a timetable grid on the next. It contained 11 items, 8 of which assessed physical activity. Items it captured were very similar to the current Go4Fun program and included travel to and from school, activities at school, activities after school and on weekends, and other activities. Sedentary behaviour was not assessed. Except for a question on their usual mode of transport to school, the students were asked to fill out the questionnaire based their activity during last seven days rather than a typical week as the researchers hypothesised that the latter was possibly more difficult to conceptualise. A list of activities was provided as a prompt, for activities at school and outside of school, but it appears that students could list any activity can in the timetable grid. OPAQ's reliability study was conducted in the UK with the questionnaire administered twice, one week apart. Reliability and validity was established with the child as the respondent. Reliability was assessed using intra-class correlations (ICCs), which ranged from 0.76 to 0.91, indicating very good repeatability. Validity was assessed in a sample of high school students in Newcastle, Australia using accelerometers (*Caltrac*) worn for four days. Activities on the questionnaire were converted to METs using the Compendium of Physical Activities.[39] Correlations between self-reported physical activity and *Caltrac* accelerometer counts were low-moderate, but significant for vigorous physical activity (r = 0.33, p = 0.01) and moderate to vigorous activity (r = 0.32, p = 0.02); correlations were not significant for moderate activity (r = 0.01, p = 0.94). The timetable grid and past week aspects of this questionnaire may provide a useful way to present questions that are similar to the Go4Fun program for non-school-based activities. The reproducibility data are encouraging, but the questionnaire would require repeat validity and reliability studies in a sample similar to the Go4Fun attendees, specifically younger and/or parents, and those from Culturally and Linguistically Diverse (CALD) backgrounds.

The Booth et al[40] paper reports on the reliability and validity of the Adolescent Physical Activity Recall Questionnaire (APARQ) which has been used as part of the NSW Schools Physical Activity and Nutrition Survey (SPANS) in 1997, 2004, and 2010 to assess physical activity among children and adolescents aged approximately 11–15 years old. The APARQ asked children to recall an average week of organised and non-

organised activity (its frequency and duration) in summer and in winter school terms. Overall, APARQ has fair to good agreement (two week test-retest reliability) and its validity, assessed by cardiorespiratory endurance (i.e. PACER or 20MSRT), is commensurate with other self-report instruments (correlations between 0.15 and 0.39).

The publication by Gwynn et al[12] reports on the validity of the Many Rivers Physical Activity Recall Questionnaire (MRPARQ) among non-Indigenous (n = 46) and Aboriginal and Torres Strait Islander children (n = 40) in regional NSW. The MRPARQ is a modified version of the Adolescent Physical Activity Recall Questionnaire[40] (APARQ see above). The MRPARQ modifications included larger fonts and headers for key parts of the week, an accompanying poster with pictures, and cultural support for Aboriginal and Torres Strait Islander children to assist completion. Children reported on all organised and non-organised physical activities during a normal week of a summer and winter school term, and stated the frequency and duration of their participation on weekdays and/or weekends for each activity reported (for both summer and winter). A subgroup of children wore an accelerometer for seven consecutive days to assess validity. For weekdays only, Pearson's correlations and ICCs between the survey data and accelerometer data were weak-moderate: 0.31 (not significant) and 0.16 ($p<0.05$), respectively, for Aboriginal and Torres Strait Islander children, and 0.38 ($p<0.05$), and 0.31 ($p<0.05$), respectively, for non-Indigenous children.

There were wider variances in the survey data captured after school compared with the accelerometer data, and younger children had difficulty estimating and reporting frequency and duration of their activity for the survey. The methods undertaken to ensure the instrument was culturally appropriate provide insights about how survey questions are utilised in vulnerable populations, however it is likely that the physical activity questions themselves may not be optimal for the Go4Fun program as the recall period is lengthy and reliability and validity data are inadequate.

Given the high respondent burden and the concerns over the difficulties children less than 12 years old have in recalling time and participation in non-organised activity, neither the APARQ nor the MRPARQ would seem appropriate tools to measure the physical activity of children participating in Go4Fun.

Prochaska et al[3] is a screening measure consisting of two questions and was originally developed in the US for primary care to screen physical activity in adolescents. This tool is the only one in this review that was not developed in Australia; however one of its questions has recently been advocated for measuring physical activity participation among Australian children (*Active Healthy Kids Australia*, 2014[8]). It has been suggested because it aligns with national guidelines that recommend children and adolescents spend at least 60 minutes every day engaged in moderate to vigorous physical activity (MVPA). The question asks:

- Over the past seven days, on how many days were you/your child engaged in MVPA (activity that increases heart rate and gets you/your child out of breath some of the time) for at least 60 minutes (can be accumulated over the entire day, e.g. bouts of 10 minutes) each day?

The psychometrics of this question have been reported (good repeatability ICC, 0.77 and moderate validity against accelerometers $r = 0.40$, $P<.001$). Given the question comprises a single item and has good face validity it is suitable to use among populations with low literacy and populations from different cultural backgrounds including Indigenous peoples. It is suggested that parents complete this question, in consultation with their child, by asking their child what physical activities they may do during recess and lunch times on school days.

Instruments measuring sedentary behaviour

There are a number of questionnaires that assess children's sedentary behaviour, however recreational screen time (i.e. watching TV, DVDs/videos, computer use, playing video games) is the most common

sedentary behaviour of children. Furthermore, screen time has been subject to national recommendations, which indicate to limit daily screen time to less than two hours. A limitation to current screen time questions is the appearance of new and constantly evolving screen devices including smart phones and tablets which are popular among children.[41, 42] It is recommended that the focus of changing sedentary behaviour be on children's screen time as much other sedentary behaviour has social and cognitive benefits, which should be encouraged (e.g. reading, hobbies, sitting to chat with friends)

The Salmon et al[43] paper investigated associations between the family environment and children's TV viewing and low-level activity. The self-administered questionnaire included three relevant items: children's usual TV viewing, computer use and playing of electronic games (screen-based behaviours) as reported by a parent. Time usually spent in these activities for typical weekdays and typical weekend days was collected. The same questions were asked of their children. Reliability was assessed for parents with a two-week gap between questionnaire administration and for children there was a one-week gap. Comparing the parents' proxy reports with the children's report assessed the convergent validity of these questions. ICCs ranging from 0.6 to 0.8 indicated good repeatability of the proxy-reported time (minutes per day) spent in each of these screen-based behaviours; the repeatability of the child report was not indicated but were said to be not as reliable as the parent report. Convergent validity was moderate to good with correlations for TV viewing (ρ= 0.61), computer use (ρ=0.47) and playing electronic games (ρ=0.44). The favourable repeatability for the proxy report on these questions is positive, however this study does not indicate the accuracy of the parent report on these behaviours or whether these indicators are adequate proxy measures of sedentary behaviour.

The Adolescent Sedentary Activity Questionnaire (ASAQ) developed by Hardy et al[5, 44] examines 14 common sedentary activities of children and adolescents. The questionnaire items include time usually spent watching TV, videos, or playing video games; using a computer for fun or study; doing homework/study or reading for fun (not on a computer); talking on the telephone, sitting with friends or hanging out; doing hobbies or crafts or music lessons/practice; and traveling in a car, bus, ferry, or train, before and after school on a usual weekday and for each weekend day. The items are reduced to domains of sedentary behaviour including screen time, active travel, cultural, hobbies and educational activities. The questionnaire was validated against seven days accelerometry data for total sedentary behaviour. Bland-Altman plots showed good agreement with less than 5% of data points outside the limits of agreement (two standard deviations from the mean of the different between the measures; -26.5 to 20.1 hours per week). The mean weekly difference between self-reported sedentary behaviour and the objective measure was -3.2±11.9 hours per week indicating large variability. The reliability of each domain assessed using two-week test-retest with ICCs for time total spent in sedentary behaviour were mostly very good (≥0.70), except for Grade 6 boys (mean age of 11.3 years old). Small screen recreation (ICC = 0.81) and cultural activity (ICC=0.82) did have higher repeatability in this group and was very good across all age and genders (ICC 0.78-0.90 for small screen recreation and ICC 0.72-0.86 for cultural activities).

Leech et al[45] determined the test-retest reliability of parent-reported daily TV viewing as part of a larger questionnaire. The parents of 5–6 and 10–12 year olds reported the number of hours (range: 0–6 or more hours), in 30 minute blocks, that their child watched (1) commercial and (2) non-commercial TV/ DVDs on a typical school and weekend day and usual TV viewing in minutes per day was calculated. The questionnaire was administered two to three weeks apart and the ICC was very good at 0.78, indicating good repeatability. This item may be a useful proxy measure of sedentary behaviour if validity in the Go4Fun sample can be established.

Combined physical activity and sedentary behaviour instruments

The paper by Finch et al[7]on general food and lifestyle habits associated with school is also included in the Dietary Intake Instruments section of this document. Within its 35 questions, 7 are related to physical activity and sedentary behaviours. For the purposes of assessing relevance to the Go4Fun program, the fuller questionnaire is likely to have too narrow a focus as the questions are only related to the school environment. However, there are two items, one each on physical activity and sedentary behaviour, which may be useful as part of a broader set of physical activity/sedentary behaviour questions:

1. How much time do you usually spend each week playing games or doing activities that make you run around or huff and puff?
2. On weekdays how much time do you usually spend watching television (TV)?

Both of these questions had a moderate to good kappa statistic, indicating good repeatability: 0.51 and 0.63 respectively. Staiano et al[46] found that TV-viewing time was associated with high waist circumference, fat mass, and abdominal subcutaneous adiposity in children and adolescents. Time spent on TV viewing could therefore be a potential proxy for increased risk for poor health, however would require validation.

The Telford et al[47] paper determined the reliability and validity of the Children's Leisure Activities Study Survey (CLASS) among children aged 5–6 and 10–12 years old. Physical activity for 5–6-year-old children was by proxy report via their parents (75% of whom were Australian-born), whereas 10–12-year-old children answered the survey themselves as well as having a proxy-report. The proxy and self-report questionnaires were identical except for demographic questions. The questionnaire consisted of a checklist of 30 physical activities. For each, participants circled yes or no to indicate participation in the activity during a typical week (Monday to Friday) during the school term and during a typical weekend (Saturday and Sunday). For each activity circled 'yes', the frequency of the activity (how many times Monday to Friday and Saturday to Sunday) and the total time spent in that activity over the same time-frames was recorded. Completion time for parents was 10 minutes, and for children was 15 minutes. An assistant guided children. Reliability determined by re-administration of the questionnaire two weeks after baseline for parents and one week after baseline for children. Validity was established using Manufacturing Technology Inc. (MTI) accelerometers. There were more acceptable levels of reliability for the proxy report of the frequency and duration of moderate, vigorous and total activity for 10–12 year olds, but not self-report. For the proxy report of 10–12 year olds, mean difference between proxy-reported total activity and the MTI total physical activity was 11.2 minutes per day and for self-report was 1.5minutes per day although confidence limits may indicate a degree of variation. The CLASS questionnaire appears to be acceptable in terms of reliability and validity of most aspects of the items assessed by proxy and self-report. The length of time to complete the CLASS survey as a stand-alone questionnaire would be acceptable, however, as part of a battery of questionnaires may still be too lengthy for the Go4Fun program. Consideration could be given to developing a reduced activity list informed by focus groups to assist in identifying the most relevant activities for this cohort. The resulting list could then be reassessed in terms of its reliability and validity.

Strugnell et al[48] reported on the reliability of a modified version of the Child and Adolescent Physical Activity and Diet Survey (CAPANS), the CAPANS-PA amongst 11–14-year-old Chinese Australian youth. Some items from the CAPANS, were themselves sourced or modified with reference to previous questionnaires (e.g. APARQ and CLASS). The questionnaire is based on children's school and non-school based physical activity and sedentary behaviours over seven days, and is a 17-item recall questionnaire with a total of 12 items. Frequency and duration of 46 commonly performed physical activities and sedentary behaviours performed Monday to Friday and Saturday to Sunday, as well as participation in school based and non-school based activities is collected. With four new items created in the sedentary behaviour section, the questions are similar to, but lengthier than those currently included in the Go4Fun program and similar to those used in

the CLASS questionnaire. The grid structure for the seven–day recall of activities is the same as that provided in the CLASS questionnaire with the question modified from recall of usual activity in a typical week. The questionnaire is six pages long and takes children 15 minutes to compete. Test-retest kappa statistics were >0.50 for most individual activities. The reliability for all sedentary activities (Monday to Friday, Saturday and Sunday) was only acceptable for females (ICC=0.83) and for social activities was not acceptable for any participants.

