# Evaluation of short dietary questions from the 1995 National Nutrition Survey

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This publication is part of the National Food and Nutrition Monitoring and Surveillance Project, funded by the Commonwealth Department of Health and Aged Care

This publication is one in a series of reports to be released from the National Food and Nutrition Monitoring and Surveillance Project, funded by the Commonwealth Department of Health and Aged Care.

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ISBN 0 642 82051 1
Publication Approval Number: 3058

# Contents

# List of tables

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### *CATI Health Survey Technical Reference Group*

Alison Daly and other members of the CATI group provided information about short dietary questions from recent health surveys.

# Abbreviations

ABS Australian Bureau of Statistics

AFGC Australian Food and Grocery Council

AFNMU Australian Food and Nutrition Monitoring Unit

AIHW Australian Institute of Health and Welfare

ANZFA Australia New Zealand Food Authority

BMI Body mass index

CDHAC Commonwealth Department of Health and Aged Care

CURF Confidentialised Unit Record File

CATI Computer assisted telephone interviewing

NHDD National Health Data Dictionary

NHMRC National Health and Medical Research Council

NATSINWP National Aboriginal and Torres Strait Islander Nutrition Working Party

NNS National Nutrition Survey, 1995 (Australia)

OATSIH Office of Aboriginal and Torres Strait Islander Health

SAS Statistical Analysis Software

SES Socio Economic Status

SEIFA Socio Economic Indexes for Areas

SIGNAL Strategic Inter-Governmental Nutrition Alliance

UQ University of Queensland

# Executive Summary

## Introduction

Six of the short dietary questions used in the 1995 National Nutrition Survey (see box below) were evaluated for relative validity both directly and indirectly and for consistency, by documenting the differences in mean intakes of foods and nutrients as measured on the 24-hour recall, between groups with different responses to the short questions.

1. Including snacks, how many times do you usually have something to eat in a day including evenings?
2. How many days per week do you usually have something to eat for breakfast?
3. In the last 12 months, were there any times that you ran out of food and couldn't afford to buy more?
4. What type of milk do you usually consume?
5. How many serves of vegetables do you usually eat each day? (a serve = 1/2 cup cooked vegetables or 1 cup of salad vegetables)
6. How many serves of fruit do you usually eat each day? (a serve = 1 medium piece or 2 small pieces of fruit or 1 cup of diced pieces)

These comparisons were made for males and females overall and for population sub-groups of interest including: age, socio-economic disadvantage, region of residence, country of birth, and BMI category.

Several limitations to this evaluation of the short questions, as discussed in the report, need to be kept in mind including:

- The method for comparison available (24-hour recall) was not ideal (gold standard); as it measures yesterday's intake. This limitation was overcome by examining only mean differences between groups of respondents, since mean intake for a group can provide a reasonable approximation for 'usual' intake.

- The need to define and identify, post-hoc, from the 24-hour recall the number of eating occasions, and occasions identified by the respondents as breakfast.

- Predetermined response categories for some of the questions effectively limited the number of categories available for evaluation.

- Other foods and nutrients, not selected for this evaluation, may have an indirect relationship with the question, and might have shown stronger and more consistent responses.

- The number of responses in some categories of the short questions eg for food security may have been too small to detect significant differences between population sub-groups.

- No information was available to examine the validity of these questions for detecting differences over time (establishing trends) in food habits and indicators of selected nutrient intakes.

By contrast, the strength of this evaluation was its very large sample size, (atypical of most validation studies of dietary assessment) and thus, the opportunity to investigate question performance in a range of broad population sub-groups compared with a well-conducted, quantified survey of intakes.

The results of the evaluation are summarised below for each of the questions and specific recommendations for future testing, modifications and use provided for each question.

The report concludes with some general recommendations for the further development and evaluation of short dietary questions.

## Question 1: Usual frequency of eating per day

**Relative validity (direct): Fair**

Only just over half of the sample group were correctly classified into the same category for the number of eating occasions, based on 24-hour recall data. It appears that some eating occasions defined by the 24-hour recall data, such as beverage only occasions, may not be considered when respondents report their usual frequency of eating on the short question. Respondents to short questions may underestimate the total number of occasions when food and or drink are consumed.

**Relative validity (indirect): Good**

Intake of selected foods, nutrients, and energy, that would be expected to be higher with greater frequency of eating in fact, were statistically significantly greater for those who reported usually eating five or more times per day compared with those who reported eating less frequently.

**Consistency for sub-groups**: **Good**

Statistically significant differences in intakes of many of the foods and nutrients tested were consistently different in the same direction for most population sub-groups.

**Recommendation**

Re-evaluate using data obtained by weighed food record from the 1996 Tasmanian Food and Nutrition Survey (Riley and Rutishauser 1998). Consider revising the question to an open-ended response format.

## Question 2: Usual frequency of eating breakfast

**Relative validity (direct): Poor**

The short question appeared to underestimate the frequency of breakfast consumption as assessed from the 24-hour recall, perhaps because people do not consider ‘breakfast’ to be ‘an eating or beverage only occasion’ as defined in the 24-hour recall.

**Relative validity (indirect)**: **Poor**

The reported usual frequency of breakfast consumption on the short question was not consistently associated with differences in food or nutrient intake as measured on the 24-hour recall which are of nutritional significance.

**Consistency for sub-groups: Poor**

Consistent differences in food and nutrient intake between population sub-groups reporting different frequency of breakfast intake were not observed.

**Recommendation**

This question does not appear to identify valid or consistent differences between response groups when compared with 24-hour recall data. Consider re-evaluating this question using weighed food record data from the Tasmanian study as a comparison method. Further cognitive testing may also be required to assess and define 'breakfast' to obtain valid and consistent responses

### Question 3: Food security: running out of food and unable to afford to buy more

**Relative validity (direct)**: **Appears good**

This was associated with all measures of socio-economic disadvantage measured in the survey.

**Relative validity (indirect)**: **Good**

Intake of foods and most nutrients that would be expected to be lower among those who were food insecure, were in fact statistically significantly lower.

**Consistency for sub-groups: Poor**

Consistency was poor for most foods and nutrients selected for analysis, perhaps partly because of the small proportion who responded affirmatively to this question.

**Recommendation**

This question appears to have reasonable validity to measure the prevalence of one aspect of food security, and those who report food insecurity appear to have diets lower in some aspects of nutritional quality than those not reporting food insecurity. Consider over-sampling of lower SES in population surveys to assess prevalence rates in population sub-groups of interest

## Question 4: Type of milk usually used

**Relative validity (direct): Good**

Groups reporting usual consumption of whole milk consumed predominantly whole milk on 24-hour recall, and those reporting usual use of fat-reduced milk usually consumed predominantly fat-reduced milk on 24-hour recall.

**Relative validity (indirect): Good**

The group reporting usually consuming whole (full-cream) milk had significantly higher mean intakes of percentage energy from total and saturated fat than those reporting usual consumption of fat reduced milk.

**Consistency: Good**

Statistically significant differences in the same direction for fat and saturated fat intake were found for all population subgroups.

**Recommendation**

Continue the use of this question as a measure of the prevalence of type of milk used, and as an indicator or discriminator of total and saturated fat consumption. Consider development of a question that measures the usual consumption of more than one type of milk, and the relative proportions of each consumed.

## Question 5: Usual vegetable intake

**Relative validity (direct): Fair**

Those reporting a greater number of usual serves on average had a higher intake of vegetables on the 24-hour recall. However, the short question appears to overestimate the number of 'standard' serves of vegetables, as compared with amounts of vegetables consumed on the 24-hour recall**.**

**Relative validity (indirect): Good**

Higher response categories for usual intakes of vegetables were associated with higher mean intakes of micronutrients usually found in vegetables.

**Consistency: Fair**

Results were consistently statistically significantly different for population sub-groups for pro-vitamin A, but not for vitamin C and folate.

**Recommendation**

The validity of this and alternative vegetable questions should be evaluated using data from the Tasmanian study. Consider separating the questions into at least two questions regarding potatoes and other vegetables. Attempts to standardise definitions of a serve size need to be made and further tested. Meanwhile, this question should be retained in population surveys so that trends can be established.

## Question 6: Usual fruit intake

**Relative validity (direct): Fair**

Mean intakes of fruit were higher among respondents reporting a higher usual frequency of fruit intake than those reporting a lower usual frequency. However, the short question appears to overestimate slightly, the number of 'standard' serves of fruit, as compared with amounts of fruit consumed on the 24-hour recall.

**Relative validity (indirect): Good**

As expected, mean intakes of micronutrients found in fruit were higher on the 24-hour recall for the groups reporting a higher usual intake of fruit.

**Consistency: Fair**

Of the nutrients evaluated, the strongest and most consistent correlate of fruit intake among population sub-groups was vitamin C, but this was not the case for pro-vitamin A or folate.

**Recommendation**

The validity of this and alternative fruit questions should be evaluated using data from the Tasmanian study. Consider including an additional question regarding fruit juice. Attempts to standardise definitions of a serve size need to be made and further tested. Meanwhile, this question should be retained in population surveys so that trends can be established.

## General recommendations

The 1996 Tasmanian Food and Nutrition Survey used a weighed food record as the primary method of dietary assessment and included the six questions evaluated in this report (4 in the same format and 2 in a modified format) and some alternative questions in addition. Thus, the performance of the six NNS questions and other short diet questions can be evaluated using a similar approach, and results will be reported shortly for comparison with these results.

Meanwhile, it is important that consistency of wording and response categories is maintained in questions used in national, and where possible, state health surveys, so that trends can be identified, nationally, and for population sub-groups.

To enable maximum potential for detecting change and comparing prevalence of responses with (changing) dietary recommendations, it would be desirable to allow open-ended responses, rather than to create categories of responses.

Terms commonly used in short questions such as ‘usual’ and ‘serve’ need to be clearly defined. The types of foods to which questions relate also need to be clearly specified.

The validity of these and other short diet questions, for detecting change over time, needs to be investigated, as a priority. One possibility is to build in smaller calibration studies to large population health surveys, so that a small sub-sample completes a more detailed dietary assessment each time the survey is conducted. From such calibration studies, it would become apparent how much change in a food or nutrient intake (as measured by the detailed method) is required, before a change in response category on the short question occurs.

# 1 Introduction

## 1.1 Background

Information about population dietary habits and how these are changing underpins rational planning and improvement of nutrition related health policies and programs.

A food and nutrition monitoring system can assist policy and service planners to obtain population-based dietary information. Underpinning a monitoring system is a national program of nutrition surveys, such as the one conducted in Australia in 1995. They occur at periodic and predictable intervals and supply information about food and nutrient intakes, how these compare with goals, and identify food habits that need to be modified on a population basis in order to improve nutrient intakes and nutritional status in accordance with recommendations. The interval between comprehensive surveys of this nature is necessarily medium to long term, ie 5-10 years. In part the time between surveys is determined by the resources required to conduct them and in part also by the fact that in the population as a whole changes in dietary intake occur relatively slowly and can only be ascertained reliably after a period of several years.

Between comprehensive nutrition surveys, the focus of food and nutrition monitoring needs to be on those aspects of food habits that are indicative of diet quality (eg fruit and vegetable intake, fat intake), as identified from comprehensive nutrition surveys. Measurement of single or selected aspects of food habits is more straightforward than measuring whole diets and the nutrients contained in them. Short questions about food habits can be included in population health surveys at minimal cost, and can supply valuable information, provided they are 'good questions'. What constitutes a 'good question' is discussed in a later section.

The AIHW was funded in 1992 to develop a plan for a National Food and Nutrition Monitoring Program, which included a review of instruments and short dietary questions in use in various health surveys around Australia at the time (Coles-Rutishauser 1996). This document summarised what was known about the performance of dietary questions, and highlighted the need for considerable further evaluation of them, if they are to be used as the basis of interim monitoring of the food and nutrition situation in Australia. In 1998, the NSW Health Department (Hewitt, Stickney and Webb 1998) compiled a set of interim recommendations for nutrition modules (clusters of questions to be administered simultaneously eg intake of fruit and vegetables) while recognising the need for extensive evaluation of these questions.

