# National Nutrition Survey 1998

# *Forword*

There is compelling evidence to suggest that a healthful diet reduces risk of chronic diseases such as coronary heart disease, certain cancers and stroke. These conditions are a main cause of morbidity and mortality among an increasingly large proportion of economically active section of our population.

Translating the science into achievable dietary changes however, remains a challenge. Identification of at-risk eating behaviours or groups consuming inadequate and excessive food or nutrient intakes requires information on the local dietary patterns. For years, the only information on national food consumption patterns in this country has been provided by the Food and Agriculture Organisation of the United Nations in its National Food Balance Sheets. These data provide information on the foods and nutrients available for consumption by the population. It does not provide information on actual food consumption. The first dietary survey was conducted in 1993 among a sample of 677 adult Singaporeans.

This publication reports on the results of the second dietary survey conducted from September to November 1998. The survey provided information on the dietary practices and food and nutrient intakes based on data collected from 2,400 Singapore residents aged 18 to 69 years. In addition to assessment of current nutritional status, findings were also compared with those from the 1993 survey to track dietary changes. There are plans to conduct such nation-wide dietary surveys every 10-yearly to provide data to assess status and trends, to set dietary targets and to plan nutrition intervention activities.

I gratefully thank the staff of the Department of Epidemiology and Disease Control for their assistance in the survey planning and data handling. A project of this magnitude would not have been possible without a team of committed staff who not only co-ordinated the fieldwork, managed and analysed the data, but also maintained the Food Information and Nutrition Information Database - the computerised system used for translating food information into energy and nutrient intakes.

I would also like to thank all survey participants without whose participation, this report would not have been possible.

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# Executive Summary

## About the Survey...

The National Nutrition Survey 1998 (NNS 98) was conducted in conjunction with the National Health Survey 1998 (NHS 98). A random sample of 4,723 Singaporean adults (aged 18 to 69 years) participated in the NHS 98, and of this study sample, 2,400 subjects were systematically selected to participate in the NNS 98. The survey was undertaken to determine the population's dietary practices and adequacy, and to assess changes in the diet of Singaporeans since the previous survey conducted in 1993.

Dietary information was collected using a combination of self- and interview-administered questionnaires, and by getting subjects to recall what they had eaten and drunk the day before the interview. Food pictures and household measures were used to aid identification of food items and quantification of portions eaten.

## Dietary Practices

The Singapore dietary guidelines recommend a diet that is low in fat and salt and adequate in grains, fruit and vegetables, and maintenance of a healthy body weight. Compared with findings from the 1993 dietary survey, there are increases in the proportions of people who reported trimming off visible fat from meat or skin from poultry, having deep-fried foods less often than six times a week, drinking reduced-fat milk, using soft margarine instead of butter as a fat spread, and choosing wholemeal or a mixture of wholemeal bread and white bread [Table A].

**Table A - Dietary practices: Comparison between 1993 and 1998 survey findings**

| Dietary Practices | Total 1993 (%) | Total 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| Trimming fat from meat | 72.1 | 86.7 | ↑* |
| Trimming skin from poultry | 60.3 | 80.7 | ↑* |
| Having deep fried foods less than 6 times/ week | 83.2 | 91.5 | ↑* |
| Drinking reduced-fat milk | 11.7 | 34.0 | ↑* |
| Using soft margarine instead of butter as fat spread | 38.5 | 48.8 | ↑* |
| Choosing wholemeal or a mixture of white & wholemeal bread | 20.6 | 30.1 | ↑* |
| Using blended oils for cooking at home | 43.7 | 42.5 | no change† |
| Adding salt/ sauces to food at the table | 31.3 | 59.2 | ↑† |

*Future interventions will aim to maintain or improve trend.
† Future interventions will aim to reverse trend.

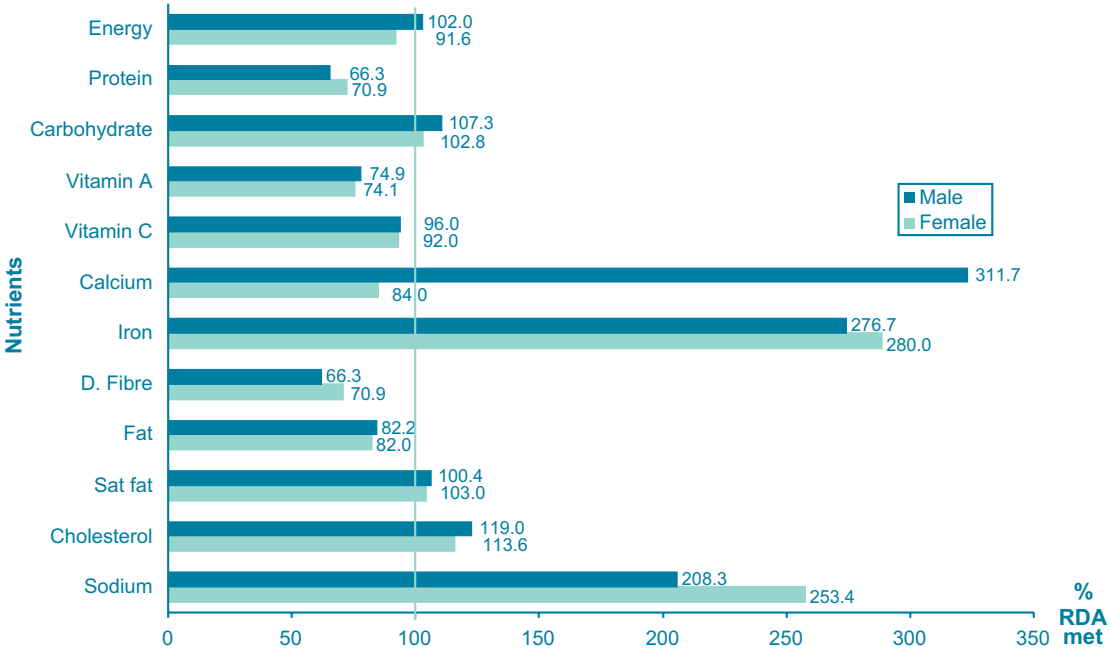
However, use of blended vegetable cooking oils (typically high in saturated fat) and addition of salt/ sauces (high in sodium) to foods served at the table are still common - reported respectively, by 42.5% and 59.2% of Singaporeans [Table A].

# Dietary Adequacy

## General

The diet of Singaporeans is generally adequate. Mean intakes of energy, protein, carbohydrate, vitamins and minerals meet at least 70% of the Recommended Dietary Allowances (RDAs) [Figure A]. RDAs are levels of energy and nutrients set to meet the needs of majority of people in the population.

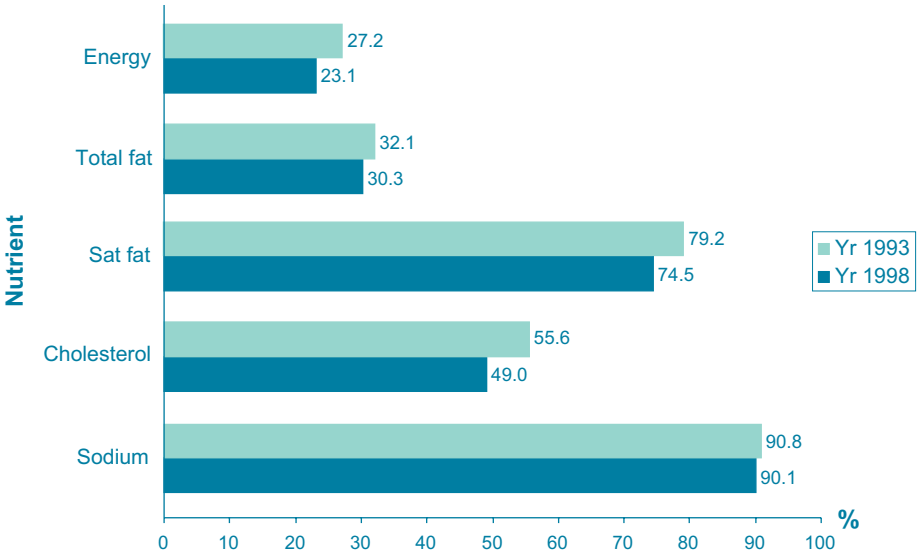
**Figure A - Adequacy of diet: Percent Recommended Dietary Allowances (RDAS) met (by gender)**




A main dietary concern of most affluent societies is excessive intakes of energy, fat, cholesterol and sodium. A diet excessive in fatty and salty foods also tends to be proportionately low in foods rich in dietary fibre and certain vitamins (e.g. vitamins A and C) and minerals (e.g. calcium and iron). Thus, problems of dietary excesses need to be addressed with those related to insufficiencies.

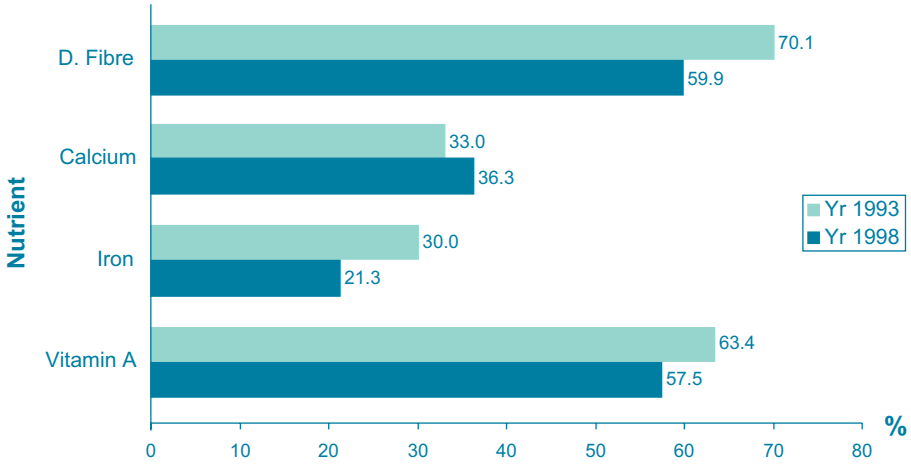
Compared with 1993, it is encouraging to note that the proportions of people whose diets are excessive in energy, saturated fat and cholesterol have declined [Figure B].

**Figure B - Proportion of Singaporeans whose diets had excesses: Comparisons between 1993 and 1998 survey findings**




At the same time, the proportions of people failing to meet the recommended levels for dietary fibre, iron and vitamin A have also declined (Figure C).

**Figure C - Proportions of Singaporeans whose diets had inadequacies: Comparisons between 1993 and 1998 survey findings**



## Dietary excesses

A diet excessive in fat and saturated fat promotes fatty deposits on the inner wall of blood vessels, thus increases the risk of coronary heart disease, while that high in sodium predisposes to hypertension. Both these conditions are prevalent among Singaporeans, and the proportions of people having these conditions have increased since the last nation-wide health survey in 1992.

The fat intake contributes about 30% of dietary energy. This is in line with the recommendation of no more than 30% dietary energy from fat. Young adults (18 to 39 years) have higher fat intake than older adults (40 to 69 years), and the fat intake of the Chinese was higher than that of the Malays and Indians. The young adults and the Chinese also reported more frequent meals eaten away from home - a likely factor contributing to the higher fat intake of these individuals.

The fat in the diet is proportionately high (39.4%) in saturated fat, the recommendation being to limit the saturated fat to no more than a third of total dietary fat. The main sources of saturated fat are coconut milk and high-saturated fat cooking oils. The Malays have the highest proportion (42.1%) of their dietary fat in the form of saturated fat, followed by the Indians [Table B]. Compared to the other age groups, those aged 18 to 39 years rank highest not only in fat intake, but also in percent of fat eaten as saturated fat.

**Table B - Fat and saturated fat intakes (by ethnic and age groups)**

| | Total fat | | Saturated fat | |
|---|---|---|---|---|
| | Mean fat intake (g) | % dietary energy* | Mean intake saturated fat (g) | % total fat* |
| Chinese | 67.4 | 31.3 | 26.2 | 38.7 |
| Malays | 61.0 | 31.1 | 25.7 | 42.1 |
| Indians | 61.0 | 29.1 | 24.5 | 40.3 |
| **Overall** | **66.6** | **31.1** | **26.2** | **39.4** |
| | | | | |
| 18-29 yrs | 69.9 | 31.6 | 28.8 | 41.2 |
| 30-39 yrs | 67.8 | 31.6 | 27.3 | 40.2 |
| 40-49 yrs | 61.2 | 30.2 | 21.3 | 38.5 |
| 50-59 yrs | 62.7 | 30.5 | 23.8 | 37.9 |
| 60-69 yrs | 52.4 | 27.9 | 18.4 | 35.6 |
| **Overall** | **66.6** | **31.1** | **26.2** | **39.4** |

** The Dietary Guidelines recommend:*
*- Dietary fat to be 20% to 30% of total energy intake.*
*- Saturated fat to be no more than 1/3 of total fat intake.*

The mean sodium intake is excessive. The Chinese have higher sodium intake than the Malays and Indians, and those aged 18 to 39 years have a higher sodium diet than their older counterparts [Table C]. The higher sodium intake among young adults and among the Chinese may be partly due to these individuals being more likely to add salt or sauces to their food at the table.

**Table C - Mean sodium intake* and percentages of Singaporeans adding salt/ sauces at the table (by ethnic and age groups)**

| | % adding salt/ sauces at table | Mean sodium intake (mg) |
|---|---|---|
| Chinese | 62.6 | 3725 |
| Malays | 53.2 | 2572 |
| Indians | 54.4 | 2688 |
| **Overall** | **59.2** | **3527** |
| | | |
| 18-29 yrs | 63.3 | 3490 |
| 30-39 yrs | 62.2 | 3401 |
| 40-49 yrs | 56.6 | 3173 |
| 50-59 yrs | 55.4 | 3159 |
| 60-69 yrs | 46.7 | 2887 |
| **Overall** | **59.2** | **3527** |

* Recommended daily allowance is ≥ 2000mg sodium.

## Dietary insufficiencies

A diet providing good amounts of fibre helps to lower blood cholesterol level and adds bulk thus reducing the likelihood of over-eating. The prevalence of low fibre intake among Singaporeans [Figure C] could be due to the large proportions of people failing to consume adequate servings of rice and alternatives (49.4%) especially the wholegrain varieties (91.7%), and fruit (79.9%) and vegetables (84.2%), given that these foods are the main sources of dietary fibre [Table D].

**Table D - Percentages of Singaporeans falling short of the recommended servings (by ethnic and age groups)**

| | Rice & alternatives | | Fruit | Vegetables |
|---|---|---|---|---|
| | Total | Wholegrains | | |
| **Recommendations:** | **(5-7 servings)** | **(≥0.5 servings)** | **(≥ 2 servings)** | **( ≥2 servings)** |
| | % | % | % | % |
| Chinese | 49.1 | 92.1 | 80.5 | 84.1 |
| Malays | 51.6 | 92.1 | 79.6 | 86.5 |
| Indians | 48.6 | 86.4 | 74.0 | 80.8 |
| **Overall** | **49.4** | **91.7** | **79.9** | **84.2** |
| | | | | |
| 18-29 yrs | 42.9 | 91.0 | 80.4 | 83.7 |
| 30-39 yrs | 49.9 | 92.7 | 83.6 | 85.4 |
| 40-49 yrs | 50.9 | 92.8 | 78.8 | 84.9 |
| 50-69 yrs | 54.9 | 90.1 | 75.7 | 82.5 |
| **Overall** | **49.4** | **91.7** | **79.9** | **84.2** |

Chinese and Malays are more likely than the Indians to fall short of the recommendations for these food groups. Young adults (18-39 years) are least likely to eat adequate amount of fruit. The lower fruit intake might also have contributed to the lower vitamin A intake among younger adults. Fruit and vegetables, especially the brightly-coloured ones, are good sources of vitamin A.

Of those who have inadequate calcium intake, half (50.6%) are women aged 18 to 49 years. This poses a public health concern as it is increasingly recognised that inadequate calcium intake during the pre-menopausal years reduces bone density and increases risk of osteoporosis after menopause. A similar pattern is observed for iron. Of those who fall short of the recommended level of iron, 88% are women aged 18 to 49 years.

These inadequacies pose public health concerns. It is increasingly recognised that inadequate calcium intake during the pre-menopausal years reduces bone density and increases risk of osteoprosis after menopause, and iron deficiency is associated with compromised mental functioning, reduced physical working capacity, and impairment of the immunological defence against infection.

## Implications and recommendations

Findings from the survey show that the diet of Singaporeans is shifting towards being more consistent with the dietary guidelines. Nutrition programmes will continue to promote a balanced and varied diet to meet nutritional needs, but with special emphasis on:

**i) Reducing dietary fat, especially saturated fat**

To create awareness of the sources of fat and saturated fat in the diet, and to impart skills on recipe modifications and making informed food choices.

**ii) Eating adequate amounts of rice and alternatives, especially the wholegrain varieties**

To increase perceived benefits and to dispel misconceptions related to eating more of these foods.

**iii) Eating more fruit and vegetables**

To focus on the recommended number of servings to consume daily, the amount of fruit and vegetables that constitute a serving, and on the healthier choices among these foods.

**iv) Reducing use of salty seasonings and processed foods**

To educate not just the consumers but also the homemakers, food service providers and food manufacturers on the main sources of dietary sodium i.e. salty seasonings added when cooking, at the table and during processing of foods (e.g. canning of fish and vegetables, curing of meats).

**v) Balancing food intake with physical activity**

To promote the concept of energy balance i.e. weight maintenance can be achieved by balancing food intake with physical activity. In fact, a diet providing sufficient energy is more likely to meet nutrient needs.

Public education will be accompanied by collaboration with the food industry to promote a healthier food supply and increased availability of point-of-sale nutrition information to help people make their food choices. To develop evidence-based interventions, studies will be undertaken to guide informed decisions about what and how to communicate to specific groups of consumers. The aim is to increase awareness, motivate and help consumers translate knowledge into appropriate actions. The change in dietary practices and food and nutrient intakes will be monitored through periodic surveys.

# Introduction

There is compelling evidence to suggest that a healthful diet may reduce deaths due to chronic degenerative diseases such as some forms of cancer, coronary heart disease and stroke which together account for more than half of all deaths in Singapore. It has been estimated that dietary practices consistent with the dietary guidelines have the potential of reducing over time, cancer incidence and mortality by between 30% and 40% (1), the risk of heart disease by 15% (2), and the risk of stroke by 22% to 30% (3, 4).

Dietary factors are also associated with osteoporosis which is a major cause of bone fractures in postmenopausal women and elderly persons (5). Osteoporosis increases with age and with a rapidly aging population in Singapore, it is a public health concern. Many patients suffering from osteoporosis fractures, especially, of the neck of the femur (hip fracture) never fully regain mobility after the initial fracture. There is also an increased risk of mortality as a consequence of the hip fracture or the associated surgery. In Singapore, the rates of hip fractures have increased over the years. Compared to 1991, the number of hip fractures managed in 1999 was almost doubled (1,278 vs 2,344 hip fractures)(6).