Moore et al[49] reported the validity of a web-based program among 7–15-year-old UK school children called the Synchronised Diet and Activity Program™ (SNAP). The software was specially designed to enhance recall in children using a 24 hour school day structure, in a segmented day format, recall diet and physical activity at the same time, using contextualisation, using gaming techniques, visual memory prompts, and reminders at the end of the questionnaire to provide an opportunity to change responses. Common physical activities (29) within the domains of sedentary, structured, household chores and play activities, as well as a free-text option box labelled 'other' were included. Transport activities were also assessed. Following selection of an activity, the participants were asked to indicate duration and intensity by dragging a slider on a timeline, which ranged from 0 to 3 hours, visually segmented into 10 minute intervals for the first hour and then in 30 minute intervals.

The validity was assessed by accelerometry, and number of minutes above three METs were calculated to determine moderate and vigorous physical activity. Applying the Passing–Bablok regression equation established an overall bias of less than four minutes between the two methods, indicating good validity of SNAP for assessment of physical activity. The overall number of items was not indicated. Qualitative analysis indicated some improvements could be made to SNAP, however many children reported that they liked the pictures and layout, thought it was fun, and easy. Further investigation into using this web-based questionnaire as well as establishing validity and reliability in an Australian population is warranted. This web-based method may not be feasible in the Go4Fun community-based context, particularly in rural and remote areas where internet connectivity may be poor.

Summary : Physical activity and sedentary behaviour instruments and issues

Identification of a low burden yet accurate measure of sedentary and physical activity in children and adolescents is a vexed issue. Population level studies favour the use of self-report techniques despite the known issues in accuracy of recall; particularly with children, validation studies continue to report, at best, modest correlation with objective measures. Expert consensus is that objective measures are far superior with regard to participant burden and accuracy, are appropriate for individual level measurement, and therefore are likely the best choice for a program such as Go4Fun.

Regardless, the administration of all measures requires staff to be adequately trained to support children appropriately during their evaluation and to ensure the process is not burdensome, particularly regarding child concerns about performance. Further, it is recommended that the completion of questionnaires be a group activity (first and last sessions of Go4Fun) if possible, but maintaining confidentiality of responses. This allows for standard delivery, ensures participants understand the question and have the opportunity to ask for clarifications.

Finally, it is important to note that few of the instruments reviewed gave any indication concerning completion time, and issues concerning respondent burden, literacy aspects, or allowances for differing ethnicities of respondents.

The available measurement options are briefly:

1) Self-report questionnaires:

a) Frequently recall of a 'usual' week.[12, 40] This type of measure takes considerable time to complete in supporting children to recall and record.
b) The recall measure of one day[50] is not a record of usual or habitual activity. To capture usual levels of activity this measure requires repeat administration. It also has the same issues regarding administration that apply to question 1a.
c) Choosing from a predetermined list of physical activities.[47] This measurement option has the following limitations:
    i) The child's usual activity may not be included, and this is particularly problematic for its use in diverse population groups
    ii) In addition, a list may encourage the child to choose activities merely because they are listed and thus appear to be socially desirable.

2) Self-report short questions:
a) Prochaska et al.[3]This one-item question has been advocated by physical activity experts across Australia.[8] Although the question was originally designed for screening adolescents' physical activity, it has been used across different child populations, including for parent proxy reporting. It addresses physical activity of at least 60 minutes per day, which may not be applicable for some children participating in the Go4Fun program.
b) Finch et al[7] [for the sedentary behaviour question only]: reports on reliability only, is for primary school aged children and needs validation if used out of context of the overall questionnaire. It only addresses weekday sedentary behaviour and TV screen time.

3) Objective measures:
a) We suggest the MOH consider objective measures but remain aware of the large burden they may place on administrators and participants, equity issues (especially if Smartphone Apps are being considered), and which Apps or wearable devices are most appropriate.

Question 1b: What is the evidence regarding best practice in developing short-form diet, physical activity and sedentary behaviour instruments for the pre/post monitoring of programs such as the mainstream Go4Fun program?

There are several principles to consider when developing short-form instruments to assess baseline and follow-up information on diet, physical activity and sedentary behaviour among children and adolescents when implementing a program such as Go4Fun. The following is a narrative review of these principles drawn from the literature and the expertise of the authors.

Rutishauser et al[51] and Marks et al (2001)[52] as part of series on monitoring food habits in the Australian population, summarised the following attributes of good dietary assessment methods and found that they should be:

1. Indicative of **important** aspects of diet quality, and should reflect aspects of food and diet that are **relevant** to the population of interest
2. **Valid** in terms of how well questions accurately assess the information they are designed to obtain and usually assessed relative to another method
3. **Reproducible** or able to show that the questions are able to provide the same results if repeated under the same conditions. If questions do not have good reproducibility, they should not be used to assess change in what they're measuring, as there will be uncertainty about whether that change is real or simply a factor of the lack of reproducibility of the question
4. **Consistent**, performing the same way in different sub-groups of the population. In order to assess this reproducibility and validity, assessments of the questions need to be conducted in different sub-groups.

5. **Responsive** such that they're able to measure change in the factor of interest. Ideally, this should be also be assessed in the process of validation, with alternative methods and the survey tool applied at two time points: baseline and follow-up. This has rarely been reported in the literature
6. **Independent of the method of administration**, so that it is able to function, independent of whether it is administered as face-to-face or self-adminstered, or via telephone or online administration.

These principles were orginally discussed in terms of dietary assessment, however the same principles could also be applied for assessment of physical activity. In a systematic review of measurement properties about physical activity questionnaires for youths, Chinapaw et al[53] discussed the principles of relibility, validity and responsiveness.

A set of qualitative attributes and measurement properties of physical activity questionnaires have been developed by Terwee et al[54] known as the Quality Assessment of Physical Activity Questionnaire (QAPAQ) checklist. It is summarised below:

1. Construct – what does the the questionnaire intend to measure?
2. Setting – in what setting is PA measured, e.g. school, home, leisure time, transport
3. Recall Period – e.g. past week, usual
4. Purpose – what is the purpose? (e.g. discriminative, evaluative)
5. Target population – age, sex, health status of population
6. Justification – why is it needed?
7. Format – clear description of number of questions, response categories
8. Interpretability– is there information on interpretation of scores?
9. Ease of use – what time and effort is required to complete it? Are clear instructions available?

In terms of the Go4Fun program, as part of the principles identified, an additional consideration related to **relevance** and **purpose**, would be that the assessment includes measures which are actively included as points of intervention as part of the program. It would not be a good use of time to measure behaviours which are not actively included in the program, unless there was a requirement to have information about these for other purposes, such as providing a descriptive snapshot. Given the concern about the burden on participants in relation to short-form measures, the review team recommend using only a limited number of questions which are simply used for descriptive purposes (if any), to focus questions on those that are likely to be able to reflect true change and for which there are **objectives** targeted as part of the program.

Important aspects of dietary intake among child and adolescent population groups are described in population monitoring and reference should be made to the recent Australian Health Survey 2011–12. For example, recent analysis of added sugars have highighted the high intake of free sugars among 9–13 year olds and 14–18 year olds in particular with almost three quarters consuming greater than 10% of energy as free sugars, with sugary drinks making up a high proportion in these age groups (more than 45% contribution from beverages).[55]

Literature about the ability of a child to self-report dietary intake has been described, and Baranowski and Domel[56] proposed a model of cognitive processing suitable for self-report from around 10 years of age. Prior to this age, errors that more commonly occur relate to attention, perception, organisation, retention, retrieval and response. For example, an attention error occurs when a child does not notice information. For example, if a child does not attend to the margarine on a cob of corn, then she or he will not be able to report it. If parents spend less time with their children, then they may be less able to accurately report their dietary intake[57] and, as children age, parents may have less control over the child's food intake. So the child or adolescent may be better able to report intake, especially as the parent may have a tendency to over-report consumption of healthy foods[58, 59] discuss issues in assessing child and adolescent diet research, and

provide a case study example of a population based obesity prevention program in which parent proxy reporting of diet was chosen for children aged under 10 years old, and self-reporting for children over 10 years old. The experience of the review team also indicates that from about the upper primary years, children are generally able to self-report their diets.

Consideration of the quality of validation and repeatability studies among diet related papers

In a recent systematic review by Golley et al[60], a group of experts in dietary assessment methods from around Australia — based on a team from the Australian Child and Adolescent Obesity Research Network (ACAORN) — developed a set of criteria to determine quality in a assessing short food questionnaires, based on previous research from Serra-Majem[61] which considered quality based on scores from the following criteria:

1. Sample size
2. Type of statistics used
3. Data collection procedure
4. Consideration given to seasonality
5. Consideration given to supplement use (if appropriate).

Consideration of the quality of validation and repeatability studies among physical activity papers

In the systematic review by Chinapaw et al[53], a quality score was created based on information about sample size, reliability, validity and statistical tests applied, and are further described below.

Reliability should be assessed as test-retest should be short enough to ensure that participants had not changed physical activity levels, but long enough to prevent recalling the previous answers. Chinapaw[53] defined adequate time interval for test-retest as:

1. > 1 day but <3 months for questionnaires recalling a usual week
2. > 1 day but <2 weeks for questionnaires recalling the previous week
3. > 1 day but <1 week for questionnaires recalling the previous day.

Other positive scores were assigned where:

1. At least 50 participants were included in the study population
2. ICC or Kappa or Pearson correlation were above the following cut-points: ICC>0.70, Kappa >0.70, Pearson >0.80.

In the same systematic review, assessment of the validity was felt to be dependent on what the questionnaire was aiming to measure. Considerations were also given to the comparison instrument (e.g. accelerometer, doubly labelled water, direct observation, pedometer, heart rate monitor etc.)

The use of measures that include delivery with visual prompts (e.g. pictures, timelines etc.) may assist completion. Use of pictures when communicating health information can provide a significantly improve attention, comprehension, recall and intention/adherence. Relevant drawings and photographs may assist in understanding messages, especially for those with lower literacy.[62, 63] Technology such as touchscreens may also facilitate questionnaire administration among these groups.[64, 65]

Question 2: How should the evidence from Question 1 be adapted for the Aboriginal Go4Fun program?

Background

High intakes of energy dense and nutrient poor foods among a larger proportion of Aboriginal and Torres Strait Islander children compared with non-Indigenous children have been reported.[6, 66] The recent National Aboriginal and Torres Strait Islander Diet and Physical Activity Survey (NATSINPAS) results reported that a higher proportion of Aboriginal and Torres Strait Islander people at every age consumed more soft drinks and cordials than their non-Indigenous counterparts.[67] Few studies exist which describe the physical activity of Aboriginal and Torres Strait Islander children, however both Gwynn et al[12] and Trost et al[50] found that children (median age 11.1 and 13.8 years old respectively) tend to be more active than their non-Indigenous counterparts. The same survey also found similar results for children in non-remote areas aged 5–17 years old with 48% of Aboriginal and Torres Strait Islander children meeting physical activity recommendations, compared with 35% of their non-Indigenous counterparts.[68] However, by adulthood these proportions have reversed with fewer Aboriginal and Torres Strait Islander than non-Indigenous people meeting recommended guidelines.[68] Another study found equivalence in proportions of Aboriginal and Torres Strait Islander and non-Indigenous children in school years 6, 8 and 10 meeting Australian physical activity recommendations (62% and 61.4%). However, the same study found a higher proportion of Aboriginal and Torres Strait Islander children exceeded screen time recommendations on weekdays compared with their non-Indigenous counterparts (62.8% and 47%).[66]

Measures

There is a paucity of valid and reliable measures of food intake and physical activity suitable for Aboriginal and Torres Strait Islander children aged 7–13 years old. Only one dietary intake measure[6] and two physical activity measures[12, 50] (neither of which include a separate measure of sedentary activity and both of which are more suited to population than individual level studies) have been validated with Aboriginal and Torres Strait Islander children.