Users of short dietary questions are increasing in number, reflecting a growing interest in monitoring food habits and population nutrition by health surveyors. Since the AIHW report on available dietary instruments was completed, many state and territory health departments have instituted a regular telephone health survey program conducted by Computer Assisted Telephone Interview (CATI). Most of these surveys include dietary questions, although the questions vary between States. The ABS conducts the largest periodic health survey program in Australia and many of its surveys include short dietary questions.

The 1995 Australian National Nutrition Survey (NNS) included several short dietary questions as well as a full 24-hour recall of foods and beverages consumed by over 13,000 people, randomly selected from the Australian population. The data from this survey provided an excellent opportunity to evaluate the performance of short dietary questions in relation to a longer and more detailed dietary assessment method on a representative sample of the population.

Although 24-hour recall assessments have substantial limitations for measuring consumption and making judgements about diet quality of individuals, they are well suited as a basis for comparing groups of people who respond in different ways to short questions about usual food intake or food habits.

## 1.2 Objectives

This report presents the findings of an evaluation of six short dietary questions from the 1995 NNS. The objectives of the evaluation were to assess whether the response categories for each question discriminate between food and/or nutrient intakes (relative validity) and whether the performance for the total population was similar across the main population sub-groups of interest (consistency). The comparative data set was the 24-hour recall data obtained using the Individual Food Intake Questionnaire described in the *National Nutrition Survey Users' Guide 1995* (ABS, 1998).

Note that there was no opportunity in this study to evaluate how well the short questions detect **change** in food habits and/or nutrient intakes.

## 1.3 Potential users of this report

This evaluation is intended to provide supporting information to current users of short dietary questions regarding factors that influence the selection of questions and the interpretation of information obtained. The evaluation has contributed information that is relevant to the selection and justification of dietary questions for inclusion in the 2001 National Health Survey.

Groups who have indicated interest in the results of this evaluation include:

- state and territory health departments, eg epidemiology branches responsible for conducting population-based nutrition surveys which include short nutrition questions/modules;
- those involved in conducting CATI surveys;
- users of the 1995 National Nutrition Survey data, particularly those interested in the results from the short questions;
- other agencies interested in population food habits and trends in these; and
- community dietitians, public health nutritionists and epidemiologists.

## 1.4 Benefits of using short dietary questions

There are several commonly used methods for assessing the overall food intake among a sample of the population including: the 24-hour recall (used in the 1995 NNS), weighed food records for one or more days and food frequency questionnaires of usual intake for periods of weeks or months. Each of these methods has particular strengths and weaknesses in the context of population-based surveys (Rutishauser, 2000).

In the absence of information on overall food intake short dietary questions can be used to assess more limited aspects of food intake and can provide both qualitative and quantitative information on intake over varying periods of time. They can be used to provide interim data on key indicators of food intake, food habits, food security, food access, barriers to dietary change and breastfeeding. They can be used at the local as well as the national level and can be administered via the telephone, via mail surveys or using face-to-face interviews.

Short dietary questions have several advantages over more comprehensive methods of assessing food and nutrient intake:

- they make fewer demands on respondents, potentially increasing response rates;
- the data are relatively inexpensive to collect, potentially enabling large sample sizes;
- they can provide summary information rapidly; and
- because the data collected are less detailed, short questions are likely to be less influenced by an increasingly complex food supply and an increasing tendency to eat food prepared outside the home, both of which make it more difficult for individuals to accurately report what they eat.

## 1.5 Limitations of short dietary questions

Despite the benefits of using short dietary questions listed above they have several limitations in relation to dietary assessment:

- they can provide information on only limited aspects of food intake and food habits;
- in general, they are more likely to be useful for describing the food intake and food habits of groups than of individuals; and
- the information they provide may not be sensitive enough to detect change at the level necessary for regular monitoring purposes.

## 1.6 Attributes of a 'good' dietary question

Attributes of 'good' dietary measurement methods have been summarised by a number of authors experienced in dietary assessment (Cameron & van Staveren 1988; Gibson 1990; Willett 1990 and Margetts and Nelson 1991). When these are applied to short dietary questions, at least six characteristics of 'good' questions can be identified.

### 1. Indicative of important aspects of dietary quality

To inform public health nutrition policy and planning, a short dietary question should reflect an aspect of nutrition that is of public health relevance for the population of interest.

### 2. Valid

A valid short question is one in which the results accurately reflect the information it is designed to obtain. It is hardly ever possible to assess the *absolute validity* of dietary questions in population-based surveys since the 'truth' is not usually known (Block 1982). Comparison with another, usually more detailed, method of dietary assessment can provide a measure of *relative validity*.

### 3. Reproducible

A reproducible question gives the same results when repeated under the same conditions.

### 4. Consistent

A consistent question is one that performs in the same way in different sub-groups of the population.

### 5. Responsive

A responsive short question is capable of measuring change in the outcome/variable/factor of interest.

### 6. Independent of the method of administration

A good short question needs to be suitable for administration in a variety of ways (eg face-to-face, self-administered, CATI). For this to occur, the questions should require minimal accompanying information (such as pictures of serve sizes).

In this report it has only been possible to evaluate each of the short questions in terms of ***relative validity*** and ***consistency*** (see section 2.2 and 2.3).

## 1.7 Context for the selection and development of short dietary questions

### National Public Health Nutrition Strategy – Eat Well Australia

The Draft Eat Well Australia strategy (SIGNAL 2000) has been developed under the umbrella of the National Public Health Partnership. The Strategic Inter-Governmental Nutrition Alliance (SIGNAL) will oversee its implementation and management.

The strategy comprises four initiatives. They include: prevention of overweight and obesity; increasing the consumption of vegetables, legumes and fruit; promotion of optimal nutrition for women, infants and children; and improving nutrition for vulnerable groups. Several indicators have been described for each of these initiatives. Development of short dietary questions should align with these initiatives and where possible provide data for indicator monitoring.

### National Aboriginal and Torres Strait Islander Nutrition Strategy and Action Plan

The Draft National Aboriginal and Torres Strait Islander Nutrition Strategy and Action Plan (NATSINWP 2000) is a companion document to the Eat Well Australia report described above.

The strategy comprises eight initiatives. They include: managing implementation of the strategy; food supply and access; building and sustaining an Aboriginal and Torres Strait Islander nutrition workforce; ‘good practice’ for public health nutrition activities in Aboriginal and Torres Strait Islander communities; family focused initiatives in food and nutrition for Aboriginal and Torres Strait Islander communities; nutrition issues of Aboriginal and Torres Strait Islander people living in urban environments; national nutrition information systems which can be accessed, updated and used by

Aboriginal and Torres Strait Islander workforce and community; and establishing links between household and community infrastructure and improved nutrition outcomes. Several indicators have been described for each of these initiatives. Development of short dietary questions should align with these initiatives and where possible provide data for indicator monitoring.

### Monitoring public health nutrition indicators

The Australian Food and Nutrition Monitoring Unit will report on a selected set of public health nutrition indicators endorsed by SIGNAL. The list is a compilation of indicators published in various reports over the past 10–15 years (*Health for all Australians* 1988; *Goals and Targets for Australia's health in the year 2000 and beyond* 1993; *Better health outcomes for Australians* 1994; *National health priority areas, cardiovascular health* 1998; *Development of national public health indicators discussion paper* 1999;) and will be refined to align with Eat Well Australia (see above).

### National Health Data Dictionary

The National Health Data Dictionary (NHDD) is coordinated by the National Health Data Committee and is published annually (including on the internet) by AIHW. It is designed to '…improve comparability of data across the health field…' and '…to make data collection activities more efficient by reducing duplication of effort in the field, and more effective by ensuring that information to be collected is appropriate to its purpose' (NHDD 1999, p xvii). Whilst the origins of the NHDD were in information systems for institutional health care, increasingly, it is being used as a vehicle for standardising public health information systems (eg definitions for body mass index, including how to measure height and weight were included in the NHDD for the first time in 1999).

A rigorous process of quality assurance and clearance is required before data elements are included in the dictionary. The process described in this report is the first step towards validating potential public health nutrition data definitions that might be included in future editions of the NHDD.

## 1.8 Forthcoming related reports

This is the first in a series of related reports intended for publication:

#### *1. Key food and nutrition data: Australia 1990-99*

This report will show current status in the Australian population for a range of food and nutrition data and indicators of interest to those working in the public health area. The data have been selected from a variety of contemporary sources, in consultation with expert groups (including SIGNAL). The report will also identify data gaps and make recommendations for future data development.

#### *2. Comparison of short questions with weighed food records*

This report will compare the results of a wide range of short questions from the NHMRC 1996 Tasmanian Food and Nutrition Survey with weighed food records. In addition, the performance of the questions among different population sub-groups will be assessed.

### *3. Recommended instruments, indicators, protocols for collection, analysis and reporting on priority food habits in the Australian population and priority subgroups*

This report will make recommendations for the development of a standard set of short questions for use in monitoring public health nutrition using results from this report and the report described above *(Comparison of short questions with weighed food records)*.

### *4. Monitoring breastfeeding: indicators and questions for use in Australia*

The objective of this product is to conduct preliminary work and make recommendations that will lead to standardised breastfeeding indicators and questions for inclusion in the National Health Data Dictionary (NHDD).

# 2 Methods

The discussion on methods is confined to the steps undertaken in selecting and evaluating the short questions. A detailed description of the survey methodology used in the 1995 NNS can be found in the *National Nutrition Survey: Users' Guide 1995* (ABS Cat No 4801.0).

## 2.1 Selection of short dietary questions from the 1995 NNS

Six short questions from the 1995 NNS were chosen for analysis. They were chosen on the following basis:

- use of the question (or one of similar content) in a selected list of recent population-based health surveys; and
- the existence of at least one comparative variable in the 24-hour recall to assess relative validity (see section 2.2).

The questions were selected from section C – Food Related Questions (see Q1 – Q3 below) which included questions on food habits and food security and from section 2 of the Food Frequency Questionnaire (FFQ) component of the 1995 NNS which included questions on food habits of interest in relation to the Dietary Guidelines for Australians (see Q4 – Q6 below).

***Questions from the 24-hour recall***

*Q1 Including snacks, how many times do you usually have something to eat in a day including evenings?*

*Q2 How many days per week do you usually have something to eat for breakfast?*

*Q3 In the last 12 months, were there any times that you ran out of food and you couldn't afford to buy more?*

***Food Frequency Questionnaire***

*Q4 What type of milk do you usually consume?*

*Q5 How many serves of vegetables do you usually eat each day?*

*Q6 How many serves of fruit do you usually eat each day?*

For each question, the analysis was restricted to adults aged 19 years and over.

The total number of 24-hour recalls completed by respondents aged 19 years and over was 10,851. The total number of FFQs returned by respondents aged 19 years and over was 8,560 (see table 2.2 for further details).

## 2.2 Evaluation criteria for each question

Having selected the six questions for analysis, the evaluation criteria for each question were identified.

**Validity** was assessed in two different ways by comparison with data obtained, in the same individuals, from the 24-hour recall interview. Because 24-hour recall data does not provide an absolute or 'gold standard' measure of usual intake we have used the term *relative validity* in this report.

A *direct* assessment of *relative validity* was obtained by comparing the response categories for each question with relevant food intake variables from the 24-hour recall to determine how well the results from the short question agreed with the same or similar information derived from the more detailed dietary assessment. For some questions it was possible to compare essentially the same data (eg number of serves of fruit compared with the number of grams of fruit and fruit products derived from the 24-hour recall) whilst for other questions the comparison was with similar data (eg frequency of eating with the number of different eating occasions reported in the 24 hour recall). For the food security question the responses were tested to see if they aligned with indices known to have socio-economic differentials.

An *indirect* assessment of *relative validity* was obtained by comparing the response categories for each question with data on some key food and nutrient variables, obtained from the 24-hour recall, that might also be expected to differ if the response categories of the question reflected real differences in food intake. A summary of the variables used to assess both direct and indirect aspects of *relative validity* for the short questions is shown in table 2.1.

**Consistency** was assessed by determining whether statistically significant relationships observed at population level ($p<0.001$), between the question response categories and relevant food and nutrient data from the 24-hour recall were also evident for the population sub-groups ($p<0.05$) selected for analysis. The population characteristics chosen for sub-group analysis were: sex, age, SEIFA index of relative disadvantage, geographic region, country of birth and body mass index. In order to ensure adequate numbers in all sub-groups the analysis was confined to two sub-groups for each socio-demographic characteristic. In each case the cut-points were based on obtaining approximately equal numbers in both sub-groups and determined by the groupings used in the 1995 NNS CURF.