The nutritional quality of a diet is often evaluated against two dietary standards - the Recommended Dietary Allowances (RDAs) (7)and the Dietary Guidelines (8). The RDAs are levels of energy and nutrients set to meet the needs of majority of people in the population. Nutrient adequacy is generally assessed by determining whether mean intakes of energy, protein, carbohydrate, vitamins and minerals (e.g. as assessed from 24-hour dietary recalls) meet at least 70% of the levels recommended by the RDAs.

The *Dietary Guidelines for Singaporeans* recommend that persons aged 2 years and older should consume a diet consisting of a variety of foods, maintain healthy weight, choose a diet that is plentiful in grain products, fruit and vegetables, moderate in salt, sodium and sugars, and low in fat, saturated fat and cholesterol, and if consuming alcoholic beverages, do so in moderation. The Healthy Diet Pyramid translates these guidelines into food-based recommendations [see Annex I] and provides a useful tool for monitoring adequacy of food intake.

With increasing affluence, the supply of food in Singapore over the past decades has changed tremendously (9). The total food energy has increased, more from animal than plant products. The first nation-wide food consumption survey was conducted in 1993 involving a random sample of 677 subjects aged 18 to 69 years (10). A main aim of the survey was to determine the dietary levels of energy and nutrients. It is increasingly recognised that food provides not only nutrients, but also a combination of other food constituents that appear to be protective against chronic diseases. This has led to recent interest in monitoring population intakes of foods and food groups, not just nutrients (11, 12).

## Objectives

The National Nutrition Survey 1998 was conducted to:

- Provide information on the population's dietary practices;
- Determine adequacy of intake of the various food groups (i.e. rice and alternatives, fruit, vegetables and meat and alternatives) making up the Healthy Diet Pyramid;
- Measure levels of intake for energy and nutrients (i.e. protein, total fat, saturated and unsaturated fats, cholesterol, carbohydrate, dietary fibre, sodium, calcium, iron, and vitamins A and C);
- Track changes in the diet of Singaporeans since the previous study conducted in 1993.

# Methodology

## Sample

The National Nutrition Survey 1998 (NNS 98) was carried out in conjunction with the National Health Survey 1998 (NHS 98). A sample of 5000 Singaporean adults aged 18 to 69 years were randomly selected from all households of different geographic locations in Singapore for participation in the NHS 98. From this study sample, about 2400 Singaporeans were systematically selected to participate in the NNS 98.

## Measures

### Dietary Practices Questionnaire

Dietary practices were assessed by a self-administered Dietary Practice Questionnaire (DPQ) [See Annex II for sample questionnaire]. The DPQ was developed based on the questionnaire used for the 1993 Food Consumption Study. It consisted of 19 multiple-choice questions and was translated into Chinese and Malay. The topics covered in the questionnaire included:

- Usual venues of breakfast, lunch and dinner
- Frequency of eating at home and outside home
- Usual frequency intake of selected food and beverages
- Food habits and attitudes

The questionnaire was self-administered. For each question, respondents were asked to select one answer that most appropriately describe their dietary habits or practices. Interviewers were available to conduct interviews for illiterate subjects or to assist when necessary.

### Food Frequency Questionnaire

Food intakes were assessed by a validated interviewer Food Frequency Questionnaire (FFQ) [See Annex III for sample questionnaire]. The FFQ consisted of 354 commonly eaten food items identified from the 1993 study as important contributors to the population's intake of energy and nutrients. The list of foods included foods that are good sources of energy and nutrients and foods that are less nutrient-dense but were eaten frequently. Interviewer-administered, the FFQ had been validated in a separate study using multiple 24-hour dietary recalls and a biochemical marker (24-hour urinary urea excretion).

**24-Hour Food Intake Questionnaire**

Assessment of dietary intake over the past twenty-four hours was used to determine the mean intakes of energy and selected nutrients of Singaporeans. Dietary adequacy was assessed by comparison of levels of intake with those recommended by the dietary standards, viz. the Recommended Dietary Allowances (RDAs) and the Dietary Guidelines.

The 24-hour food intake questionnaire was interviewer-administered [See Annex IV for sample questionnaire]. Interviewer recorded information on the meal type, time and venue of consumption, description and quantities of foods and beverages consumed over a 24-hour period (midnight to midnight) of the day prior to the day of interview. The number of interviews conducted on different days of the week was almost identical to control for variability in food intakes on weekdays (Monday to Friday) and weekend (Sunday). As Saturday is a working day for some people and a weekend for others, dietary intake was not collected on that day.

A number of aids were used to facilitate identification of foods and quantification of portion sizes eaten. The Compendium of Food Pictures consisted of 14 photographs on groups of food and 69 photographs on individual foods. Produced to reflect the actual size of foods, these photographs were useful in helping subjects estimate amounts eaten as fractions or multiples of the illustrated reference portions. Thickness of food eaten was estimated from a set of 200 food thickness cards each of 0.55mm thick. Household measures such as graduated bowls and glasses and spoons of varying sizes were also used for estimation of volumes drunk or amounts eaten.

## Data collection

Data were collected between Sep 98 and Nov 98. Respondents were interviewed at six community centres or clubs in different geographic locations. Respondents were first given the DPQ for self-administration before being interviewed for their usual intakes of foods as listed in the FFQ and for their food and drink intakes over the previous 24 hours.

## Data analysis

### Data coding

Dietary practices and food intake data were coded using the Food Information and Nutrient Database (FIND) developed by the Department of Nutrition. The FIND was also used to convert food intake data to energy and nutrient intakes.

### Statistical analysis

Data were analysed using SPSS version 9.0. Significance level was set at $p$=0.05.

One-way ANOVA and *t*-test were used to examine the differences in mean intakes of foods, energy and nutrients between the genders and various ethnic and age groups. Distribution of subjects across the diet-related variables was examined using *Chi*-square statistics. Results were presented by gender, ethnic and age groups. Where findings were extrapolated to the population as a whole, the study sample was weighted to the gender, ethnic and age group distribution of the 1998 Singapore resident population.

# Results

# 1. Subjects

The demographic characteristics of the survey subjects are generally comparable to those of the Singapore population [Table 1.1]. The sample was distributed approximately equally among males and females (45.9% and 54.1% respectively), the mean age was 38.8 years (range 18 to 69 years, standard error = 0.25 years), and the majority are Chinese (61.3%) followed by Malays (21.12%) and Indians (17.5%).

**Table 1.1 - Demographic profile of respondents as compared with that of the Singapore population in 1998[1]**

| | Survey sample n | (%) | Population estimates n (1000s) | (%) |
|---|---|---|---|---|
| **Gender** | | | | |
| Males | 1093 | 45.9 | 1080.4 | 50.1 |
| Females | 1284 | 54.1 | 1075.2 | 49.9 |
| **Ethnic groups** | | | | |
| Chinese | 1456 | 61.3 | 1722.4 | 79.9 |
| Malay | 505 | 21.2 | 273.0 | 12.7 |
| Indian | 416 | 17.5 | 160.2 | 7.4 |
| **Age groups** | | | | |
| 18 - 29 yrs | 563 | 23.7 | 563.3 | 26.1 |
| 30 - 39 yrs | 749 | 31.5 | 603.8 | 28.0 |
| 40 - 49 yrs | 627 | 26.4 | 524.4 | 24.3 |
| 50 - 59 yrs | 274 | 11.5 | 287.9 | 13.4 |
| 60 - 69 yrs | 164 | 6.9 | 176.2 | 8.2 |
| **Overall** | **2377** | **100.0** | **2155.6** | **100.0** |

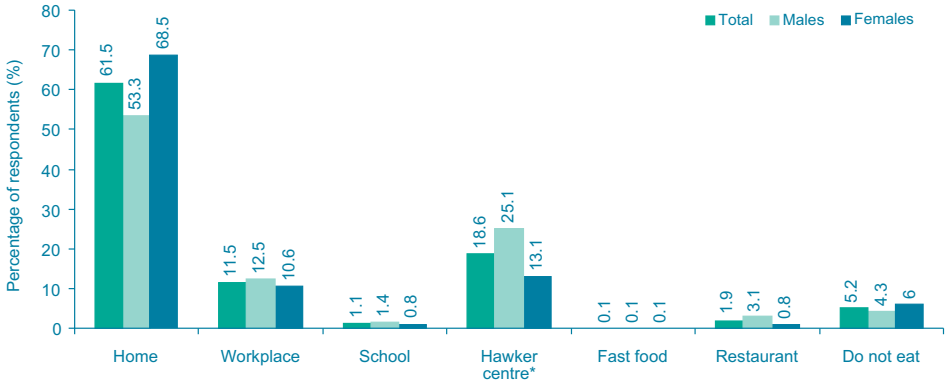
[1] Source - *Department of Statistics, Singapore, 1998*

# 2. Dietary Practices

## 2.1 Breakfast venue

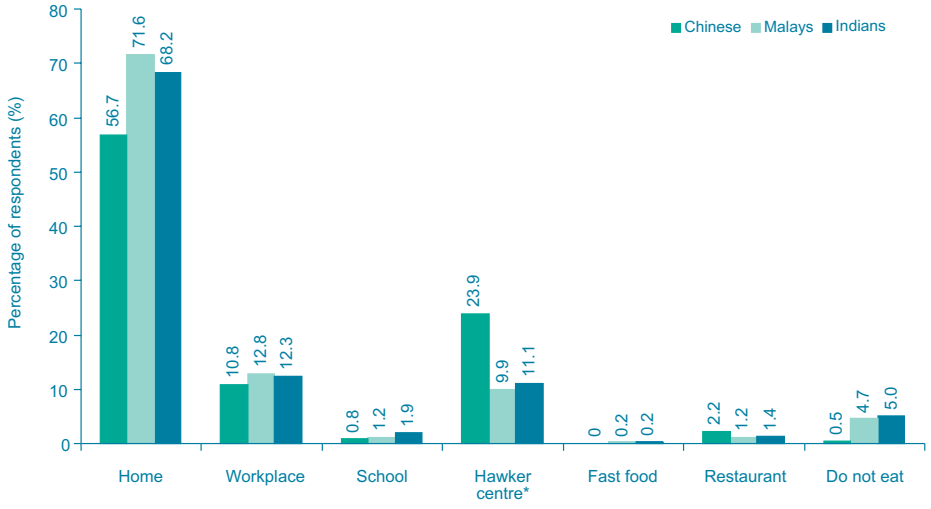
The majority of Singaporeans take breakfast, with only 5.2% skipping this meal. Most people have their breakfast prepared at home (61.5%), with more females (68.5%) than males (53.3%) reporting doing so. For those who have their breakfast away from home, hawker centres are the usual outlets (18.6%), followed by workplace canteens (11.5%).

**Fig 2.1.1 - Distribution by breakfast venue and gender**




All ethnic groups usually have home-prepared breakfast. Compared to other ethnic groups, Chinese are more likely to have breakfast away from home, with hawker centres being the most frequented venue (23.9%).

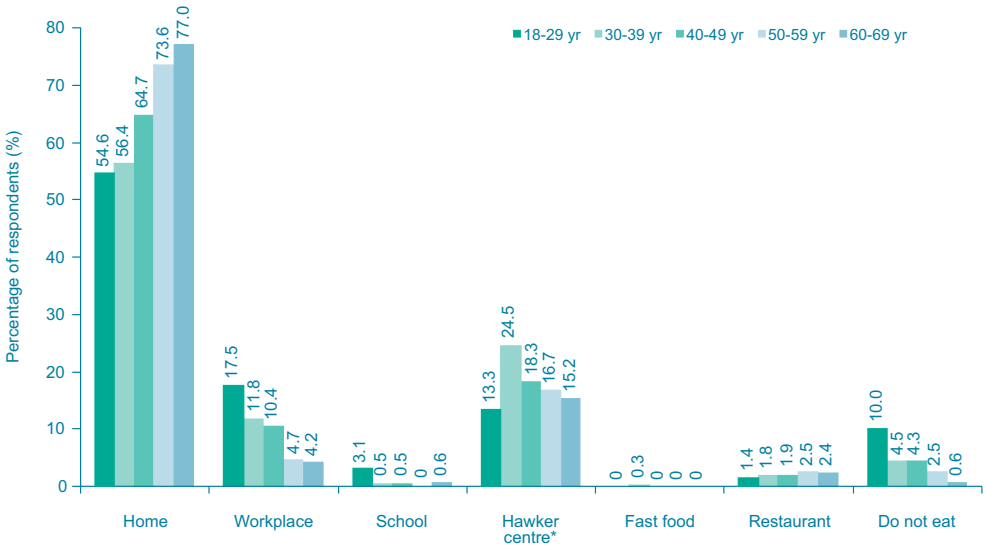
**Fig 2.1.2 - Distribution by breakfast venue and ethnic groups**




**include hawker centres, food courts and coffee shops*

The proportion of people who have home-prepared breakfast increases with age, peaking at 77% among those aged 60-69 years. Of those who have their breakfast away from home, workplace canteens are most popular among those aged 18-29 years (17.5%) whereas hawker centres are most popular among those aged 30-39 years (24.5%). Those aged 18-29 years (10.0%) are most likely to skip breakfast.

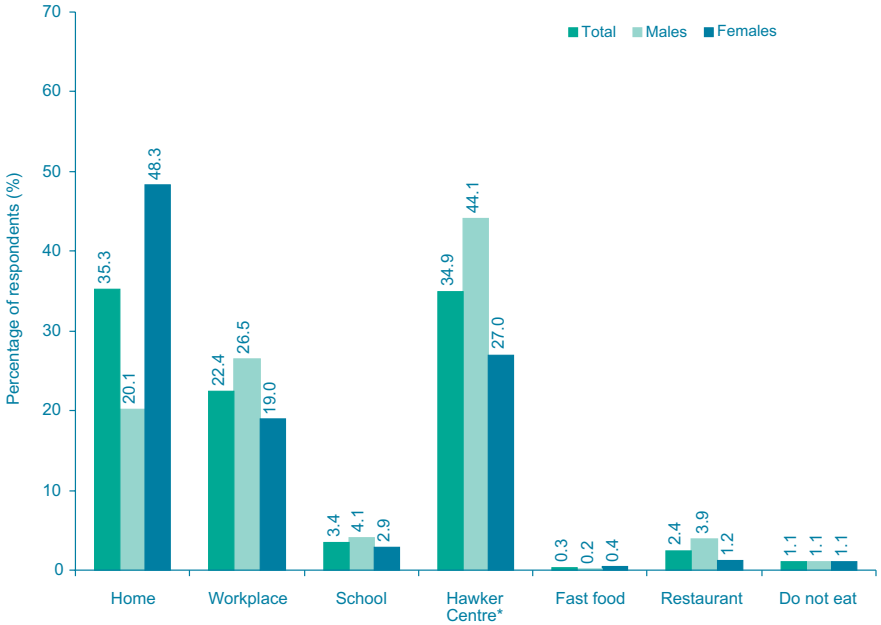
**Fig 2.1.3 - Distribution by breakfast venue and age groups**




## 2.2 Lunch venue

Only 35.3% of the population have their lunch prepared at home with the proportion of females (48.3%) doubling that of males (20.1%). Apart from home, hawker centres are the most frequented lunch venue (34.9%) followed by workplace canteens (22.4%).

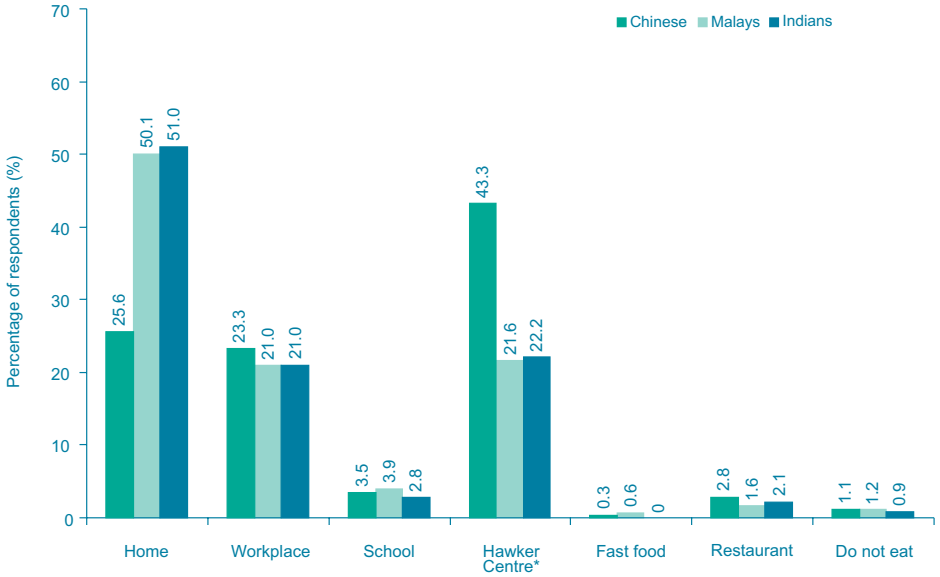
**Fig 2.2.1 - Distribution by lunch venue and gender**




**include hawker centres, food courts and coffee shops*

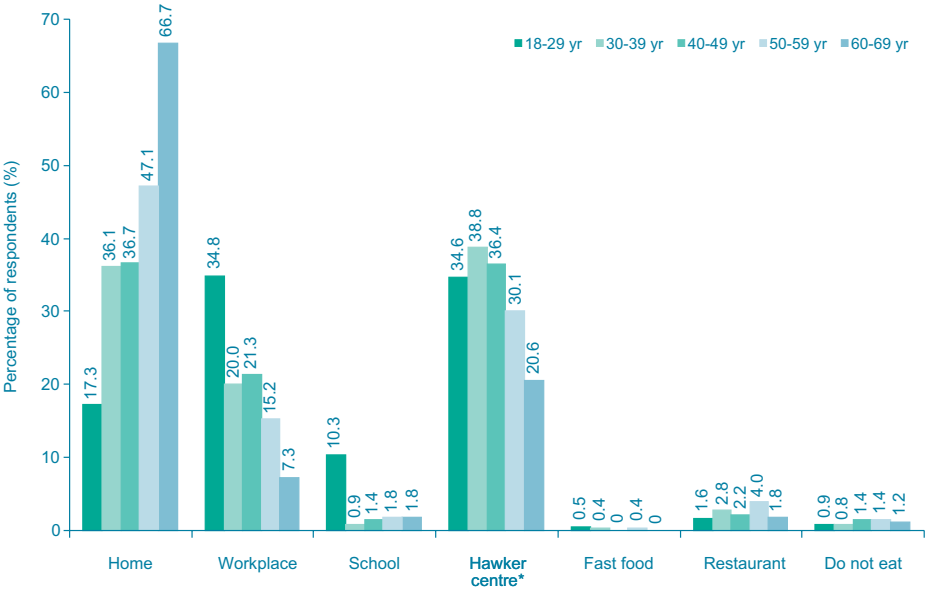
Most Chinese usually lunch out (74.4%), especially at hawker centres (43.3%) whereas higher proportions of Malays (50.1%) and Indians (51%) usually have home-prepared lunch.