Diet instruments

The Many Rivers Short Food Frequency Questionnaire (MRSFFQ) has been described earlier in this review on p.15 in relation to non-Indigenous children. In regards to Aboriginal and Torres Strait Islander children a number of the short questions perform well from a repeatability perspective and these are: beans, fish, traditional foods, soup, margarine/butter, type of milk, chicken, eggs, water, hot chips, crisps/salty snacks, confectionary, and breakfast cereal. The short questions that perform best from a validity perspective are those on: vegetables, milk, butter/margarine, fish, meat products, fish, fruit juice, soft drinks, crisps/salty snacks and breakfast cereal. Those that target the key foods addressed in the Go4Fun sessions are those on: fruit, vegetables, sugary drinks, water, hot chips, takeaway foods and breakfast. It was notable that unlike other drink questions, the water question did not perform well. Unlike other drinks, children often obtain water from taps (home, elsewhere) and water fountains (at school, sports grounds) and consequently find the quantity consumed is much more problematic to estimate.

Physical activity and sedentary behaviour instruments

Gwynn et al[6] found that the 'usual week' self-report questionnaire validated in their MRPARQ study performed similarly across Aboriginal and Torres Strait Islander and non-Indigenous children (see Appendix 3), and demonstrated modest validity. The MRPARQ is described previously in this review and whilst this did not include a separate sedentary activity section, children were asked to report all activity regardless of level. The mean age of the study participants was 11.1 years old. The study results reflect the well-documented limitations of young people to accurately self-report[69-72] and their tendency to over and/or under report.[73, 74]

Culturally appropriate support was provided to Aboriginal and Torres Strait Islander children and included: posters of activities Aboriginal children commonly engaged in to assist them in their completion of the survey and the employment of Aboriginal Health Workers from their community to deliver the survey. The significant limitation of this tool for children is the requirement that they recall an entire week's usual activity (including weekends) during both summer and winter.

Trost et al[50] also found that the 'previous day' self-report measurement tool validated in their study (Previous Day Physical Activity Recall-24) PDPAR-24, performed similarly across populations of Aboriginal and Torres Strait Islander and non-Indigenous children (see Appendix 3), and also demonstrated modest validity. The mean age of participants in this study was 13.8 years old, slightly older than children in the Gwynn et al[6] paper. This self-report measurement tool required recall of the previous 24 hours only. The PDPAR-24 instrument made use of a standardised grid organised into 30-minute time blocks. Commonly performed activities pertaining to the Australian context, including sedentary activities such as TV watching, were listed (and numbered; n = 69) on the form, and participants entered the main activity in which he or she participated during each time period. The main activity was defined as the activity that occupied most of the 30-minute period and participants then rated the intensity of that activity as light, moderate, hard or very hard. The significant limitation of the PDPAR-24 was the need for multiple administrations to obtain a reliable estimate of a child's habitual physical activity level and the inclusion of a predetermined list of activities (see comments on this type of instrument previously on page 23, 1 (c)).

5 Recommendations

1. It is preferable that children under 10 years old do not self-complete diet or physical activity questions.
2. For children under 10 years old, only collect information about diet and physical activity if a parent is able to provide a proxy report.
3. For children aged 10–12 years old, consider either the use of child or parent proxy report.
4. For children aged over 12 years, child report is preferred.
5. Include a mechanism to identify the person who fills in the report at the point of survey completion. Variations of questionnaire forms could also be used with wording reflective of whether the child or parent/carer is the respondent e.g. "How many serves of fruit does your child usually eat each day?" rather than "How many serves of fruit do you usually eat each day?"
6. Pay attention to mode of administration and make use of technology as a mode of data collection where feasible.
7. Make use of good visual prompts within the questionnaires; diet assessment tools in particular lend themselves to visual prompts.
8. Staff administering these measures should receive thorough training in how to support children and parents to complete the questionnaires in group settings. A manual must be developed for staff to use in the field to assist them adhering to the administration protocol.
9. Questionnaires should be completed and checked for completeness during the first and last session of Go4Fun. While questionnaires should be undertaken as a group activity to standardise their administration, facilitators should ensure that each participant prepares their responses individually. Parents who proxy report for their child should discuss the question and their responses with the child.
10. Aboriginal children who are completing the questionnaires in the group setting require the presence of an Aboriginal staff member to support completion of the survey. This staff member should preferably be from the children's community and preferably occupy the lead position in the team.

Recommended dietary intake instruments

The following short questions which address the key diet components of the Go4Fun program are recommended. These are completed by the child (only if aged 10 years old or over) and taken from the MRSSFQ.[6] If the child is aged under 10 years old we recommend that parents are used as the proxy respondent. The wording of the question should reflect this, e.g. "How many serves of fruit does your child usually eat each day?"

Similar domain questions are also included in several other papers reviewed in the section on Dietary Instruments. The recommended questions have been validated for use with children and their parents or carers and also apply to Aboriginal and Torres Strait Islander children. It is recommended that such questions are accompanied with good visual prompts. Examples of visual prompts can be located in the dietary questionnaires used in the Students as Lifestyle Activists (SALSA) high school community intervention currently run in high schools in Western Sydney[75, 76] (see Appendix 1).

1. **How many serves of fruit do you USUALLY eat each day? (A 'serve' is 1 medium piece or 2 small pieces of fruit or a cup of diced pieces.) This includes all fresh, dried, frozen, and tinned fruit**.

☐ I don't eat fruit

☐ 1 serve or less

☐ 2 serves

☐ 3 serves

☐ 4 serves or more

2. **How many serves of vegetables do you USUALLY eat each day? (A 'serve' is half a cup of cooked vegetables or 1 cup of salad vegetables.) This includes all fresh, dried, frozen and tinned vegetables.**

☐ I don't eat vegetables

☐ 1 serve or less

☐ 2 serves

☐ 3 serves

☐ 4 serves

☐ 5 serves or more

3. **How much soft drink, cordials or sports drinks do you USUALLY drink (e.g. cordial, Coke, Lemonade, Gatorade)? (one can of soft drink = 1 ½ cups)**

☐ I don't drink soft drink

☐ Less than one cup a week

☐ About 1-3 cups a week

☐ About 4-6 cups a week

☐ About 1-2 cups a day

☐ About 2-3 cups a day

☐ 3 cups or more a day

4. **How much water do you USUALLY drink each day? This can be plain tap water or bottled water. (1 average bottle = 2 cups)**

☐ I don't drink water

☐ Less than one cup a day

☐ About 1 to 2 cups a day

☐ About 2 to 3 cups a day

☐ About 3 to 4 cups a day

☐ About 4 cups or more a day

5. How often do you eat hot chips, wedges, or hot French fried potatoes?

☐ Never or rarely

☐ Less than once a week

☐ About 1 to 2 times a week

☐ About 3 to 4 times a week

☐ About 5 to 6 times a week

☐ About once a day

☐ 2 or more times a day

6. How often do you have meals or snacks, such as burgers, pizza, chicken, or chips from places like McDonalds, Hungry Jacks, Pizza Hut, KFC, Red Rooster or local take-away food places?

☐ Never or rarely

☐ Less than once a week

☐ About 1 to 2 times a week

☐ About 3 to 4 times a week

☐ About 5 to 6 times a week

☐ About once a day

☐ 2 or more times a day

Evidence suggests that eating meals in front of the television is associated with increased weight and poorer diet quality.[23-25] We also recommend the inclusion of a question[7] on eating dinner in front of television be included to assess pre/post program behaviour change using mean values for the group.

7. How many times a week do you usually eat your meal at night in front of the television (TV)?

_____days a week

OR

☐ I rarely / never eat in front of the TV

Recommended physical activity instrument

The following short questions on physical activity have been validated by Prochaska et al[3] for use in primary care setting:

> **Physical activity is any activity that increases your heart rate and makes you get out of breath some of the time.**
>
> **Physical activity can be done in sports, playing with friends, or walking to school.**
>
> **Some examples of physical activity are running, brisk walking, roller blading, biking, dancing, skateboarding, swimming, soccer, basketball, football, and surfing.**

8. **Add up all the time you spend in physical activity each day (don't include your physical education (PE) or gym class)**

   a) Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?

O No days O 1 day O 2 days O 3 days O 4 days O 5 days O 6 days O 7 days

   b) Over a typical or usual week, on how many days are you physically active for a total of at least 60 minutes per day?

O No days O 1 day O 2 days O 3 days O 4 days O 5 days O 6 days O 7 days

Scoring: (Q1+Q2)/2 <5 indicates not meeting physical activity guidelines

A slightly modified version is recommended for use in population measurement of Australian children's physical activity participation by Active Healthy Kids Australia[8] and is recommended for the Go4Fun program:

Over the past 7 days, on how many days were you/your child engaged in moderate to vigorous physical activity for at least 60 minutes (this can be accumulated over the entire day, for example in bouts of 10 minutes) each day?

Moderate to vigorous activity is any activity that increases the heart rate and gets you out of breath some of the time

O No days O 1 day O 2 days O 3 days O 4 days O 5 days O 6 days O 7 days

Recommendations for comparison with physical activity guidelines can be found within the Active Healthy Kids Australia[8] report.

Recommended sedentary behaviour instrument

The review team have reviewed the evidence, and cannot recommend an evidence-based short question for measurement of sedentary behaviour for inclusion in the Go4Fun program.

The review team identified the following short question[7] which may address the sedentary behaviour component of the Go4Fun program, however it is limited to weekdays and the screen time is limited to television viewing:

9. **On weekdays how much time do you usually spend watching television (TV)?**

_____ hours _____minutes

We suggest this question be used to assess change in sedentary behaviours pre/post program rather than to compare against sedentary behaviour guidelines.

We identify this area as a gap in the literature which warrants research testing the validity and reliability of a short question covering all aspects of screen time in which children in this age group typically participate.

7 Appendices

Appendix 1: Diet and Physical Activity Instruments.

Students as Lifestyle Activists (SALSA)

(questionnaire utilised in Shah et al, 2016)

Students As LifeStyle Activists

Today's date: 2014

Day Month

Student ID number	
School name	
School Year	
Class	

Instructions

- ☺ Please read each question carefully and try to answer them as honestly as you can.

☺ This is not a test so there are no right or wrong answers.

☺ If you are unsure of a question, please raise your hand and someone will help you.

☺ All your answers to the questions are confidential.

For each question, please tick one response box to show your answer:

1. I am a …
   - ☐ Girl
   - ☐ Boy

2. At home my parents usually speak …
   - ☐ English
   - ☐ Another language: _____

3. Did you have breakfast today?
   - ☐ Yes
   - ☐ No

4. How many days last week did you have something for breakfast?
   - ☐ No days
   - ☐ 1 day
   - ☐ 2 days
   - ☐ 3 days
   - ☐ 4 days
   - ☐ 5 days

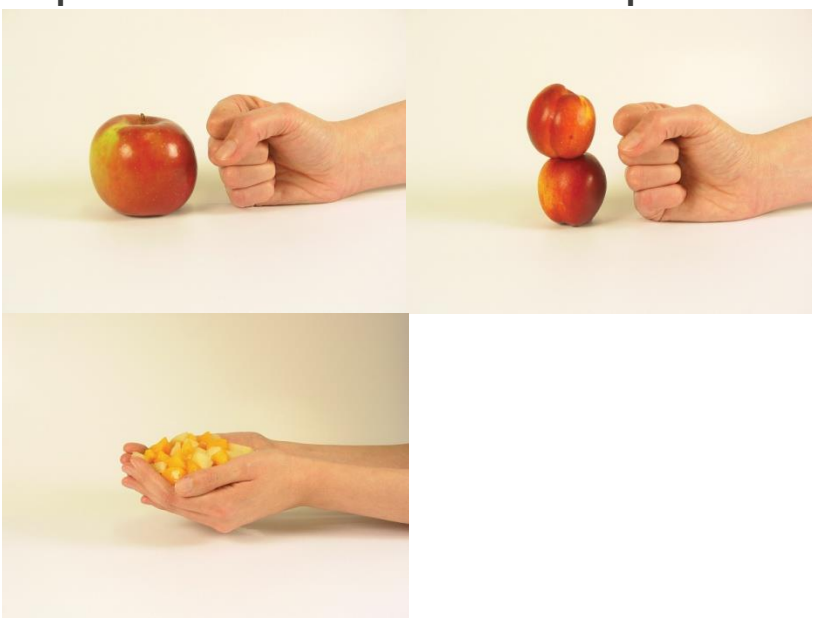
- ☐ 6 days
- ☐ 7 days

5. Where do you usually eat breakfast on a school day?
   - ☐ At home
   - ☐ On the way to school
   - ☐ At school
   - ☐ I don't eat breakfast

6. Do you believe eating breakfast will:
   - ☐ Help you to do better at school
   - ☐ Have no effect on your school work
   - ☐ Not sure

7. Over the next month, I plan to eat breakfast every day:
   - ☐ Agree
   - ☐ Neither agree or disagree
   - ☐ Disagree

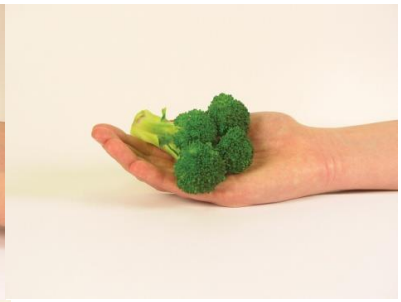
Each picture below shows an example of one serve of fruit:



8. How many serves of fruit do you eat every day?
    - ☐ I don't eat fruit every day
    - ☐ 1 serve
    - ☐ 2 serves
    - ☐ 3 serves or more

9. Over the next month, how many serves of fruit do you plan to eat every day:
    - ☐ I don't plan to eat fruit every day
    - ☐ 1 serve
    - ☐ 2 serves
    - ☐ 3 serves or more

Each picture below shows an example of one serve of vegetables:



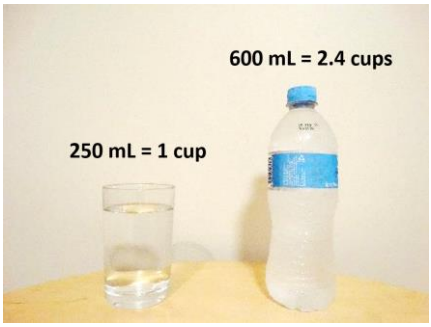
10. How many serves of vegetables do you eat every day?