## 2.3 Analysis

The distribution of responses for each short question was determined and reviewed to ensure, as far as possible, adequate sample sizes for statistical comparisons between response groups. Response categories for five of the six questions were aggregated as a consequence of this review (see table 2.2). The population sub-groups selected for this analysis were the same as those chosen to assess consistency (see section 2.2). In the final analysis population-weighted estimates for the chosen variables of interest from the 24-hour recall were compared with the modified response categories for each of the six questions. The weighted percentages in the final analysis can differ slightly from those in table 2.2 (unweighted). Differences reflect adjustments for survey non-response and unequal probabilities of selection.

***Relative validity (direct)*** was assessed both for the total sample of respondents aged 19 years and over and by sex. Because the nature of the data obtained and the type of analysis used to assess agreement differed between the six questions the specific approach used for each question is described in the results section of this report.

***Relative validity (indirect)*** was assessed statistically by testing differences between means derived from the 24-hour recall data using t-tests or one-way analysis of variance. These results were confirmed using equivalent non-parametric tests (Kruskal-Wallis and median one-way analysis). If a statistically significant result obtained at population level ($p<0.001$) was confirmed by the non-parametric tests, **consistency** was then assessed for the relevant variable(s) by repeating the statistical analysis for each of the 22 population sub-groups. A question was deemed to give consistent results across population sub-groups if at least 20 of the 22 of the sub-groups (90%) showed statistically significant differences ($p<0.05$) between means for all response categories for the question.

Despite the known skewness of food and nutrient intake distributions, means rather than medians have been reported in this report because in general readers are more familiar with this statistic for food and nutrient intakes and because means for sub-groups can be aggregated whereas this is not possible with medians. Data analysis was undertaken using SAS V8.0. The results are shown in chapter 3.

**Table 2.1: Comparative variables* from the 24-hour recall chosen to assess the relative validity of the six selected questions from the 1995 NNS**

| Questions | Direct assessment | Indirect assessment | | |
|---|---|---|---|---|
| | | Food groups[#] | Nutrients | Other |
| ***Frequency of eating*** | | | | |
| **Q1 Including snacks, how many times do you usually have something to eat in a day including evenings?** | Number of 'eating occasions' - excluding the occasion of 'plain drinking water' | Cereals and cereal products, fruit products and dishes, vegetable products and dishes, milk products and dishes | Total fat (as a % energy); intake of calcium | Total energy, EI:BMR |
| ***Frequency of eating breakfast*** | | | | |
| **Q2 How many days per week do you usually have something to eat for breakfast?** | 'Breakfast' or 'brunch' as an eating occasion | Cereals and cereal products, fruit products and dishes, milk products and dishes | Nutrient density of calcium, iron, folate, dietary fibre | Total energy, EI:BMR |
| ***Food security*** | | | | |
| **Q3 In the last 12 months, were there any times that you ran out of food and you couldn't afford to buy more?** | Socioeconomic variables: labour force status, SEIFA, main source of income, equivalent income type of occupancy | Meat, poultry and game products and dishes, milk products and dishes, fruit products and dishes | Nutrient density of calcium, iron, folate, vitamin C | Total energy, EI:BMR |
| ***Milk intake*** | | | | |
| **Q4 What type of milk do you usually consume?**<br><br>*(Note: Comparison based on 'whole' and 'Low/reduced fat and skim')* | 'Whole milk' compared with food codes 1911 and 1912<br><br>'Low/reduced fat and skim' compared with food codes 1913, 1914 and 1915 | | Total fat (as % energy), Saturated fat (as % energy) | |
| ***Vegetable intake*** | | | | |
| **Q5 How many serves of vegetables do you usually eat each day? (a serve = ½ cup cooked vegetables or 1 cup of salad vegetables)** | Vegetable products and dishes | | Intake of provitamin A, vitamin C and folate | |

| Questions | Direct assessment | Indirect assessment | | |
|---|---|---|---|---|
| | | Food groups[#] | Nutrients | Other |
| ***Fruit intake*** | | | | |
| **Q6 How many serves of fruit do you usually eat each day? (a serve = 1 medium piece or 2 small pieces of fruit or 1 cup of diced pieces)** | Fruit products and dishes | | Intake of provitamin A, vitamin C and folate | |

* Comparative variables are those identified on the CURF

# The food groups used are the major food groups from the 1995 NNS (ABS, 1998 Cat No 4801.0)

**Table 2.2: 1995 NNS response categories compared with the response categories chosen for analysis, for each of the six selected short dietary questions**

| Questions | 1995 NNS response categories | | | 1995 NNS response categories used in the analysis | |
|---|---|---|---|---|---|
| | Response categories | Number of respondents | Percentage of total sample | Grouped response categories | Number of respondents |
| ***Frequency of eating*** | | | | | |
| **Q1 Including snacks, how many times do you usually have something to eat in a day including evenings?** | Once | 81 | 0.8 | <5 times | 6,306 |
| | 2 to 4 times | 6,225 | 57.4 | 5 or more times | 4,424 |
| | 5 to 6 times | 3,971 | 36.6 | | |
| | 7 or more times | 453 | 4.2 | | |
| | Don't know/varies/depends | 115 | 1.1 | | |
| | Not stated | 6 | 0.1 | | |
| | **TOTAL** | **10,851** | | **TOTAL** | **10,730** |
| ***Frequency of Eating Breakfast*** | | | | | |
| **Q2 How many days per week do you usually have something to eat for breakfast?** | Rarely or never | 908 | 8.4 | Rarely or never | 908 |
| | 1 to 2 days | 777 | 7.2 | | |
| | 3 to 4 days | 634 | 5.8 | 1 to 4 days | 1,411 |
| | 5 or more days | 8,481 | 78.2 | 5 or more days | 8,481 |
| | Don't know/varies/depends | 47 | 0.4 | | |
| | Not stated | 4 | 0.0 | | |
| | **TOTAL** | **10,851** | | **TOTAL** | **10,800** |
| ***Food Security*** | | | | | |
| **Q3 In the last 12 months, were there any times that you ran out of food and you couldn't afford to buy more?** | Yes | 525 | 4.8 | Yes | 525 |
| | No | 10,289 | 94.8 | No | 10,289 |
| | Not applicable/stated | 37 | 0.3 | | |
| | **TOTAL** | **10,851** | | **TOTAL** | **10,814** |

| Questions | 1995 NNS response categories | | | 1995 NNS response categories used in the analysis | |
|---|---|---|---|---|---|
| | Response categories | Number of respondents | Percentage of total sample | Grouped response categories | Number of respondents |
| ***Milk Intake*** | | | | | |
| **Q4 What type of milk do you usually consume?** | Whole | 4,002 | 46.8 | Whole | 4,002 |
| | Low/reduced fat | 2,595 | 30.3 | Low/reduced fat and skim | 3,814 |
| | Skim | 1,219 | 14.2 | | |
| | Evaporated or sweetened milk | 47 | 0.6 | | |
| | None of the above | 356 | 4.2 | | |
| | Don't know | 20 | 0.2 | | |
| | Both low/fat reduced and skim | 51 | 0.6 | | |
| | Both whole and low/fat reduced | 51 | 0.6 | | |
| | Both whole and skim | 39 | 0.5 | | |
| | Not stated or unusable response | 180 | 2.1 | | |
| | **TOTAL** | **8,560** | | **TOTAL** | **7,816** |

| Questions | 1995 NNS response categories | | | 1995 NNS response categories used in the analysis | |
|---|---|---|---|---|---|
| | Response categories | Number of respondents | Percentage of total sample | Grouped response categories | Number of respondents |
| ***Vegetable Intake*** | | | | | |
| **Q5 How many serves of vegetables do you usually eat each day? (a serve = ½ cup cooked vegetables or 1 cup of salad vegetables)** | Don't eat vegetables | 30 | 0.4 | <2 serves (includes 'Don't eat vegetables') | 2,177 |
| | 1 serve or less | 2,147 | 25.1 | | |
| | 2-3 serves | 4,626 | 54.0 | 2-3 serves | 4,626 |
| | 4-5 serves | 1,475 | 17.2 | 4 or more serves | 1,670 |
| | 6 serves or more | 195 | 2.3 | | |
| | Not stated | 78 | 0.9 | | |
| | Unusable response | 9 | 0.1 | | |
| | **TOTAL** | **8,560** | | **TOTAL** | **8,473** |
| ***Fruit Intake*** | | | | | |
| **Q6 How many serves of fruit do you usually eat each day? (a serve = 1 medium piece or 2 small pieces of fruit or 1 cup of diced pieces)** | Don't eat fruit | 222 | 2.6 | <2 serves (includes 'Don't eat fruit') | 4,135 |
| | 1 serve or less | 3,913 | 45.7 | | |
| | 2-3 serves | 3,645 | 42.6 | 2-3 serves | 3,645 |
| | 4-5 serves | 616 | 7.2 | 4 or more serves | 711 |
| | 6 serves or more | 95 | 1.1 | | |
| | Not stated | 64 | 0.8 | | |
| | Unusable response | 5 | 0.1 | | |
| | **TOTAL** | **8,560** | | **TOTAL** | **8,491** |

*Source*: 1995 NNS

# 3 Results and interpretation

## 3.1 Frequency of eating

### Question

*Including snacks, how many times do you usually have something to eat in a day including evenings?*

The analysis compares: '< 5 times per day' and '5 or more times per day'.

### Limitations to evaluation

The pre-determined response categories for this question, which were once, 2 to 4 times, 5 to 6 times and 7 or more times per day, resulted in over 90% of all responses falling into two of the four possible categories: 2 to 4 times and 5 to 6 times. As a consequence of this distribution of responses it was possible to compare data statistically only for the two categories of response described above.

Relative validity was assessed directly by determining the number of different eating occasions reported in the 24-hour recall and comparing this with the number based on the short question response category. The number of different options provided for describing an eating occasion in the 24-hour recall was seven. Using the number of different eating occasions may have underestimated the total number of eating occasions from the 24-hour recall because while a person is unlikely to refer to an eating occasion such as breakfast more than once during a period of 24 hours it is possible that options such as 'food and/or beverage break' and 'other' could have occurred more than once during the same period. On the other hand, because each food and beverage consumed had to be assigned to an eating occasion in the 24-hour recall the 24-hour recall might result in a higher number of eating occasions than the response obtained from the short question that might omit 'beverage intake only' occasions.

### Results of evaluation

#### *Pattern of response (table 3.1.1)*

Over 99% of the sample provided a useable response to the question but about 1% could not specify their usual frequency of eating. The majority (57%) of those who completed the question reported usually eating less than five times per day. The proportion of respondents who reported usually eating five or more times per day was consistently higher for females than males in all population sub-groups. It was also higher for younger adults, those born in Australia, those living in rural and remote areas, those with a BMI <25 and for those living in areas for which the index of relative social disadvantage was in the upper two quintiles for Australia.

#### *Relative validity - direct (table 3.1.2)*

When the data from 24-hour recall and the short question were cross-classified using three categories (1, 2 to 4 and 5 or more eating occasions per day) ~55% of the respondents were classified into the same category by both sources of information and <1% into non-adjacent categories. About one third of all the respondents were classified into a higher category by the 24-hour recall data than by their response to the short question. This result suggests that some 'eating occasions' defined by the 24-hour recall, such as beverage intake only occasions, may not be included by respondents when reporting their 'usual frequency of eating'.

#### *Relative validity - indirect (table 3.1.3)*

Table 3.1.3 shows means and 95% confidence intervals and the results of statistical evaluation between frequency categories by t-test. Non-parametric tests of differences gave similar results.

*Foods*

Intake of cereals and cereal products, fruit products and dishes and milk products and dishes were all statistically significantly greater for those who reported usually eating five or more times per day as compared with those who reported eating less frequently. Intake of vegetable products and dishes was significantly higher for women but not for men.

*Energy*

Energy intake in kJ per day and the ratio of energy intake to basal metabolic rate were also both significantly higher in those who reported usually eating five or more times per day.