**Fig 2.2.2 - Distribution by lunch venue and ethnic groups**




The proportion of people who have home-prepared lunch increases with age, peaking at 66.7% for those aged 60-69 years. Most of those aged 18-29 years (82.7%) lunch out, mostly at workplace canteens (34.8%) and hawker centres (34.6%). For those aged 30-59 years, the majority of those who eat out frequent hawker centres for lunch.

**Fig 2.2.3 - Distribution by lunch venue and age groups**

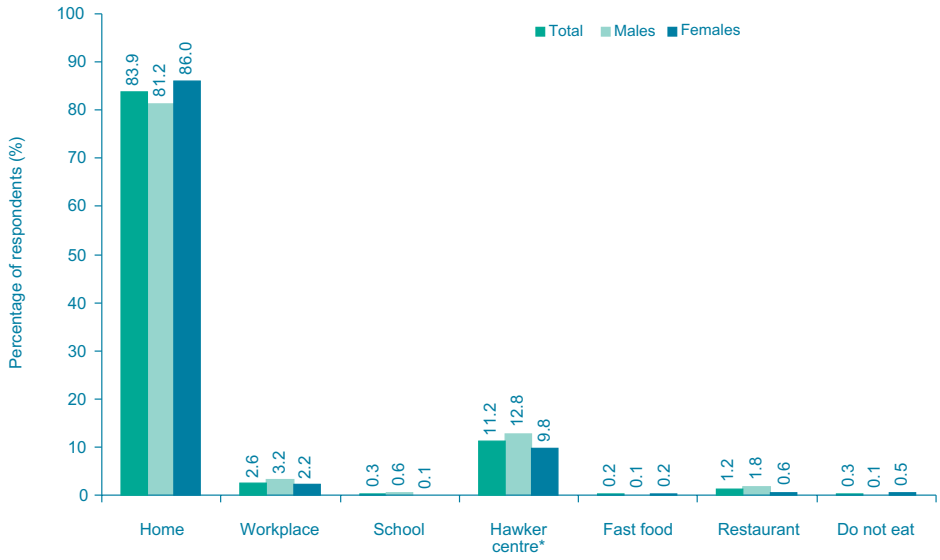



**include hawker centres, food courts and coffee shops*

## 2.3. Dinner venue

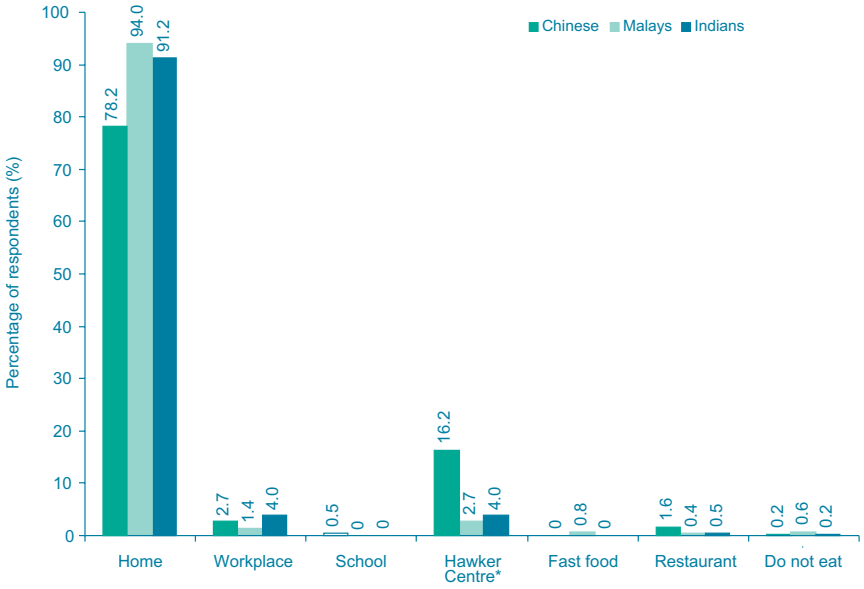
The majority of Singaporeans have home-cooked dinner (83.9%). Among those who eat out for dinner, hawker centres (11.2%) are the usual outlets.

**Fig 2.3.1 - Distribution by dinner venue and gender**




While the majority have their dinner at home, the proportion of Chinese (21.8%) who have dinner away from home is double that for the Malays (6%) and Indians (8.8%). The usual venues for dining out are the hawker centres.

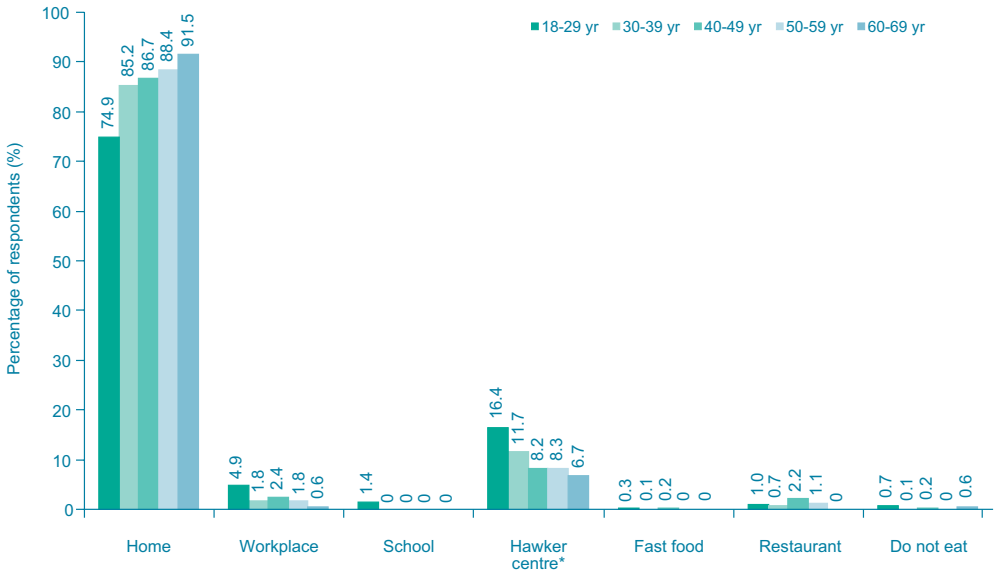
**Fig 2.3.2 - Distribution by dinner venue and ethnic groups**




**include hawker centres, food courts and coffee shops*

The proportion of those who have home-prepared dinner increases with age, peaking at 91.5% for those aged 60-69 years. The younger adults are more likely to dine out than the older ones, with hawker centres (16.4%) being the most frequented outlets.

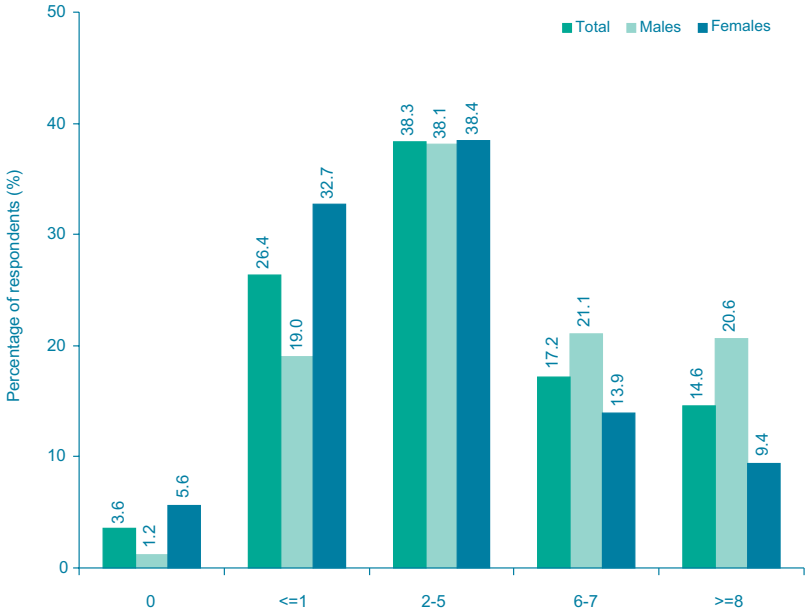
**Fig 2.3.3 - Distribution by dinner venue and age groups**




## 2.4 Eating at hawker centres

More than two-thirds (70%) of the Singaporeans patronise hawker centres at least twice a week. Hawker centre patrons (38.3%) usually have meals there two to five times a week. Males are more likely to be frequent patrons, with 41.7% of them visiting hawker centres six or more times a week, compared to only 23.3% for females.

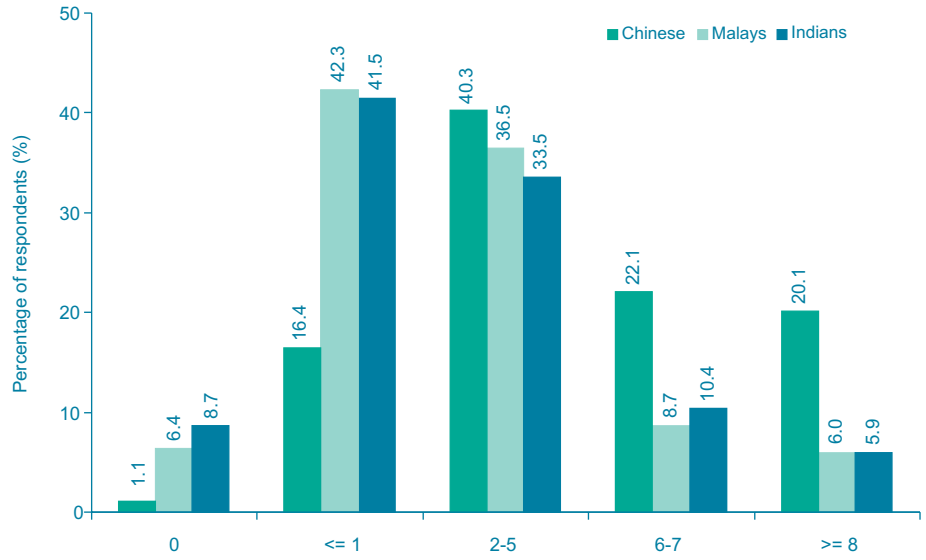
**Fig 2.4.1 - Distribution by frequency (times per week) of eating at hawker centres* and gender**




**include hawker centres, food courts and coffee shops*

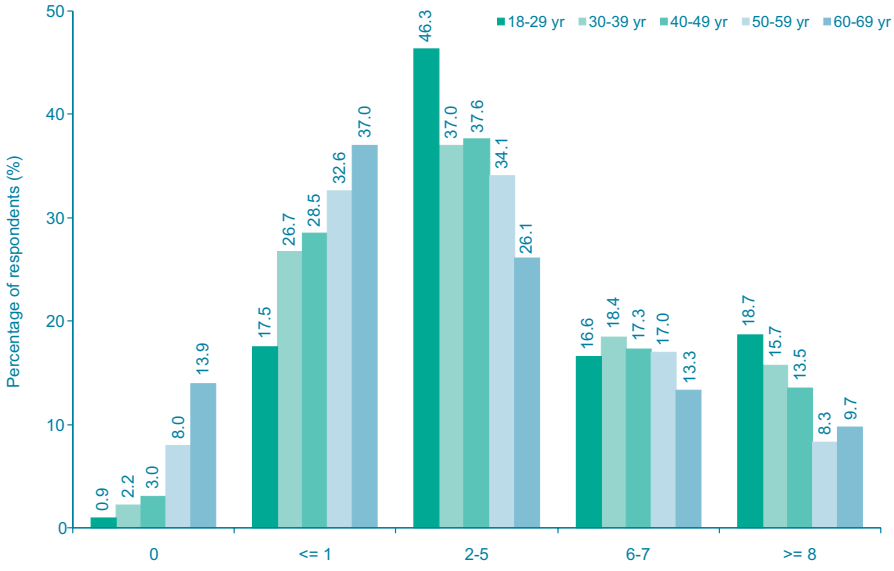
Chinese patronise hawker centres more frequently than other ethnic groups, with 82.5% of Chinese having their meals there at least twice a week compared to 51.2% of Malays and 49.8% of Indians who reported doing so. As much as 42.2% of Chinese patronise hawker centres at least six times a week, whereas only 14.7% of Malays and 16.3% of Indians do so.

**Fig 2.4.2 - Distribution by frequency (times per week) of eating at hawker centres* and ethnic groups**




Younger adults most frequently patronise hawker centres, with 81.6% of those aged 18-29 years visiting these outlets at least twice a week and 18.7% at least eight times a week.

**Fig 2.4.3 - Distribution by frequency (times per week) of eating at hawker centres* and age groups**

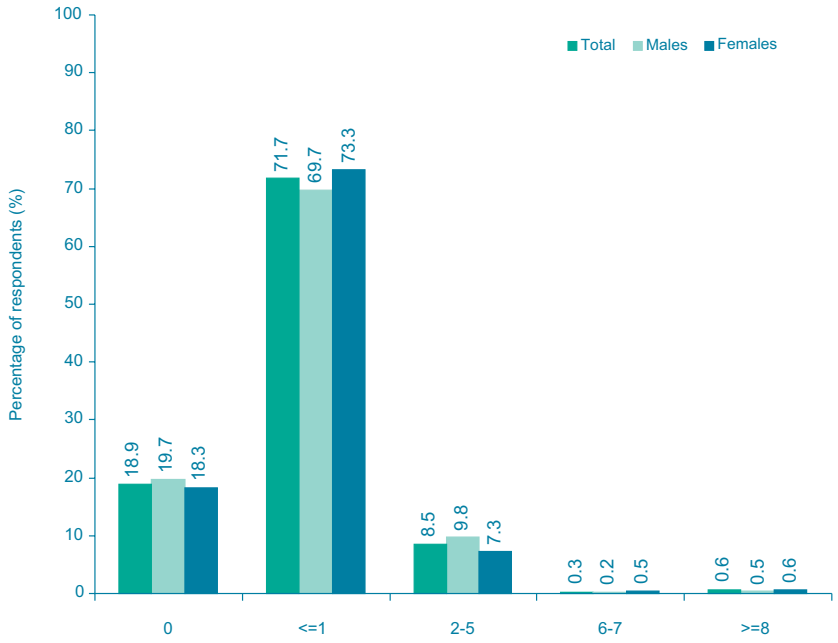



**include hawker centres, food courts and coffee shops*

## 2.5 Frequency of eating at western fast food restaurants

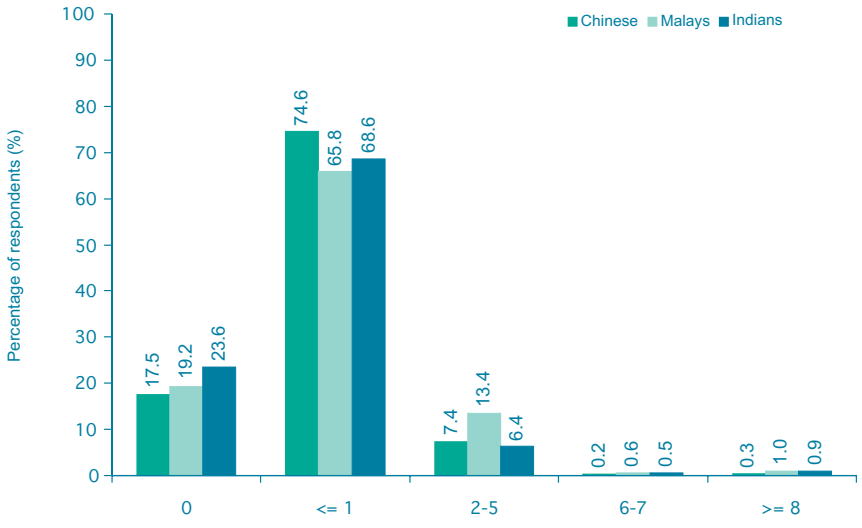
Most people eat in western fast food restaurants once a week or less (71.7%) and almost 19% never eat there.

**Fig 2.5.1 - Distribution by frequency (times per week) of eating at western fast food restaurants and gender**




Malays patronise fast food restaurants more often than other ethnic groups, with 15.0% of Malays having their meals there at least twice a week, compared to 7.9% of Chinese and 7.8% of Indians.

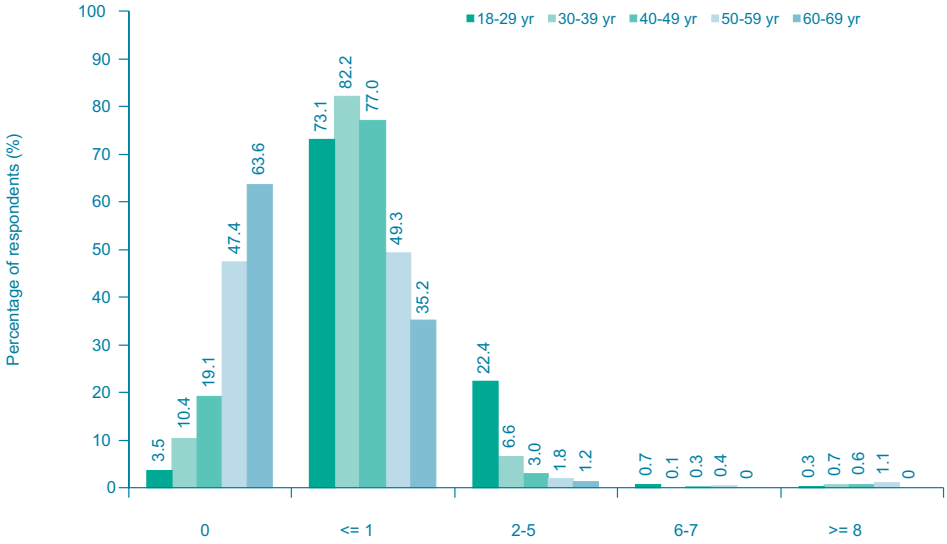
**Fig 2.5.2 - Distribution by frequency (times per week) of eating at western fast food restaurants and ethnic groups**




**include hawker centres, food courts and coffee shops*

Fast food restaurants are usually frequented by younger Singaporeans, with 23.4% of those aged 18-29 years having their meals there at least twice a week. In contrast, 98.8% of those aged 60-69 years eat at fast food restaurants once a week or less.

