



Food for thought: what do short questions on food habits tell us about dietary intakes?

Summary

Information on food and nutrient intake and trends is important for policy makers, food regulators, educators, and health professionals to promote optimal health and wellbeing. Short questions (SQs) on food habits are often used as proxies to assess good nutrition when comprehensive dietary collection methods, such as 24-hour food recalls (where the respondent recalls all foods eaten within one or more 24-hour periods) are not available.

Analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey (CSIRO & University of South Australia 2008) was undertaken to assess how well responses to SQs compared with estimates of 'usual' food and nutrient intakes based on 24-hour food recalls (food recalls).

Milk type

- Eight in 10 children reported usually drinking the same type of milk in the SQ as in the food recall. Agreement between the two methods was highest for children who reported drinking whole/full cream milk.
- The type of milk reported as usually consumed in the SQ appeared to be predictive of total fat intake and saturated fat intake as calculated from the food recall. There was a relationship between the percentage of fat in the milk usually consumed and a child's total fat and saturated fat intake as a percentage of their total dietary energy intake.

Fruit and vegetable intake

- 24% of respondents reported the same number of fruit serves in both the SQ and the dietary recall, and 26% for vegetables. Two-thirds reported a result in the SQ within one serve of what they reported in the food recall, for both fruit and vegetables. In general, higher levels of fruit and vegetable intake were reported in the SQs than in the food recall.
- The more fruit and vegetable serves a child reported consuming in the SQs, the more likely they were to have an adequate intake (AI) of dietary fibre in the food recall.

Discretionary salt use

- Responses to the SQs concerning adding salt to meals showed no relationship to children exceeding the upper level of intake (UL) for sodium or meeting the estimated average requirement (EAR) for iodine.

The SQs therefore may be a reasonable proxy for type of milk usually consumed, a reasonable approximation of fruit and vegetable intake, and of limited value for predicting sodium or iodine intakes.

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1 Introduction

Good nutrition contributes to quality of life and helps to maintain a healthy body weight, protect against infections, and reduce the risk of chronic disease and premature death (AIHW 2012a). In order to assess nutrition in the population, it is vital for researchers, policy makers and health professionals to be able to accurately assess and understand the eating habits of individuals and population groups.

There are numerous dietary measurement methods used by researchers to evaluate population food and nutritional status. With respect to SQs, six elements of 'good' dietary measurement methods have been identified (Box 1.1) (Marks et al. 2001).

Box 1.1: Elements of good short questions on food habits

- **Indicative of important aspects of dietary quality**—reflects an aspect of nutrition that is of interest
- **Valid**—results accurately reflect information they are designed to obtain
- **Reproducible**—gives the same result when repeated under similar conditions
- **Consistent**—performs the same way in different sub-groups of the population
- **Responsive**—can measure changes in the outcome/variable/factor of interest
- **Independent of the method of administration**—can be administered multiple ways and should require minimal accompanying information such as pictures of serve sizes

Source: Marks et al. 2001.

While each of the six elements is important, this bulletin focuses on testing specific aspects of the validity of the SQs as administered in the 2007 Australian National Children's Nutrition and Physical Activity Survey (also known as the 2007 Children's Survey) (CSIRO & University of South Australia 2008). This is investigated by comparing results from the SQs with those from a more comprehensive dietary methodology, the 24-hour food recall (food recall). Investigation of all six elements would be required as part of a more comprehensive assessment of the utility of the SQs, and could be an area for future work.

Objectives

The first objective of this analysis is to examine how well responses to SQs on food habits in the 2007 Children's Survey correspond with the results from food recalls in the same survey. This bulletin also discusses how results from this analysis of the 2007 Children's Survey compare with results from a similar analysis of the 1995 National Nutrition Survey (NNS) of adults.

The second objective is to explore if any additional information about children's diets can be gained from analysis of the 2007 Children's Survey SQs.

Comprehensive dietary surveys

Comprehensive dietary surveys are useful tools for assessing food consumption and nutrient intakes of populations. They can be administered by telephone, in person, or by mail, and may involve food recalls (where the respondent recalls all foods eaten within one or more 24-hour periods) or weighed food records (where the respondent also provides the weights of all foods eaten). From this, analysts can derive detailed information about a person's dietary intake, including total energy, fats, carbohydrates, proteins and various vitamins and minerals. Such surveys are often expensive, labour intensive and time consuming to administer and analyse (Marks et al. 2001), particularly at a national level. For these reasons, comprehensive assessment of food intake and nutrition in the Australian population occurs infrequently.

As well as the high financial cost and respondent burden, there can be large variation in day-to-day intake that is difficult to account for. To help determine normal dietary habits, comprehensive dietary surveys should be conducted over several days, or at least more than one day.

The most recent source of detailed national food and nutrient intake information for the population aged 17 and over is the 1995 National Nutrition Survey (NNS) (ABS 1997). The most recent data source for children aged 2–16 is the 2007 Children's Survey (CSIRO & University of South Australia 2008).

Short questions on food habits

SQs on food habits are often used as indicators of or proxies for good nutrition, particularly when comprehensive dietary information is not available. Short questions, such as 'How many serves of fruit do you usually eat each day?' or 'What is the main type of milk that you usually use?', are often used as a source of readily available and timely information on dietary intakes. However, their use as proxies for assessing good nutrition may not always be appropriate due to a variety of factors (Marks et al. 2001, Riley et al. 2001, Rutishauser et al. 2001, Rangan et al. 2006). While SQs can assist in providing information on dietary intakes, it is important that their limitations are understood and documented if they are to be used in regular food and nutrition monitoring programs.

The 2007–08 National Health Survey (NHS) asked selected SQs of persons aged 5 and over (ABS 2009). The 2007 Children's Survey asked SQs for children aged 2–16.

Comparison of short questions on food habits with food recalls

An advantage of the 2007 Children's Survey is that it collected dietary information using food recall and SQs. The last national nutritional survey in Australia that contained both was the 1995 National Nutrition Survey.

Absolute validity of dietary questions can rarely be assessed in population-based surveys (Block 1982). For example, usually no video footage would exist to confirm actual food intakes, nor would a researcher be present to record all food intakes as they occur. However, *relative validity* can be measured by comparing results with another, usually more detailed method of dietary assessment (Marks et al. 2001). Relative validity of the SQs can be assessed by comparing responses in the SQs with results from food recalls.

Thorough analysis has previously been performed on the relative validity of the SQs in the 1995 NNS with respect to adults aged 19 and over (Marks et al. 2001, Rutishauser et al. 2001). However, similar analyses for children have not yet been repeated and published, and the 2007 Children's Survey provides an opportunity for such analysis.

Australian Dietary Guidelines and recommendations

The Australian Dietary Guidelines are the national reference for promoting better nutritional outcomes for the general population. The *Australian guide to healthy eating* (Smith et al. 1998) provides practical recommendations regarding the types and amounts of foods required for optimal health and wellbeing (see Box 2.2 for recommendations regarding fruit and vegetable intake). The guidelines can be used as a reference with which to assess aspects of 'good nutrition'.

The current Australian Dietary Guidelines (NHMRC 2003) include the recommendations to:

- Eat plenty of vegetables, legumes and fruits
- Limit saturated fat and moderate total fat intake
- Choose food low in salt.

Apparent adherence to each of these recommendations can be examined through analysis of the 2007 Children's Survey SQs and food recalls.

The selection of specific SQs in population surveys is based on the public health significance of the concepts they measure. For example, an SQ on fruit and vegetable intake relates to epidemiological evidence that people who regularly eat diets high in fruits and vegetables (including legumes) have lower risks of certain chronic conditions, such as heart disease, Type 2 diabetes, and some eye diseases, such as cataracts and macular degeneration (AIHW 2011a). An SQ on milk type relates to evidence suggesting links between saturated fat intakes and coronary heart disease, and SQs on salt intake relate to evidence that excess sodium in the diet can contribute to increased blood pressure, which is an important risk factor for cardiovascular disease.