*Nutrients*

The proportion of total energy from fat did not differ significantly with frequency of eating category but intake of calcium expressed in mg per day was significantly higher in those who reported usually eating five or more times per day.

#### *Consistency (table 3.1.4)*

Fruit intake, energy intake and calcium intake all showed statistically significant differences between frequency categories for all 22 population sub-groups tested. The remaining variables tested (cereal and milk intake and EI:BMR) showed statistically significant differences for 17 or more sub-groups. The exceptions for cereal (5) and milk intake (1) all occurred in males while those for EI:BMR (2) occurred in both males and females but not for the same population sub-groups.

## Conclusion

Evaluation of this question was limited by the use of pre-determined response categories in the 1995 NNS. When there is no prior information on the distribution of responses for a question an open rather than a closed question format is more likely to provide information that can be effectively evaluated.

Significant differences in food and nutrient intake were associated with greater frequency of eating. Those usually eating more frequently (five or more times per day) having a significantly higher mean intake by 24-hour recall than those usually only eating between one and four times per day. The differences between frequency categories were statistically significant for all 22 population sub-groups tested, for fruit intake, energy intake and calcium intake.

## Pattern of response

**Table 3.1.1: Percentage of respondents 19 years and over, by usual frequency-of-eating category from short question, for major population sub-groups in the 1995 NNS**

| Population subgroup | < 5 times per day | 5 or more times per day |
|---|---|---|
| ***ADULTS*** | | |
| **All aged 19 years and over** | **57.2** | **42.8** |
| ***MALES*** | | |
| ***All*** | 58.7 | 41.4 |
| ***Age*** | | |
| **19–44 years** | 55.7 | 44.3 |
| **45 years and over** | 62.3 | 37.7 |
| ***SEIFA*** | | |
| **1st and 2nd quintiles** | 61.3 | 38.7 |
| **4th and 5th quintiles** | 55.8 | 44.2 |
| ***Regions**** | | |
| **Metro/capital** | 60.0 | 40.1 |
| **Remote/rural** | 56.4 | 43.7 |
| ***Country of birth*** | | |
| **Australia** | 55.6 | 44.4 |
| **Not Australia** | 67.1 | 32.9 |
| ***BMI*** | | |
| **<25** | 54.1 | 45.9 |
| **25 or more** | 61.1 | 38.9 |
| ***FEMALES*** | | |
| ***All*** | 55.8 | 44.2 |
| ***Age*** | | |
| **19–44 years** | 52.3 | 47.7 |
| **45 years and over** | 60.0 | 40.0 |
| ***SEIFA#*** | | |
| **1st and 2nd quintiles** | 58.3 | 41.7 |
| **4th and 5th quintiles** | 53.2 | 46.8 |
| ***Regions**** | | |
| **Metro/capital** | 56.9 | 43.1 |
| **Remote/rural** | 53.5 | 46.5 |
| ***Country of birth*** | | |
| **Australia** | 53.5 | 46.5 |
| **Not Australia** | 62.6 | 37.4 |
| ***BMI*** | | |
| **<25** | 53.4 | 46.6 |
| **25 or more** | 58.5 | 41.5 |

# Quintile 1 represents areas with the greatest relative disadvantage and quintile 5 those with the least disadvantage

* 'Regions' excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as 'ACT/NT', 'Brisbane' and 'Other Qld metropolitan/rural centres').

*Source*: 1995 NNS CURF

## Relative validity - direct

### Table 3.1.2: Usual frequency-of-eating category from short question cross- classified by number of different eating occasions from 24-hour recall, by sex and for respondents 19 years and over

| Usual frequency of eating * | Number of eating occasions from 24-hour recall | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Males | | | Females | | | All 19 years and over | | |
| | < 2 | 2-4 | 5 or more | <2 | 2-4 | 5 or more | <2 | 2-4 | 5 or more |
| | Percent | | | | | | | | |
| **<2** | 0.04 | 0.66 | 0.25 | 0.04 | 0.32 | 0.28 | 0.04 | 0.49 | 0.26 |
| **2-4** | 0.15 | 25.7 | 32.3 | 0.02 | 21.1 | 34.9 | 0.08 | 23.4 | 33.6 |
| **5 or more** | 0.00 | 11.4 | 29.6 | 0.04 | 9.7 | 33.6 | 0.05 | 10.5 | 31.6 |

* Excludes those who were coded as 'Not applicable' or reported 'Don't know' or 'No answer'.

*Source*: 1995 NNS CURF

## Relative validity - indirect

### Table 3.1.3: Mean food, energy and nutrient intake from 24-hour recall, by frequency-of-eating category from short question, for respondents 19 years and over

| Parameters | < 5 times per day (95% CI) | 5 or more times per day (95% CI) | Level of significance between means by t-test # |
|---|---|---|---|
| **Foods** | | | |
| **Cereals and cereal products (g/day)** | 199.6 (193.9-205.4) | 229.4 (222.7-236.1) | *** |
| **Fruit products and dishes (g/day)** | 121.6 (115.4-127.7) | 176.5 (169.4-183.7) | *** |
| **Vegetable products and dishes (g/day)** | 255.1 (248.6-261.5) | 268.1 (260.6-275.6) | ** |
| **Milk products and dishes (g/day)** | 259.9 (251.6-268.2) | 330.6 (321.0-340.2) | *** |
| **Energy intake** | | | |
| **Total energy intake (kJ/day)** | 8,801 (8,684-8,918) | 9,855 (9,720-9,991) | *** |
| **EI/BMR** | 1.36 (1.34-1.39) | 1.53 (1.50-1.55) | *** |
| **Nutrients** | | | |
| **Proportion of energy from total fat (%)** | 32.4 (32.2-32.7) | 32.5 (32.2-32.7) | NS |
| **Calcium (mg/day)** | 776.6 (762.0-791.3) | 943.0 (926.1-960.0) | *** |

# * p<0.05, ** p<0.01 and *** p<0.001

*Source*: 1995 NNS CURF

## Consistency: sub-group analysis

### Table 3.1.4: Statistically significant differences (·) in mean food and nutrient intake from 24-hour recall, between frequency-of-eating categories, for major population sub-groups

| Population subgroup | | Cereals g/day | | Fruit g/day | | Milk g/day | | Total energy kJ/day | | EI:BMR | | Calcium mg/day | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Sex*** | | **M** | **F** | **M** | **F** | **M** | **F** | **M** | **F** | **M** | **F** | **M** | **F** |
| ***All 19 years and over*** | | · | · | · | · | · | · | · | · | · | · | · | · |
| ***Age*** | **19–44 years** | · | · | · | · | · | · | · | · | · | · | · | · |
| | **45 years and over** | | · | · | · | · | · | · | · | | · | · | · |
| ***SEIFA*** | **1st and 2nd quintiles** | · | · | · | · | · | · | · | · | · | · | · | · |
| | **4th and 5th quintiles** | | · | · | · | · | · | · | · | · | | · | · |
| ***Regions#*** | **Metro/capital** | | · | · | · | | · | · | · | · | · | · | · |
| | **Remote/rural** | · | · | · | · | · | · | · | · | · | | · | · |
| ***Country of birth*** | **Australia** | · | · | · | · | · | · | · | · | · | · | · | · |
| | **Not Australia** | | · | · | · | · | · | · | · | · | · | · | · |
| ***BMI*** | **<25** | | · | · | · | · | · | · | · | · | · | · | · |
| | **25 or more** | · | · | · | · | · | · | · | · | · | · | · | · |

# 'Regions' excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as 'ACT/NT', 'Brisbane' and 'Other Qld metropolitan/rural centres').

· Population sub-groups with statistically significant differences at $p<0.05$

*Source*: 1995 NNS CURF

## 3.2 Frequency of eating breakfast

### Question

*How many days per week do you usually have something to eat for breakfast?*

The analysis compares: rarely or never, 1 to 4 times per week, and 5 or more times per week.

### Limitations to evaluation

The question provided four response options rarely or never, 1 to 2 times, 3 to 4 times and 5 or more days per week. The distribution of responses obtained, however, meant that the middle two frequency categories had to be aggregated to provide sufficient data for the purpose of statistical analysis.

Relative validity was assessed directly by determining the proportion of individuals who reported consuming breakfast or brunch in the 24-hour recall compared with the proportion expected on the basis of their response to the breakfast question. For example 2/7x100 or 29% of persons who report that they usually consume breakfast twice a week would be expected to consume breakfast on any given day.

In the 24-hour recall all foods or beverages consumed were assigned to an eating occasion. It is possible, therefore, that the 24-hour recall resulted in a higher frequency of breakfast/brunch occasions than would be expected from the short question since, in the context of the short question, the consumption of a single food or beverage item might not be considered as ‘a breakfast’.

### Results of evaluation

#### *Pattern of response (table 3.2.1)*

All respondents provided a useable answer to the question and less than 0.5% could not specify their usual frequency of breakfast consumption. More than 75% of respondents reported usually eating breakfast on five or more days per week and less than 10% reported rarely or never eating breakfast. For all population sub-groups a higher proportion of females than males reported eating breakfast five or more times per week. Regular consumption of breakfast was highest in females aged 45 years and over (>90%).

#### *Relative validity - direct (table 3.2.2)*

With the exception of those who usually reported eating breakfast on five or more days per week the proportion of respondents who reported a breakfast/brunch eating occasion yesterday in the 24-hour recall greatly exceeded the proportion that would have been expected on the basis of their response to the breakfast question. This result suggests that using the ‘eating occasion’ variable from the 24-hour recall to assess the frequency of breakfast per week may well overestimate the ‘true’ usual frequency of breakfast consumption.

#### *Relative validity - indirect (table 3.2.3)*

Table 3.2.3 shows mean intakes and 95% confidence intervals for the three breakfast frequency categories and the results of statistical evaluation of differences between means by one-way analysis of variance. Non-parametric tests gave similar results.

*Foods*

Of the foods evaluated only intake of cereals and cereal products showed statistically significant differences in mean intake between all frequency response categories. Intake of fruit and fruit products and milk and milk dishes did not differ significantly between those who rarely or never ate breakfast and those who usually ate breakfast on one to four days per week but were significantly higher for those who usually ate breakfast on five or more days per week than for those who usually ate breakfast on one to four days per week.

*Energy*

Neither total energy intake nor the ratio of energy intake to basal metabolic rate (EI:BMR) showed consistent statistically significant increases with increasing frequency of breakfast. Mean energy intake (kJ/day) was lowest for those who usually ate breakfast on five or more days per week while this group had the highest mean EI:BMR.

*Nutrient density*

Nutrient density (intake expressed /kJ) for dietary fibre, calcium, iron and folate, were evaluated for this question because of the particular contribution that breakfast foods can make to the intake of these nutrients. No statistically significant increases with increasing frequency of breakfast were found between those eating breakfast once or less per week and those eating breakfast on two to three days per week. However, the density of the diet was significantly higher for all four nutrients in those who consumed breakfast on five or more days per week than for those who consumed breakfast less frequently.

***Consistency (table 3.2.4)***

Cereal intake was significantly higher with frequency of breakfast for only eight of the 22 population sub-groups tested. For both males and females cereal intake increased significantly with the frequency of breakfast in those aged 19-44 years and those who were born in Australia.

## Conclusion

The direct assessment of relative validity indicated that in the 24-hour recall the proportion of respondents, who described an eating occasion as breakfast or brunch, was considerably higher than the proportion that would be expected on the basis of the response to the breakfast question.

If the breakfast question provides valid information on the usual frequency of breakfast then the proportion of the population who eat breakfast on less than five days per week is only ~25% and this frequency of breakfast consumption is not consistently associated with differences in food or nutrient intake which are likely to be of nutritional significance.