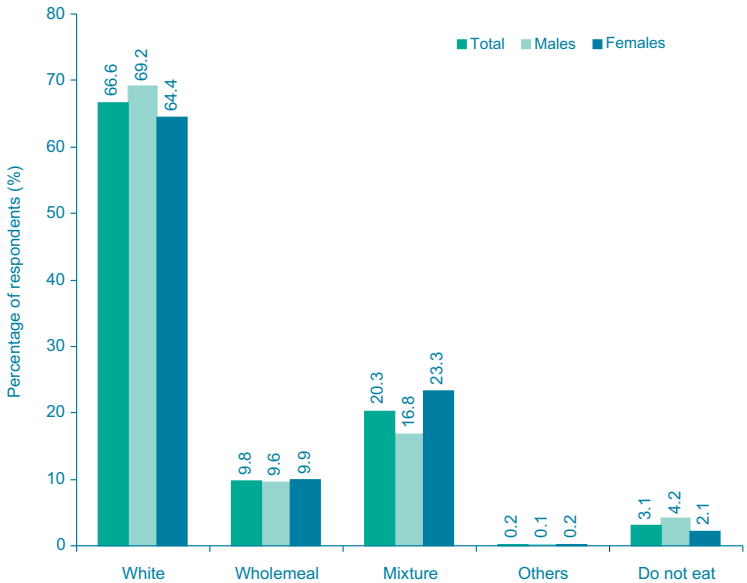
**Fig 2.5.3 - Distribution by frequency (times per week) of eating at western fast food restaurants and age groups**




## 2.6 Types of bread eaten

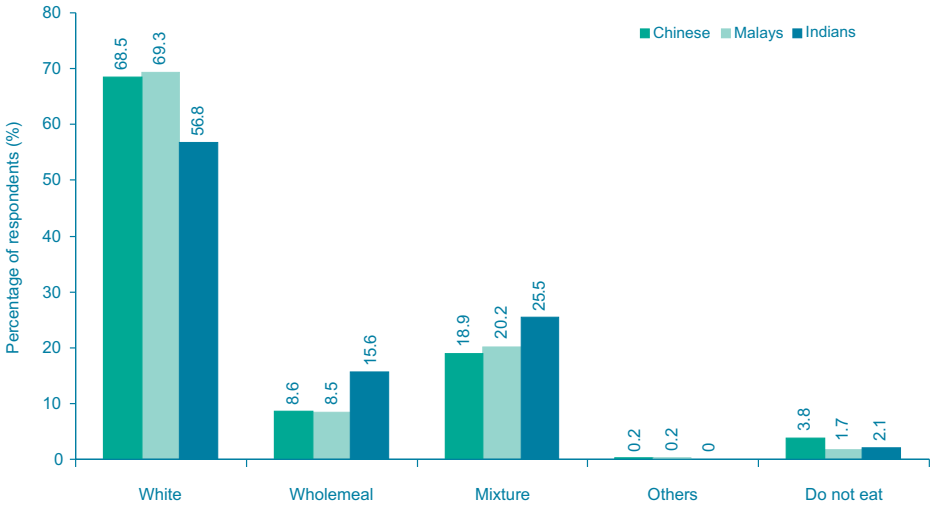
A large proportion of the population (66.6%) usually eats white bread. About one-third (30.1%) of the population consumes wholemeal bread or a mixture of white and wholemeal bread. Females (33.2%) are more likely to be in this group than males (26.4%).

**Fig 2.6.1 - Distribution by types of bread eaten and gender**



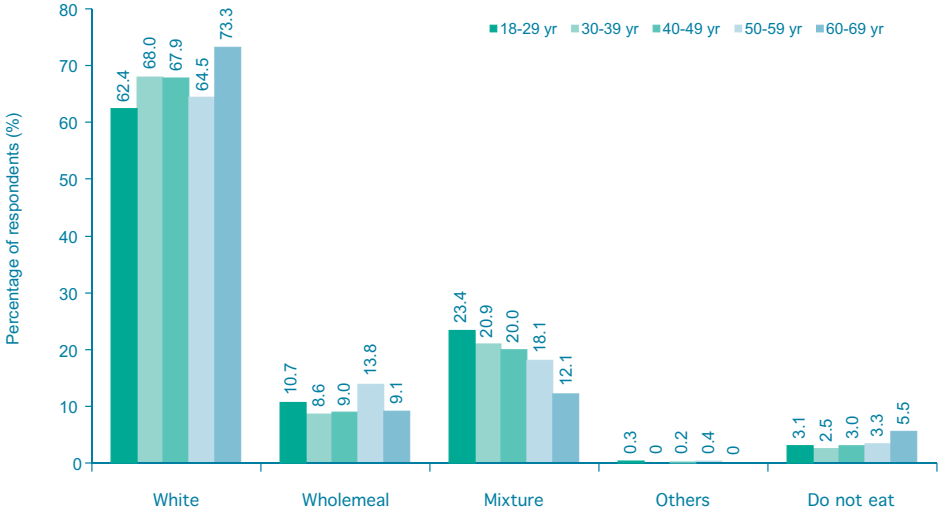
White bread is the usual choice for all races, particularly among the Chinese (68.5%) and Malays (69.3%). Indians are more likely to include wholemeal bread (41.1%) compared to Chinese and Malays (27.5% and 28.7% respectively).

**Fig 2.6.2 - Distribution by types of bread eaten and ethnic groups**




Among all age groups, the highest proportion of people having wholemeal bread is among those aged 50-59 years (13.8%). The proportion of people having a mixture of white and wholemeal bread is highest among those aged 18-29 years (23.4%).

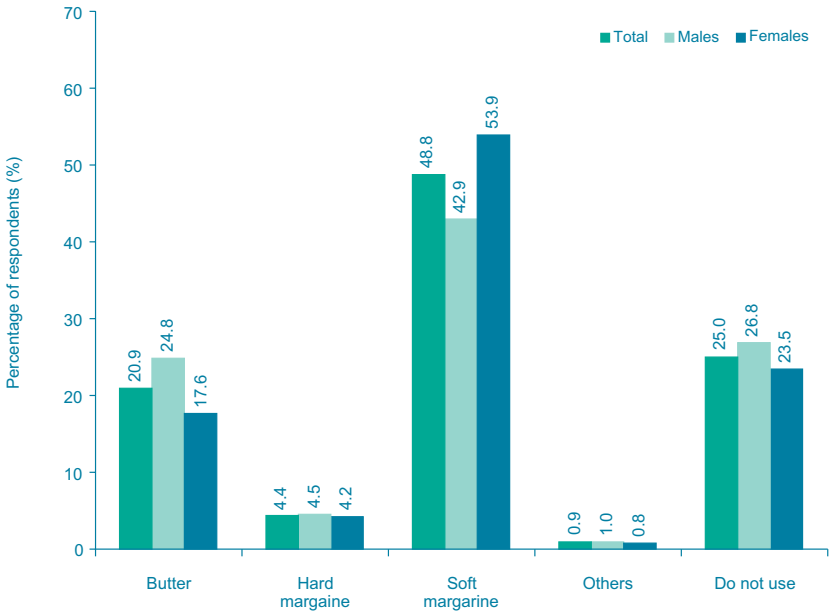
**Fig 2.6.3 - Distribution by types of bread eaten and age groups**



## 2.7 Types of fat spread used

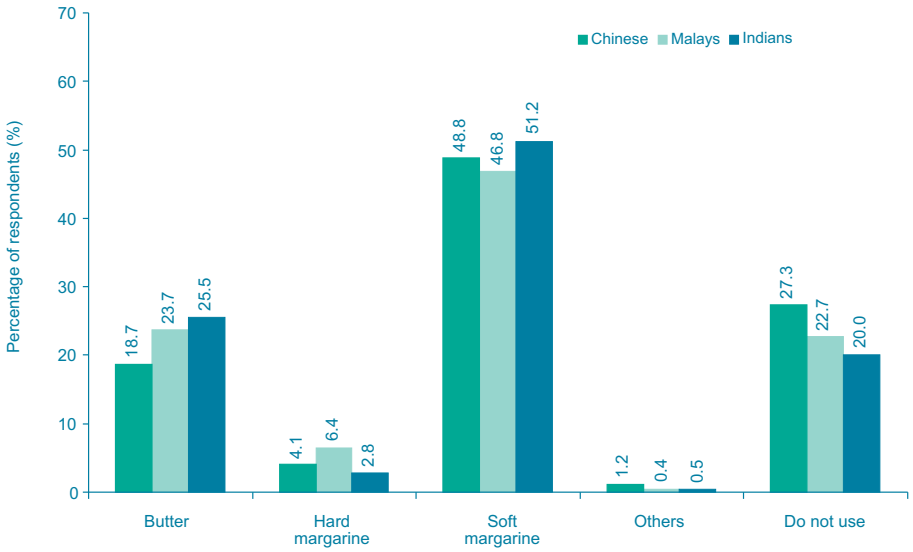
Three quarters of the population use some form of fat spread on bread or crackers. Majority of the population uses soft margarine (48.8%) followed by butter (20.9%). Females are more likely to use soft margarine than males (53.9% compared to 42.9%).

**Fig 2.7.1 - Distribution by types of fat spread and gender**



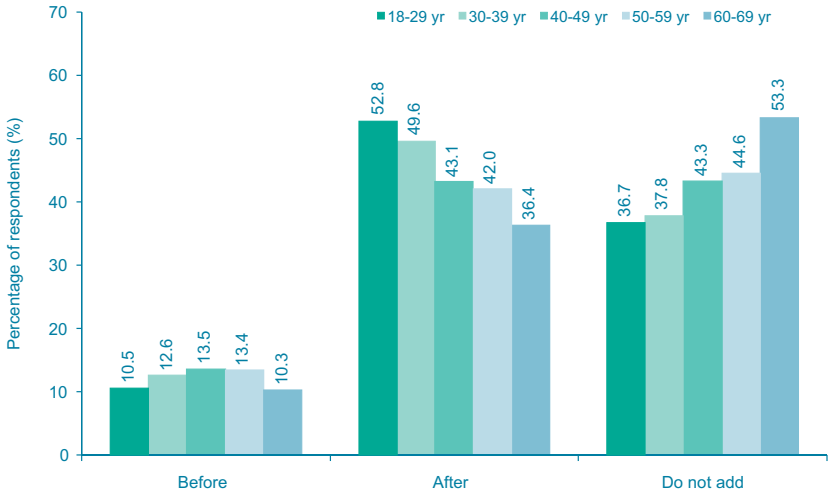

Soft margarine is the usual choice for fat spread among all ethnic groups. Malays are most likely to use butter or hard margarine (30.1%), followed by the Indians (28.3%) and Chinese (22.8%).

**Fig 2.7.2 - Distribution by types of fat spread and ethnic groups**



A large proportion of those aged 60-69 years (41.2%) do not use fat spread. Among those who use fat spread, soft margarine is the usual choice across all age groups.

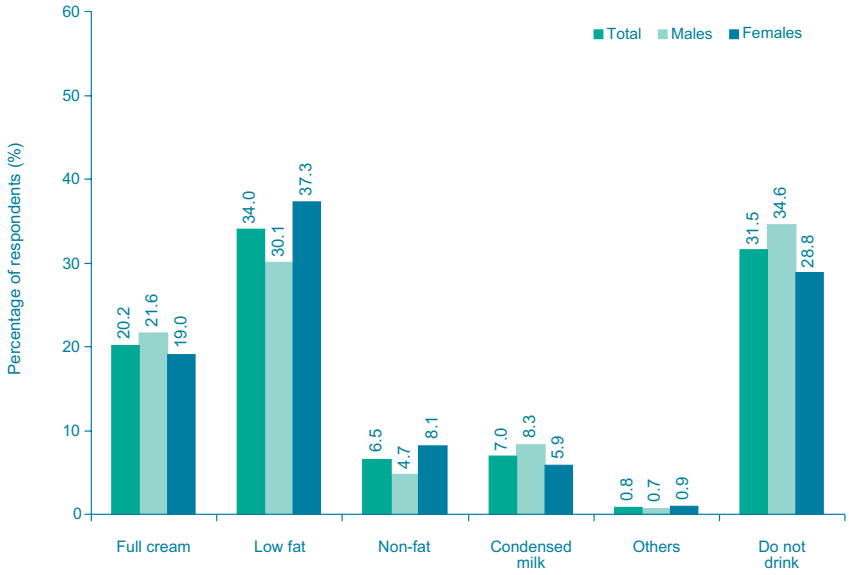
**Fig 2.7.3 - Distribution by types of fat spread and age groups**




## 2.8 Types of milk consumed

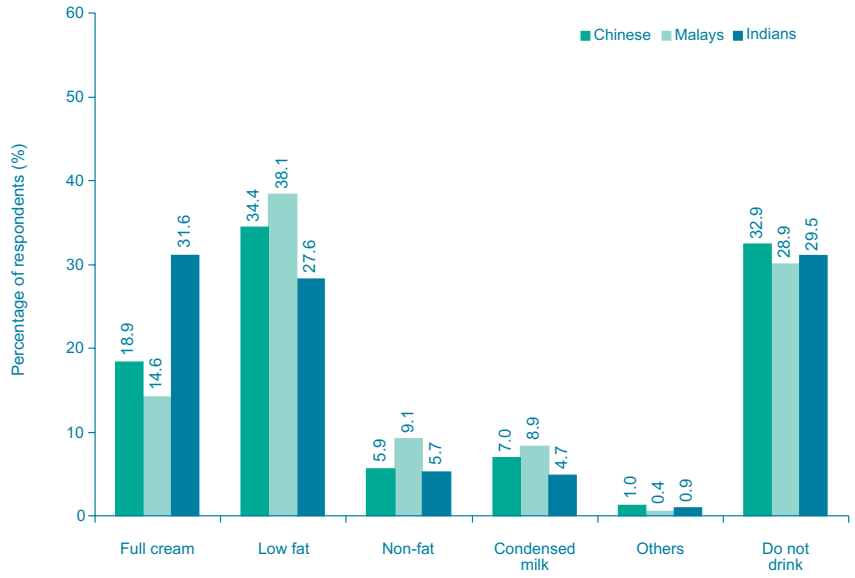
About a third of Singaporean adults (31.5%) do not drink milk, males being more likely than females (34.6% compared to 28.8%). Among those who reported drinking milk, more than half (59.1%) usually have low fat or non-fat milk. However, more than a quarter (27.2%) of the people usually have full cream or sweetened condensed milk.

**Fig 2.8.1 - Distribution by types of milk consumed and gender**



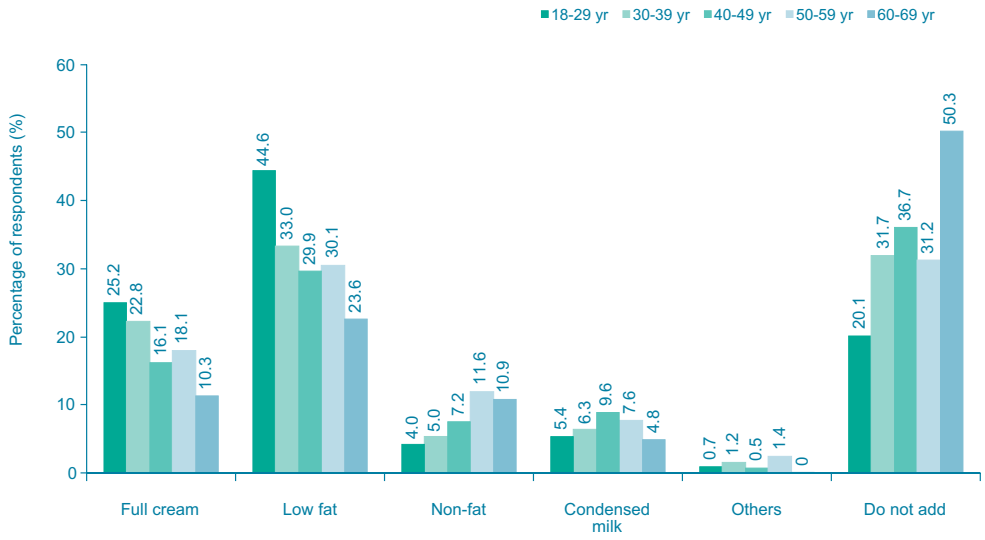
Most Indians (31.6%) usually have full cream milk whereas most Malays (38.1%) and Chinese (34.4%) usually choose low fat milk.

### 2.8.2 - Distribution by types of milk consumed and ethnic groups




Half of those aged 60-69 years (50.3%) do not drink milk. In contrast, more than three-quarters of those aged 18-29 years reported drinking some forms of milk (79.9%). Among those who drink milk, about half prefer low fat milk (ranging from 44.7% to 56.3%).

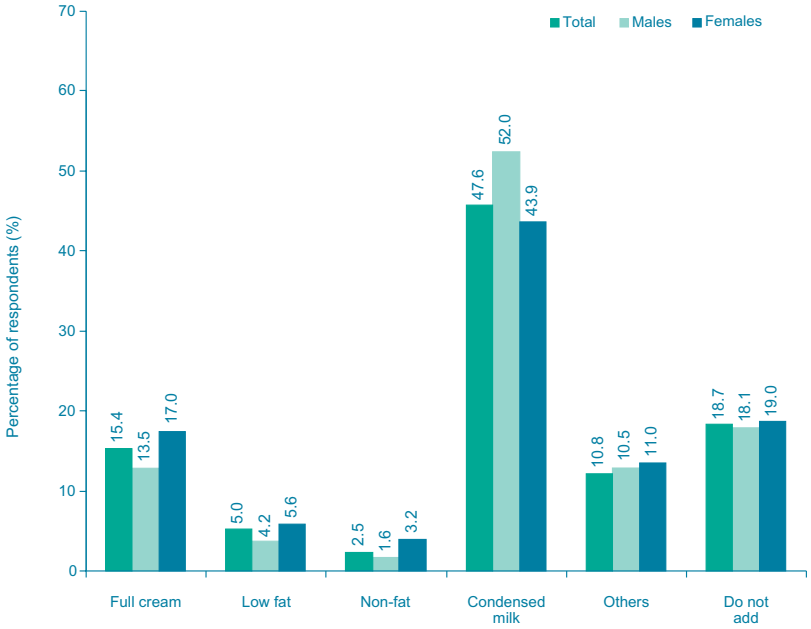
### Fig 2.8.3 - Distribution by types of milk consumed and age groups



## 2.9 Types of milk added to beverages

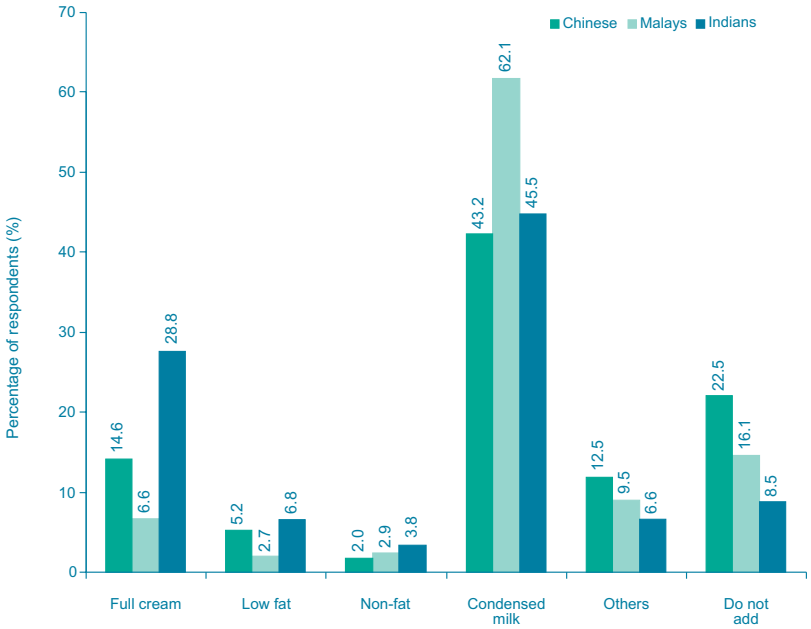
Although reduced fat milk is the most common type of milk consumed, few people use it for their beverages. For addition to beverages, sweetened condensed milk (47.6%) is most commonly used, followed by full cream milk (15.4%). A similar pattern is observed for males and females.