Historically, parts of Australia have experienced iodine deficiency due to the naturally low iodine content of soils in many localised areas. Iodine is an essential nutrient required for normal thyroid function, growth and development and it is especially important for the brain during foetal and postnatal life (Delange 2000). Common iodine sources include seafood, dairy and iodised table salt. Due to recent concerns about emerging iodine deficiency, questions regarding the use of iodised salt have been included in the SQs.

2 Methods

Data source: 2007 Children's Survey

The 2007 Children's Survey collected data on children's food consumption, physical activity levels and physical measurements for Australian children aged 2–16. Responses were analysed for 4,487 children who completed the entire survey. The survey data were collected from February to August 2007 (DoHA 2012). Interviews were scheduled during the week as well as on weekends, although fewer were conducted on Sundays than on other days of the week (CSIRO & University of South Australia 2008). The 2007 Children's Survey data were obtained by the Australian Institute of Health and Welfare (AIHW) from the Australian Data Archive and statistical analyses were conducted using SAS Enterprise Guide© Version 4.3.

Short questions on food habits

Information on food habits was collected using SQs via computer-assisted personal interviews. For children aged 2–8, survey answers were provided by a parent or carer on behalf of the child, and children aged 9–16 completed this part of the survey themselves. The SQs on food habits are in Box 2.1.

Box 2.1: Short questions on food habits in the 2007 Children's Survey

What is the main type of milk that you usually use?

How many serves of fruit do you usually eat each day?

How many serves of vegetables do you usually eat each day?

Does the person who prepares the meal add salt when they are cooking? Is it iodised?

Do you add salt to your meal at the table? Is it iodised?

Source: CSIRO & University of South Australia 2008.

Milk intake included all liquid milk, flavoured milk and condensed milk, but not other dairy-based products such as cheese and yoghurt. Response options were: *Whole/full cream, Low/reduced fat, Skim, Evaporated or sweetened condensed, Soy milk, None of the above, Does not drink milk, and Don't know.*

Fruit and vegetable intake response options were *Less than one serve, One serve, Two serves, Three serves, Four serves, Five serves, Six or more serves, and Don't eat fruits or Don't eat vegetables.* According to the survey, there was no clear indication of whether the respondent was to include fruit juice as fruit, however as the question was phrased 'how many serves of fruit do you usually eat', we have assumed people would not include fruit juice. Potatoes were included as vegetables. Fruit and vegetable intake values were analysed against recommendations in the *Australian guide to healthy eating* (Smith et al. 1998) (Box 2.2).

Questions regarding added salt (if salt was added to the meal during cooking, or at the table), had the response options: *Yes usually*, *Yes sometimes*, *No* and *Don't know*.

Questions regarding if salt was iodised had the response options: *Yes usually*, *No*, and *Don't know*.

Food recall

Food consumption data were collected using two food recalls, the first via a computer-assisted personal interview, and the second via a computer-assisted telephone interview. These data were used to calculate food and nutrient intakes (for example, total energy, fat, protein, fibre and selected vitamins and minerals such as calcium, vitamin C, sodium and iodine), using a food composition database developed by Food Standards Australia New Zealand. Calculated food and nutrient intakes were provided as part of the 2007 Children's Survey dataset.

The quantity of salt added to meals was not measured in the food recalls, making it difficult to accurately determine discretionary salt (sodium) intake.

In analysis of the food recall in this bulletin, fruit juice was not included in the calculation of the mean number of fruit serves reported.

The 2007 Children's Survey used two food recalls per respondent, in most cases on non-consecutive days. These were used to estimate the average food intakes over two days and two day-adjusted 'usual' nutrient intakes. These methods help to reduce variation in day-to-day intakes.

Australian dietary recommendations

The recommendations used in the determination of 'good nutrition' in this bulletin are in Boxes 2.2 and 2.3. The amounts of fruit and vegetables (in grams) reported as consumed in the food recall, were converted to serve sizes based on the *Australian guide to healthy eating*. This allowed for comparisons between serves reported in the SQs and serves reported in the food recall.

Box 2.2: Recommendations for fruit and vegetable consumption

The *Australian guide to healthy eating* recommends that children, depending on their age, should consume 1–3 serves of fruit ('sufficient fruit') and 2–4 serves of vegetables ('sufficient vegetables') per day (Smith et al. 1998).

	Fruit	Vegetables
Children 4–7 years	1–2	2–4
Children 8–11 years	1–2	3–5
Adolescents 12–18 years	3–4	4–9

By convention, a serve of fruit is 150 grams, and a serve of vegetables is 75 grams. Some examples of what constitutes a 'serve' are:

Fruit	Vegetables
1 medium apple, orange, banana	1 medium potato
2 items of small fruit such as apricots, plums	1 cup of salad vegetables
About 8 strawberries	½ cup tomatoes, capsicum, cucumber
1 cup of canned fruit	½ cup carrots, swede, turnip
About 20 grapes or cherries	½ cup peas, broad beans, lentils
Dried fruit (30 grams)	½ cup spinach, cabbage, broccoli

Source: Adapted from DoHA & NHMRC 2003.

Box 2.3: Recommendations for total fat and saturated and *trans* fat intakes

Total fat—The optimal range for total fat consumption is 20–35% of total energy intake from fat. For this bulletin, 30% has been used as a reference point.

Saturated and *trans* fat combined—The optimal range for saturated and *trans* fat consumption is 8–10% of total energy intake from saturated and *trans* fat. For this bulletin, 10% has been used as a reference point.

Source: NHMRC & NZMoH 2006.

Box 2.4: Nutrient reference definitions used in this bulletin

Acceptable macronutrient distribution range (AMDR)—An estimate of the range of intake for each macronutrient for individuals (expressed as per cent contribution to energy), which would allow for an adequate intake of all the other nutrients whilst maximising general health outcomes.

Adequate intake (AI)—The average daily nutrient intake level based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people that are assumed to be adequate.

Estimated average requirement (EAR)—A daily nutrient level estimated to meet the requirements of half the healthy individuals in a particular life stage and gender group.

Upper level of intake (UL)—The highest average daily nutrient intake level likely to pose no adverse health effects to almost all individuals in the general population. As intake increases above the UL, the potential risk of adverse effects increases.

Source: NHMRC & NZMoH 2006.

Analyses undertaken

Analyses were undertaken to assess responses to selected SQs (Box 2.1) in relation to results from the food recall. The analyses are summarised in Table 2.1. Direct assessments and indirect assessments of relative validity were performed, and additional relationships were explored between the SQs and food recall responses for selected nutrients of interest for population nutrition.

Table 2.1: Summary of relationships examined between short questions and measures from the food recall in the 2007 Children's Survey

SQ	Measure from food recall		
	Direct assessment of SQ	Indirect assessment of SQ	Additional relationships explored
What is the main type of milk that you usually use?	Type of milk consumed in greatest volume (if more than one type of milk) ^(a)	Total fat intake (<30% of energy intake) ^(a) Saturated fat intake (<10% of energy intake) ^(a)	..
How many serves of fruit do you usually eat each day?	Mean number of fruit consumed ^(a)	Dietary fibre (at/above AI) Vitamin C (at/above EAR) ^(a) Folate (at/above EAR) ^(a)	Total fat intake (<30% of energy intake) Saturated fat intake (<10% of energy intake) Calcium (at/above EAR)
How many serves of vegetables do you usually eat each day?	Mean number of vegetable serves consumed ^(a)	Dietary fibre (at/above AI) Vitamin C (at/above EAR) ^(a) Folate (at/above EAR) ^(a)	Total fat intake (<30% of energy intake) Saturated fat intake (<10% of energy intake) Calcium (at/above EAR)
Does the person who prepares the meal add salt when they are cooking? Is it iodised?	..	Sodium intake (above UL)	Iodine intake (at/above EAR)
Do you add salt to your meal at the table? Is it iodised?	..		