- ☐ I don't eat vegetables every day
- ☐ 1 serve
- ☐ 2 serves
- ☐ 3 serves
- ☐ 4 serves
- ☐ 5 or more serves

11. Over the next month, how many serves of vegetables do you plan to eat every day:

- ☐ I don't plan to eat vegetables every day
- ☐ 1 serve
- ☐ 2 serves
- ☐ 3 serves
- ☐ 4 serves
- ☐ 5 or more serves

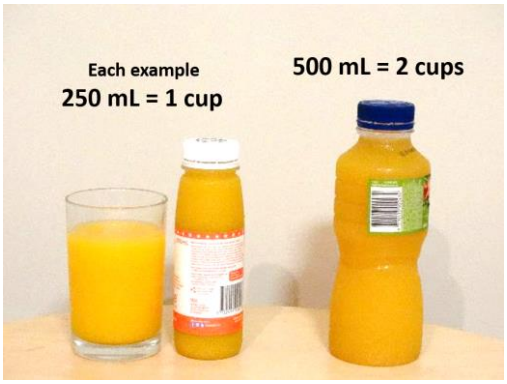
12. To help you answer this question take a look at the picture below



How many cups of water do you drink every day?

- ☐ I don't drink water every day
- ☐ 1 to 2 cups a day
- ☐ 3 or more cups a day

13. To help you answer this question take a look at the picture below

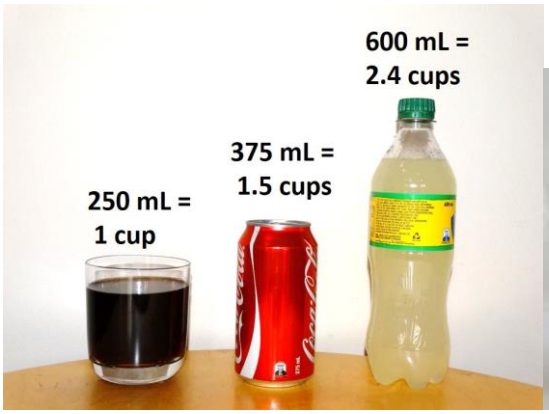


How many cups of fruit juice do you drink?

- ☐ I never drink juice
- ☐ 1 to 3 cups a week or less
- ☐ 4 to 6 cups a week

- ☐ 1 to 2 cups a day
- ☐ 3 or more cups a day

14. To help you answer this question take a look at the pictures below



approx. **600 mL = 2.4 cups**

How many **cups of soft drink, sports drink or cordial do** you drink?

- ☐ I never have these drinks
- ☐ 1 to 3 cups a week or less
- ☐ 4 to 6 cups a week
- ☐ 1 to 2 cups a day
- ☐ 3 or more cups a day

15. To help you answer this question take a look at the picture below

How many cups of energy drinks do you drink?

- ☐ I never have energy drinks
- ☐ 1 to 3 cups a week or less
- ☐ 4 to 6 cups a week
- ☐ 1 to 2 cups a day
- ☐ 3 or more cups a day

16. I prefer sugary drinks (e.g. fruit juice, soft drink, cordial, sports or energy drinks) instead of water:

- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree

17. How often do you drink "diet" or "sugar free" soft drinks or energy drinks?

- ☐ Never
- ☐ Sometimes
- ☐ Always

18. In the past week, on how many days have you done a total of 60 minutes or more of physical activity, which was

enough to make you huff and puff? This may include sport, exercise and brisk walking or cycling for recreation or to get to and from places? Please tick only one box.

- ☐ No days
- ☐ 1 day
- ☐ 2 days
- ☐ 3 days
- ☐ 4 days
- ☐ 5 days
- ☐ 6 days
- ☐ 7 days

19. Over the next month, I plan to be physically active on all or most days of the week:
    - ☐ Agree
    - ☐ Neither agree or disagree
    - ☐ Disagree

20. On a normal school day, how much of your free time would you spend sitting and using a mobile phone, iPad, tablet, computer, gaming console or watching TV/DVDs?
    - ☐ 0 to 1 hour
    - ☐ 1 to 2 hours
    - ☐ 2 to 3 hours
    - ☐ More than 3 hours

21. On a normal Saturday, how much of your free time would you spend sitting and using a mobile phone, iPad, tablet, computer, gaming console or watching TV/DVDs?

- ☐ 0 to 1 hour
- ☐ 1 to 2 hours
- ☐ 2 to 3 hours
- ☐ More than 3 hours

22. On a normal Sunday, how much of your free time would you spend sitting and using a mobile phone, iPad, tablet, computer, gaming console or watching TV/DVD?

- ☐ 0 to 1 hour
- ☐ 1 to 2 hours
- ☐ 2 to 3 hours
- ☐ More than 3 hours

23. Over the next month, I plan to spend less free time sitting and doing activities involving screens (mobile phone, tablet, computer, gaming console, TV).

- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree

Thank you! ☺

Many River Diabetes Prevention Project (Gwynn et al 2011)

FOODS I USUALLY EAT

Please answer the following questions about yourself:

1 Are you a BOY or a GIRL? ☐ Boy ☐ Girl

2 What is you date of birth?

ɜɜ / ɜɜ / ɜɜɜɜ

Day Month Year

3 What language do you speak most at home?

☐ English

☐ Another language (please write it here) _____

We are interested to learn about your recent eating habits, for instance over the past month. For the follow questions please answer how many times a DAY or WEEK you USUALLY eat these foods?

Tick only one answer for each question.

4 How often do you eat bread? (This includes bread rolls, flat breads, bagels, muffins)

☐ Never or rarely

☐ Less than once a day

☐ ABOUT 1-3 TIMES A DAY

☐ ABOUT 4-5 TIMES A DAY

☐ 6 or more times a day

5 What type of bread do you USUALLY eat?

☐ Brown (multigrain, wholemeal)

☐ White

☐ Other

☐ Not sure

6 How often do you have butter or margarine on your bread or rolls?

☐ Never

☐ Not very often

☐ Sometimes

☐ Almost always

☐ Always

7 How much milk (in total) do you USUALLY drink each day? (This includes all types of milk including flavoured milk and milk on cereal.)

☐ I don't drink milk

☐ Less than one cup a day

☐ About 1 to 2 cups a day

☐ About 2 to 3 cups a day

☐ 3 cups or more a day

8 What type of milk do you USUALLY drink? (Choose one type of milk only)

☐ I don't drink milk

☐ Whole milk (full cream)

☐ Trim, low or reduced fat milk

☐ Skim (non-fat) milk

☐ Flavoured Milk (such as chocolate, strawberry)

☐ Soy Milk

☐ Not Sure

9 How many serves of vegetables do you USUALLY eat each day? (A 'serve' is a half-cup of cooked vegetables or 1 cup of salad vegetables). This includes all fresh, dried, frozen and tinned vegetables.

☐ I don't eat vegetables

☐ 1 serve or less

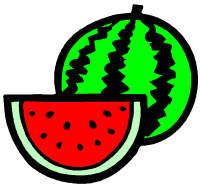
☐ 2 serves

☐ 3 serves

☐ 4 serves

☐ 5 serves or more

10 How many serves of fruit do you USUALLY eat each day? (A 'serve' is 1 medium piece or 2 small pieces of fruit or a cup of diced pieces). This includes all fresh, dried, frozen, and tinned fruit.



☐ I don't eat fruit

☐ 1 serve or less

☐ 2 serves

☐ 3 serves

☐ 4 serves or more

11 How much water do you USUALLY drink each day? This can be plain tap water or bottled water. (1 average bottle=2 cups)

☐ I don't drink water

☐ Less than one cup a day

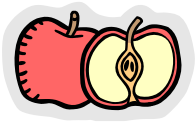
☐ About 1 to 2 cups a day

☐ About 2 to 3 cups a day

☐ About 3-4 cups a day

☐ About 4 cups or more a day

12 How much fruit juice do you USUALLY drink?



☐ I don't drink juice

☐ Less than 1 cup a week

☐ About 1 -3 cups per week

☐ About 4-6 cups per week

☐ About 1-2 cups a day

☐ About 2-3 cups a day

☐ 3 cups or more a day

13 How often do you eat cheese?

☐ Never or rarely

☐ Less than once a week

☐ About 1-3 times a week

- ☐ About 4-6 times a week
- ☐ About once a day 2 or more times a day

14 How often do you eat yoghurt?

- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1-3 times a week
- ☐ About 4-6 times a week
- ☐ About once a day
- ☐ 2 or more times a day

15 How often do you eat breakfast cereal? (ready-made, home-made or cooked)

- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1-3 times a week
- ☐ About 4-6 times a week
- ☐ About once a day
- ☐ 2 or more times a day

16 How often do you eat pasta, rice, or noodles?

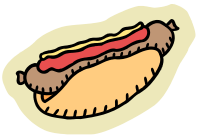
- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1-3 times a week
- ☐ About 4-6 times a week
- ☐ About once a day
- ☐ 2 or more times a day

17 How often do you eat red meat such as beef or lamb? Include all steaks, chops, roasts, mince, stir fries and casseroles.

- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1-2 times a week
- ☐ About 3-4 times a week
- ☐ About 5-6 times a week

☐ Everyday

18 How often do you eat meat products such as sausages, hot dogs, ham, devon, sausage rolls, salami, meat pies, chicken nuggets or bacon?



☐ Never or rarely
☐ Less than once a week
☐ About 1-2 times a week
☐ About 3-4 times a week
☐ About 5-6 times a week
☐ Everyday

19 How often do you eat chicken?

☐ Never or rarely
☐ Less than once a week
☐ About 1-2 times a week
☐ About 3-4 times a week
☐ About 5-6 times a week
☐ Everyday

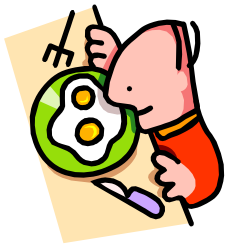
20 How often do you eat fish?

☐ Never or rarely
☐ Less than once a week
☐ About 1-2 times a week
☐ About 3-4 times a week
☐ About 5-6 times a week
☐ Everyday

21 How often do you eat baked beans, three bean mix, lentils, split peas, or dried beans?

☐ Never or rarely
☐ Less than once a week
☐ About 1-2 times a week
☐ About 3-4 times a week
☐ About 5-6 times a week
☐ Everyday

22 How often do you eat eggs?



- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1-2 times a week
- ☐ About 3-4 times a week
- ☐ About 5-6 times a week
- ☐ About once a day
- ☐ 2 or more times a day

You're over half way through the survey. Please turn over.

23

How often do you eat traditional Australian foods ('bush tucker"), such as kangaroo or pippies?

- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1-2 times a week
- ☐ About 3-4 times a week
- ☐ About 5-6 times a week
- ☐ Everyday

24 How often do you USUALLY have soup?

- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1-2 times a week
- ☐ About 3-4 times a week
- ☐ About 5-6 times a week
- ☐ Everyday

25 What type of soup do you USUALLY eat?

- ☐ I don't eat soup
- ☐ Vegetable soup
- ☐ Creamy soup

- [ ] Tomato soup
- [ ] Meat or Chicken and vegetable soup
- [ ] Not sure

26 How often do you eat hot chips, wedges, or French fried potatoes?

- [ ] Never or rarely
- [ ] Less than once a week
- [ ] About 1-2 times a week
- [ ] About 3-4 times a week
- [ ] About 5-6 times a week
- [ ] About once a day
- [ ] 2 or more times a day

27 How often do you eat potato crisps or other salty snacks (such as Twisties, Corn chips)?

- [ ] Never or rarely
- [ ] Less than once a week
- [ ] About 1-2 times a week
- [ ] About 3-4 times a week
- [ ] About 5-6 times a week
- [ ] About once a day
- [ ] 2 or more times a day

28 How often do you have meals or snacks such as burgers, pizza, chicken, or chips from places like McDonalds, Hungry Jacks, Pizza Hut, KFC, Red Rooster or local take-away food places?

- [ ] Never or rarely
- [ ] Less than once a week
- [ ] About 1-2 times a week
- [ ] About 3-4 times a week
- [ ] About 5-6 times a week
- [ ] About once a day
- [ ] 2 or more times a day

29 How often do you eat confectionary (such as lollies and chocolates)?

- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1-2 times a week
- ☐ About 3-4 times a week
- ☐ About 5-6 times a week
- ☐ About once a day
- ☐ 2 or more times a day

30 How often do you eat sweet foods, such as sweet biscuits, cakes, or muffins?

- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1-2 times a week
- ☐ About 3-4 times a week
- ☐ About 5-6 times a week
- ☐ Once a day
- ☐ 2 or more times a day

31 How much soft drinks, cordials or sports drinks do you USUALLY drink? (like cordial, Coke, Lemonade, Gatorade). (1 cup =250ml, one can of soft drink = 1 ½ cups)

- ☐ I don't drink soft drinks
- ☐ Less than one cup a week
- ☐ About 1-3 cups a week
- ☐ About 4-6 cups a week
- ☐ About 1-2 cups a day
- ☐ About 2-3 cups a day
- ☐ 3 cups or more a day

32 How many teaspoons of sugar altogether do you add to your food and drink each day? (include sugar added to tea, coffee, cereal, fruit, etc.)

Total _____ teaspoons

33 Are there any other foods that you usually eat that are not listed here?

If yes, what are those foods:

_____

_____ _____

34. How many days a week do you usually buy the following meal from the school canteen (including lunch orders)?

Please tick ONE box for each meal

	Never / rarely	1-2 times/ week	3-4 times / week	Every day
Breakfast	1	2	3	4
Recess	1	2	3	4
Lunch	1	2	3	3

These questions are about buying food from shops near your school.

35. Before school, how many days a week do you usually buy something to eat on the way to school? (please tick one box only)

☐ Every day

☐ Four days a week

☐ Three days a week

☐ Two days a week

☐ One day a week

☐ Never or rarely

36. After school, how many days a week do you usually buy something to eat on the way home from school? (please tick one box only)

☐ Every day

☐ Four days a week

☐ Three days a week

☐ Two days a week

☐ One day a week

☐ Never or rarely

37. If you do buy food or drink before and after school, please list the three most common foods you buy.

Before school

1. _____

2. _____

3. _____

After school

1. _____

2. _____

3. _____

Thank you for completing this  **survey!**

Modified Child Diet Questionnaire (Wilson et al 2008)

This questionnaire asks about what you eat and drink. It starts with some general questions about what you think about fruit and vegetables and then about what you eat and drink at different times.

The teacher and classroom helpers will help you fill out this questionnaire.

The information will be used to describe all of the children in years 5, 6 & 7 as a group. Your individual information will be kept private and confidential.

Reference Number
☐☐☐☐☐☐-☐

Your Name_____

Year level (for example yr 6) _____

What you usually eat and drink

1. Think about <u>today</u>. Describe what you drink at each time?

Tick as many boxes as apply

Drinks you will have/have had today at:	**Recess** 1	**Lunch** 2	**After school *(not including dinner)*** 3
a. Nothing to drink	☐	☐	☐
b. Cordial	☐	☐	☐
c. Fruit Juice or fruit juice drink	☐	☐	☐
d. Regular Soft Drink or Energy/Sports Drink (e.g. *Powerade*)	☐	☐	☐
e. Diet Soft Drink (e.g. Coke Zero, Diet Fanta)	☐	☐	☐
f. Water	☐	☐	☐
g. Milk/flavoured milk	☐	☐	☐

2. Think about today. Describe what you eat at each time?

Tick as many boxes as apply

Foods you will have/have eaten today at:	**Recess** 1	**Lunch** 2	**After school *(not including dinner)*** 3
a. Nothing to eat	☐	☐	☐
b. Potato crisps or similar snack (e.g. twisties)	☐	☐	☐
c. Chocolate/Chocolate bar	☐	☐	☐
d. Lollies	☐	☐	☐
e. Muesli bar/ fruit bar	☐	☐	☐
f. Yoghurt / custard	☐	☐	☐
g. Savoury biscuits (e.g. saladas, jatz & dip)	☐	☐	☐

h.	Sweet biscuits/Cake/Muffin/Doughnut	☐	☐	☐
i.	Ice-cream/Ice block	☐	☐	☐
j.	Vegetables or salad	☐	☐	☐
k.	Fruit (fresh or canned)	☐	☐	☐
l.	Dried fruit (e.g. sultanas)	☐	☐	☐
m.	Hot chips/French fries/wedges	☐	☐	☐
n.	Pie/Pastie/Sausage roll	☐	☐	☐
o.	Hot dog	☐	☐	☐
p.	Pizza	☐	☐	☐
q.	Sandwich/roll	☐	☐	☐
r.	Bread/toast	☐	☐	☐
s.	Spaghetti/pasta/noodles/rice	☐	☐	☐
t.	Soup	☐	☐	☐

3. In the class room, how often do you have a 'fruit and/or vegetable break'?

Tick one box

Never/rarely	Once/week	Most days/week	Every day
1 ☐	2 ☐	3 ☐	4 ☐

4. In class time, do you usually have a drink on your desk?

Tick one box

1. ☐ Not allowed
2. ☐ No, even though it is allowed
3. ☐ Yes - If yes, what do you usually drink? _____

5. How often do you usually do the following?

Tick one box in each row

	Never/rarely OR Less than once/week 1	About 1-3 times/week 2	About 4-6 times/week 3	Every day 4
a. Drink water	☐	☐	☐	☐
b. Drink fruit juice or fruit juice drink	☐	☐	☐	☐
c. Drink soft drink (not including *diet* soft drink)	☐	☐	☐	☐
d. Carry a water bottle	☐	☐	☐	☐
e. Eat chocolate or lollies	☐	☐	☐	☐
f. Eat hot chips/French fries/wedges	☐	☐	☐	☐
g. Eat potato crisps or similar snack (e.g. twisties)	☐	☐	☐	☐
i. Help choose or buy groceries for the family	☐	☐	☐	☐
j. Help prepare your dinner	☐	☐	☐	☐
k. Eat dinner with most of the family	☐	☐	☐	☐
l. Eat dinner in front of the television	☐	☐	☐	☐
m. Eat snacks in front of the television	☐	☐	☐	☐

What do you think about

6. How strongly do you agree or disagree with the following statements?

Tick one box in each row

	Strongly agree 1	Agree 2	Not sure 3	Agree 4	Strongly disagree 5
a. Eating vegetables makes me feel healthy	☐	☐	☐	☐	☐
b. I like the taste of many vegetables	☐	☐	☐	☐	☐
c. In my home, vegetables are served at dinner most nights	☐	☐	☐	☐	☐
d. I like tasting new vegetables that I haven't tried before	☐	☐	☐	☐	☐
e. It is easy to prepare vegetables to eat e.g. make a salad	☐	☐	☐	☐	☐
f. Eating fruit makes me feel healthy	☐	☐	☐	☐	☐
g. I like the taste of most fruit	☐	☐	☐	☐	☐
h. Fruit is an easy snack	☐	☐	☐	☐	☐
i. I like tasting new fruits that I haven't tried before	☐	☐	☐	☐	☐
j. In my home fruit is available to eat at any time	☐	☐	☐	☐	☐
l. I like to drink water	☐	☐	☐	☐	☐
m. I ask my parents to buy foods or drinks that I see advertised on television	☐	☐	☐	☐	☐
n. My parents encourage me to eat fruit and vegetables	☐	☐	☐	☐	☐
o. Most of my teachers encourage the students to eat fruit and vegetables	☐	☐	☐	☐	☐

7. Where did you/will you get your recess from today?

Tick one box

Home today	Canteen	Shop outside of school	Friends	No recess
1	2	3	4	5
☐	☐	☐	☐	☐

8. Where did you/will you get your lunch from today?

Tick one box

Home today	Canteen	Shop outside of school	Friends	No lunch
1	2	3	4	5
☐	☐	☐	☐	☐

About fruit and vegetables you eat

9. How many serves of vegetables do you usually eat each day?
(1 serve = 1 cup of salad vegetables, OR ½ a cup of cooked vegetables, OR 1 medium potato)

Tick one box

1. ☐ I don't eat vegetables
2. ☐ Less than 1 serve a day
3. ☐ 1-2 serves a day
4. ☐ 3-5 serves a day
5. ☐ More than 5 serves a day

10. How many serves of fruit do you usually eat each day?
(1 serve = 1 medium piece, OR 2 small pieces of fruit e.g. mandarins or apricots, OR 1 cup of diced pieces)

Tick one box

1. ☐ I don't eat vegetables
2. ☐ Less than 1 serve a day
3. ☐ 1-2 serves a day
4. ☐ 3-5 serves a day
5. ☐ More than 5 serves a day

11. Below is a list of different types of fruits (fresh, canned or dried). For each fruit please indicate answer PART A and PART B.

PART A: **Please indicate if you ate this fruit yesterday, by ticking the box that applies to you, for each fruit**

PART B: **Please indicate if you like this fruit by ticking the box that applies to you, for each fruit**

Tick one box in each row

Type of fruit	PART A		PART B		
	I ate this fruit yesterday	I didn't eat this fruit yesterday	Never had it or don't know what it is	Yes I like this fruit	No I don't like this fruit
	1	2	3	4	5
a. Apple	☐	☐	☐	☐	☐
b. Apricot	☐	☐	☐	☐	☐
c. Banana	☐	☐	☐	☐	☐
d. Grapes	☐	☐	☐	☐	☐
e. Kiwi fruit	☐	☐	☐	☐	☐
f. Mandarin	☐	☐	☐	☐	☐
g. Nectarine	☐	☐	☐	☐	☐
h. Orange	☐	☐	☐	☐	☐
i. Peach	☐	☐	☐	☐	☐
j. Pear	☐	☐	☐	☐	☐
k. Pineapple	☐	☐	☐	☐	☐
l. Plum	☐	☐	☐	☐	☐
m. Rockmelon	☐	☐	☐	☐	☐
n. Strawberries	☐	☐	☐	☐	☐
o. Watermelon	☐	☐	☐	☐	☐

12. Below is a list of different types of vegetables (fresh, canned or frozen). For each vegetable please answer PART A and PART B

PART A: **Please indicate if you ate this vegetable yesterday, by ticking the box that applies to you, for each vegetable**

PART B: **Please indicate if you like this vegetable by ticking the box that applies to you, for each vegetable**

Tick one box in each row

Type of vegetable	I ate this vegetable yesterday 1	I didn't eat this vegetable yesterday 2
a. Beans (green)	☐	☐
b. Beetroot	☐	☐
c. Broccoli	☐	☐
d. Brussel sprouts	☐	☐
e. Cabbage	☐	☐
f. Capsicum	☐	☐
g. Carrot	☐	☐
h. Cauliflower	☐	☐
i. Celery	☐	☐
j. Chinese greens	☐	☐
k. Corn	☐	☐
l. Cucumber	☐	☐
m. Eggplant	☐	☐
n. Legumes (baked beans, chickpeas, lentils, kidney beans)	☐	☐
o. Lettuce	☐	☐
p. Mushroom	☐	☐
q. Peas	☐	☐
r. Potato (not hot chips)	☐	☐

s.	Potato fried e.g. hot chips/ french fries/wedges	☐	☐
t.	Pumpkin	☐	☐
u.	Spinach	☐	☐
v.	Sweet potato	☐	☐
w.	Tomato	☐	☐
x.	Zucchini	☐	☐
y.	Squash	☐	☐