### 2.9.1 - Distribution by types of milk added to beverages and gender



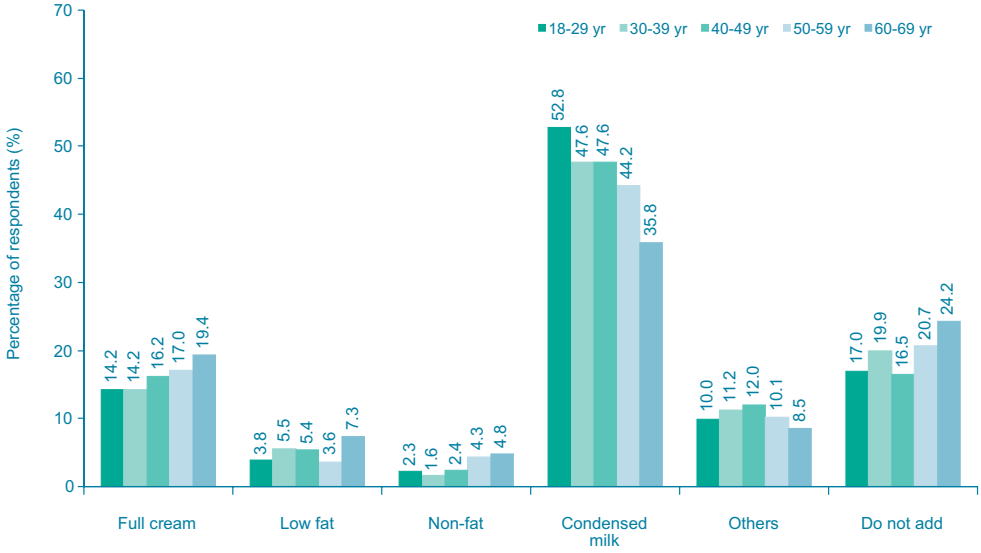

Malays (62.1%) are more likely than Chinese (43.2%) and Indians (45.5%) to use sweetened condensed milk for their beverages. The use of milk for beverages is more common among the Indians (91.5%), than the Chinese (77.5%) and Malays (83.9%). About a quarter (22.5%) of the Chinese have their beverages plain.

### Fig 2.9.2 - Distribution by types of milk added to beverages and ethnic groups



About a quarter (24.2%) of those aged 60-69 years have their beverages plain. Sweetened condensed milk and full cream milk are most commonly used by all age groups.

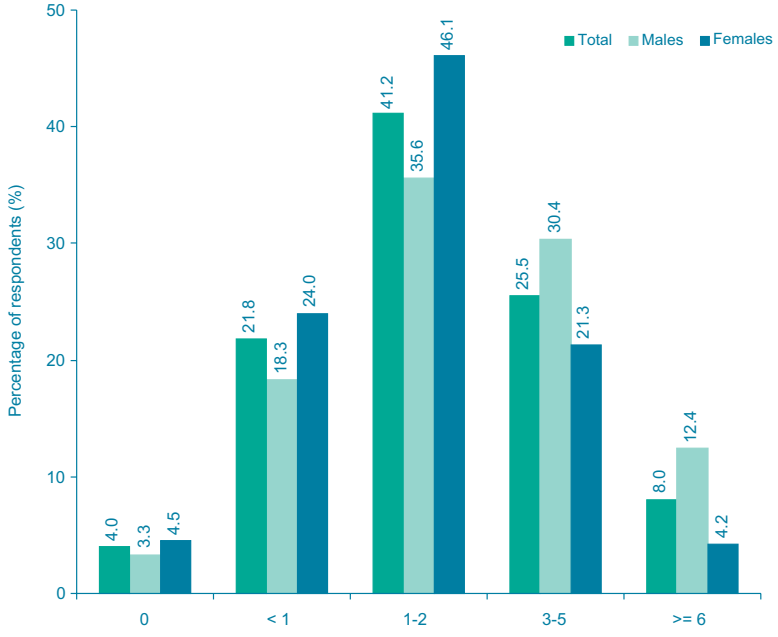
**Fig 2.9.3 - Distribution by types of milk added to beverages and age groups**




## 2.10 Consumption of eggs

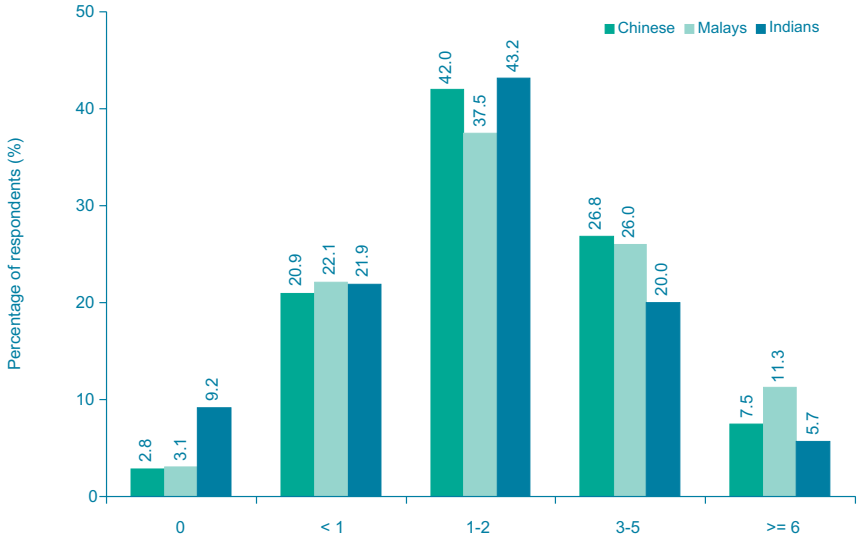
Two-thirds (67.0%) of the people consume two or fewer eggs per week. Only 8% of the people consume more than five eggs per week. Among these, males (12.4%) are more likely to report doing so than females (4.2%).

**Fig 2.10.1 - Distribution by frequency (number per week) of egg consumption and gender**



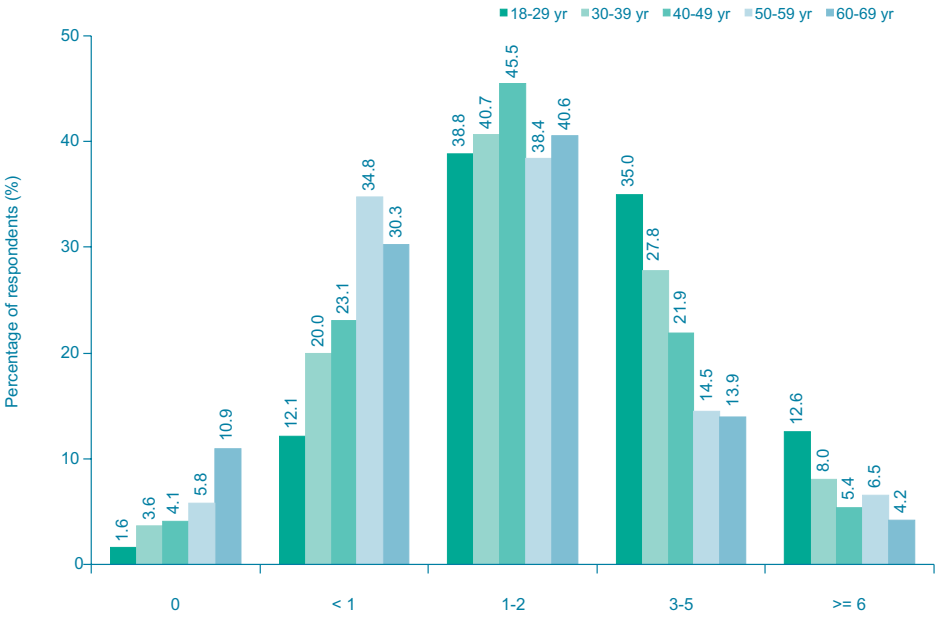
Indians (74.3%) are more likely than Chinese (65.7%) and Malays (62.7%) to consume two or fewer eggs per week. Malays on the other hand are more likely than the other ethnic groups to consume more than five eggs per week.

**Fig 2.10.2 - Distribution by frequency (number per week) of egg consumption and ethnic groups**




Egg consumption generally declines with age. About half (47.6%) of those below 30 years old reported having three or more eggs per week, whereas a large proportion (greater than 40%) of those 50 years and above consume less than one egg per week.

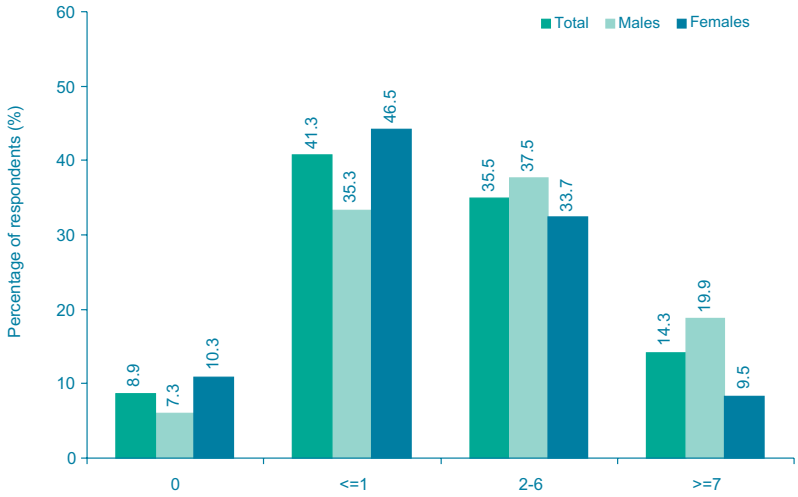
**Fig 2.10.3 - Distribution by frequency (number per week) of egg consumption and age groups**



## 2.11 Consumption of sweetened drinks

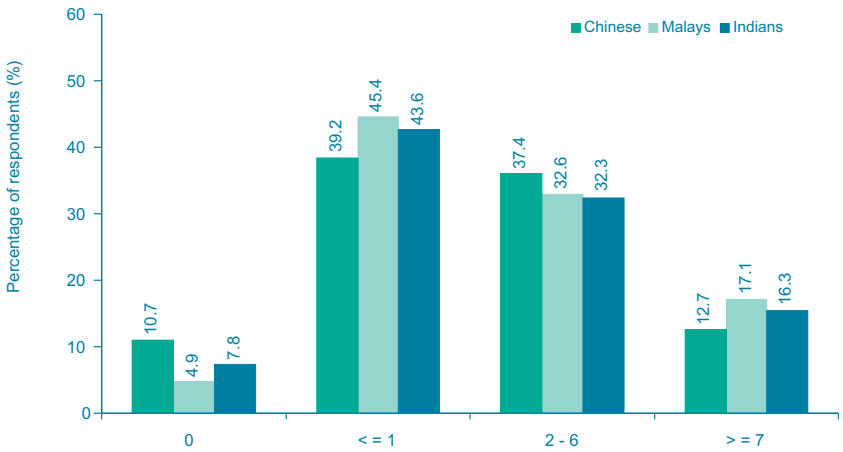
Half of the population (50.2%) consumes sweetened drinks once a week or less, females (56.8%) being more likely than males (42.6%) to do so. More males than females (19.9% *vs* 9.5%) are frequent consumers of sweetened drinks (more than six times a week).

**Fig 2.11.1 - Distribution by frequency (number per week) of sweetened drinks consumption and gender**



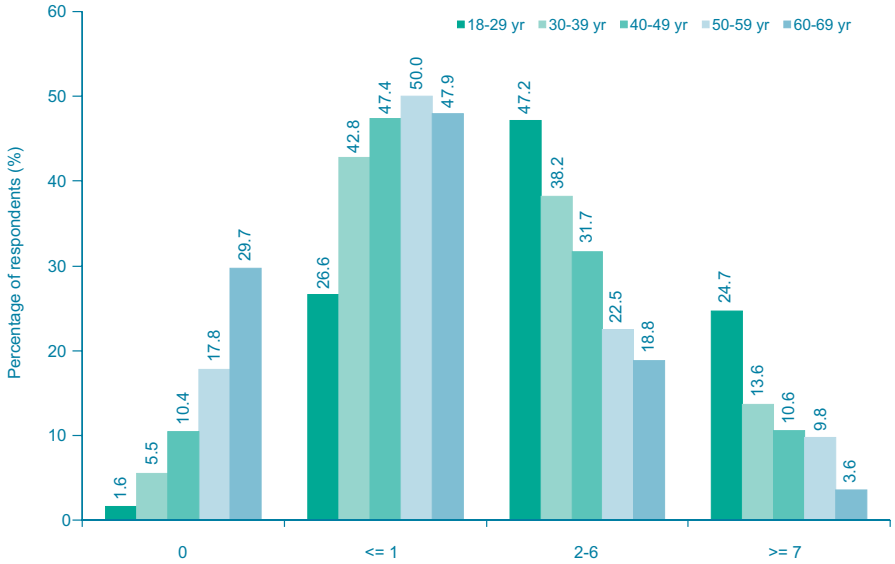

Indians and Malays (17.1% and 16.3%) are more likely to be frequent consumers of sweetened drinks (more than six times a week) as compared to Chinese (12.7%).

**Fig 2.11.2 - Distribution by frequency (number per week) of sweetened drinks consumption and ethnic groups**



The consumption of sweetened drinks decreases with age. About 80% of those aged 60-69 years have sweetened drinks once a week or less. Nearly half (47.2%) of those aged 18-29 years consume sweetened drinks two to six times a week and a quarter of them (24.7%) consume these drinks more than six times a week.

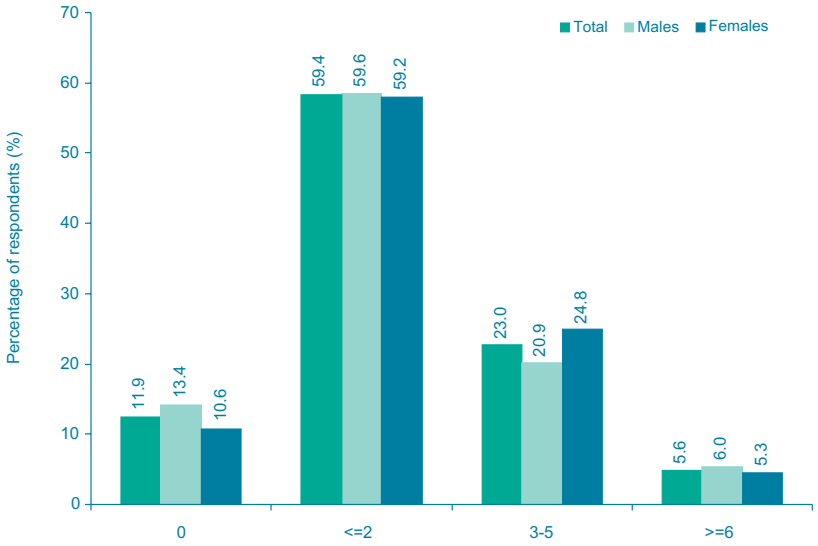
**Fig 2.11.3 - Distribution by frequency (number per week) of sweetened drinks consumption and age groups**




## 2.12 Consumption of sweet desserts and snacks

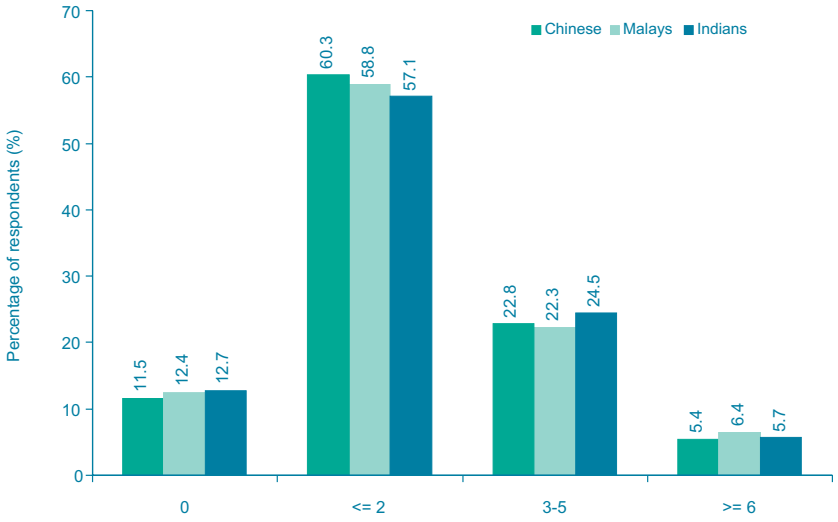
Almost three-quarters of the people (71.3%) have sweet desserts and snacks twice a week or less. Only a small proportion (5.6%) of the people have sweet desserts and snacks more than five times a week.

**Fig 2.12.1 - Distribution by frequency (times per week) of sweet desserts and snacks consumption and gender**



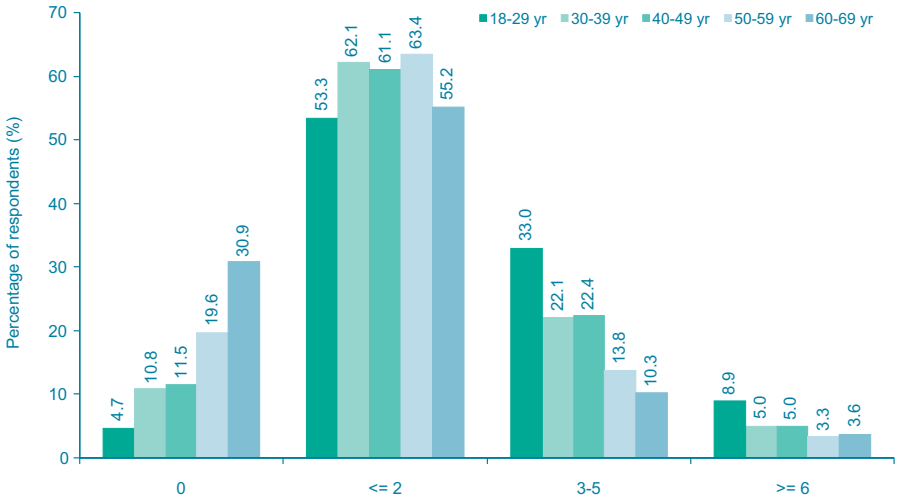
The pattern of consumption of sweet desserts and snacks is similar among the Chinese, Malays and Indians.

**Fig 2.12.2 - Distribution by frequency (times per week) of sweet desserts and snacks consumption and ethnic groups**




Older people do not consume sweet desserts and snacks as often as their younger counterparts. Over 40% of those aged 18-29 years consume sweet desserts and snacks at least three times per week while only 13.9% of those aged 60-69 years reported doing so.