(a) Relationship also assessed and published in 2001 review of 1995 NNS for adults aged 19 and over (Rutishauser et al. 2001).

Notes

1. Categories of direct assessment and indirect assessment build upon work from the 2001 review of the 1995 NNS (Rutishauser et al. 2001).
2. AI = adequate intake; EAR = estimated average requirement; UL = upper level of intake. See Box 2.4 for definitions.

Direct assessments of relative validity

Direct assessments of the relative validity of the SQs were made by comparing the response to the SQs with related information from the food recall, when this information was available.

- The **type of milk** reported in the SQ 'What is the main type of milk you usually use' was compared with the type of milk reported as being consumed in the greatest volume (if more than one type of milk was consumed) in the two days of food recall data. Dried milk and milk-based fruit drinks reported in the food recall were not included in the analysis, and when milk type was not specifically reported in the food recall it was assumed to be whole/full cream milk.
- The **number of fruit serves** reported in the SQ was compared with the mean number of fruit serves consumed per day, calculated from the two days of food recall data. Fruit juice was not included in the mean number of serves calculated from the food recall.
- The **number of vegetable serves** reported in the SQ was compared with the mean number of vegetable serves consumed per day, calculated from the two days of food recall data.
- A direct assessment of the relative validity of **discretionary salt use** could not be performed as the food recalls did not ask the respondent to record each time salt was added to a food.

Indirect assessments of relative validity

Indirect assessments of the relative validity of the SQs were made by comparing the SQ responses with selected food and nutrient results obtained from the food recall, that might also be expected to differ if the responses to the SQs pointed to real differences in food intake (Rutishauser et al. 2001).

Total fat and saturated fat intakes were analysed against the acceptable macronutrient distribution range (AMDR) (NHMRC & NZMoH 2006). The contribution of total fat and saturated fat to total energy was calculated based on a model adjusting for two days of intake (two-day adjustment model).

The published 2007 Children's Survey nutrient database did not include *trans* fats, and so these intakes were not included in the analysis when comparing saturated fat and *trans* fat intakes with the AMDR. However, in a review report of *trans*-fatty acids (FSANZ 2009), it was reported that *trans* fats are less than 1% of total energy intake and saturated fats are 14% of total energy intake in the population.

Nutrient intakes, as listed in Table 2.1, were analysed against the nutrient reference values (NRVs) for Australia and New Zealand (NHMRC & NZMoH 2006). Nutrient intake information was available in the 2007 Children's Survey dataset and calculated based on a model adjusting for two days of intake. In this bulletin, measurement of 'folate' refers to dietary folate equivalent.

Additional relationships explored

Since SQs are used as a proxy for good nutrition, other relationships were also explored to determine how well certain SQs predicted levels of other important nutrients not primarily sourced from the food in the given SQ. For example, what (if any) is the relationship between fruit serves and calcium intakes. The nutrients selected have previously been identified as being at-risk in certain Australian subpopulations (AIHW 2012b).

3 Results

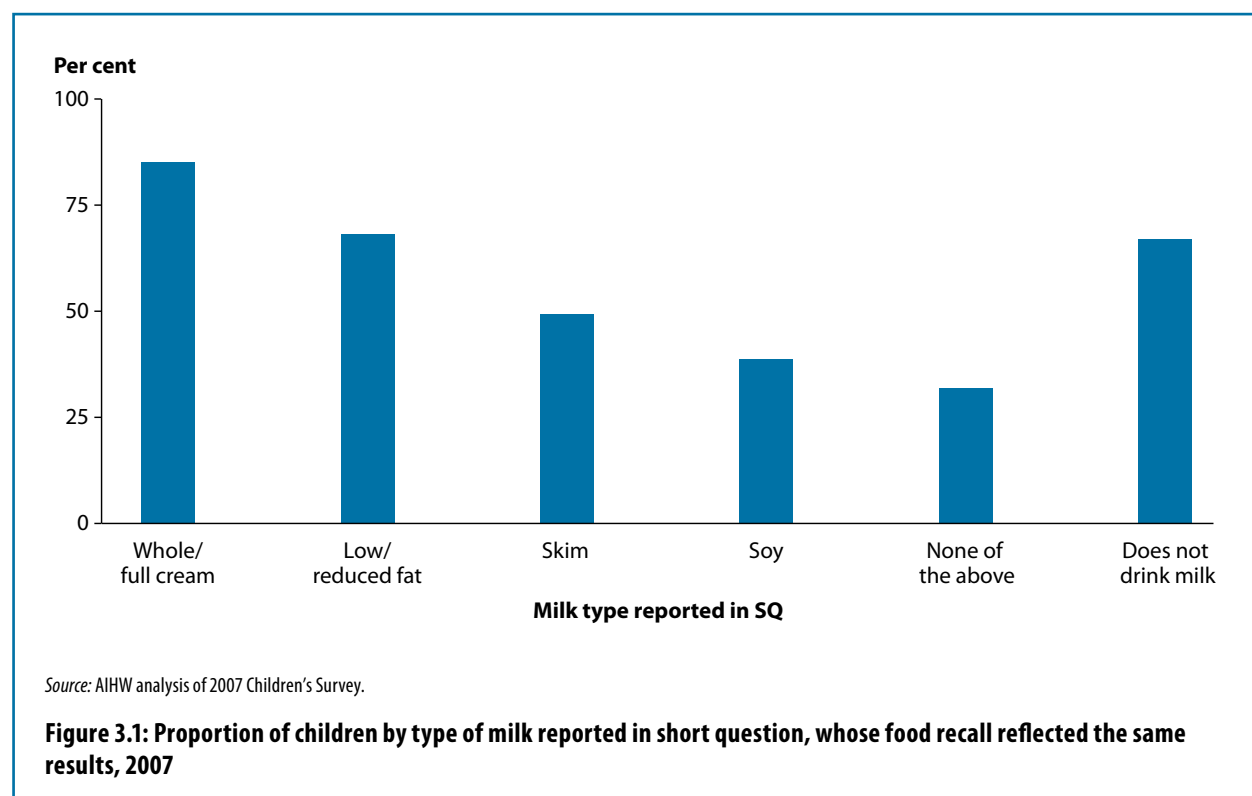
Milk type

In the SQ, the majority (62%) of children reported mainly drinking whole/full cream milk, followed by low/reduced fat (27%), skim (5%), soy (3%), and 2% reported that they did not drink milk. This pattern varied by age, with 73% of children aged 2–3 drinking whole/full cream milk, compared with 57% of children aged 14–16. Less than 1% of children reported not knowing what type of milk they usually drink.

Direct assessment of relative validity

Overall, nearly 8 in 10 children (77%) who answered *What is the main type of milk that you usually use?* in the SQ reported the same information in the food recall (excluding children who reported they did not know the type of milk they usually drink).

Children who reported consuming whole/full cream milk in the SQ were most likely (85%) to report the same results in the two food recalls. Children who consumed low/reduced fat milk, or didn't drink milk were less likely to report this in the food recall (68% and 67%, respectively). Children who consumed skim or soy milk were the least likely to report the same results in the food recall as in the SQ (49% and 39%, respectively) (Figure 3.1).