☺ Fantastic, you've finished

THANK YOU

Many Rivers Physical Activity Recall Survey (MRPARQ) (Gwynn et al, 2010)

(Extracted from full questionnaire)

PART C: PHYSICAL ACTIVITY

ORGANISED SUMMER SPORT, GAMES AND OTHER PHYSICAL ACTIVITIES	NUMBER OF TIMES PER WEEK you usually do this sport or game, including training	THE USUAL AMOUNT OF TIME you spend doing this activity EACH TIME you do it	
1 CLUB	Times per week	Hours	Minutes
2			
3			
4			
5			
6			
1 SCHOOL	Times per week	Hours	Minutes
2			
3			
4			
5			
6			

PART C: PHYSICAL ACTIVITY (continued)

ORGANISED WINTER SPORT, GAMES AND OTHER PHYSICAL ACTIVITIES	NUMBER OF TIMES PER WEEK you usually do this sport or game, including training	THE USUAL AMOUNT OF TIME you spend doing this activity EACH TIME you do it	
1 CLUB	Times per week	Hours	Minutes
2			
3			
4			
5			
6			
1 SCHOOL	Times per week	Hours	Minutes
2			
3			
4			
5			
6			

PART C: PHYSICAL ACTIVITY (continued)

NON-ORGANISED SUMMER SPORT, GAMES AND OTHER PHYSICAL ACTIVITIES	NUMBER OF TIMES PER WEEK you usually do this sport or game, including training	THE USUAL AMOUNT OF TIME you spend doing this activity **EACH TIME** you do it	
		Hours	Minutes
1 TRAVEL TO AND FROM SCHOOL	Times per week		
2			
1 SCHOOL	Times per week	Hours	Minutes
2			
3			
1 AFTER SCHOOL	Times per week	Hours	Minutes
2			
3			
4			
5			
6			
7			
8			

PART C: PHYSICAL ACTIVITY (continued)

NON-ORGANISED WINTER SPORT, GAMES AND OTHER PHYSICAL ACTIVITIES	NUMBER OF TIMES PER WEEK you usually do this sport or game, including training	THE USUAL AMOUNT OF TIME you spend doing this activity EACH TIME you do it	
TRAVEL TO AND FROM SCHOOL	Times per week	Hours	Minutes
1			
2			
SCHOOL	Times per week	Hours	Minutes
1			
2			
3			
AFTER SCHOOL	Times per week	Hours	Minutes
1			
2			
3			
4			
5			
6			
7			
8			

PART C: PHYSICAL ACTIVITY (continued)

NON-ORGANISED WEEKEND SPORT, GAMES AND OTHER PHYSICAL ACTIVITIES	NUMBER OF TIMES PER WEEK you usually do this sport or game, including training	THE USUAL AMOUNT OF TIME you spend doing this activity EACH TIME you do it	
		Hours	Minutes
1 SUMMER	Times per week		
2			
3			
4			
5			
6			
7			
1 WINTER	Times per week	Hours	Minutes
2			
3			
4			
5			
6			
7			

PACE+ Adolescent Physical Activity Measure (Prochaska et al, 2001)

PACE+ Adolescent Physical Activity Measure

Physical activity is any activity that increases your heart rate and makes you get out of breath some of the time.

Physical activity can be done in sports, playing with friends, or walking to school.

Some examples of **physical activity** are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football, and surfing.

Add up all the time you spend in physical activity each day (don't include your physical education or gym class).

P1 Over the past 7 d, on how many days were you physically active for a total of at least 60 min per day?

○	○	○	○	○	○	○	○
0 days	1	2	3	4	5	6	7 days

P2 Over a typical or usual week, on how many days are you physically active for a total of at least 60 min per day?

○	○	○	○	○	○	○	○
0 days	1	2	3	4	5	6	7 days

Scoring: (P1 + P2)/2 < 5 indicates not meeting physical activity guidelines.

Sixty-minute screening measure for moderate to vigorous physical activity: PACE+ (Patient-Centered Assessment and Counseling for Exercise Plus Nutrition).

Modified version from the Active Healthy Kids Australia (2014):

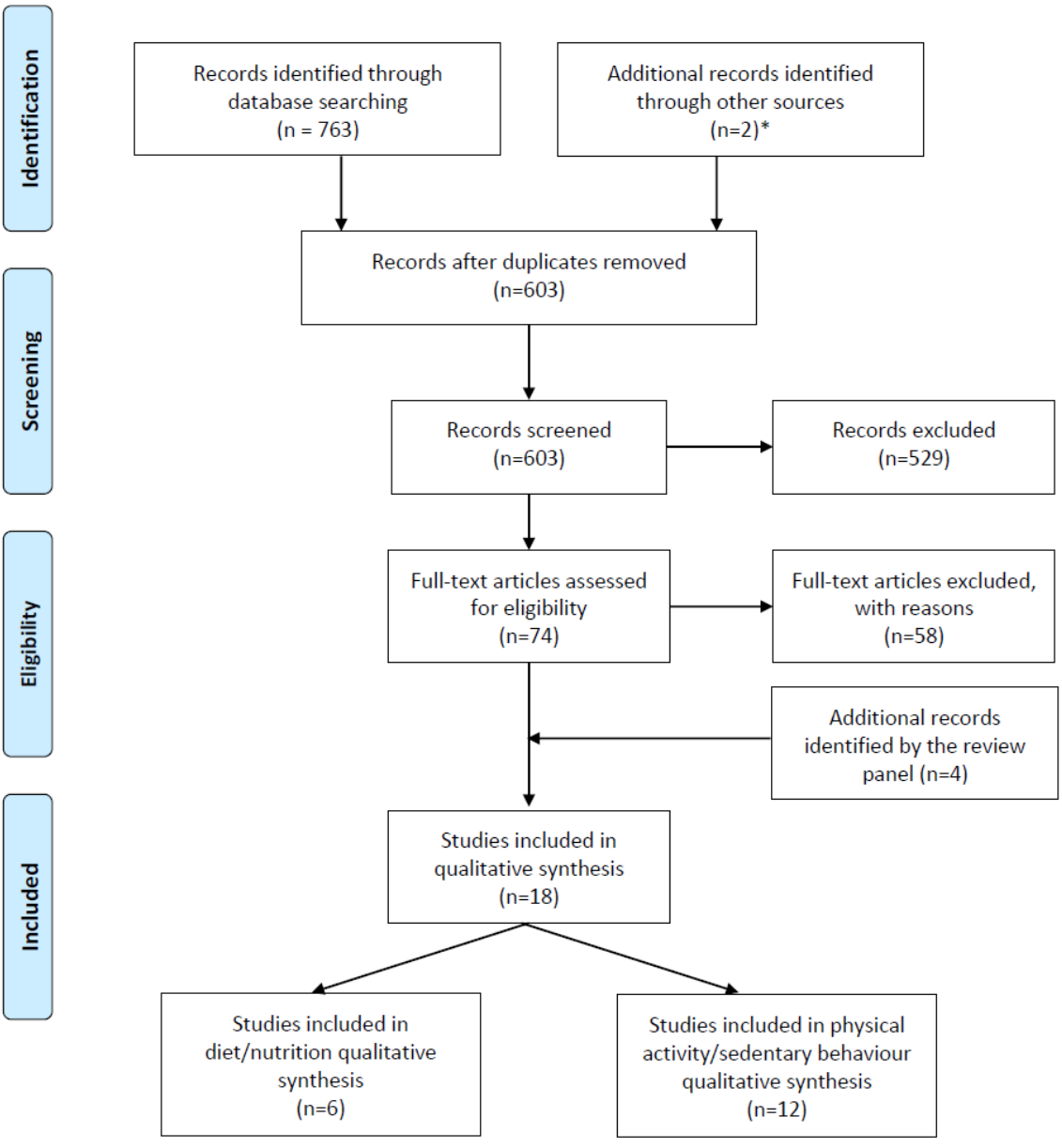
17. Over the past 7 days, on how many days was your child engaged in moderate to vigorous physical activity for at least 60 minutes (this can be accumulated over the entire day, for example in bouts of 10 minutes) each day?

Moderate to vigorous activity is any activity that increases the heart rate and gets you out of breath some of the time

○ No days ○ 1 day ○ 2 days ○ 3 days ○ 4 days ○ 5 days ○ 6 days ○ 7 days

Appendix 2: Literature search flow charts

Flow of information through the different phases of the rapid review (Question 1a)

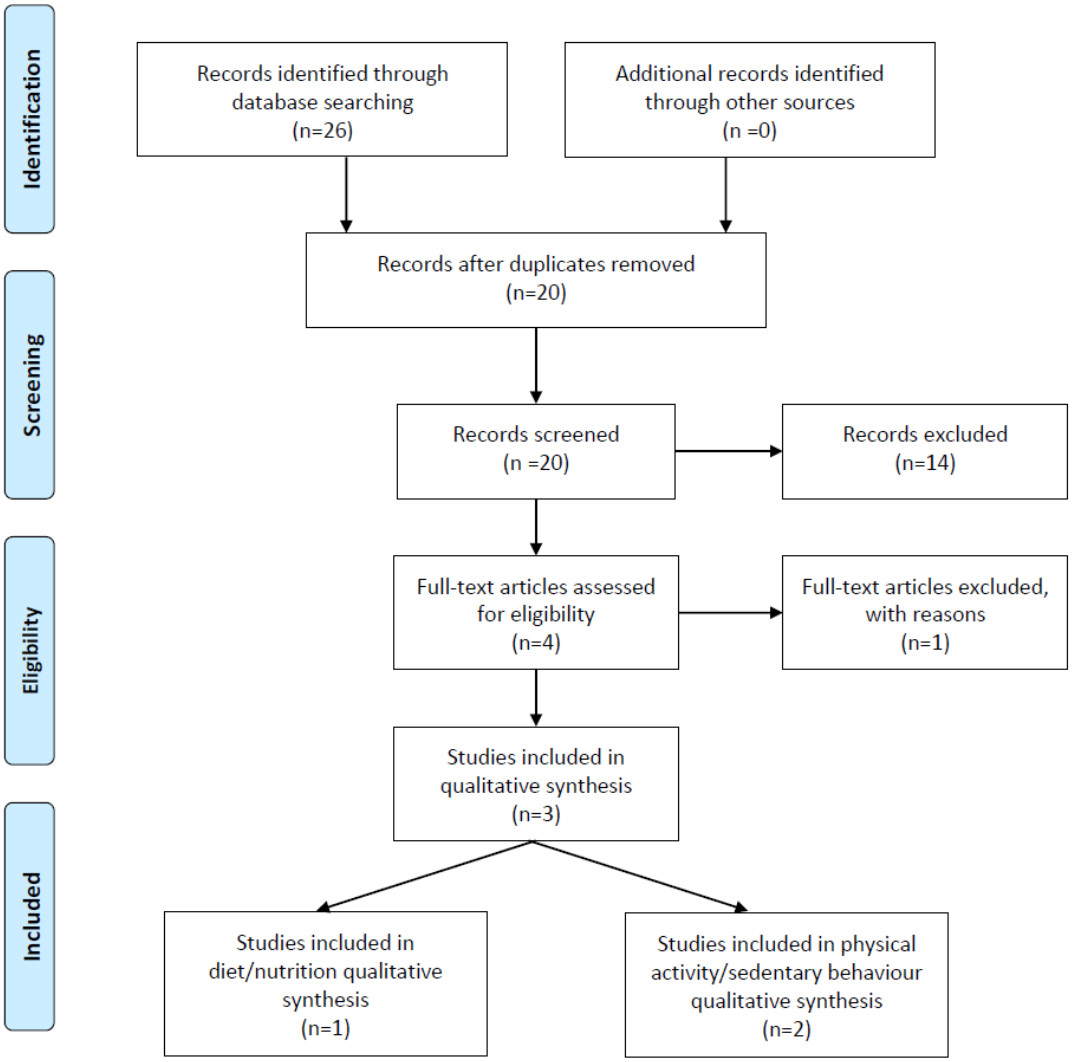


*Queensland Government (2016), Ministry of Health (New Zealand Government; 2015)

Modified From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Flow of information through the different phases of the rapid review (Question 2)



Modified From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Appendix 3: Data extraction tables.