## Pattern of response

**Table 3.2.1: Percentage of respondents 19 years and over, by frequency-of-breakfast category from short question, for major population sub-groups in the 1995 NNS**

| Population subgroup | | Rarely or never | 1 to 4 times per week | 5 or more times per week |
|---|---|---|---|---|
| | | ***ADULTS*** | | |
| **All aged 19 years and over** | | **8.47** | **13.52** | **78.01** |
| | | ***MALES*** | | |
| ***All*** | | 10.4 | 15.5 | 74.2 |
| ***Age*** | **19–44 years** | 13.5 | 21.6 | 65.0 |
| | **45 years and over** | 6.4 | 7.8 | 85.7 |
| ***SEIFA*** | | | | |
| | **1st and 2nd quintiles** | 12.2 | 14.8 | 73.0 |
| | **4th and 5th quintiles** | 8.4 | 15.7 | 76.0 |
| ***Regions**** | | | | |
| | **Metro/capital** | 11.3 | 15.5 | 73.2 |
| | **Remote/rural** | 9.2 | 14.2 | 76.6 |
| ***Country of birth*** | | | | |
| | **Australia** | 9.8 | 15.4 | 74.9 |
| | **Not Australia** | 12.0 | 15.9 | 72.1 |
| ***BMI*** | | | | |
| | **<25** | 11.0 | 15.1 | 73.9 |
| | **25 or more** | 10.0 | 15.8 | 74.2 |
| | | ***FEMALES*** | | |
| ***All*** | 6.6 | 11.6 | 81.8 | |
| ***Age*** | | | | |
| | **19–44 years** | 9.5 | 17.0 | 73.4 |
| | **45 years and over** | 3.2 | 5.1 | 91.7 |
| ***SEIFA*** | | | | |
| | **1st and 2nd quintiles** | 8.7 | 12.7 | 78.6 |
| | **4th and 5th quintiles** | 5.2 | 10.3 | 84.5 |
| ***Regions**** | | | | |
| | **Metro/capital** | 7.3 | 11.7 | 81.0 |
| | **Remote/rural** | 5.3 | 11.3 | 83.4 |
| ***Country of birth*** | | | | |
| | **Australia** | 6.3 | 10.7 | 82.9 |
| | **Not Australia** | 7.5 | 14.1 | 78.4 |
| ***BMI*** | | | | |
| | **<25** | 7.0 | 13.0 | 80.0 |
| | **25 or more** | 6.4 | 10.2 | 83.5 |

* 'Regions' excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as 'ACT/NT', 'Brisbane' and 'Other Qld metropolitan/rural centres').

*Source*: 1995 NNS CURF

## Relative validity - direct

**Table 3.2.2: Expected and observed percentage of respondents who reported 'breakfast' or 'brunch' in the 24-hour recall, by usual frequency-of-breakfast category from short question, for respondents 19 years and over**

| | Percentage reporting breakfast/brunch | | | |
|---|---|---|---|---|
| **Usual frequency of breakfast (number of days per week)** | **Expected from question** | **Observed from 24-hour recall** | | |
| | | **Males** | **Females** | **All aged 19 years and over** |
| **Rarely or never** | <14 | 50.6 | 56.5 | 52.9 |
| | | (45.6-55.7) | (50.6-62.4) | (49.1-56.8) |
| **1 to 4 days** | 14 to 57 | 78.2 | 80.2 | 79.1 |
| | | (74.7-81.7) | (76.7-83.8) | (76.6-81.6) |
| **5 or more days** | 71 to 100 | 96.3 | 96.9 | 96.7 |
| | | (95.6-97.0) | (96.4-97.5) | (96.2-97.1) |

*Source*: 1995 NNS CURF

## Relative validity - indirect

### Table 3.2.3: Mean food, energy and nutrient intake from 24-hour recall, by frequency-of-breakfast category from short question, for respondents 19 years and over

| Parameters | Rarely or never (95% CI) | 1 to 4 days per week (95% CI) | 5 or more days per week (95% CI) | Level of significance between means by analysis of variance # |
|---|---|---|---|---|
| **Foods** | 1 | 2 | 3 | |
| **Cereals and cereal products (g/day)** | 138.4 (123.4-153.3) | 194.7 (182.8-206.5) | 223.9 (219.0-228.8) | *** (all means) |
| **Fruit products and dishes (g/day)** | 67.7 (51.9-83.6) | 88.1 (75.6-100.7) | 163.0 (157.8-168.3) | *(1,2) *** (2,3) |
| **Milk products and dishes (g/day)** | 232.6 (210.9-254.3) | 257.7 (240.5-274.8) | 302.3 (295.2-309.5) | NS (1,2) *** (2,3) |
| **Energy intake** | | | | |
| **Total energy intake (kJ/day)** | 9,383 (9,077-9,689) | 9,766 (9,524-10,008) | 9,155 (9,054-9,256) | NS (1,2) *** (2,3) |
| **EI/BMR** | 1.36 (1.30-1.42) | 1.43 (1.38-1.47) | 1.44 (1.42-1.46) | NS |
| **Nutrient density** | | | | |
| **Dietary fibre (g/MJ)** | 2.04 (1.95-2.14) | 2.20 (2.12-2.27) | 2.84 (2.80-2.87) | NS (1,2) *** (2,3) |
| **Calcium (mg/MJ)** | 83.1 (79.6-86.6) | 83.3 (80.5-86.1) | 99.2 (98.0-100.3) | NS (1,2) *** (2,3) |
| **Iron (mg/MJ)** | 1.36 (1.32-1.41) | 1.35 (1.31-1.39) | 1.68 (1.66-1.69) | NS (1,2) *** (2,3) |
| **Folate (µg/MJ)** | 26.3 (25.2-27.4) | 27.2 (26.3-28.1) | 32.2 (31.8-32.5) | NS (1,2) *** (2,3) |

# * p<0.05, ** p<0.01 and *** p <0.001

*Source*: 1995 NNS CURF

## Consistency: sub-group analysis

### Table 3.2.4: Statistically significant differences (·) in mean intake of cereals and cereal products from 24-hour recall, between frequency-of-breakfast categories from short question, for major population sub-groups

| Population sub-group | | Males | Females |
|---|---|---|---|
| ***All 19 years and over*** | | · | · |
| ***Age*** | **19–44 years** | · | · |
| | **45 years and over** | | |
| ***SEIFA*** | **1st and 2nd quintiles** | | |
| | **4th and 5th quintiles** | | |
| ***Regions**** | **Metro/capital** | · | |
| | **Remote/rural** | | |
| ***Country of birth*** | **Australia** | · | · |
| | **Not Australia** | | |
| ***BMI*** | **<25** | | |
| | **25 or more** | · | |

* 'Regions' excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as 'ACT/NT', 'Brisbane' and 'Other Qld metropolitan/rural centres').

· Population sub-groups with statistically significant differences at $p<0.05$

*Source*: 1995 NNS CURF

## 3.3 Food security

### Question

*In the last 12 months were there any times that you ran out of food and you couldn't afford to buy more?*

The analysis compares those respondents who reported yes with those who reported no to running out of food.

### Limitations to evaluation

It was not possible to assess the relative validity of this question directly. Instead the proportion of positive responses was estimated for a number of indices that are known to show socio-economic differentials. The indices chosen for analysis were labour-force status, SEIFA index of relative disadvantage, main source of income, equivalent income and type of house occupancy.

The variables chosen to assess relative validity for this question (table 2.2) were based on socio-economic differences in food and nutrient intake considered to be of nutritional importance or identified in other studies.

The small number of positive responses to the food security question (5%) limited population sub-group analysis for this question.

### Results of evaluation

#### *Pattern of response (table 3.3.1)*

Over 99% of the 1995 NNS sample provided a useable response to the question but less than 5% gave a positive response. Females reported a slightly higher rate of positive responses than males but the greatest difference in the proportion of positive responses was observed between younger and older age groups, with the younger group reporting about three times the rate reported by the older group.

#### *Relative validity - direct (table 3.3.2)*

Tables 3.3.2 a-e show the proportion of positive responses (with 95% confidence intervals) for selected categories of the socioeconomic measures used to assess this question. For all indices analysed the proportion of positive responses was highest in those categories associated with greater socioeconomic disadvantage. Of the indices selected for analysis the nature of house occupancy showed the greatest differential. On average almost 16% of those paying rent or board gave a positive response to the food security question.

#### *Relative validity - indirect (table 3.3.3)*

Table 3.3.3 shows means and 95% confidence intervals and the results of statistical analysis for the differences between the food security groups. With the two exceptions discussed below non-parametric tests identified the same food and nutrient intake variables as significantly different between the food security response groups.

*Foods*

Mean intake of meat and meat products and fruit and fruit products was significantly lower in those who had run out of food at some time. In contrast mean but not median intake of milk and milk products was significantly higher for those who had run out of food at some time.

*Energy*

Neither total energy intake nor the ratio of energy intake to basal metabolic rate (EI:BMR) differed significantly between food security groups.

*Nutrient density*

Despite the similar level of energy intake the nutrient density of the diet (nutrient intake/MJ) for iron, vitamin C and folate was significantly lower for those who had run out of food. Consistent with the results for milk and milk products the mean but not the median nutrient density for calcium was significantly higher for those who had run out of food.

***Consistency (table 3.3.4)***

None of the variables that differed significantly for the sample as a whole differed significantly for all 22 of the population sub-groups tested. The most consistent nutrient (expressed as mg/kJ) was vitamin C, which differed significantly for 18 of the 22 sub-groups. The exceptions were older men and women, men in the upper quintiles of SEIFA and women not born in Australia. In general consistency was better in females than males probably due to a higher rate of positive responses in females as compared with males.

## Conclusion

In the sample as a whole a positive response to the food security question was associated both with a significantly greater likelihood of socio-economic disadvantage and a lower intake of some food groups (meat and fruit), but not other food groups (milk and milk products) that are important sources of nutrients in the Australian diet. Although evaluation of this question was limited, at sub-group level, by the low prevalence of positive responses (~5%) the density of vitamin C was significantly lower in all but four of the sub-groups tested.

## Pattern of response

### Table 3.3.1: Percentage of respondents 19 years and over, who reported running out of food based on short question, for major population sub-groups in the 1995 NNS

| Population subgroup | Percent who ran out of food in the last 12 months |
|---|---|
| ***ADULTS*** | |
| **All aged 19 years and over** | **5.2** |
| ***MALES*** | |
| ***All*** | 4.5 |
| ***Age*** | |
| **19–44 years** | 6.5 |
| **45 years and over** | 1.9 |
| ***SEIFA*** | |
| **1st and 2nd quintiles** | 6.9 |
| **4th and 5th quintiles** | 2.1 |
| ***Regions**** | |
| **Metro/capital** | 4.5 |
| **Remote/rural** | 4.1 |
| ***Country of birth*** | |
| **Australia** | 4.6 |
| **Not Australia** | 3.9 |
| ***BMI*** | |
| **<25** | 6.7 |
| **25 or more** | 3.2 |
| ***FEMALES*** | |
| ***All*** | 5.8 |
| ***Age*** | |
| **19–44 years** | 8.4 |
| **45 years and over** | 2.7 |
| ***SEIFA*** | |
| **1st and 2nd quintiles** | 8.4 |
| **4th and 5th quintiles** | 3.4 |
| ***Regions**** | |
| **Metro/capital** | 5.6 |
| **Remote/rural** | 6.1 |
| ***Country of birth*** | |
| **Australia** | 5.8 |
| **Not Australia** | 5.9 |
| ***BMI*** | |
| **<25** | 5.9 |
| **25 or more** | 5.8 |

* 'Regions' excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as 'ACT/NT', 'Brisbane' and 'Other Qld metropolitan/rural centres').