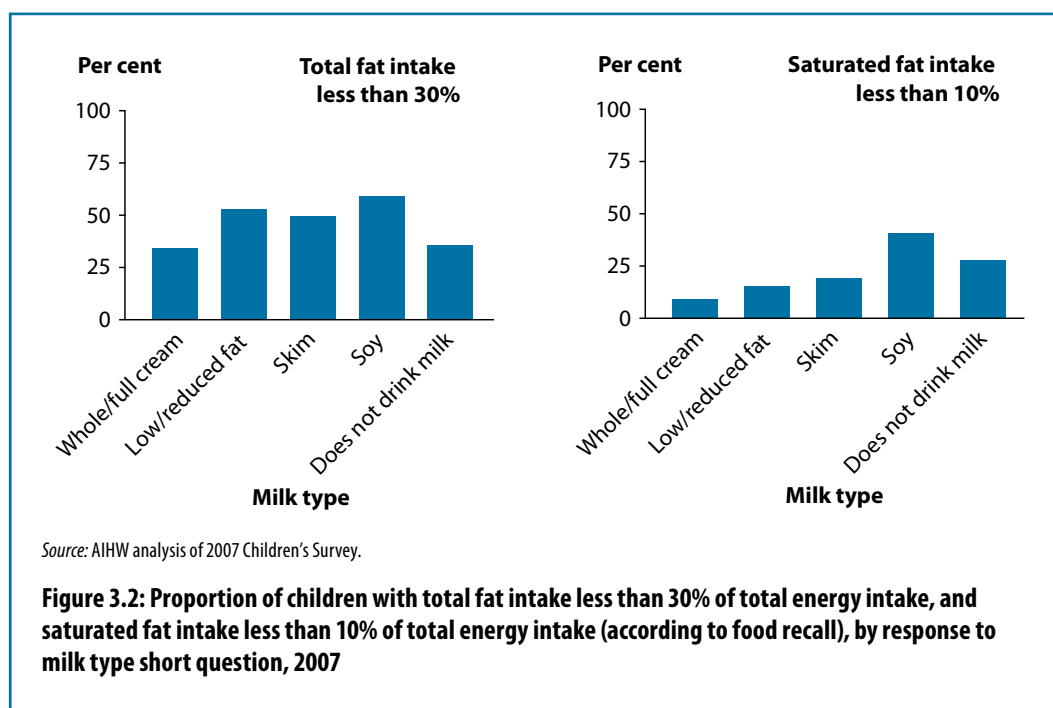


Indirect assessment of relative validity

Total fat intake

Results from the food recall showed that overall, 41% of children met the recommendation of having less than 30% of their total energy intake from fat (based on an average of the two days of intake).

- Children who reported consuming whole/full cream milk in the SQ had higher mean fat intakes according to the food recall, compared with children who reported drinking other milk types (Figure 3.2).
- Thirty-four per cent of children who reported consuming whole/full cream milk in the SQ met the recommendation of less than 30% of their total energy intake from fats (according to the food recall), compared with 49% who reported drinking skim milk, 53% drinking low/reduced fat milk, and 59% of children who reported drinking soy milk.
- Children who reported not drinking milk had similar results to children who reported drinking whole/full cream milk, however less than 1% reported not consuming milk, so this finding should be treated with caution.



Saturated fat intake

Results from the food recall showed that overall, 12% of children met the recommendation of having less than 10% of their total energy intake from saturated fat (based on an average of two days).

- Children who reported consuming whole/full cream milk in the SQ were least likely (7%) to have saturated fat intakes of less than 10% of their total energy intake according to the food recall. In comparison, 16% of children who reported consuming low/reduced fat milk, 19% of children who reported consuming skim milk, and 41% of children who reported drinking soy milk met this recommendation (Figure 3.2).
- Twenty-eight per cent of children who reported not drinking milk met the saturated fat intake recommendation, however less than 1% reported not consuming milk, so this finding should be treated with caution.

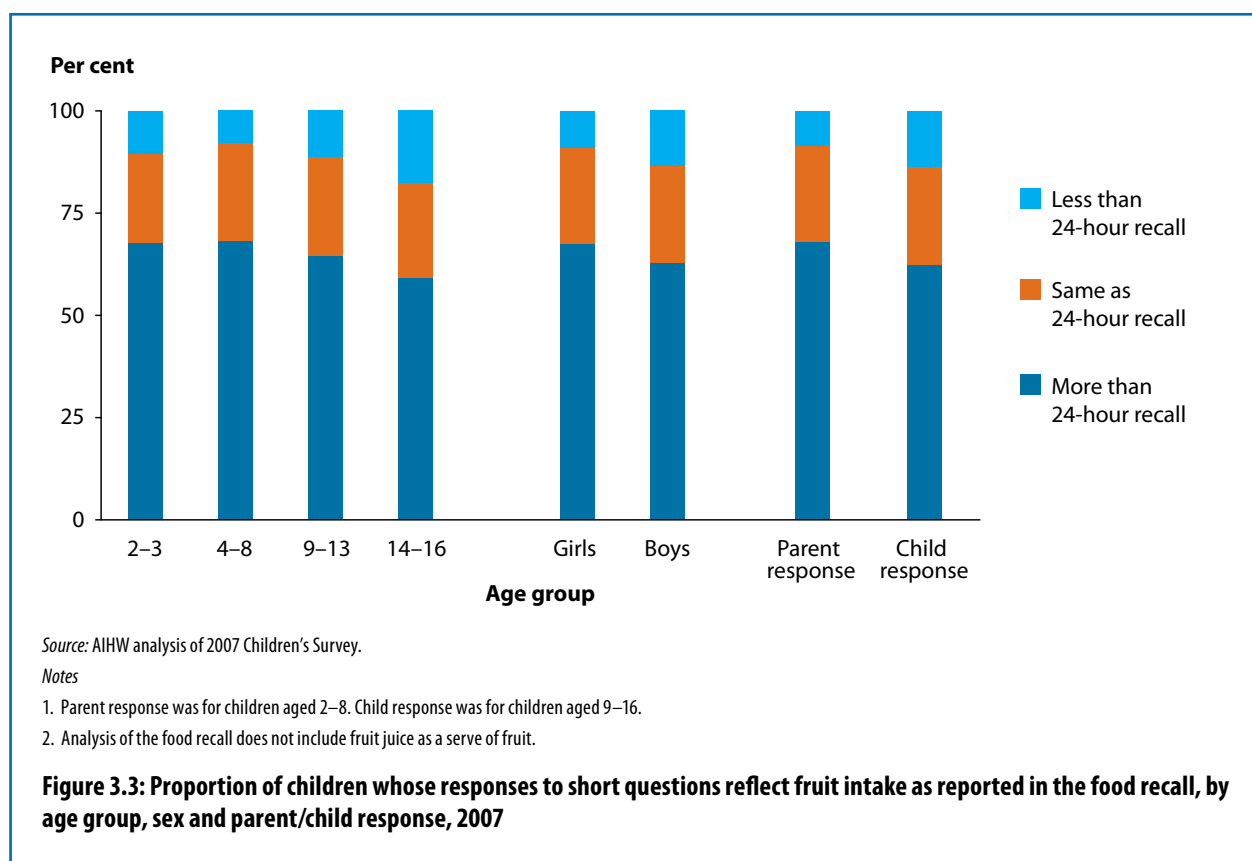
Fruit intake

In the SQ, 7% of children reported usually eating less than one serve of fruit each day, 54% of children reported usually eating one or two serves, and 39% reported eating three or more fruit serves each day. When fruit juice was included as a serve, 9 in 10 children aged 2–13 met the recommended intake for fruit, compared with one-quarter of children aged 14–16 (AIHW 2010). When fruit juice was excluded, 1% of children aged 14–16 met the recommendation, compared with 51% of those aged 9–13, 61% of those aged 4–8 and 68% of those aged 2–3 (AIHW 2010). In this bulletin, fruit juice was not counted towards serves of fruit.

Direct assessment of relative validity

In the SQ, 24% of children reported a usual fruit intake that was identical to the mean fruit intake from their two food recalls. The majority of children (65%) 'over-reported' intakes in the SQ, compared with the food recall. Responses were similar for girls and boys, and whether reported by parents or self-reported (Figure 3.3).