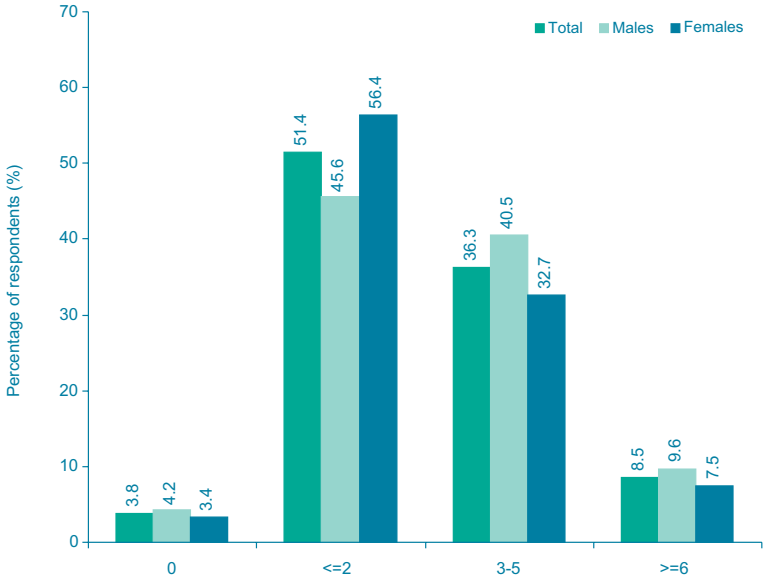
**Fig 2.12.3 - Distribution by frequency (times per week) of sweet desserts and snacks consumption and age groups**



## 2.13 Consumption of deep fried food

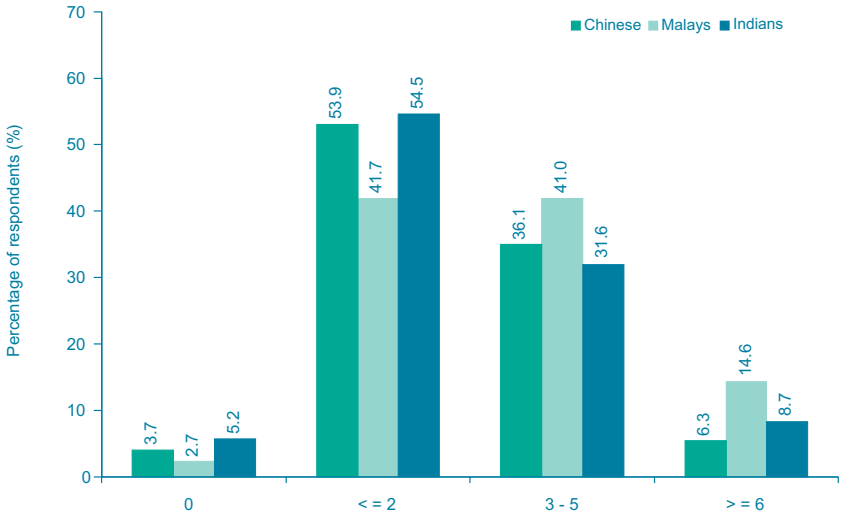
More than half of the people (55.2%) have deep fried food twice a week or less. A higher proportion of females (59.8%) than males (49.8%) are in this category. Only 8.5% of the people have deep fried food at least six times a week, males (9.6%) being more likely to do so.

**Fig 2.13.1 - Distribution by frequency (times per week) of deep fried food consumption and gender**



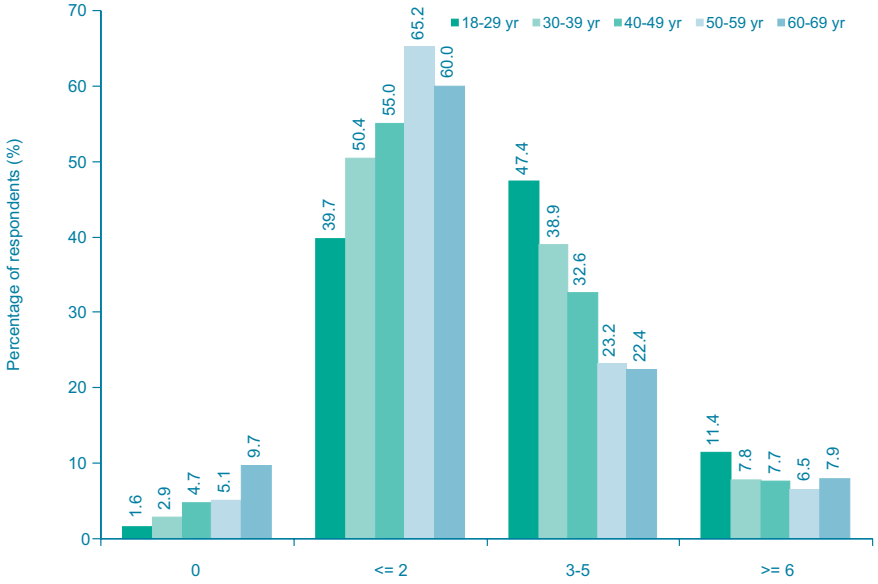

Malays consume deep fried food more frequently than the other ethnic groups. Over half of the Malays (55.6%) consumes deep fried food three times or more a week, compared to the Chinese (42.4%) and Indians (40.3%).

**Fig 2.13.2 - Distribution by frequency (times per week) of deep fried food consumption and ethnic groups**



Frequent consumers of deep fried food are those aged 18-29 years. The majority (58.8%) of these young adults have deep fried food three times a week or more. This is nearly double those aged 60-69 years (30.3%).

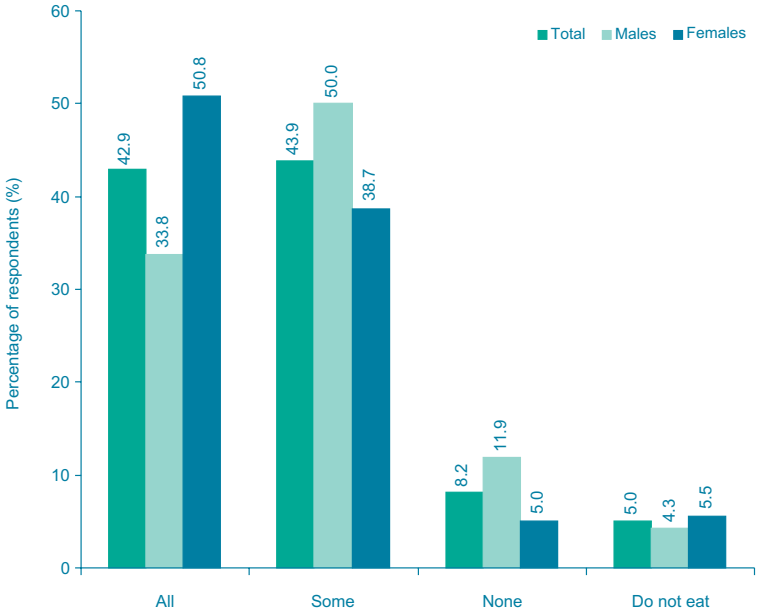
**Fig 2.13.3 - Distribution by frequency (times per week) of deep fried food consumption and age groups**




## 2.14 Trimming fat from meat

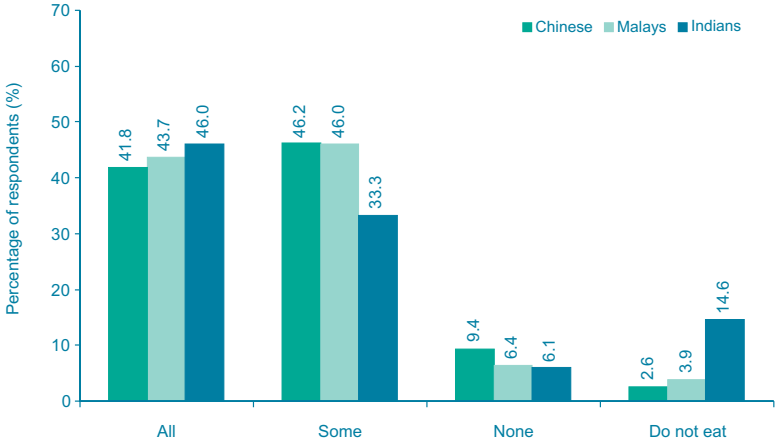
The majority (86.8%) of people trim off some or all of the visible fat from meat. A small percentage (8.2%) of the people do not trim any visible fat from meat eaten, males (11.9%) being more likely than females (5.0%) to do so.

**Fig 2.14.1 - Distribution by amount of fat trimmed from meat and gender**



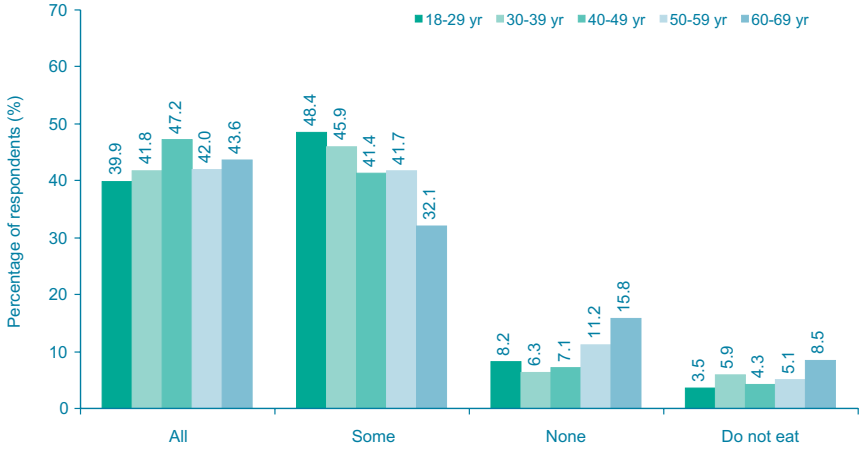
The highest proportion of people who reported not eating meat is among the Indians (14.6%). Among those who consume meat, about 90% of all ethnic groups trim some or all visible fat from meat eaten.

**Fig 2.14.2 - Distribution by amount of fat trimmed from meat and ethnic groups**




Those in the 60-69 years age group are more likely not to eat meat (8.5%). However, they are also more likely not to trim off any fat when eating meat.

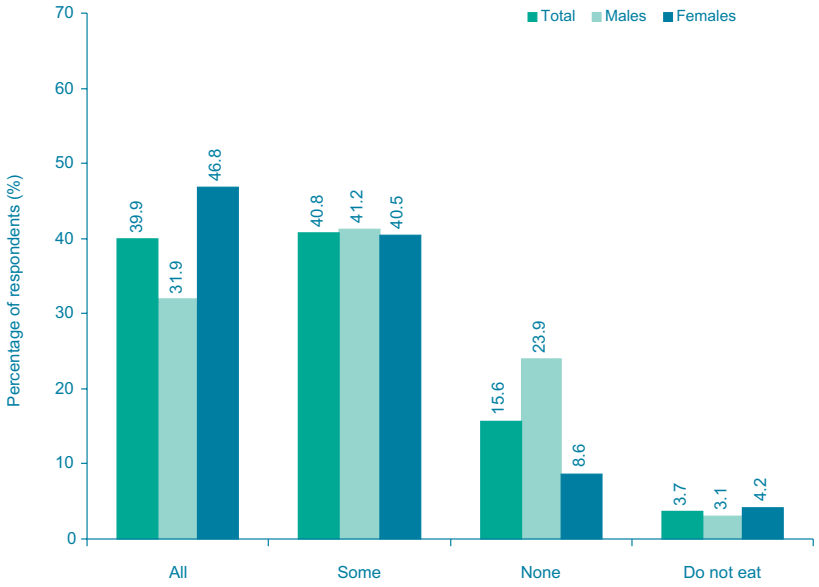
**Fig 2.14.3 - Distribution by amount of fat trimmed from meat and age groups**



## 2.15 Amount of skin trimmed from poultry

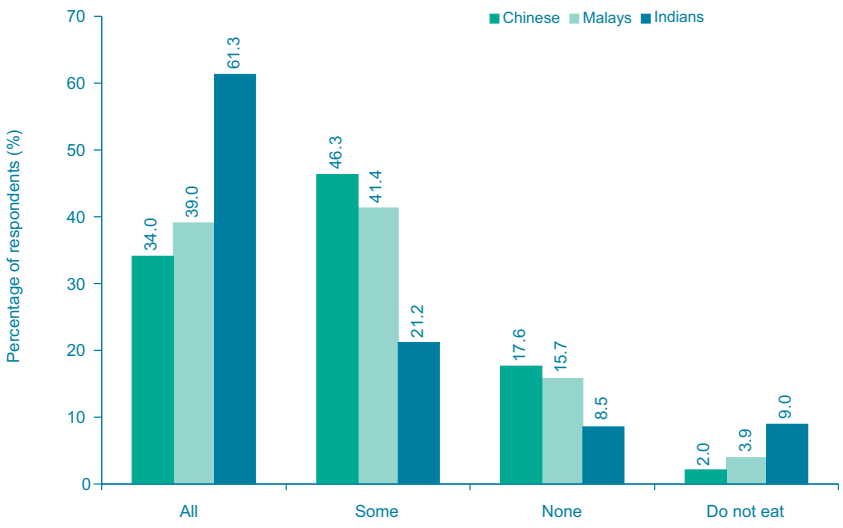
Most Singaporeans (80.7%) trim off all or some of the skin from poultry, with more females (87.3%) than males (73.1%) reporting doing so. Almost a quarter of the males (23.9%) have the skin on when eating poultry.

**Fig 2.15.1 - Distribution by amount of skin trimmed from poultry and gender**



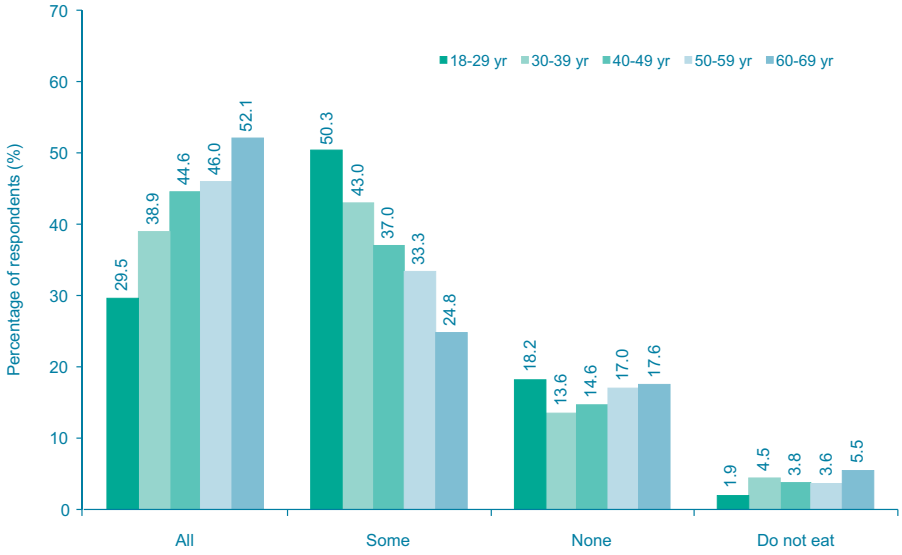

More Indians (61.3%) trim all skin from poultry than Chinese (34.0%) and Malays (39.0%). More Chinese (17.6%) and Malays (15.7%) than Indians (8.5%) have poultry with the skin on.

**Fig 2.15.2 - Distribution by amount of skin trimmed from poultry and ethnic groups**



The proportion of people who have poultry with all skin removed increases with age, peaking at 52.1% for those aged 60-69 years. Almost 70% of those aged 18-29 years remove the skin of poultry only partially or not at all.

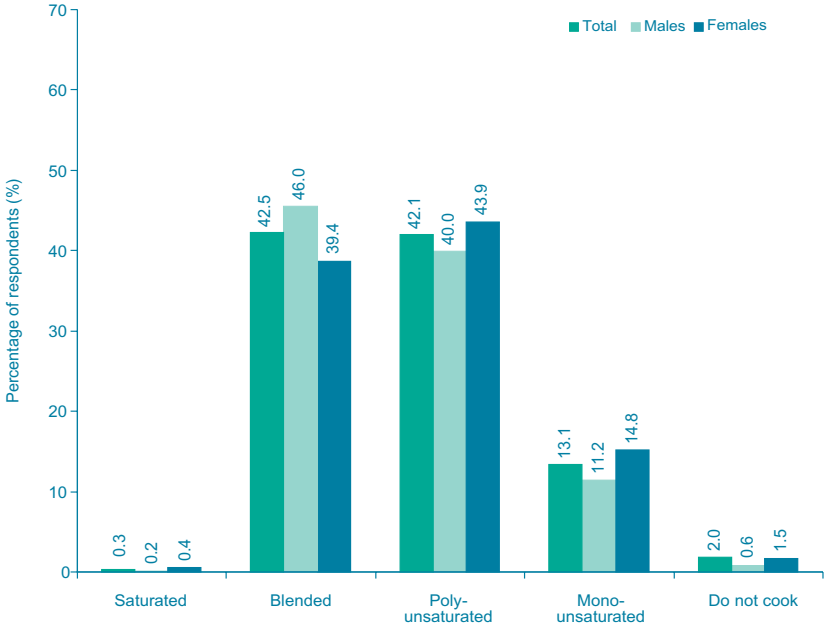
**Fig 2.15.3 - Distribution by amount of skin trimmed from poultry and age groups**




## 2.16 Types of fat and oil used for cooking at home

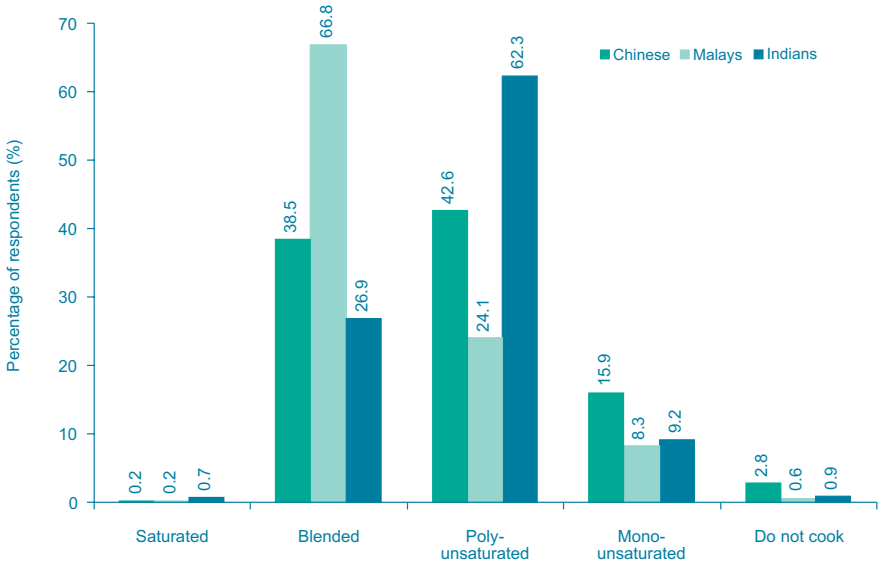
Most people use blended oils (42.5%) and polyunsaturated oils (42.1%) for cooking. Monounsaturated oils are less commonly used. Females are more likely to use polyunsaturated oils (43.9%) and monounsaturated oils (14.8%) than males (40% and 11.2% respectively).