Table 1: Diet Instruments included in the review from peer-reviewed journal articles.

Reference	Setting	Design	Sample	Instrument	Administration	Statistics
Finch et al, 2007[7]	Local government primary school (Hunter Region, NSW, Australia).	Questionnaire development and reliability testing. Administration was one week apart for reliability testing.	n= 245 children from Year 4 (n = 88), Year 5 (n = 84), Year 6 (n = 73). Mean age 10.7± 0.91 years. 52% F Ethnicity not indicated.	School Food Eating Habits and Lifestyle Survey (SEHLS) 35 items, including 27 on assessing "usual" food habits, five on "usual" physical activity and sedentary pursuits, and three on demographic variables.	Self-administered in class by children with teacher supervision. The questionnaire took around 30minutes to complete in pilot testing.	**Reliability** Kappa 0.18-0.68 and were within 95%CI for food habit questions.

Gwynn et al, 2011[6]	Many Rivers Diabetes Prevention Project. 11 Department of Education and Training primary schools in three regional areas (north coast, NSW, Australia).	A short FFQ was completed twice, two weeks apart (reliability) and compared with the mean of three 24 hour recalls (validity).	**Reliability** n=241 Age not specified. 59% F n=92 Aboriginal and Torres Strait Islander, n=149 non-Indigenous. **Validity** n=205 10-12 years, mean age 10.8± 0.7 years. 58% F n=78 Aboriginal and Torres Strait Islander children, n=127 non-Indigenous children.	The Short Food Frequency Questionnaire (SFFQ) consisted of three demographic questions, 36 items (number of response categories 4-7) including 28 short questions on usual food intake.	Self-administered by the child. Culturally appropriate support was provided to Aboriginal and Torres Strait Islander children throughout the study.	**Reliability** Kappa 0.30-0.82. **Validity** 18 of 23 questions had increasing trends ($P<0.05$) for mean daily weight and/or frequency as survey response categories increased.

Hendrie et al, 2014 [29]	Various, Adelaide (SA, Australia).	The questionnaire was completed twice, one week apart (reliability). This was compared against the mean of three 24 hour recalls (validity). Daily intake was used to calculate diet quality from both the questionnaire and the 24 hour recalls.	n=63 4-11 years, mean age 7.1 ±2.1 years. 97% F (parents), 44% F (children). 69.8% "normal" weight; 15.9% overweight/obese. Ethnicity not indicated.	The Short Food Survey (SFS) consists of 38 items on "usual" intake, including 35 on food and three on beverages.	The survey was completed online by the parent.	**Reliability** ICC was 0.43-0.94 for food groups/beverages, and was 0.92 for total diet index score (all $P<0.01$). **Validity** ICC was 0.04-0.44 for food groups/beverages and was 0.44 for the total diet index score ($P<0.01$). Percentage agreement across tertiles of index scores was 84% between the administrations and 43% when comparing the SFS with the mean of the recalls. Bias values were within 95%CI.
Marshall et al, 2014 [34]	Various. Includes tools developed in North America, Europe, Asia-Pacific, Latin America, Africa, and one of unknown origin. 31 indices were from developing countries.	Systematic review of diet quality indices in paediatric populations.	Age was not always specified. Where age was specified: 6 months to adult, children, adolescents, infants, toddlers. Ethnicity not specified but may be indicated by paper country of origin	Indices were mainly scored on 4-30 components for which points were allocated and summed and/or servings are summed. A small number score on a list of food items or food groups.	Administration method of original tools not indicated.	N/A

Magarey et al, 2009 [32]	Five study samples of children from Adelaide (South Australia, Australia) and Sydney (NSW, Australia).	Reliability (Studies 2 and 5; range 5-57 days between administration, median 10days), internal consistency (Studies 1 (baseline), 3 and 5), relative validity (studies 4 and 5) used a 7-day food checklist, and the ability to detect change (Study 1).	n = 706 children (all five studies), age range 4-16 years. Ethnicity not specified. Study 1 n = 168 (baseline) n=132 (at 6 months) Age 5-10 years BMI z score>=1.07-4.0 (22% overweight, 78% obese) Study 2 n = 39 Age 4-5 years 15% overweight, 7% obese Study 3 n = 280 Age 4-5 years 15% overweight, 6% obese Study 4 n = 126 Age 5-6 years Study 5 n = 92 (reliability); n = 87 (validity) Age 5-16 years 16% overweight, 1% obese.	Children's Dietary Questionnaire (CDQ) 28-item semi-quantitative FFQ. Four separate food group scores were calculated. Scores reflected food group intake in the previous 24 hours by dividing items that measured intake in the past week by seven before summing.	Self-administered by the parent or caregiver (with or without researcher assistance). A trained researcher responded in three studies and a parent responded in two studies.	**Reliability** ICC 0.51-0.90 (P<0.001, Studies 2 and 5). **Validity** Pearson's correlations 0.31-0.60 (*P*<0.001, studies 4 and 5). **Internal consistency** Alpha co-efficient 0.13-0.76. Item: total correlation range from (0.10-0.37) to (0.49-0.62). **Ability to detect change** Significant changes in the expected direction for dietary patterns (baseline vs 6 months).

Wilson et al, 2008[33]	Eat well be active Community Programs, a community-based childhood obesity intervention project in South Australia. A mix of public and private, and metropolitan and rural primary schools.	Reliability (test-retest period not indicated/varied) and validity against 7-day food records (following both administrations of the questionnaire) was tested.	n = 134 (reliability) n = 117 (validity) 36% from Year 5, 33%, from Year 6, 31%, from Year 7 (not indicated which samples the proportions relate to). 10-12 years 62% F 66% attended metropolitan schools, 61% attended public schools. 14% overweight (9% M, 17% F), 6% obese (4% M, 8% F). Ethnicity not indicated.	Child Nutrition Questionnaire (CNQ) assesses (a) dietary patterns relating to childhood obesity, and (b) behaviours, attitudes, environments and knowledge associated with healthy eating. 14 questions with a variable number of items; 12 scores are developed from the questionnaire and placed into five categories.	Self-administered by the child. Assistance was available. The questionnaire took 20 minutes to complete.	**Reliability** ICC 0.16-0.66. All were within 95%CI. **Validity** Spearman's correlations 0.34-0.48 (all $P<0.01$). Mean bias ranged from -1.2 to 0.6 and all values were within limits of agreement.

CI = Confidence intervals, ICC= Intra-class correlation co-efficient, FFQ=food frequency questionnaire, N/A=not applicable. Articles are listed in alphabetical order.

Table 2: Physical activity and sedentary behaviour instruments included in the review from peer-reviewed journal articles.

Reference	Setting	Design	Sample	Instrument	Administration	Statistics
Booth et al, 2002[40]	44 randomly selected high schools from three education sectors across NSW (Australia).	The questionnaire was administered twice, two weeks apart (reliability). It was tested against the Multistage Fitness Test (MFT; validity). The validity study was conducted independently of the reliability study (different students at different schools).	**Reliability** n = 226 (n = 121 Year 8, n = 105 Year 10). Mean age 13.7 ±0.40 years (Year 8), 15.7±0.40 years (Year 10). 48% F (Year 8), 29% F (Year 10). Ethnicity not indicated. **Validity** n = 2026 (n = 1072 Year 8, n = 954 Year 10). Mean age 13.1 years (SD not given; Year 8), 15.1 years (SD not given; Year 10). 48% F (Year 8), 45% F (Year 10). 82% English-speaking, 7.0% Asian 4.5% Middle-Eastern, 4.2%, European, and cultural backgrounds, 2.6% did not respond or were otherwise classified.	Adolescent Physical Activity Recall Questionnaire (APARQ): four items with sub-items (a list of up to seven activities with frequency and time reported for each). The four items ask about organised and non-organised activities undertaken in summer (terms 1 and 4) and winter (terms 2 and 3).	Self-administered by the child.	**Reliability:** Per cent agreement 67–83% and weighted Kappa 0.33– 0.71 for the three category measure (vigorously active, moderately active, inactive). Per cent agreement 76–90% and Kappa 0.25– 0.74 for the two category measure (adequately active, inactive). ICC (95%CI) for total energy expenditure from 0.30 (0.05-0.51) to 0.91 (0.82-0.96). **Validity:** Higher mean laps in moderately and vigorously active categories than the inactive category for girls, but only in vigorously active and inactive categories were different for boys (three category measure). Higher mean laps in active vs. inactive category for all groups (two-category measure). Spearman's correlations (energy expenditure and MFT Laps): 0.14-0.39 ($P<0.01$-$P<0.001$).

Gwynn et al, 2010[12]	Many Rivers Diabetes Prevention project. 11 Department of Education and Training primary schools in three regional areas (north coast, NSW, Australia).	Validity was assessed against accelerometers for seven consecutive days.	n = 86 10-12 years; mean age 11.1 ±0.7 years. 59% F 23% overweight or obese n = 40 Aboriginal and Torres Strait Islander, n = 46 non-Indigenous children.	Many Rivers Physical Activity Recall Questionnaire (MRPARQ; a modified version of the Adolescent Physical Activity Recall Questionnaire (APARQ)). All organised and non-organised physical in a "normal" week during summer and winter.	Self-administered by children seated in small groups with one or two members of the research team to assist, which always included an Aboriginal Health Worker for assistance.	**Validity** ICC 0.25 (P<0.05) and Pearson's correlation 0.37 (P<0.05) for overall average weekday daily MVPA accelerometer and MRPARQ.
Lubans et al, 2008 [77]	One secondary school in Oxford (UK) and one independent school in Newcastle (NSW, Australia).	Reliability was assessed in the UK sample via administration of the questionnaire twice, one week apart. Validity was assessed in the Australian sample by comparing the questionnaire data to accelerometer data from four consecutive school days (worn prior to questionnaire administration).	**Reliability** n = 87 Mean age 13.1±0.9 years 44.8% F **"**Predominantly white" Mixed socioeconomic backgrounds. **Validity** n = 51 Mean age 12.6±0.5 years. 47.1% F "Predominantly white". Mixed socioeconomic backgrounds.	Oxford Physical Activity Questionnaire (OPAQ); Eight items excluding demographics on last seven days. Items include travel to/from school, activities at school, activities after school and on weekends, and other activities.	Self-administered by children. The questionnaire took 15 minutes to complete.	**Reliability** ICC (95% CI) for moderate activity was 0.76 (0.63–0.84), vigorous activity 0.80 (0.70–0.87), and moderate to vigorous activity 0.91 (0.87–0.95). **Validity** Spearman's correlations with moderate activity was r = 0.01 (NS), vigorous activity r = 0.33 (P = 0.01), moderate to vigorous activity r = 0.32 (P = 0.02).

Prochaska et al, 2001[3]	Two high schools and two middle schools in San Diego, California, Pittsburgh (Pennsylvania, USA).	Three studies; two studies evaluated test-retest reliability and concurrent validity (against accelerometry) of six single item and three composite measures of physical activity. A third study evaluated the best measure of those examined (and modified) in the previous two studies.	*Study 1* n = 250 Mean age 14.6±1.4 years. 56% F 36% white, 25% Asian/ Pacific Islander, 17% African American, 9% Hispanic, 13% other. *Study 2* n = 57 Mean age 13.9±1.7 years. 37% white, 25% Asian/ Pacific Islander, 4% African American, 12% Hispanic, 23% other. *Study 3* n = 148 Mean age 12.1±0.9 years. 65% F 27% white, 24% Asian/ Pacific Islander, 7% African American, 5% Hispanic, 23% multiracial, 14% other.	The recommended measure had two recall assessing frequency of past seven days and "usual" activity performed for a total of at least 60 minutes per day.	Self-administered by children, supervised by research staff.	**Reliability** ICC 0.77 (Kappa 61%). **Validity** MVPA correlation with accelerometer data r = 0.40 (P<0.001).