Two-thirds (66%) of children reported their fruit intake in the SQ within one serve of what was reported based on an average of their two food recalls. One in 3 (31%) reported more fruit intake in the SQ by more than one serve and 3% reported less fruit intake by more than one serve, compared with the food recalls.

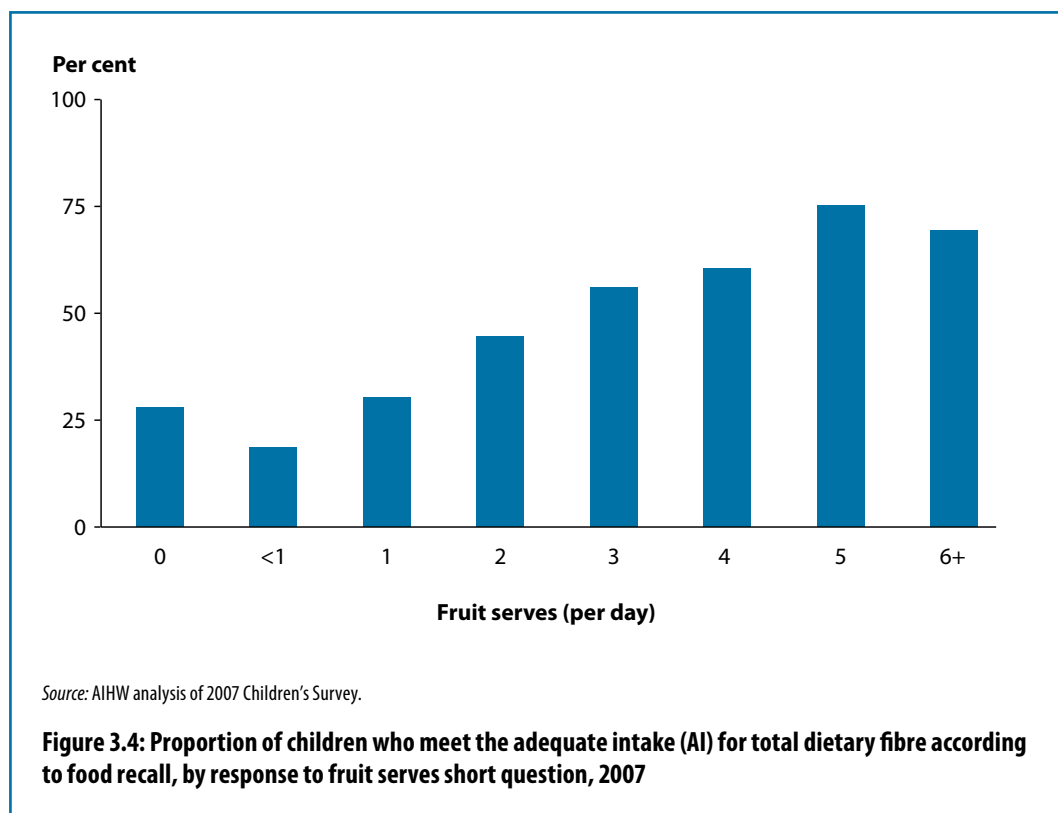


Indirect assessment of relative validity

Differences were explored in the proportion of children meeting the EAR for vitamin C and folate and the AI for dietary fibre (according to results from the food recall data), among groups with different intakes of fruit as reported in the SQ.

Dietary fibre

In general, a positive relationship was observed between fruit intake reported in the SQ and fibre intake as measured in the food recall. As fruit serves increased, in general, so did the proportion of children who met the AI for dietary fibre (Figure 3.4).



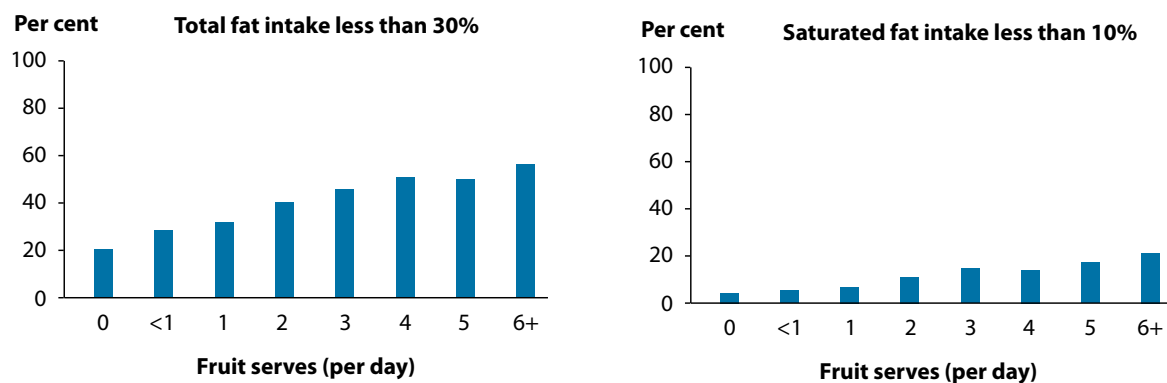
Vitamin C and folate

Most (97%) of children met the EAR for vitamin C and folate. Those least likely to meet the EAR, particularly for vitamin C, were children who reported not consuming fruit. However, as only a small number of children reported not eating fruit, these results should be interpreted with caution.

Additional information from fruit intake short question

Total fat and saturated fat intake

Fruit intake from the SQ appeared to be related to total fat and saturated fat intakes expressed as a proportion of total energy consumed, calculated from the food recall data (Figure 3.5). As children consumed more fruit serves they were more likely to meet the recommendation of having less than 30% of their total energy intake from fat, and less than 10% from saturated fat.



Source: AIHW analysis of 2007 Children's Survey.

Figure 3.5: Proportion of children with total fat intake less than 30% of total energy intake, and saturated fat intake less than 10% of total energy intake (according to food recall), by response to fruit intake short question, 2007

Calcium intake

Fruit intake in the SQ was examined with respect to meeting the EAR for calcium according to the food recall, and no relationship was observed.

Vegetable intake

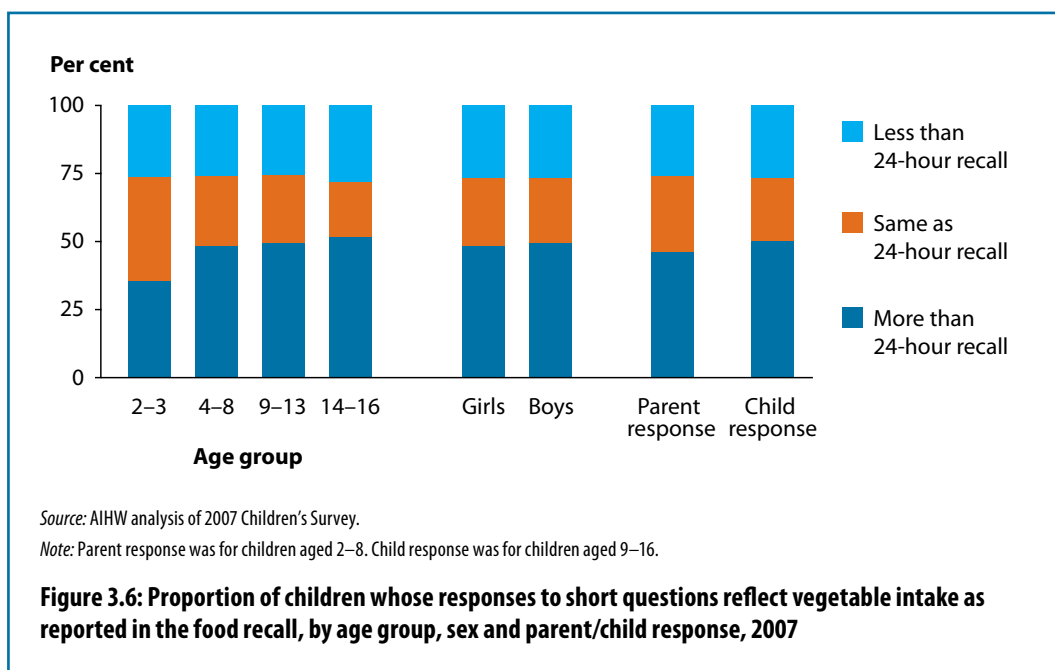
In the SQ, 44% of children reported usually eating fewer than two vegetable serves each day, 42% reported eating two or three serves, and 14% reported eating four or more vegetable serves each day. The recommended number of vegetable serves was met by 22% of children aged 4–8, 14% of children aged 2–3 and 9–13 and 5% of children aged 14–16 (AIHW 2010).