*Source*: 1995 NNS CURF

## Relative validity - direct

### Table 3.3.2a: Percentage of respondents 19 years and over who reported running out of food in the last 12 months, based on the short question, by labour force status#

| Population subgroup | Employed (95% CI) | Unemployed or not in labour force (95% CI) |
|---|---|---|
| **All aged 19 years and over** | 4.0 (3.4-4.5) | 11.3 (9.8-12.8) |
| **Sex** | | |
| **Males** | 3.3 (2.6-3.9) | 13.2 (10.4-16.1) |
| **Females** | 4.9 (4.0-5.8) | 10.3 (8.6-12.0) |

# Analysis excludes those who were coded as 'Not applicable' or 'Not stated'.

*Source*: 1995 NNS CURF

### Table 3.3.2b: Percentage of respondents 19 years and over who reported running out of food in the last 12 months, based on short question, by quintiles of SEIFA index of relative disadvantage#

| Population subgroup | Quintile 1 and 2 (95% CI) | Quintile 4 and 5 (95% CI) |
|---|---|---|
| **All aged 19 years and over** | 7.7 (6.7-8.6) | 2.7 (2.1-3.2) |
| **Sex** | | |
| **Males** | 6.9 (5.5-8.2) | 2.1 (1.4-2.8) |
| **Females** | 8.4 (7.1-9.7) | 3.4 (2.5-4.2) |

*Source*: 1995 NNS CURF

### Table 3.3.2c: Percentage of respondents 19 years and over who reported running out of food in the last 12 months, based on short question, by main source of income#

| Population subgroup | Wages/salary (95% CI) | Own business or share in partnership (95% CI) | Government pension or benefit (95% CI) | Other* (95% CI) |
|---|---|---|---|---|
| **All aged 19 years and over** | 3.8 (3.2-4.5) | 1.7 (0.8-2.7) | 9.0 (7.8-10.2) | 3.5 (2.3-4.6) |
| **Sex** | | | | |
| **Males** | 3.2 (2.5-4.0) | 2.0 (0.7-3.2) | 9.2 (7.4-11.1) | 1.2 (0.0-2.3) |
| **Females** | 4.6 (3.6-5.6) | 1.2 (0.0-2.6) | 8.9 (7.4-10.3) | 4.7 (3.1-6.3) |

# The analysis excludes those who were coded as 'Not applicable'.

* 'Other' includes superannuation, interest/dividends and other sources of income.

*Source*: 1995 NNS CURF

**Table 3.3.2d: Percentage of respondents 19 years and over who reported running out of food in the last 12 months, based on short question, by deciles of equivalent income#**

| Population subgroup | Lower 3 deciles (95% CI) | Upper 3 deciles (95% CI) |
|---|---|---|
| **All aged 19 years and over** | 10.6 (9.2-12.0) | 3.5 (3.0-4.0) |
| **Sex** | | |
| **Males** | 10.5 (8.4-12.6) | 2.8 (2.1-3.4) |
| **Females** | 10.7 (8.9-12.6) | 4.3 (3.6-5.1) |

# The analysis excludes those who were coded as 'Not determined'.

*Source*: 1995 NNS CURF

**Table 3.3.2e: Percentage of respondents 19 years and over who reported running out of food in the last 12 months, based on short question, by type of expenditure on housing#**

| Population subgroup | Paying rent or board to reside in dwelling (95% CI) | Paying off house/dwelling (95% CI) | Owner of the dwelling (95% CI) |
|---|---|---|---|
| **All aged 19 years and over** | 15.8 (13.7-17.8) | 4.3 (3.2-5.4) | 1.6 (1.0-2.1) |
| **Sex** | | | |
| **Males** | 15.0 (12.0-18.0) | 2.7 (1.4-4.0) | 1.4 (0.7-2.2) |
| **Females** | 16.4 (13.7-19.2) | 5.8 (4.1-7.5) | 1.7 (0.9-2.5) |

# The analysis excludes those who were coded as 'Other' or 'Not applicable'.

*Source*: 1995 NNS CURF

## Relative validity - indirect

**Table 3.3.3: Mean food and energy intake and nutrient density from 24-hour recall, by food security category from short question, for respondents 19 years and over**

| Parameters | Ran out of food in the last 12 months | Did not run out of food in the last 12 months | Level of significance between means by t-test # |
|---|---|---|---|
| **Foods** | | | |
| **Meat, poultry and game products and dishes (g/day)** | 129.6 (114.9-144.4) | 158.6 (155.3-162.0) | *** |
| **Milk products and dishes (g/day)** | 328.7 (304.0-353.4) | 287.5 (281.8-293.1) | ** |
| **Fruit products and dishes (g/day)** | 91.8 (74.0-109.5) | 146.1 (142.1-150.2) | *** |
| **Energy intake** | | | |
| **Total energy intake (kJ/day)** | 9,416 (9,024-9,809) | 9,251 (9,159-9,342) | NS |
| **EI/BMR** | 1.48 (1.41-1.54) | 1.42 (1.41-1.44) | NS |
| **Nutrient density** | | | |
| **Calcium (mg/MJ)** | 100.9 (96.8-104.9) | 95.4 (94.5-96.4) | * |
| **Iron (mg/MJ)** | 1.52 (1.47-1.57) | 1.60 (1.59-1.61) | ** |
| **Vitamin C (mg/MJ)** | 10.9 (9.7-12.0) | 14.9 (14.6-15.2) | *** |
| **Folate (µg/MJ)** | 29.4 (28.2-30.6) | 31.0 (30.7-31.3) | * |

# * p <0.05, ** p<0.01, *** p<0.001.

Note: The mean intake of milk products and the nutrient density of calcium were both higher among those who reported running out of food compared with those who hadn't.

*Source*: 1995 NNS CURF

## Consistency: sub-group analysis

### Table 3.3.4: Statistically significant differences (·) in mean food and nutrient intake from 24-hour recall, between food security categories from short question, for major population sub-groups

| Population subgroup | | Meats g/day | | Milk g/day | | Fruit g/day | | Calcium mg/MJ | | Iron mg/MJ | | Vitamin C mg/MJ | | Folate µg/MJ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sex* | | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| ***All aged 19 years and over*** | | · | | | · | · | · | | · | · | | · | · | | · |
| ***Age*** | **19–44 years** | · | | | · | | · | | · | · | | · | · | | |
| | **45 years and over** | | | | | | | | · | | · | | | | |
| ***SEIFA*** | **1st and 2nd quintiles** | · | | | · | · | · | | · | · | · | · | · | | · |
| | **4th and 5th quintiles** | | | | | | · | | | | | | · | | · |
| ***Regions#*** | **Metro/capital** | · | · | | | | · | | | · | | · | · | | |
| | **Remote/rural** | | · | · | · | · | | | · | | | · | · | · | · |
| ***Country of birth*** | **Australia** | · | | | · | | · | | | · | · | · | · | | · |
| | **Not Australia** | · | · | | | | | | · | | · | · | | | |
| ***BMI*** | **<25** | · | | | · | | · | | | | · | · | · | | · |
| | **25 or more** | | | | | | · | | · | · | | · | · | · | |

# 'Regions' excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as 'ACT/NT', 'Brisbane' and 'Other Qld metropolitan/rural centres').

· Population sub-groups with statistically significant differences at $p<0.05$

*Source*: 1995 NNS CURF

## 3.4 Type of milk usually consumed

### Question

*What type of milk do you usually consume?*

The analysis compares whole milk and low-reduced fat and skim milk.

### Limitations to evaluation

Ninety-eight percent of the sample gave a useable response to the milk question that had six response options (whole milk, reduced fat milk, skim milk, evaporated milk, none of the above, don't know). Just over 4% of respondents usually used 'none of the above' and ~2% evaporated milk or a combination of milks. This evaluation is based only on the 91% of respondents who usually used whole milk, reduced fat milk or skim milk. For the purpose of statistical analysis respondents who usually used skim milk were combined with those who usually consumed reduced fat milk.

Relative validity was assessed directly by determining the average amount of each type of milk consumed in the 24-hour recall for the respondents in the two categories 'whole milk' and 'reduced fat/skim milk'. The amount of whole milk was derived from food codes 1911 and 1912 and the amount of reduced fat /skim milk was derived from food codes 1913, 1914 and 1915.

### Results of evaluation

#### *Pattern of response (table 3.4.1)*

Overall 53.5% of the sample used for analysis usually consumed whole milk. Men were more likely than women to consume whole milk (61% v 47%) and whole milk was also more likely to be consumed by younger adults, those living in rural/remote areas and those with a body mass index in the normal range.

#### *Relative validity - direct (table 3.4.2)*

The 24-hour recall data confirmed the response given to the milk question. Those who reported usually using whole milk had a mean intake of 212g of whole milk and 22g of reduced fat/skim milk from the 24-hour recall while those who reported usually using reduced fat/skim milk had a mean intake of reduced fat/skim milk of 183g and <10g of whole milk. These differences were statistically highly significant. In the 24-hour recall about 8% of respondents used both whole and reduced fat / skim milk.

#### *Relative validity - indirect (table 3.4.3)*

Table 3.4.3 shows means and 95% confidence intervals and the results of statistical evaluation for differences in mean percentage energy from total fat and from saturated fat. Both the proportion of total energy from fat and that from saturated fat were significantly higher for those who usually used whole milk. Non-parametric tests gave the same result.

#### *Consistency (table 3.4.4)*

Statistically significant differences in mean percent energy from total fat and from saturated fat were found for all 22 of the population sub-groups tested.

## Conclusion

The question provided a valid indicator of the main type of milk consumed in the 24-hour recall. For those who usually used whole milk the mean percent energy from total fat and from saturated fat was consistently higher than for users of reduced fat/skim milk for all 22 of the population sub-groups tested.

The fact that only ~2% respondents to the question indicated that they usually used a combination of whole and reduced fat milks while in the 24-hour recall ~8% reported using more than one type of milk suggests that the current question format is likely to underestimate the 'usual' use of more than one type of milk although in 1995 the question was nevertheless very effective in identifying the main type of milk used.

## Pattern of response

### Table 3.4.1: Percentage of respondents 19 years and over, by usual type of milk consumed from short question, for major population sub-groups in the 1995 NNS

| Population subgroup | Whole milk | Low/reduced fat and skim milk |
|---|---|---|
| ***ADULTS*** | | |
| **All aged 19 years and over** | **53.5** | **46.5** |
| ***MALES*** | | |
| ***All*** | 60.6 | 39.4 |
| ***Age*** | | |
| **19–44 years** | 67.3 | 32.7 |
| **45 years and over** | 51.9 | 48.1 |
| ***SEIFA*** | | |
| **1st and 2nd quintiles** | 64.7 | 35.3 |
| **4th and 5th quintiles** | 56.4 | 43.6 |
| ***Regions**** | | |
| **Metro/capital** | 57.5 | 42.5 |
| **Remote/rural** | 67.6 | 32.4 |
| ***Country of birth*** | | |
| **Australia** | 61.9 | 38.1 |
| **Not Australia** | 56.4 | 43.6 |
| ***BMI*** | | |
| **<25** | 68.0 | 32.0 |
| **25 or more** | 56.5 | 43.5 |
| ***FEMALES*** | | |
| ***All*** | 46.5 | 53.5 |
| ***Age*** | | |
| **19–44 years** | 50.9 | 49.1 |
| **45 years and over** | 41.1 | 58.9 |
| ***SEIFA*** | | |
| **1st and 2nd quintiles** | 51.2 | 48.8 |
| **4th and 5th quintiles** | 41.4 | 58.7 |
| ***Regions**** | | |
| **Metro/capital** | 43.1 | 56.9 |
| **Remote/rural** | 53.1 | 46.9 |
| ***Country of birth*** | | |
| **Australia** | 45.5 | 54.5 |
| **Not Australia** | 49.7 | 50.3 |
| ***BMI*** | | |
| **<25** | 52.0 | 48.0 |
| **25 or more** | 40.3 | 59.7 |

* 'Regions' excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as 'ACT/NT', 'Brisbane' and 'Other Qld metropolitan/rural centres').

*Source*: 1995 NNS CURF

## Relative validity - direct

### Table 3.4.2: Mean intake (g) of different types of milk from 24-hour recall, by usual type of milk consumed from short question, for respondents 19 years and over

| Usual type of milk consumed | Whole milk | | | Fat reduced or skim | | |
|---|---|---|---|---|---|---|
| Type and amount of milk consumed from 24-hour recall # | Whole milk | Low/reduced fat and skim milk | Level of significance between means | Whole milk | Low/reduced fat and skim milk | Level of significance between means |
| | Mean intake g/day (95%CI) | | | | | |
| **Population subgroup** | | | | | | |
| **All aged 19 years and over** | 211.5 (205.5-217.4) | 22.3 (15.9-28.6) | *** | 8.7 (4.1-13.3) | 182.9 (178.0-187.8) | *** |
| **Sex** | | | | | | |
| **Males** | 232.5 (223.0-242.0) | 25.9 (14.1-37.6) | *** | 8.3 (1.6-15.0) | 207.0 (198.8-215.3) | *** |
| **Females** | 184.6 (177.6-191.7) | 19.7 (13.1-26.2) | *** | 9.3 (3.0-15.6) | 165.4 (160-171.3) | *** |

# 'Whole milk' includes fat increased (food code 1911) and regular whole milk (food code 1912) and 'Fat reduced' includes reduced fat milk (food code 1913), low fat milk (food code 1914) and skim milk (food code 1915).