Hardy et al, 2007a[44]	High schools near the study centre, Girls' Healthy Development Study (Sydney, Australia).	Prospective cohort study (2.5 years), comprising five data collections, six months apart, between 2000 and 2002. Construct validity of the questionnaire was assessed using accelerometers worn at each time point for seven consecutive days.	n = 163 Mean ages at data collections 1 to 5 were 12.8, 13.4, 13.9, 14.4, and 14.9 years, respectively. 100% F ~25% non-English speaking background.	Sedentary Behaviour Questionnaire. Three main items (with sub-items) on sedentary behaviour on weekday and weekends and movie-going.	Self-administered by children.	**Validity** Bland-Altman plots showed <5% of data points were outside the limits of agreement (2SD; 26.5 to 20.1 hours/week).
Hardy et al, 2007b[5]	Four primary and four high schools randomly selected from Sydney (New South Wales, Australia).	The questionnaire was completed twice, two weeks apart (reliability) during Autumn, 2002.	n = 250 (Grade 6=98; Grade 8 = 73 and Grade 10 = 79) Mean age 11.3 years (Year 6), 13.3 years (Year 8) and 15.3 (Year 10). 44% F (overall), 49% F (Year 6), 47% F (Year 8), 37% F (Year 10). Ethnicity not indicated.	Adolescent Sedentary Activities Questionnaire (ASAQ). Two main items with the same question; one on school days, one on weekends (11-12 sub-items identical except for the addition of church on weekends). "Usual" week during school term.	Self-administered by children.	**Reliability** ICC (95%CI) 0.01 (-0.88-0.46) to 0.95 (0.89-0.88). Most ICC ≥ 0.70. **Validity** Face validity was determined via pilot testing with a group of approximately 50 students (mean age 12 years).

Leech et al, 2014[45]	Health Eating and Play study (HEAPS), state and Catholic primary schools in greater Melbourne (VIC, Australia).	Cross-sectional study, including 56 items FFQ, 7 days accelerometer data, and questions on sedentary behaviour. Questions were administered twice, 2-3 weeks apart.	n=972 children (n=362 5-6 years, n=610 10-12 years). n=133 parents (reliability study). 50% F 5-6 years, 56% F 10-12 years. 22% overweight/obese (5-6 years) and 29% overweight/obese (10-12 years). 19% maternal education low (5-6 years), 23% maternal education low (10-12 years) 92% of families of children 5-6 years usually spoke English at home, 87% of families of children 10-12 years usually spoke English at home.	Questions on sedentary behaviour asked the number of hours (range: 0–6 or more hours), in 30-minute blocks, their child watched (1) commercial and (2) non-commercial TV/ DVDs on a typical school and weekend day. Usual daily TV viewing (minute/day) was calculated.	Self-administered by parents.	**Reliability** ICC (95%CI) 0.78 (0.69–0.84) usual daily TV viewing (minute/day).

Salmon et al, 2005[43]	Nineteen primary schools in Melbourne (Vic, Australia)	Parents completed a questionnaire about their child's television viewing (validity). Questions were tested for reliability among a sample of the children (1 week apart) and parents (2 weeks apart).	n=878 children with complete TV viewing data 54% F 22% F overweight, 5% F obese, 22% M overweight, 9% M obese 82% F (responding parents) Material education level was used as an indicator of SES; SES was evenly distributed across families (low SES, 30%; medium SES, 37%; high SES, 33%). **Reliability** n=147 children Mean age 11.8±0.8 years 55% % n=156 parents mean age 40.0±5.2 years 88% F 94% of all families reported speaking English at home, but it is not clear what the proportion was for the reproducibility element.	3 items on time spent in sedentary behaviour (watching TV, playing electronic games, and using the computer) were answered for a typical week (Monday to Friday) and a typical weekend (Saturday and Sunday).	Self-administered by children and parents.	**Reliability*** ICC of the proxy-reported time (minutes per day) spent in each of these screen-based behaviours ranged from 0.6 to 0.8. **Validity*** ICC of the proxy-reported time (minutes per day) spent in each of these screen-based behaviours ranged from 0.44 to 0.61. *Report states that "Because proxy-reported sedentary time was more reliably reported, these items were used in analyses rather than the children's self-reports." (p1942).

Finch et al, 2007[7]	One local government primary school (Hunter Region, NSW, Australia).	Questionnaire development and reliability testing. The questionnaire was administered twice, 1 week apart.	n=245 (n=88 Year 4, n=84 Year 5, n=73 Year 6). Mean age 10.7± 0.91 years. 52% F Ethnicity not indicated.	School Food Eating Habits and Lifestyle Survey (SEHLS) included 35 items, including 27 on assessing "usual" food habits, 5 on "usual" physical activity and sedentary pursuits, and 3 on demographic variables.	Self-administered in class by children with teacher supervision	**Reliability** Physical activity questions: Kappa 0.57-0.71 Sedentary behaviour questions: Kappa 0.51-0.59
Moore et al, 2008[49]	A local primary and secondary school, Northeast England (UK).	Children wore an accelerometer for 2 days (day 1, to desensitise them to wearing the monitor, and day 2, the day of recall) to assess validity of recalled activities.	n=121 7-15 years, mean age 10·7±2·2 years. 60% F 94% spoke English as their first language.	The Synchronised Nutrition and Activity ProgramTM (SNAPTM) Recall of previous day activity. The overall number of items was not indicated. 29 common physical activities within the domains of sedentary, structured, household chores, play activities, and a free-text option were included. Transport activities were also assessed.	Self-administered by children (some availability of assistance was indicated, but not detailed). Web-based. The whole questionnaire (including nutrition questions) took 15-40 minutes dependent primarily on reading ability and Internet connection speed.	**Validity** Passing–Bablok regression equation established an overall bias of less than 4 minutes between the two methods, indicating good validity.

Strugnell et al, 2011[48]	Three separate school samples from two Chinese weekend cultural schools from eastern metropolitan Melbourne (VIC, Australia)	Reliability of individual items and scales within the questionnaire determined by administration twice, 1 week apart.	n=77 11-14 years, mean age 12±0.8 years. 51% F 82% were of Chinese ethnicity (born in China, having both parents born in China, or having both maternal grandparents being born in China).	Child and Adolescent Physical Activity and Nutrition Survey – Physical Activity (CAPANS-PA). The questionnaire the same as the Western Australian (WA) Child and Adolescent Physical Activity and Nutrition Survey (CAPANS) with minor modifications. Investigates 7 days school and non-school based physical activity, sedentary behaviours and associated correlates. Items within the CAPANS-PA have been derived from several sources including The Children's Leisure Activity Study (CLASS) and APARQ.	Self-administered by children. Takes 15 minutes to complete.	**Reliability** Kappa (95%CI) for individual activities -0.04(-0.07-0) to 0.82 (0.57-1.00).Kappa was >0.50 for most individual activities.

Telford et al, 2004[47]	Five state primary schools in Melbourne (VIC Australia).	Reliability of a parental proxy questionnaire and a children's self-report questionnaire (2 weeks apart for parents and 1 week apart for children). Criterion validity assessed using accelerometry.	n=169 children (n=58 5–6 years, n=111 10-12 years). n=169 parents (n=58 parents of 5-6 years group, n=111 parents of 10-12 years group (2 excluded)). Mean age 5.3±0.5 yr (5-6 years), 37.4±6.2 years (parents of 5-6 years group), 10.6±0.8 years (10-12 year group), 40.3±5.9years (parents of 10-12 years group). 37%F (5-6 years) 91%F (parents of 5-6 years) 63%F (10-12 years) 83%F (parents of 5-6 years) 77% of parents Australian born (5-6 year age-group). 75% of parents Australian born (10-12 year age-group).	The Children's Leisure Activities Study Survey (CLASS) Consists of a list of 30 physical activities. Participants indicate participation in activities during a typical week (Monday to Friday) and during a typical weekend (Saturday and Sunday). For each activity, frequency and the total time spent is reported.	Self-administered by parents (proxy report for both 5-6-year-old and 10-12-year-old children), and 10-12 year-old children, who completed the questionnaire in class guided by an investigator. The questionnaire took 10 minutes for parents to complete and 15 minutes for children to complete.	**Reliability** ICC for 10-12 years only: For self-report ranged from 0.36 (P<0.001) for total activity (frequency) to 0.74 (P<0.001) for total activity (duration). For proxy-report ranged from 0.24 (NS) for total activity (duration) to 0.75 (P<0.001) for vigorous activity (frequency). **Validity** Spearmans correlations between child (10-12 years) and proxy report: Vigorous activity: frequency rs=0.13 (NS), duration rs=0.19 (P<0.05). Moderate activity: frequency rs=0.07 (NS), duration rs=0.14 (NS). Total activity frequency: rs=0.25 (P<0.01).

Notes: SD=standard deviation, ICC=intra-class correlation co-efficient, CI=confidence intervals, MVPA=moderate and vigorous physical activity, NS=not significant, SES=socioeconomic status. Articles are listed in alphabetical order in the following sequence: articles on physical activity instruments, articles on sedentary behaviour instruments, articles on combined physical activity and sedentary behaviour instruments.

Table 3: Diet, physical activity and sedentary behaviour instruments used in Aboriginal and Torres Strait Islander children included in the review from peer-reviewed journal articles.

Reference	Setting	Design	Sample	Instrument	Administration	Validity
Gwynn et al, 2011[6]	Many Rivers Diabetes Prevention Project. 11 Department of Education and Training primary schools in three regional areas (north coast, NSW, Australia).	A short FFQ was completed twice, two weeks apart (reliability) and compared with the mean of three 24 h recalls (validity).	**Reliability** n = 241 Age not specified. 59% F n = 92 Aboriginal and Torres Strait Islander, n = 149 non-Indigenous. **Validity** n = 205 10-12 years, mean age 10.8± 0.7 years. 58% F n = 78 Aboriginal and Torres Strait Islander children, n = 127 non-Indigenous children.	The Short Food Frequency Questionnaire (SFFQ) consisted of three demographic questions, 36 items (number of response categories 4-7) including 28 short questions on usual food intake.	Self-administered by the child. Culturally appropriate support was provided to Aboriginal and Torres Strait Islander children throughout the study.	**Reliability** Kappa 0.28-0.89 in Aboriginal and Torres-Strait Islander children. Kappa 0.33-0.77 in non-Indigenous children. **Validity** 18 of 23 questions had increasing trends ($P<0.05$) for mean daily weight and/or frequency as survey response categories increased.

Gwynn et al, 2010 [12]	Many Rivers Diabetes Prevention project. 11 Department of Education and Training primary schools in three regional areas (north coast, NSW, Australia).	Validity was assessed against accelerometers for seven consecutive days.	n = 86 10-12 years; mean age 11.1±0.7 years. 59% F 23% overweight or obese n = 40 Aboriginal and Torres Strait Islander, n = 46 non-Indigenous children	Many Rivers Physical Activity Recall Questionnaire (MRPARQ), a modified version of the Adolescent Physical Activity Recall Questionnaire (APARQ)). All organised and non-organised physical in a "normal" week during summer and winter.	Self-administered by children seated in small groups with one or two members of the research team to assist, which always included an Aboriginal Health Worker for assistance.	**Validity** ICC 0.16 (P<0.05) and Pearson's correlation 0.31 (NS) for average weekday daily MVPA accelerometer and MRPARQ in Aboriginal and Torres Strait Islander children. ICC 0.31 (P<0.05) and Pearson's correlation 0.38 (P<0.05) for average weekday daily MVPA accelerometer and MRPARQ in non-Indigenous children.
Trost et al, 2007[50]	Public secondary schools from Brisbane South (Queensland, Australia).	Validity was assessed against a pedometer worn on the day previous to answering the questionnaire.	n = 122 13.8±1.2 years 53%F n = 63 Aboriginal and Torres Strait Islander, n = 59 non-indigenous	24-hour physical activity recall (the PDPAR-24). Participants enter the main activity (of 69) in which he/she participated during each 30 minute time period between 9am and 9am in the previous 24hrs (excluding midnight-5am).	Children self-administered the instrument in groups of approximately five individuals under the supervision of the research team who followed a standardised administrator script.	**Validity** Spearman's correlations for mean METs, vigorous physical activity, MVPA and screen-based activity were 0.34 (P<0.05), 0.34 (P<0.05), 0.28 (P<0.05), and -0.13 (NS) respectively in Aboriginal and Torres Strait Islander children and 0.32 (P<0.05), 0.26 (P<0.05), 0.28 (P<0.05), and -0.20 (NS) respectively in non-Indigenous children.

Notes: ICC=intra-class correlation co-efficient, MVPA=moderate and vigorous physical activity, METs=metabolic equivalent of tasks, NS=not significant. Articles are listed in alphabetical order in the following sequence: the article on the diet instruments the article on the physical activity instrument, the article on combined the physical activity and sedentary behaviour instrument.

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