Direct assessment of relative validity

In the SQ, 26% of children (25% of boys and 27% of girls) reported a usual vegetable intake that was identical to the mean vegetable intake from the two food recalls (Figure 3.6). Nearly half (47%) of all children reported a higher vegetable intake in the SQ compared with the food recall, and 27% reported a lower vegetable intake in the SQ.

The analysis of the parents' response (for children aged 2–8) showed that 30% of parents reported the same number of serves in the SQ as in the food recall. Among older children (children aged 9–16), 22% reported the same number of serves in both methods.

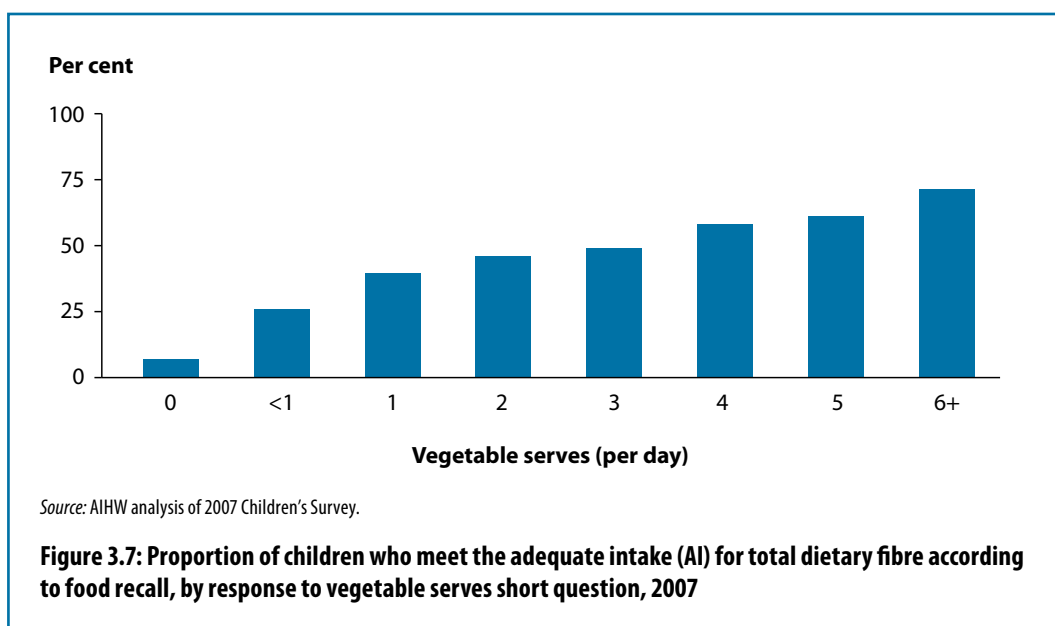
Two-thirds (67%) of children reported their vegetable intake in the SQ within 1 serve of their food recall estimate, while 22% 'over-reported' their vegetable intake and 11% 'under-reported' their vegetable intake in the SQ.



Indirect assessment of relative validity

Dietary fibre

Based on their food recall results, the higher the number of vegetables reported in the SQ, the higher the proportion of children who met the AI for fibre. Among those who reported not consuming vegetables in the SQ, 7% met the AI for dietary fibre according to the food recalls. This rose to 49% of children who reported eating 3 serves per day, and 72% of children who reported usually consuming 6 or more vegetable serves each day (Figure 3.7).



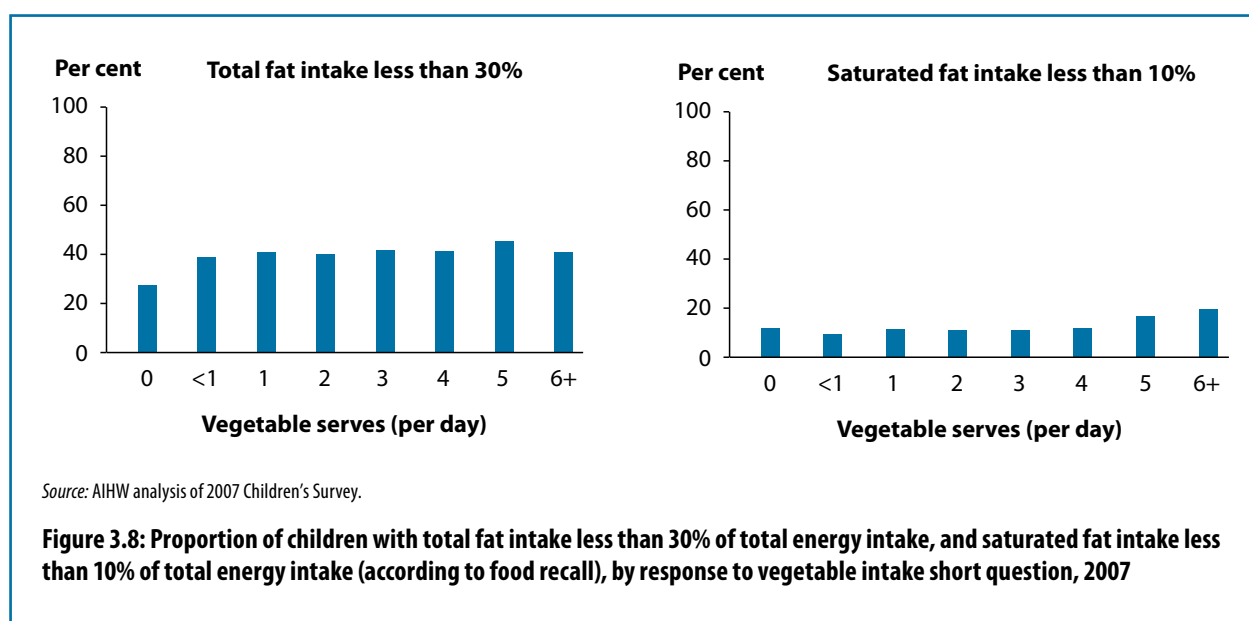
Vitamin C and folate

Children who reported not consuming vegetables were less likely to meet the EAR for folate. However, only 0.5% of children reported not consuming any vegetables, so this finding should be interpreted with caution. Otherwise, no relationships were noted between vegetable intake reported in the SQ and meeting the EAR for vitamin C or folate.