* p<0.05, **p<0.01 and *** p<0.001

*Source*: 1995 NNS CURF

## Relative validity - indirect

### Table 3.4.3: Mean percentage energy from fat from 24-hour recall, by usual type of milk consumed from short question, for respondents 19 years and over

| | Percent of energy from 24-hour recall | | |
|---|---|---|---|
| Type of milk usually consumed | Whole milk (95% CI) | Low/reduced fat and skim milk (95% CI) | Level of significance between means |
| **Proportion of energy from total fat (%)** | 34.1 (33.8-34.3) | 31.0 (30.7-31.2) | *** |
| **Proportion of energy from saturated fat (%)** | 13.9 (13.8-14.0) | 11.7 (11.5-11.8) | *** |

* p<0.05, p<0.01 and *** p<0.001.

*Source*: 1995 NNS CURF

## Consistency: sub-group analysis

### Table 3.4.4: Statistically significant differences ( ·) in percent energy from fat from 24-hour recall, by usual type of milk consumed from short question, for major population sub-groups

| Population subgroup | | % energy from total fat | | % energy from saturated fat | |
|---|---|---|---|---|---|
| ***Sex*** | | **M** | **F** | **M** | **F** |
| ***All 19 years and over*** | | · | · | · | · |
| ***Age*** | **19–44 years** | · | · | · | · |
| | **45 years and over** | · | · | · | · |
| ***SEIFA*** | **1st and 2nd quintiles** | · | · | · | · |
| | **4th and 5th quintiles** | · | · | · | · |
| ***Regions#*** | **Metro/capital** | · | · | · | · |
| | **Remote/rural** | · | · | · | · |
| ***Country of birth*** | **Australia** | · | · | · | · |
| | **Not Australia** | · | · | · | · |
| ***BMI*** | **<25** | · | · | · | · |
| | **25 or more** | · | · | · | · |

# 'Regions' excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as 'ACT/NT', 'Brisbane' and 'Other Qld metropolitan/rural centres').

· Population sub-groups with statistically significant differences between milk groups $p<0.05$

*Source*: 1995 NNS CURF

## 3.5 Usual vegetable intake

### Question

*How many serves of vegetables do you usually eat each day? (a serve = ½ cup cooked vegetables or 1 cup of salad vegetables)*

The analysis compares 1 serve or less, 2 to 3 serves, and 4 serves or more.

### Limitations to evaluation

In the 1995 NNS the vegetable question followed the self-administered food frequency questionnaire. This meant that when completing the question respondents had already read through a list of foods identified as vegetables. For this reason the question did not include prompts to indicate which foods to include as vegetables. If used as a 'stand-alone', the question needs to include information about which foods to include as vegetables.

The predetermined response categories for this question limited statistical analysis to only three categories because although five possible response categories were provided the two extreme categories contained only a very small number of responses while the middle category contained over half of all responses.

Relative validity was determined directly by calculating the mean intake of vegetables and vegetable dishes in the 24-hour recall (food codes 2311 to 2393 ie not including legumes) for each response category. The quantity of vegetables derived from these food codes also excludes vegetables that are constituents of mixed dishes where meat, fish, eggs or cereal are the major ingredient but includes the non-vegetable constituents of dishes where vegetables are the main ingredients (food codes 2391-2393).

The nutrient variables chosen to assess relative validity indirectly were nutrients largely derived from vegetable sources such as pro-vitamin A, vitamin C and folate.

### Results of evaluation

#### *Pattern of response (table 3.5.1)*

Ninety-nine percent of the sample provided a useable response to the question. The majority of these respondents (55%) usually consumed between 2 and 3 serves of vegetables per day. The proportions of men and women in the 2 to 3 serves category were similar except for younger women and women born outside Australia. A higher proportion of women than men (22% v 15%) usually ate four or more serves per day.

#### *Relative validity - direct (table 3.5.2)*

The mean intake of vegetables from the 24-hour recall confirmed that those who reported a greater usual number of serves of vegetables per day (from the short question) on average also had a higher intake of vegetables per day. While the differences in mean 24-hour recall intake between all question categories were statistically significantly different the average amounts consumed did not necessarily equate with estimates based on the weight of vegetables normally used for a serve (75g). For those reporting one serve or less of vegetables per day (from the short question) the mean intake from the 24-hour recall was 200g and 265g for those reporting 2 to 3 serves per day.

***Relative validity - indirect (table 3.5.3)***

Table 3.5.3 shows means and 95% confidence intervals and the results of statistical analysis for differences in nutrient intake from the 24-hour recall evaluated by one-way analysis of variance. Non-parametric tests of differences gave similar results. Intake for all three nutrients evaluated (pro-vitamin A, vitamin C and folate) showed statistically significant increases with increasing category of usual vegetable intake. Those in the highest category of vegetable intake had a mean intake of pro-vitamin A that was almost twice the intake of those in the lowest category of usual intake. The equivalent increase for vitamin C and folate was ~50% and 25% respectively indicating that, of the nutrients evaluated, vegetable intake was most strongly associated with intake of pro-vitamin A.

***Consistency (table 3.5.4)***

A statistically significant increase in intake of pro-vitamin A with increasing category of usual vegetable intake was observed for all population sub-groups except women living in rural/remote areas and for folate for all population sub-groups except men in the two lowest SEIFA quintiles and those with a BMI <25.

## Conclusion

While the vegetable question clearly was able to discriminate between groups with significantly different intakes of vegetables based on the 24 hour recall it is not appropriate to use information from this question to derive the level of vegetable intake on the basis of a constant serve size. Firstly the 'perceived' size of a serve of vegetables clearly varied between population sub-groups. Secondly the data from this analysis showed that as the usual number of 'reported' serves of vegetables from the short question increased, the average 24-hour recall quantity, when expressed per 'reported' serve from the short question decreased. From the 24 hour recall data the mean serve size for those usually consuming one serve or less per day was ~200g while for those usually consuming four or more serves per day it was less than 85g. Of the nutrients evaluated the strongest and only consistent nutrient correlate of vegetable intake was pro-vitamin A.

## Pattern of response

### Table 3.5.1: Percentage of respondents 19 years and over, by usual number of serves of vegetables from short question, for major population sub-groups in the 1995 NNS

| Population subgroup | 1 serve or less* | 2 to 3 serves | 4 serves or more |
|---|---|---|---|
| | ***ADULTS*** | | |
| **All aged 19 years and over** | **26.0** | **55.3** | **18.7** |
| | ***MALES*** | | |
| ***All*** | 29.7 | 55.0 | 15.4 |
| ***Age*** | | | |
| **19–44 years** | 34.6 | 54.2 | 11.1 |
| **45 years and over** | 23.3 | 55.9 | 20.8 |
| ***SEIFA*** | | | |
| **1st and 2nd quintiles** | 32.2 | 53.2 | 14.7 |
| **4th and 5th quintiles** | 27.2 | 57.7 | 15.1 |
| ***Regions**** | | | |
| **Metro/capital** | 30.8 | 55.7 | 13.6 |
| **Remote/rural** | 25.9 | 57.1 | 17.1 |
| ***Country of birth*** | | | |
| **Australia** | 29.2 | 55.2 | 15.7 |
| **Not Australia** | 31.4 | 54.3 | 14.3 |
| ***BMI*** | | | |
| **<25** | 32.0 | 53.1 | 14.9 |
| **25 or more** | 28.4 | 56.0 | 15.7 |
| | ***FEMALES*** | | |
| ***All*** | 22.4 | 55.6 | 22.0 |
| ***Age*** | | | |
| **19–44 years** | 25.3 | 58.1 | 16.6 |
| **45 years and over** | 19.0 | 52.7 | 28.4 |
| ***SEIFA*** | | | |
| **1st and 2nd quintiles** | 27.2 | 51.7 | 21.1 |
| **4th and 5th quintiles** | 19.3 | 59.1 | 21.6 |
| ***Regions**** | | | |
| **Metro/capital** | 22.5 | 56.5 | 21.0 |
| **Remote/rural** | 19.9 | 55.6 | 24.5 |
| ***Country of birth*** | | | |
| **Australia** | 21.3 | 54.5 | 24.3 |
| **Not Australia** | 25.9 | 58.9 | 15.2 |
| ***BMI*** | | | |
| **<25** | 24.0 | 55.8 | 20.2 |
| **25 or more** | 20.7 | 55.4 | 23.9 |

* Includes ‘Don’t eat vegetables’.

** ‘Regions’ excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as ‘ACT/NT’, ‘Brisbane’ and ‘Other Qld metropolitan/rural centres’).

*Source*: 1995 NNS CURF

## Relative validity - direct

### Table 3.5.2: Mean intake of vegetable products and dishes from 24-hour recall, by usual number of serves of vegetables from short question, for respondents 19 years and over

| Population subgroup | 1 serve or less# (95% CI) | 2 to 3 serves (95% CI) | 4 serves of more (95% CI) | Level of significance between means by analysis of variance |
|---|---|---|---|---|
| | | g/day | | |
| **All aged 19 years and over** | 204.1 (195.0-213.1) | 265.0 (258.8-271.2) | 332.4 (321.7-343.1) | *** |
| **Sex** | | | | |
| **Males** | 220.5 (206.8-234.3) | 297.4 (287.3-307.5) | 377.7 (358.6-396.9) | *** |
| **Females** | 182.8 (171.3-194.4) | 233.8 (226.4-241.1) | 301.6 (290.0-313.3) | *** |

# Includes 'Don't eat vegetables'.

* p<0.05, ** p<0.01 and *** p<0.001.

*Source*: 1995 NNS CURF

## Relative validity - indirect

### Table 3.5.3: Mean and 95% CI for nutrient intake from 24-hour recall, by usual number of serves of vegetables from short question, for respondents 19 years and over

| Nutrients | 1 serve or less# (95% CI) | 2 to 3 serves (95% CI) | 4 serves or more (95% CI) | Level of significance between means by analysis of variance |
|---|---|---|---|---|
| **Provitamin A (mg/day)** | 2,590 (2,421-2,759) | 3,629 (3,513-3,745) | 4,899 (4,700-5,098) | *** |
| **Vitamin C (mg/day)** | 108.4 (103.7-113.2) | 128.6 (125.3-131.9) | 148.7 (143.1-154.4) | *** |
| **Folate (µg/day)** | 245.6 (240.2-251.0) | 273.2 (259.5-276.9) | 299.8 (293.5-306.1) | *** |

# Includes 'Don't eat vegetables'.

* p<0.05, ** p<0.01 and *** p<0.001

*Source*: 1995 NNS CURF

## Consistency: sub-group analysis

**Table 3.5.4: Statistically significant differences (·) in mean intake from 24-hour recall, between categories of usual vegetable intake from short question, for major population sub-groups**

| Population subgroup | | Provitamin A µg/day | | Vitamin C mg/day | | Folate µg/day | |
|---|---|---|---|---|---|---|---|
| *Sex* | | M | F | M | F | M | F |
| *All 19 years and over* | | · | · | · | · | · | · |
| *Age* | 19–44 years | · | · | | · | · | · |
| | 45 years and over | · | · | · | · | · | · |
| *SEIFA* | 1st and 2n quintiles | · | · | · | · | | · |
| | 4th and 5thquintiles | · | · | | | · | · |
| *Regions#* | Metro/capital | · | · | | | · | · |
| | Remote/rural | · | | · | | · | · |
| *Country of birth* | Australia | · | · | | · | · | · |
| | Not Australia | · | · | · | · | · | · |
| *BMI* | <25 | · | · | | · | | · |
| | 25 or more | · | · | · | · | · | · |

# 'Regions' excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as 'ACT/NT', 'Brisbane' and 'Other Qld metropolitan/rural centres').

*Source*: 1995 NNS CURF

## 3.6 Usual fruit intake

### Question

*How many serves of fruit do you usually eat each day? (a serve = 1 medium piece or 2 small pieces of fruit or 1 cup of diced pieces)*

The analysis compares 1 serve or less, 2 to 3 serves, and 4 serves or more.