**Fig 2.16.1 - Distribution by types of fat and oil for cooking at home and gender**



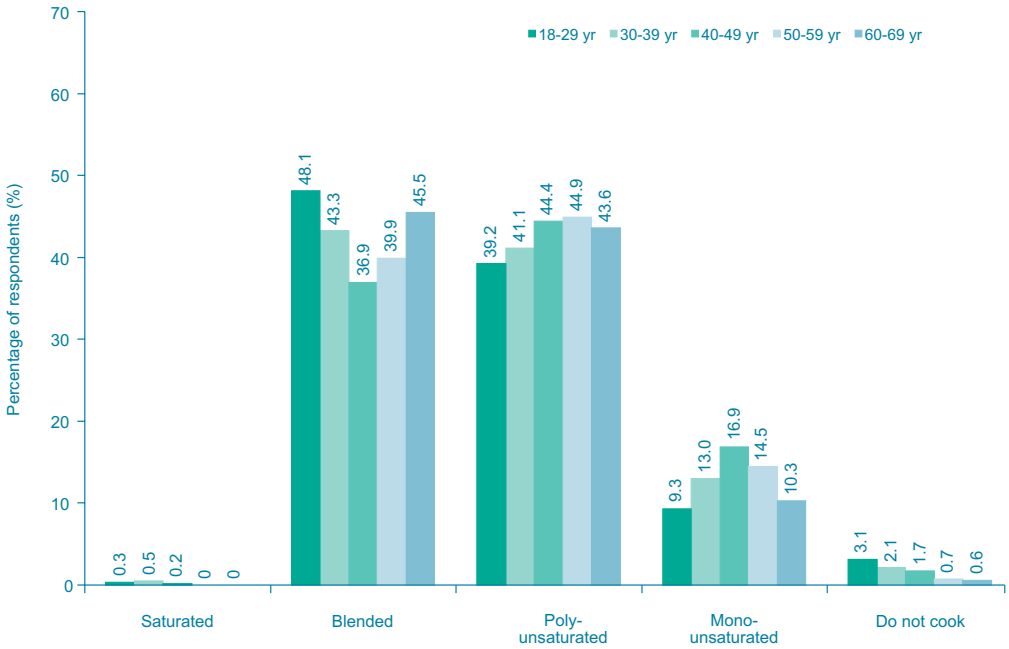
Most Malays (66.8%) cook with blended oils, while polyunsaturated oils are commonly used by the Indians (62.3%) and Chinese (42.6%).

**Fig 2.16.2 - Distribution by types of fat and oil for cooking at home and ethnic groups**




All age groups most commonly use blended oils and polyunsaturated oils. Monounsaturated oils are more commonly used by those aged 30-59 years than their younger (18-29 years) or older (60-69 years) counterparts.

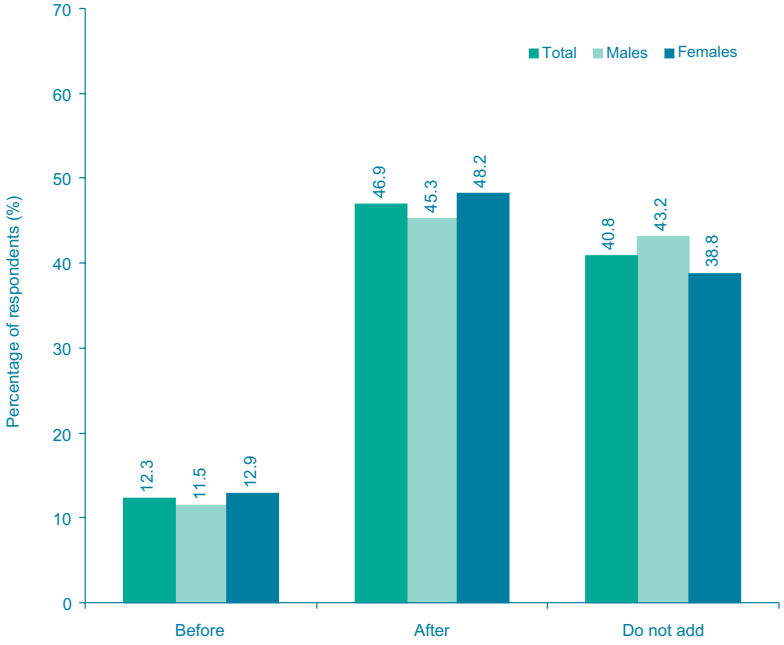
**Fig 2.16.3 - Distribution by types of fat and oil for cooking at home and age groups**



## 2.17 Salt/ sauces addition at the table

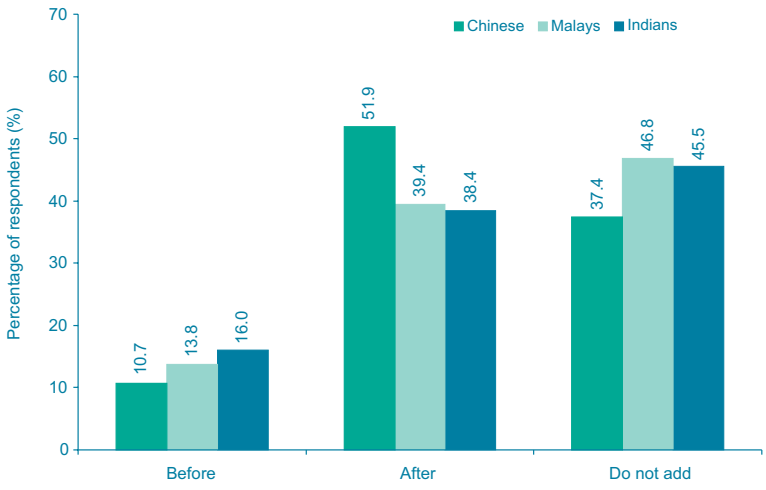
Most people (87.7%) do not add salt/ sauces at the table or only do so after tasting the food. A proportion (12.3%) of people however, tend to add salt/ sauces even before tasting the food, males and females being as likely to do so.

**Fig 2.17.1 - Distribution by salt/ sauces addition at the table and gender**



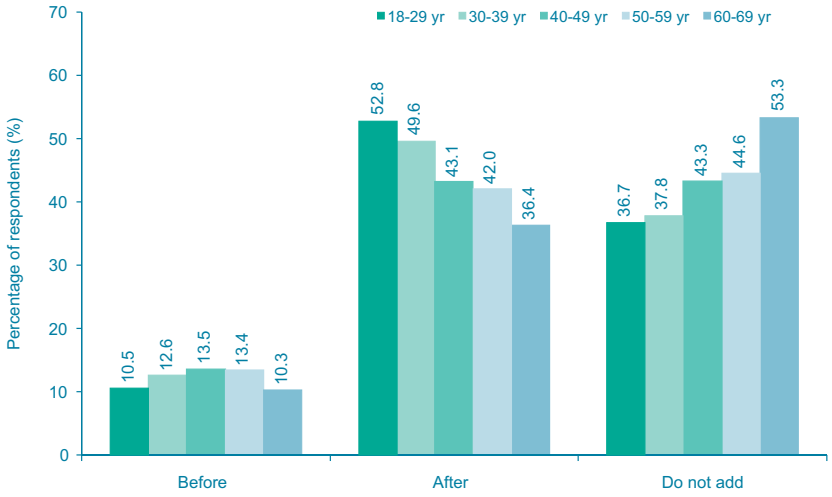

Chinese (51.9%) are more likely to add salt/ sauces after tasting the food, whereas there are proportionately more Malays (46.8%) and Indians (45.5%) who do not use salt/ sauces at the table.

**Fig 2.17.2 - Distribution by salt/ sauces addition at the table and ethnic groups**



The practice of adding salt/ sauces to food after tasting is the highest among the 18-29 years age group (52.8%), and this habit decreases with age. The majority of those not adding salt/ sauces even after tasting food are those aged 60-69 years, followed by those aged 40-59 years.

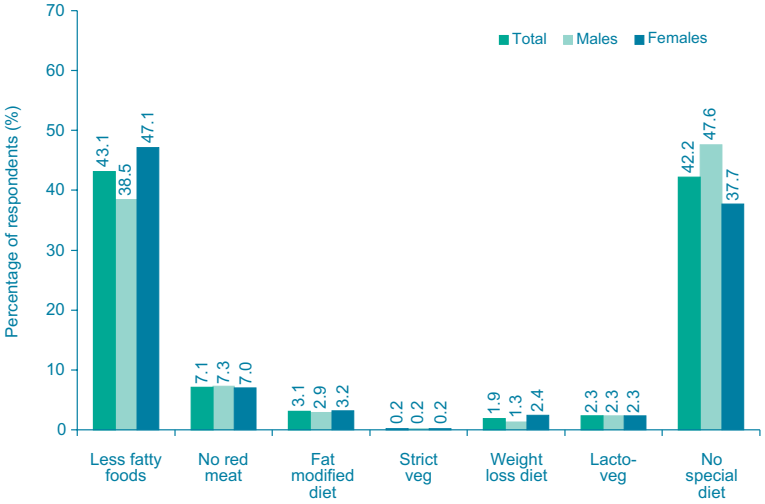
### 2.17.3 - Distribution by salt/ sauces addition at the table and age groups




## 2.18 Types of diet

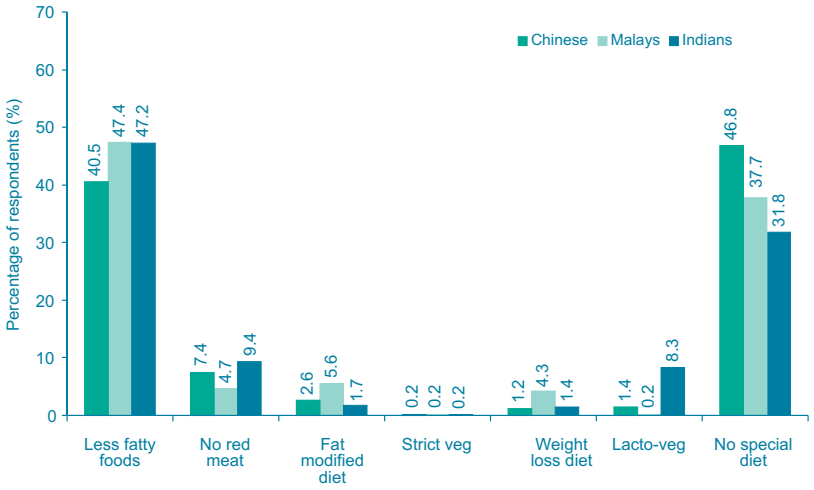
Nearly half (43.1%) of the respondents, mostly females are trying to reduce their intake of fatty foods. Majority of the remaining respondents do not have any special diet.

### Fig 2.18.1 - Distribution by types of diet and gender



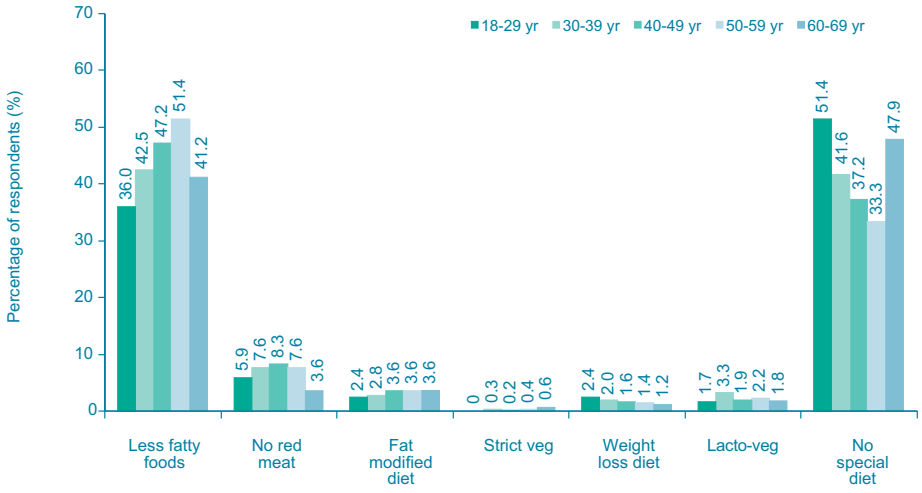
A higher proportion of Chinese (46.8%) than Malays (37.7%) and Indians (31.8%) do not have any special diet. The latter two ethnic groups are more likely to cut down on their intake of fatty foods.

**Fig 2.18.2 - Distribution by types of diet and ethnic groups**




Most people reported having no special diet or cutting down on fatty foods. Whereas those aged 18-29 years and 60-69 years are more likely not to be on any special diet, those aged 30-59 years are more likely to cut down on fatty foods.

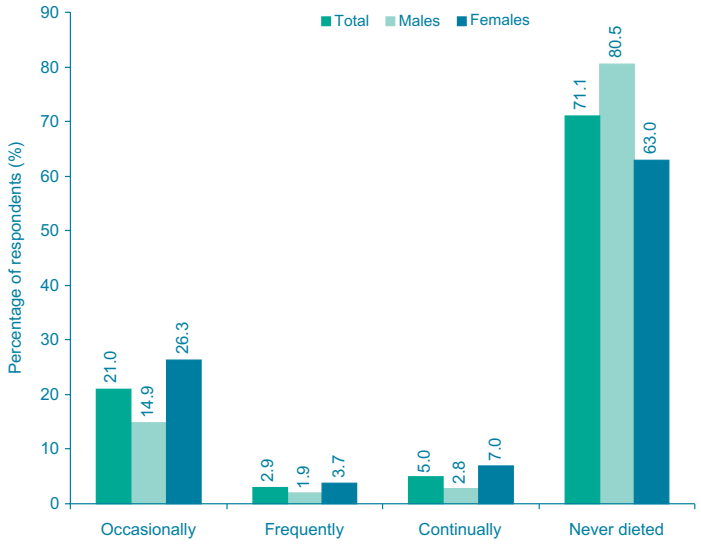
**Fig 2.18.3 - Distribution by types of diet and age groups**



## 2.19 Frequency of dieting

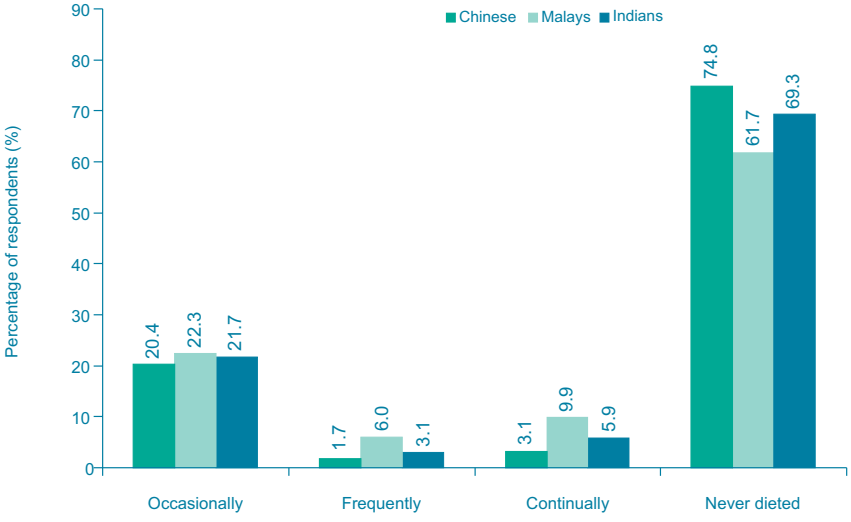
Almost three-quarters of the respondents (71.1%) never dieted. Over one-fifth (21%) of the people occasionally dieted, females being more likely to do so (26.3%). A small proportion (5%) of the people reported being on diet continually.

**Fig 2.19.1 - Distribution by frequency of dieting and gender**



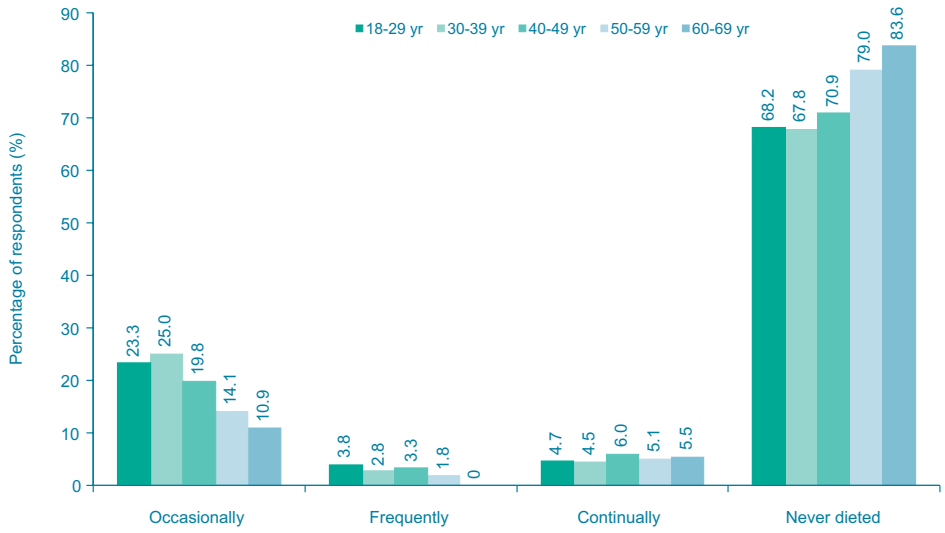

Majority of the people from the three ethnic groups never dieted. However, more Malays (15.9%) than Chinese (4.8%) and Indians (9.0%) reported being on a diet frequently or continually.

**Fig 2.19.2 - Distribution by frequency of dieting and ethnic groups**



Those who are older tend to report that they have never dieted. Those aged 18-29 years (23.3%) and 30-39 years (25.0%) are more likely to be dieting occasionally compared to other age groups.

**Fig 2.19.3 - Distribution by frequency of dieting and age groups**




## 2.20 Comparison of findings with the 1993 Food Consumption Study

Compared to 1993, there are more people having home-cooked meals in 1998. There is a concurrent reduction in the number of people eating out in hawker centres and other outlets, restaurants being an exception [Table 2.20.1]. Although the number of people eating in restaurants constituted a relatively small proportion, there appears to be a two-fold increase over the years.

Compared to 1993, in 1998 Malays and those in the 30-39 years age group are more likely to have their dinner prepared at home [Table 2.20.2]. However, there is an increased tendency for Indians not to have their breakfast at home [Table 2.20.2].

In 1998, there is a decline in the frequency that people reported eating in hawker centres - significantly more people eat in hawker centres two to five times or once or less a week instead of six times or more a week [Table 2.20.3].