Additional information from vegetable intake short question

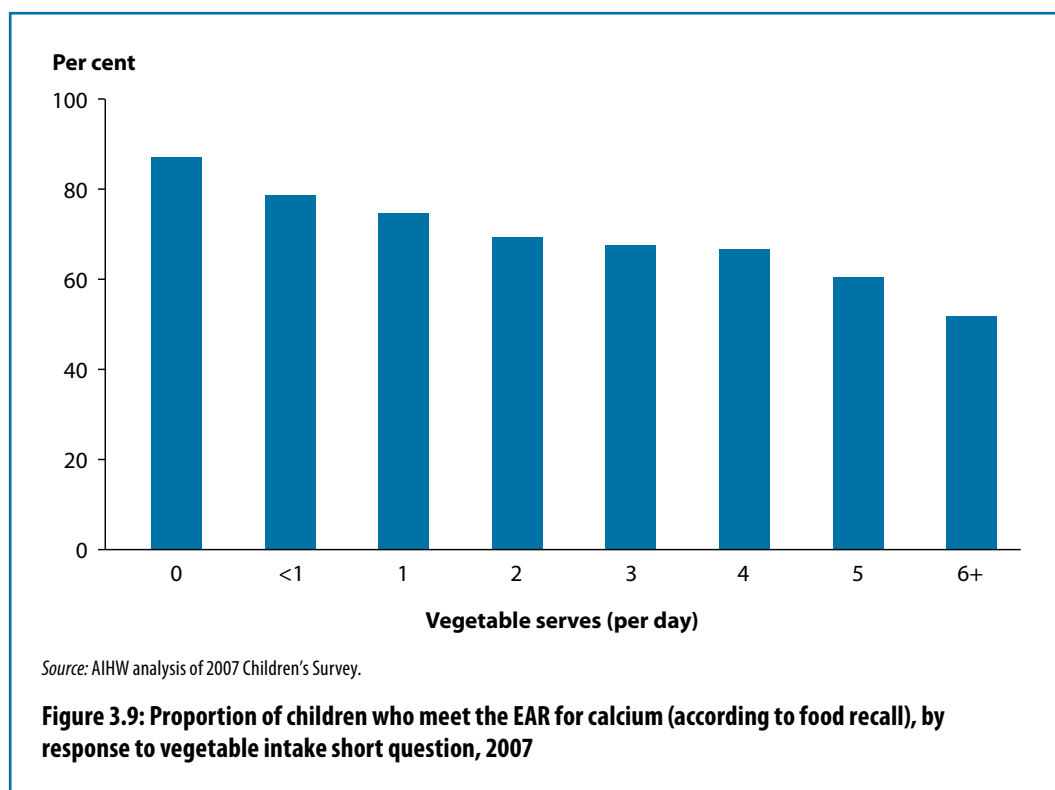
Total fat and saturated fat intake

Unlike fruit intake responses in the SQ, vegetable intake responses did not appear to be predictive of total fat and saturated fat intakes expressed as a proportion of total energy intake (Figure 3.8) as calculated from the food recall.



Calcium intake

Although a direct relationship would not be expected to be observed, vegetable intake as reported in the SQ showed an inverse relationship with meeting the EAR for calcium. As vegetable serves reported in the SQ increased, the proportion of children who met the EAR calcium (according to the food recalls) decreased (Figure 3.9), a finding that is unlikely to indicate a meaningful relationship between the two.



Discretionary salt use

Discretionary salt use was not reported in the food recall, therefore reports of salt used and amounts of salt used cannot be directly compared between the SQs and the food recall.

In the SQs, the majority of children reported not adding salt to their meals at the table or during cooking. However, the quality of children's responses has been identified as potentially unreliable as children may be unlikely to know if salt was added during cooking (Baines, personal communication).

Of children who reported adding salt at the table at meal time, 50% reported adding iodised salt, and of children who reported having salt added during cooking, 39% reported that it was iodised.

Indirect assessment of relative validity

Sodium intake

Generally, all children greatly exceeded the EAR for sodium and so the UL was used as a point of reference. Analysis of the food recall showed that 93% of all children had sodium intakes above the UL, and this did not differ if salt was added (or not added), during cooking, or at the table.

Iodine intake

According to the food recall, 96% of all children met the EAR for iodine. The reported addition of salt during cooking, at the table, or not added, had little impact on the proportion of children who met the EAR for iodine.

4 Discussion

The infrequency of large national dietary surveys and their associated costs and respondent burden has led to consideration of other methodologies that can be used to collect information about dietary behaviours and intake. SQs can be used to assess diet, are less burdensome for both survey staff and respondents, and can be cost-effective when compared with comprehensive dietary surveys (Marks et al. 2001). However, it is important to examine the validity and accuracy of SQs and be aware of their applications and limitations.

The overall aim of this bulletin is to identify whether SQs are a useful replacement for or supplement to comprehensive dietary surveys like food recalls. With the exception of salt use SQs, overall results described below for milk type consumed and fruit and vegetable intake are generally similar to results from the 1995 NNS. Assessment of relationships between fruit and vegetable intake and meeting the AI for fibre were not included in that analysis (Rutishauser et al. 2001).

Milk type

Relationship between SQ and food recall

Nearly 8 in 10 children who answered the SQ on the type of milk they usually drink reported similar results in the food recall. Agreement between the two methods was highest for children who reported drinking whole/full cream milk, and lower for children who reported drinking other types of milk. However, the majority of children drank whole/full cream milk. This suggests that the SQ may be a reasonable proxy for the food recall with respect to type of milk.

Some of the difference in responses, even if children answered both the SQ and food recall accurately, could be due to children being asked what type of milk they usually drink, and the food recall only referred to two days, which may not be 'usual' days. Some of the difference, for parents and/or children, may also be due to social approval bias, whereby respondents provide answers considered more desirable or socially acceptable (Miller et al. 2008).

Total fat and saturated fat intake

Milk type has previously been used as a proxy indicator for fat intake (Marks et al 2001). Analysis of the 1995 NNS showed that asking people about the main type of milk consumed provides a valid indicator of energy obtained from total fat and saturated fat (Rutishauser et al. 2001).

Children who reported drinking low/reduced fat, skim and soy milks in the SQ were more likely than those who reported drinking whole/full cream milk to meet the recommended intake of having a total fat intake of less than 30% and saturated fat intake of 10% or less. This result is consistent with analysis of the 1995 NNS (administered to children and adults). Analysis of the 2007 Children's Survey suggests that the SQ regarding type of milk usually consumed may be predictive of achieving recommended maximum intakes of total fat and saturated fat expressed as a proportion of total energy intakes.

Fruit and vegetable intake

Relationship between SQ and food recall

In the SQs, about 1 in 4 respondents reported the same number of serves consumed for fruit and vegetables as reported in the food recall (24% for fruit and 26% of vegetables). The majority of respondents reported eating more of both fruit (65%) and vegetables (47%) in the given SQ as compared with the food recall.

Despite this finding, 66% of respondents reported their fruit intake in the SQ within one serve of the intake reported in the food recall, and 67% reported their vegetable intake within one serve. There were no major differences between boys and girls or by age group. Parents' reports of vegetable intake in the SQ indicated greater consistency with the food recall than children's reports, but this relationship was not observed for fruit.

These results suggest that for fruit and vegetable intake, most responses to the SQs are within one serve of what was recorded in the food recall. However answers to the fruit and vegetable SQs are only accurate to the same number of serves for one-quarter of respondents. Previous studies have indicated only poor or moderate agreement between food frequency questions and food recall records for fruit and vegetable consumption (Mackerras et al. 2004, Ambrosini et al. 2003).

In the 2007 Children's Survey, SQ responses tended to over-estimate intake compared with the food recall. Over-reporting of fruit and vegetable consumption may be influenced by social approval bias. However, social approval bias may affect results of the SQs as well as the food recall, and does not completely explain why the number of serves reported in the SQs is generally higher. An additional reason for the difference could relate to the different questions asked. The SQs ask how much is usually consumed, whereas the food recall is for two specific 24-hour periods that may not represent the respondent's 'usual behaviour'. Also, fruit juice was not counted toward fruit serves in this analysis of the food recall data, and it is unknown how many respondents may have included juice in their estimate for the SQ. This could result in reporting more fruit serves in the SQ for some individuals.

Further analyses to investigate the relationship between SQs and food recall data for fruit and vegetable intake could identify subgroups in the population where reporting appears to show more or less agreement. Such work could further inform how SQs could be used as proxies.