### Limitations to evaluation

In the 1995 NNS the fruit question like the vegetable question followed the end of the self-administered food frequency questionnaire. This meant that when completing the question respondents had already read through a list of foods identified as fruit. For this reason the question did not include prompts to indicate which foods to include as fruit. If used in a 'stand-alone' context the question needs to include information about which foods to include as fruit.

The predetermined response categories for this question limited statistical analysis to only three categories because although five possible response categories were provided the lowest and two upper categories contained only a very small number of responses while the two intermediate categories accounted for almost 90% of all responses.

Relative validity was determined directly by calculating the mean intake of fruit products and dishes in the 24-hour recall (food codes 1611 to 1691) for each response category. The quantity of fruit derived from these food codes excludes fruit that is a constituent of mixed dishes where cereal is the major ingredient but includes the non-fruit constituents of dishes of which fruit are the main ingredients (food code1691).

The nutrient variables chosen to assess relative validity indirectly were the same nutrients as for the vegetable question, ie pro-vitamin A, vitamin C and folate.

### Results of evaluation

#### *Pattern of response (table 3.6.1)*

Ninety-nine percent of the sample provided a useable response to the question. Over 90% of these respondents usually consumed less than four serves of fruit per day. The proportion of men in the one serve or less category was higher than for women (54% v 45%) for all population sub-groups. Among men the proportion consuming one serve or less per day was lowest for those born outside Australia and those aged 45 years and over. Among women the proportion was lowest (<40%) for those aged 45 years and over.

#### *Relative validity - direct (table 3.6.2)*

The mean intake of fruit from the 24-hour recall confirmed that those who reported a greater usual number of serves of fruit per day from the short question on average also had a higher intake of fruit expressed in grams per day. While the differences in mean 24-hour recall intake between all categories were statistically significantly different the average amount from 24-hour recall intake did not equate with estimates based on the weight of fruit normally used for a serve (150g). For those reporting two to three serves of fruit per day the mean intake from the 24-hour recall was 190g and 375g for those reporting four or more serves per day.

***Relative validity - indirect (table 3.6.3)***

Table 3.6.3 shows means and 95% confidence intervals and the results of statistical analysis of differences in nutrient intake from the 24-hour recall evaluated by one-way analysis of variance. Non-parametric tests of differences gave similar results. Intake for all three nutrients evaluated (pro-vitamin A, vitamin C and folate) showed statistically significant increases with increasing category of usual fruit intake. Those in the highest category of fruit intake had a mean intake of vitamin C that was almost twice that of those in the lowest category of usual intake. The equivalent increase for pro-vitamin A and folate was ~50% and 25% respectively indicating that, of the nutrients evaluated, fruit intake was most strongly associated with intake of vitamin C.

***Consistency (table 3.6.4)***

A statistically significant increase in intake of vitamin C with increasing category of usual fruit intake was observed for all population sub-groups except women born outside Australia. In contrast for pro-vitamin A and folate statistically significant differences were observed for only just over half of the population sub-groups tested.

## Conclusion

The fruit question, like the vegetable question, was able to discriminate between groups with significantly different intakes of fruit. In addition the average quantity associated with a serve of fruit differed little between men and women and did not decrease as the usual number of reported serves increased. For those usually reporting one serve of fruit or less per day (from the short question) the average quantity per day from the 24 hour recall was ~70g while for those usually reporting two to three serves it was ~75g (per reported serve), and for those usually reporting four or more serves per day ~85g. These results suggest that it may be possible to derive a quantitative estimate of the usual amount of fruit consumed on the basis of a question which asks about the usual number of serves of fruit consumed per day. Of the nutrients evaluated the strongest and only consistent nutrient correlate of fruit intake was vitamin C.

## Pattern of response

### Table 3.6.1: Percentage of respondents 19 years and over, by usual number of serves of fruit from short question, for major population sub-groups in the 1995 NNS

| Population subgroup | 1 serve or less* | 2 to 3 serves | 4 serves or more |
|---|---|---|---|
| | ***ADULTS*** | | |
| **All aged 19 years and over** | **49.3** | **42.6** | **8.1** |
| | ***MALES*** | | |
| ***All*** | 54.2 | 38.2 | 7.6 |
| ***Age*** | | | |
| **19–44 years** | 59.5 | 33.9 | 6.5 |
| **45 years and over** | 47.3 | 43.6 | 9.1 |
| ***SEIFA*** | | | |
| **1st and 2nd quintiles** | 56.0 | 36.8 | 7.2 |
| **4th and 5th quintiles** | 53.0 | 39.5 | 7.4 |
| ***Regions#*** | | | |
| **Metro/capital** | 53.9 | 38.4 | 7.7 |
| **Remote/rural** | 57.0 | 36.5 | 6.4 |
| ***Country of birth*** | | | |
| **Australia** | 56.9 | 36.7 | 6.4 |
| **Not Australia** | 45.7 | 42.8 | 11.6 |
| ***BMI*** | | | |
| **<25** | 58.2 | 35.3 | 6.6 |
| **25 or more** | 51.9 | 39.8 | 8.3 |
| | ***FEMALES*** | | |
| ***All*** | 44.6 | 46.9 | 8.5 |
| ***Age*** | | | |
| **19–44 years** | 48.8 | 43.5 | 7.7 |
| **45 years and over** | 39.6 | 51.0 | 9.5 |
| ***SEIFA*** | | | |
| **1st and 2nd quintiles** | 46.0 | 45.1 | 8.9 |
| **4th and 5th quintiles** | 43.1 | 48.3 | 8.6 |
| ***Regions***** | | | |
| **Metro/capital** | 42.7 | 49.3 | 8.1 |
| **Remote/rural** | 48.5 | 41.9 | 9.6 |
| ***Country of birth*** | | | |
| **Australia** | 45.0 | 46.7 | 8.3 |
| **Not Australia** | 43.3 | 47.7 | 9.1 |
| ***BMI*** | | | |
| **<25** | 45.6 | 45.7 | 8.7 |
| **25 or more** | 43.5 | 48.1 | 8.4 |

* Includes ‘Don’t eat fruit’.

# ‘Regions’ excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as ‘ACT/NT’, ‘Brisbane’ and ‘Other Qld metropolitan/rural centres’).

*Source*: 1995 NNS CURF

## Relative validity - direct

### Table 3.6.2: Mean intake of fruit products and dishes from 24-hour recall, by usual number of serves of fruit from short question, for respondents 19 years and over

| Population subgroup | 1 serve or less# (95% CI) | 2 to 3 serves (95% CI) | 4 serves or more (95% CI) | Level of significance between means by analysis of variance |
|---|---|---|---|---|
| | | g/day | | |
| **All aged 19 years and over** | 69.7 (63.8-75.5) | 190.6 (184.3-196.9) | 374.4 (359.9-388.8) | *** |
| **Sex** | | | | |
| **Males** | 65.8 (57.5-74.1) | 203.4 (193.5-213.2) | 371.7 (349.6-393.8) | *** |
| **Females** | 74.3 (66.0-82.6) | 180.6 (172.5-188.7) | 376.8 (357.8-395.8) | *** |

# Includes 'Don't eat fruit'.

* p<0.05, ** p<0.01 and *** p<0.001

*Source*: 1995 NNS CURF

## Relative validity - indirect

### Table 3.6.3: Mean and 95% CI for nutrient intake from 24-hour recall by usual number of serves of fruit from short question, for respondents 19 years and over

| Parameters | 1 serve or less# (95% CI) | 2 to 3 serves (95% CI) | 4 serves or more (95% CI) | Level of significance between means by analysis of variance |
|---|---|---|---|---|
| **Provitamin A (mg/day)** | 3,134 (3,010-3,258) | 3,916 (3,783-4,050) | 4,842 (4,536-5,148) | *** |
| **Vitamin C (mg/day)** | 109.8 (106.4-113.3) | 134.9 (131.2-138.6) | 190.2 (181.7-198.6) | *** |
| **Folate (µg/day)** | 259.9 (256.0-263.8) | 276.1 (271.9-280.3) | 310.6 (300.9-320.2) | *** |

# Includes 'Don't eat fruit'.

* p<0.05, ** p<0.01 and *** p<0.001

*Source*: 1995 NNS CURF

## Consistency: sub-group analysis

**Table 3.6.4: Statistically significant differences (·) in mean nutrient intakes from 24-hour recall, between categories of usual fruit intake from short question, for major population sub-groups**

| Population subgroup | | Provitamin A µg/day | | Vitamin C mg/day | | Folate µg/day | |
|---|---|---|---|---|---|---|---|
| *Sex* | | M | F | M | F | M | F |
| *All 19 years and over* | | · | · | · | · | · | · |
| *Age* | 19–44 years | · | · | · | · | | · |
| | 45 years and over | | · | · | · | · | · |
| *SEIFA* | 1st and 2n quintiles | · | · | · | · | | · |
| | 4th and 5thquintiles | | | · | · | · | |
| *Regions#* | Metro/capital | | · | · | · | · | · |
| | Remote/rural | | | · | · | · | |
| *Country of birth* | Australia | · | · | · | · | · | · |
| | Not Australia | | | · | | · | |
| *BMI* | <25 | | · | · | · | | · |
| | 25 or more | | · | · | · | | |

# 'Regions' excludes the ACT, Qld and NT because they were classified separately when the data were coded (ie they were coded as 'ACT/NT', 'Brisbane' and 'Other Qld metropolitan/rural centres').

· Population sub-groups with statistically significant differences at p<0.05

*Source*: 1995 NNS CURF

# 4 General conclusions and recommendations

## Introduction

Six of the short dietary questions used in the 1995 National Nutrition Survey were evaluated for relative validity both directly and indirectly and for consistency, by documenting the differences in mean intakes of foods and nutrients as measured by the 24-hour recall, between groups with different responses to the short questions. These comparisons were made for males and females overall and for population sub-groups of interest including: age, socio-economic disadvantage, region of residence, country of birth, and BMI category.

Several limitations to this evaluation of the short questions, as discussed in previous sections, need to be kept in mind including:

- the method for comparison available (24-hour recall) was not ideal (gold standard), as it measures yesterday's intake. This limitation was overcome by examining only mean differences between groups of respondents, since mean intake for a group can provide a reasonable approximation for 'usual' intake.

- the need to define and identify, post-hoc, from the 24-hour recall the number of eating occasions, and occasions identified by the respondents as breakfast.

- predetermined response categories for some of the questions effectively limited the number of categories available for evaluation.

- other foods and nutrients, not selected for this evaluation may have an indirect relationship with the question and might have shown stronger and more consistent responses.

- the number of responses in some categories of the short questions, eg for food security, may have been too small to detect significant differences between population sub-groups.

- no information was available to examine the validity of these questions for detecting differences over time (establishing trends) in food habits and indicators of selected nutrient intakes.

By contrast, the strength of this evaluation was its very large sample size, (atypical of most validation studies of dietary assessment) and thus, the opportunity to investigate question performance in a range of broad population sub-groups compared with a well-conducted, quantified survey of intakes.

## General recommendations

The 1996 Tasmanian Food and Nutrition Survey used a weighed food record as the primary method of dietary assessment and included all six of the short dietary questions evaluated in this report (4 in the same format and 2 in a modified format) and some alternative questions in addition. Thus, the performance of these and other short diet questions can be evaluated using a similar approach.

Meanwhile, it is important that consistency of wording and response categories is maintained in questions used in national, and where possible, state health surveys, so that trends can be identified nationally and for population sub-groups.

To enable maximum potential for detecting change and comparing prevalence of responses with (changing) dietary recommendations, it would be desirable to allow open-ended responses, rather than to create categories of responses.

Terms commonly used in short questions such as ‘usual’ and ‘serve’ need to be clearly defined. The types of foods to which questions relate also need to be clearly specified.

The validity of these and other short diet questions, for detecting change over time, needs to be investigated, as a priority. One possibility is to build in smaller calibration studies to large population health surveys, so that a small sub-sample completes a more detailed dietary assessment each time the survey is conducted. From such calibration studies, it would become apparent how much change in a food or nutrient intake (as measured by the detailed method) is required, before a change in response category on the short question occurs.

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