The SQs in the 2007–08 NHS showed that for people aged 15 and over, about 90% had inadequate intakes of vegetables and 50% had inadequate fruit intakes when compared with recommendations (ABS 2009). As suggested by our results, SQs appear to over-estimate intakes and so actual fruit and vegetable consumption may be lower than previously estimated.

Dietary fibre intake

The analysis of fruit intake as well as vegetable intake showed that as the fruit and vegetable serves a child reported consuming in the SQ increased, the more likely they were to meet the AI for dietary fibre according to the food recall. This relationship lends support to the validity of the fruit and vegetable intake SQs, as it could be expected that dietary fibre would increase as fruit and vegetable intake increases. The relationship between fruit and vegetable intake and fibre was not examined in the analysis of the 1995 NNS (Rutishauser et al. 2001).

Vitamin C, folate and calcium intake

Most children (97%) met the EAR for vitamin C and folate. However, results suggest that children who reported not eating fruit in the SQ were less likely to meet the EAR for vitamin C, and that children who reported not eating vegetables in the SQ were less likely to meet the EAR for folate. These findings are plausible as fruit contains vitamin C, and vegetables contain folate. However, the findings are based on a small sample of children who reported eating no fruit and no vegetables, so this analysis should be interpreted with caution.

No relationship was noted between fruit intake in the SQ and meeting the EAR for calcium, as measured from the food recalls. However, an inverse relationship was noted for vegetables; as vegetable intake increased, the proportion of children meeting the EAR for calcium appeared to decrease. Further investigation is required to further examine this apparent difference, but initial findings suggest that an SQ such as vegetable intake may not be appropriate as a global proxy for 'good nutrition'.

Total fat and saturated fat intake

No relationship was found between responses to the vegetable intake SQ and exceeding the recommended intake of total fat and saturated fat expressed as a proportion of total energy. A relationship was found for the fruit intake SQ.

Discretionary salt use

Relationship between SQs and food recall

The relative validity of the discretionary salt use SQs was difficult to assess through comparison with the food recall, as children were not specifically asked to report on whether they added salt to a specific meal at the table, or if salt was added during cooking.

Sodium and iodine intake

The analysis found no relationship between what respondents reported in the SQs on discretionary salt use compared with being above the UL for sodium or meeting the EAR for iodine in the food recall.

The quantity of salt added to meals was not measured in the food recall, making it difficult to accurately determine discretionary salt (sodium) intake. Processed foods usually contribute substantial amounts of salt to the diet (about 85%), and so the addition of discretionary salt may only be a minor contributor to overall sodium intake.

SQ responses to adding salt to meals at the table and during cooking do not appear to predict respondents who exceeded the UL for sodium or met the EAR for iodine.

Limitations of the analysis

- ♦ Assessment of the validity of the SQs is not based on comparing results with a 'gold standard', as a 'gold standard' was not available. Responses to the SQs on type of milk, and fruit and vegetable serves that are usually consumed have been compared with responses reported in the food recalls, which measure what the respondent reported eating over two 24-hour periods, and may not necessarily represent the respondent's usual dietary habits.
- ♦ The SQs and food recall are based on self-reports (or the parent's report for younger children) and may be subject to social approval bias as well as the respondent's ability to accurately recall all food consumed.
- ♦ Respondents may have difficulty with the definition of certain fruit and vegetable serves. For example, one large apple, which respondents may consider to be one piece, may actually weigh enough to be considered as two serves. Alternatively, one small fruit, such as a mandarin, may be considered one serve, when it is most likely to be only half a serve. While efforts were made to indicate to respondents what constitutes a 'serve', responses may still be based on varying understanding of serves sizes.
- ♦ Parents responded for children aged 2–8, whereas children aged 9–16 responded themselves. In some cases, for example, with vegetable intake, the older children's responses appeared to be less consistent with the food recall data (22%), compared with parent's responses on behalf of the younger children (30%). However, this difference was not seen with fruit intake responses. It is difficult to determine whether parents responded more accurately than the older children.

Further work

During 2011–13, the Australian Health Survey is being administered to both adults and children. The survey will include a nutrition component with SQs as well as food recalls. While this bulletin addresses the relative validity and potential applications of the SQs in children, similar data have not been available for adults since the 1995 NNS. The Australian Health Survey will provide an opportunity for similar investigations.

The Australian Government has funded the Get Up & Grow initiative for children, which is designed to promote increased physical activity and healthy eating (DoHA 2012). In order to evaluate the program, it will be important to understand children's dietary habits and intakes to monitor trends over time. Therefore, selected SQs may be of interest to easily, regularly and cost-effectively assess changes in dietary habits in children over time.

While self-reported data may not provide an accurate estimate of specific food intake, capturing such data the same way, over multiple points in time, can point to general trends that are important to assess. For example, self-reported overweight or obesity data from four National Health Surveys shows an increase over time of overweight or obesity in adults (AIHW 2011b). For trend analysis, it is crucial that SQs remain unchanged across surveys, to collect evidence of changes in dietary habits over time.

5 Conclusion

SQs on food habits can be a useful supplement to food recall surveys to collect information on dietary habits. The SQ on milk type appears to predict, to some extent, the percentage of a child's total and saturated fat intake. Likewise, the more serves of fruits and vegetables a child reported consuming in the SQs, the more likely they were to have met the AI for dietary fibre. However, on their own, SQs are not reliable predictors of overall 'good nutrition' of a population and should not be used as a substitute for more comprehensive food recalls.

SQs can provide useful trend data over time if the wording remains consistent across surveys. They may be used to easily, regularly and cost-effectively assess changes in dietary habits in children over time, particularly to evaluate initiatives designed to promote healthy eating.

Acknowledgments

This bulletin was written by Tim Olsen, Jeanette Tyas and Ilona Brockway, with assistance from Ann Hunt from the AIHW Population Health Unit. Valuable input was provided by Lisa McGlynn and by Janis Baines, Section Manager, Food Composition, Evaluation and Modelling at Food Standards Australia New Zealand.

The project was funded by the Australian Government Department of Health and Ageing.

Abbreviations

2007 Children's Survey	2007 Australian National Children's Nutrition and Physical Activity Survey
ABS	Australian Bureau of Statistics
AMDR	acceptable macronutrient distribution range
AIHW	Australian Institute of Health and Welfare
AI	adequate intake
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DoHA	Department of Health and Ageing
EAR	estimated average requirement
food recall	24-hour food recall
FSANZ	Food Standards Australia New Zealand
NHMRC	National Health and Medical Research Council
NHS	National Health Survey
NNS	National Nutrition Survey
NRV	nutrient reference value
SQ(s)	short question(s)
UL	upper level of intake

Symbols

.. not applicable

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Related publications

The following AIHW publications relating to children's health and nutrition might also be of interest:

- AIHW 2010. Health and wellbeing of young Australians: indicator framework and key national indicators. Bulletin no. 77. Cat. no. AUS 123. Canberra: AIHW.
- AIHW 2011. Mandatory folic acid and iodine fortification in Australia and New Zealand: baseline report for monitoring. Cat. no. PHE 139. Canberra: AIHW.
- AIHW 2011. Mandatory folic acid and iodine fortification in Australia and New Zealand: supplement to the baseline report for monitoring. Cat. no. PHE 153. Canberra: AIHW.
- AIHW 2012. Australia's food and nutrition 2012. Cat. no. PHE 163. Canberra: AIHW.

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Bulletin 108

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ISBN 978-1-74249-367-1

Suggested citation

Australian Institute of Health and Welfare 2012. Food for thought: what do short questions on food habits tell us about dietary intakes? Bulletin no. 108. Cat. no. AUS 163. Canberra: AIHW.

Australian Institute of Health and Welfare

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