**Table 2.20.1 - Meal venues and frequency of eating at hawker centres: Comparison between 1993 and 1998 surveys**

| Dietary Practices | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| **Breakfast:** | | | |
| Home-prepared | 56.8 | 61.5 | ↑ |
| Workplace canteen | 13.9 | 11.5 | ↓ |
| School | 0.4 | 1.1 | ↑ |
| Hawker centre | 25.8 | 18.6 | ↓ |
| Restaurant | 0.1 | 1.9 | ↑ |
| Do not eat | 2.2 | 5.2 | ↑ |
| **Lunch:** | | | |
| Home-prepared | 25.6 | 35.3 | ↑ |
| Workplace canteen | 25.9 | 22.4 | ↓ |
| School | 3.5 | 3.4 | ≈ |
| Hawker centre | 38.6 | 34.9 | ↓ |
| Restaurant | 1.2 | 2.4 | ↑ |
| Do not eat | 0.7 | 1.1 | ≈ |
| **Dinner:** | | | |
| Home-prepared | 74.8 | 83.9 | ↑ |
| Workplace canteen | 5.4 | 2.6 | ↓ |
| School | - | 0.3 | ≈ |
| Hawker centre | 16.1 | 11.2 | ↓ |
| Restaurant | 1.4 | 1.2 | ≈ |
| Do not eat | 0.1 | 0.3 | ≈ |
| **Frequency of eating at hawker centres** | | | |
| Never or once a week or less | 21.4 | 30.0 | ↑ |
| 2 - 5 times a week | 19.5 | 38.3 | ↑ |
| 6 times a week or more | 59.1 | 31.8 | ↓ |

**Table 2.20.2 - Meal venues and frequency of eating at hawker centres: Difference between 1993 and 1998 surveys**

| Difference (%)[2] | | Eating venues[1] A | B | C | D | E | F[3] | G | H | p* |
|---|---|---|---|---|---|---|---|---|---|---|
| **Usual breakfast venue** | | | | | | | | | | |
| **Race:** | Chinese | 2.5 | 2.2 | -2.7 | 0.3 | -4.9 | - | -0.9 | 3.7 | .789 |
| | Malays | 8.1 | 0.5 | -5.3 | 1.2 | -4.8 | - | 0.2 | 0.0 | .096 |
| | Indians | -7.3 | 1.4 | 1.5 | 1.9 | -1.3 | - | 0.0 | 3.6 | .033 |
| **Gender:** | Males | 9.1 | 3.1 | -0.8 | 0.6 | -11.8 | - | -1.4 | 1.1 | .342 |
| | Females | -1.1 | 0.6 | -4.0 | 0.8 | -1.3 | - | 0.1 | 4.8 | .081 |
| **Age group:** | 18-29 years | 3.5 | 1.1 | -3.3 | 1.8 | -5.9 | - | -2.5 | 5.4 | .457 |
| | 30-39 years | 8.0 | 1.8 | -4.3 | 0.5 | -9.9 | - | 0.3 | -5.5 | .990 |
| | 40-49 years | 5.6 | 1.9 | -1.8 | 0.5 | -9.7 | - | 0.0 | 3.6 | .814 |
| | 50-59 years | 1.7 | 2.5 | 1.9 | 0.0 | -5.9 | - | 0.0 | -0.2 | .954 |
| | 60-69 years | -4.9 | 2.4 | 4.2 | 0.6 | -2.9 | - | 0.0 | 0.6 | .997 |
| **Total** | | 4.7 | 1.8 | -2.4 | 0.7 | -7.2 | - | -0.7 | 3.0 | .579 |
| **Usual lunch venue** | | | | | | | | | | |
| **Race:** | Chinese | 2.5 | 1.9 | -3.0 | -0.4 | 0.3 | - | -2.0 | 0.4 | .559 |
| | Malays | 0.3 | -0.2 | -0.9 | 2.6 | -2.7 | - | 0.2 | 0.3 | .803 |
| | Indians | 2.4 | -0.3 | -7.4 | -0.4 | 6.0 | - | -1.2 | 0.9 | .407 |
| **Gender:** | Males | 4.3 | 2.5 | 1.1 | 0.9 | -6.4 | - | -3.4 | 0.9 | .799 |
| | Females | 7.0 | 0.3 | -7.4 | -1.0 | 0.5 | - | 0.2 | 0.0 | .537 |
| **Age group:** | 18-29 years | 6.8 | -0.1 | -1.9 | 3.5 | -4.1 | - | -5.7 | 0.9 | .961 |
| | 30-39 years | 6.1 | 1.7 | -4.8 | 0.5 | -3.3 | - | 0.3 | -1.7 | .817 |
| | 40-49 years | 6.4 | 1.5 | -1.9 | -2.1 | -4.2 | - | 0.0 | 0.4 | .798 |
| | 50-59 years | 12.7 | 4.0 | -5.3 | -3.3 | -9.8 | - | 0.0 | 1.4 | .967 |
| | 60-69 year | -10.9 | -0.4 | 5.1 | 1.8 | 2.6 | - | 0.6 | 1.2 | .344 |
| **Total** | | 6.9 | 1.2 | -3.5 | -0.1 | -3.7 | - | -1.6 | 0.4 | .808 |
| **Usual dinner venue** | | | | | | | | | | |
| **Race:** | Chinese | 5.9 | 0.3 | -3.0 | - | -2.2 | - | -1.9 | 0.2 | .064 |
| | Malays | 8.6 | -2.3 | -2.7 | - | -4.1 | - | -0.7 | 0.6 | .047 |
| | Indians | 4.7 | 0.5 | -0.5 | - | -3.8 | - | 0.0 | -1.0 | .286 |
| **Gender:** | Male | 9.6 | -0.5 | -0.1 | - | -7.2 | - | 2.2 | -0.1 | .007 |
| | Female | 7.8 | 0.2 | -5.3 | - | -2.4 | - | 1.1 | 0.5 | .611 |
| **Age group:** | 18-29 years | 7.3 | -0.7 | -3.2 | - | -3.5 | - | -2.1 | 0.4 | .639 |
| | 30-39 years | 13.9 | -0.7 | -6.2 | - | -6.0 | - | -1.1 | 0.1 | .028 |
| | 40-49 years | 3.0 | 0.1 | 0.3 | - | -2.5 | - | -1.1 | 0.2 | .954 |
| | 50-59 years | 8.8 | 1.1 | 1.8 | - | -9.4 | - | -2.3 | 0.0 | .227 |
| | 60-69 years | 1.4 | 0.0 | -0.5 | - | 0.5 | - | 0.0 | 0.6 | .375 |
| **Total** | | 8.9 | -0.2 | -2.8 | - | -4.9 | - | -1.6 | 0.2 | .022 |

1 A= Home-prepared food; B= Restaurant / coffee house; C= Workplace / polytechnic / university canteen; D= School / JC canteen; E= Hawker centre / coffee shop stall / food court; F= Fast food restaurant; G= Others; H= Do not eat breakfast

2 Difference (%) = 1998 (%) minus 1993 (%)

3 Option F was not included in 1993 survey

* *p* value for $x^2$ statistic

**Table 2.20.3 - Frequency of eating at hawker centres, coffee shops and/ or other food stalls: Difference between 1993 and 1998 surveys**

| Difference (%)[2] | | Frequency[1] A | B | C | D | *p** |
|---|---|---|---|---|---|---|
| **Race:** | Chinese | 1.5 | 20.9 | 5.5 | -27.9 | .000 |
| | Malays | 5.8 | 19.0 | -7.4 | -17.5 | .000 |
| | Indians | 8.6 | 8.9 | -2.9 | -14.6 | .009 |
| **Gender:** | Males | 8.5 | 20.4 | 6.6 | -35.4 | .000 |
| | Females | 7.1 | 17.0 | -4.2 | -19.9 | .000 |
| **Age group**: | 18-29 years | 5.6 | 25.5 | -1.8 | -29.4 | .000 |
| | 30-39 years | 14.7 | 14.7 | 3.3 | -32.6 | .000 |
| | 40-49 years | 7.5 | 23.3 | 8.4 | -29.3 | .000 |
| | 50-59 years | 10.0 | 12.6 | 3.2 | -25.7 | .019 |
| | 60-69 years | -11.1 | 12.3 | 3.0 | -4.2 | .878 |
| **Total** | | 8.5 | 18.8 | 0.9 | -28.2 | .000 |

1 A= Once a week or less / never; B= 2-5 times per week; C= 6-7 times per week; D= 8 times a week or more;
2 Difference (%) = 1998 (%) minus 1993 (%)
* *p* value for $x^2$ statistic

In 1998, proportionally more people consume a mixture of wholemeal and white breads [Table 2.20.4]. Indians, females and those aged 30-39 years are more likely to have switched from either white or wholemeal bread to a mixture of both [Table 2.20.5].

**Table 2.20.4 - Usual types of bread eaten: Comparison between 1993 and 1998 surveys**

| Usual types of bread eaten | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| White | 75.2 | 66.6 | ↓ |
| Wholemeal | 14.8 | 9.8 | ↓ |
| Mixture of white and wholemeal | 5.8 | 20.3 | ↑ |

**Table 2.20.5 - Usual types of bread eaten: Difference between 1993 and 1998 surveys**

| Difference (%)[2] | | Frequency[1] A | B | C | D[3] | E | *p** |
|---|---|---|---|---|---|---|---|
| **Race:** | Chinese | -7.4 | -5.0 | 13.2 | - | -1.0 | .228 |
| | Malays | -5.0 | -8.3 | 13.9 | - | -0.9 | .177 |
| | Indians | -12.8 | -8.9 | 19.6 | - | 2.1 | .001 |
| **Gender:** | Males | -8.6 | -4.1 | 14.0 | - | -1.4 | .102 |
| | Females | -8.1 | -6.1 | 14.5 | - | -0.6 | .018 |
| **Age group:** | 18-29 years | -14.2 | -1.1 | 19.3 | - | -4.5 | .333 |
| | 30-39 years | -9.7 | -5.4 | 13.6 | - | 1.5 | .006 |
| | 40-49 years | -5.9 | -9.7 | 14.5 | - | 0.9 | .110 |
| | 50-59 years | -7.6 | 0.9 | 10.6 | - | -4.2 | .929 |
| | 60-69 years | 4.6 | -14.4 | 6.9 | - | 2.9 | .571 |
| **Total** | | -8.6 | -5.0 | 14.5 | - | -1.1 | .006 |

1 A= Ordinary / enriched; B= Wholemeal / high fibre; C= A mixture of ordinary / enriched / wholemeal and high fibre; D= Others; F= Do not eat bread or bread roll at all
2 Difference (%) = 1998 (%) minus 1993 (%)
3 Option D was not included in 1993 survey
* *p* value for $x^2$ statistic

Compared to 1993, the proportion of people who drink low fat milk has increased by about 22.0%, whereas the proportion who drink full cream or sweetened condensed milk decreased by about 7.0% [Table 2.20.6]. Chinese and those aged 30-39 years are more likely to have switched from sweetened condensed or full cream milk to low fat milk [Table 2.20.7].

For milk added to beverages, results of the 1998 survey found that more people use full cream or low fat milk rather than sweetened condensed milk as compared to 1993 findings [Table 2.20.7]. Younger and Chinese adults are more likely to report doing so.

**Table 2.20.6 - Usual types of milk consumed and added to beverages: Comparison between 1993 and 1998 surveys**

| Dietary practices | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| **Types of milk consumed** | | | |
| Full cream milk | 27.3 | 20.2 | ↓ |
| Low fat milk | 11.7 | 34.0 | ↑ |
| Non-fat milk | 6.2 | 6.5 | ≈ |
| Condensed milk | 14.7 | 7.0 | ↓ |
| Did not drink milk | 37.4 | 31.5 | ↓ |
| Others | 2.7 | 0.8 | ↓ |
| **Types of milk added to beverages** | | | |
| Full cream milk | 9.9 | 15.4 | ↑ |
| Low fat milk | 1.8 | 5.0 | ↑ |
| Non-fat milk | 2.8 | 2.5 | ≈ |
| Condensed milk | 50.6 | 47.6 | ↓ |
| Did not add milk to beverages | 24.7 | 18.7 | ↓ |
| Others | 10.2 | 10.8 | ↑ |

**Table 2.20.7 - Usual types of milk consumed or added to beverages: Difference between 1993 and 1998 surveys**

| | | Type of milk[1] | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Difference (%)[2] | | A | B | C | D | E | F | *p** |
| **Milk consumed** | | | | | | | | |
| **Race:** | Chinese | -6.4 | 23.6 | -0.4 | -8.9 | -2.3 | -5.5 | .004 |
| | Malays | -17.7 | 23.6 | 3.7 | -3.0 | 0.4 | -7.0 | .254 |
| | Indians | -8.9 | 10.9 | -1.2 | -2.3 | 0.9 | 0.7 | .836 |
| **Gender:** | Males | -3.4 | 21.3 | -0.8 | -9.1 | -2.9 | -5.2 | .094 |
| | Females | -10.8 | 22.6 | 1.1 | -6.1 | -0.8 | -6.0 | .053 |
| **Age group:** | 18-29 years | -16.5 | 26.8 | 2.4 | -1.0 | -1.4 | -10.3 | .329 |
| | 30-39 years | -4.2 | 24.6 | 1.6 | -12.0 | -1.9 | -8.0 | .008 |
| | 40-49 years | -2.7 | 20.8 | -3.6 | -2.2 | -3.4 | -9.0 | .159 |
| | 50-59 years | 7.5 | 18.2 | -2.5 | -17.0 | -1.3 | -4.8 | .217 |
| | 60-69 years | -8.7 | 17.2 | -0.6 | -21.2 | 0.0 | 13.2 | .375 |
| **Total** | | -7.1 | 22.3 | 0.3 | -7.7 | -1.9 | -5.9 | .010 |
| **Milk added to beverages** | | | | | | | | |
| **Race:** | Chinese | 6.2 | 3.8 | -1.2 | -6.1 | 1.3 | -3.5 | .017 |
| | Malays | -0.4 | 1.9 | 2.0 | 0.7 | 4.0 | -8.4 | .054 |
| | Indians | -3.5 | -1.0 | 2.3 | 1.3 | 2.7 | -1.9 | .939 |
| **Gender:** | Males | 4.7 | 3.0 | 0.7 | -2.6 | 0.3 | -6.2 | .075 |
| | Females | 6.0 | 3.2 | -1.5 | -2.6 | 0.7 | -5.9 | .083 |
| **Age group:** | 18-29 years | 5.3 | 2.1 | 0.2 | 1.4 | -1.8 | -7.1 | .044 |
| | 30-39 years | 5.8 | 5.5 | -1.3 | -7.7 | -0.4 | -1.9 | .508 |
| | 40-49 years | 5.3 | 3.4 | -0.3 | 1.4 | 2.0 | -11.7 | .022 |
| | 50-59 years | 4.4 | -2.3 | -0.5 | -1.8 | 4.6 | -4.5 | .823 |
| | 60-69 years | 6.6 | 4.9 | 2.2 | -11.4 | 2.0 | -4.3 | .823 |
| **Total** | | 5.5 | 3.2 | -0.3 | -3.0 | 0.6 | -6.0 | .013 |

1 A= Whole / full cream; B= Low fat; C= Skimmed/ non- fat; D= Sweetened condensed milk; E= Others
F= Do not drink milk or milk- based drinks at all

2 Difference (%) = 1998 (%) minus 1993 (%)

* *p* value for $x^2$ statistic

Over the years, there appears to be a shift from using butter to soft margarine on bread or crackers [Table 2.20.8]. Females, Chinese and those aged 30-39 years and 60-69 years are more likely to have made the change [Table 2.20.9].

**Table 2.20.8 - Usual types of fat spread used: Comparison between 1993 and 1998 surveys**

| Types of fat spread used | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| Butter | 25.1 | 20.9 | ↓ |
| Hard margarine | 5.7 | 4.4 | ≈ |
| Soft margarine | 38.5 | 48.8 | ↑ |
| Others | 9.5 | 0.9 | ↓ |
| Do not use fat spread at all | 21.2 | 25.0 | ↑ |

**Table 2.20.9 - Usual types of fat spread used: Difference between 1993 and 1998 surveys**

| Difference (%)[2] | | Type of fat spread used[1] A | B | C | D | E | *p** |
|---|---|---|---|---|---|---|---|
| **Race:** | Chinese | -5.4 | -0.5 | 9.2 | -7.8 | 4.6 | .047 |
| | Malays | -6.9 | -3.6 | 17.0 | -12.6 | 6.2 | .091 |
| | Indians | -0.4 | -7.3 | 8.2 | -7.9 | 7.4 | .225 |
| **Gender:** | Males | 0.6 | -1.6 | 11.3 | -11.0 | 0.6 | .511 |
| | Females | -8.4 | -1.2 | 8.3 | -6.2 | 7.5 | .000 |
| **Age group:** | 18-29 years | -4.6 | 0.8 | 16.2 | -11.7 | -0.7 | .326 |
| | 30-39 years | -3.2 | -3.0 | 5.3 | -8.4 | 9.3 | .006 |
| | 40-49 years | -7.4 | -0.5 | 8.5 | -7.2 | 6.7 | .056 |
| | 50-59 years | -2.7 | 0.0 | 11.0 | -5.0 | -3.3 | .554 |
| | 60-69 years | -2.3 | -9.9 | 1.5 | -6.3 | 16.9 | .028 |
| **Total** | | -4.2 | -1.3 | 10.3 | -8.6 | 3.8 | .003 |

1 A= Butter; B= Hard margarine; C= Soft margarine; D= Others; E= Do not use fat spread at all
2 Difference (%) = 1998 (%) minus 1993 (%)
* *p* value for $x^2$ statistic

There appears to be increasing popularity of polyunsaturated oil although the change is not significant [Table 2.20.10 & 2.20.11].

**Table 2.20.10 - Usual types of fat and oils used for cooking: Comparison between 1993 and 1998 surveys**

| Types of fat and oils used for cooking | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| Saturated oils | - | 0.3 | - |
| Blended oils | 43.7 | 42.5 | ≈ |
| Polyunsaturated oils | 37.8 | 42.1 | ↑ |
| Monounsaturated oils | 17.4 | 13.1 | ↓ |
| Do not cook | 1.1 | 2.0 | ↑ |

**Table 2.20.11 - Usual types of fat or oil used for cooking at home: Difference between 1993 and 1998 surveys**

| | | Type of fat or oil[1] | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Difference (%)[2] | | A[3] | B | C | D | E[3] | F | *p** |
| **Race:** | Chinese | - | -2.3 | 4.9 | -4.7 | - | 1.6 | .460 |
| | Malays | - | -3.9 | 0.2 | 2.9 | - | 0.6 | .242 |
| | Indians | - | -1.4 | -3.5 | 5.7 | - | -1.5 | .728 |
| **Gender:** | Males | - | 4.4 | 0.1 | -6.6 | - | 1.7 | .929 |
| | Females | - | -6.6 | 8.0 | -2.1 | - | 0.2 | .087 |
| **Age group:** | 18-29 years | - | -3.9 | 4.6 | -2.8 | - | 1.8 | .112 |
| | 30-39 years | - | 6.2 | -0.3 | -7.6 | - | 1.0 | .941 |
| | 40-49 years | - | 4.6 | -2.0 | -3.3 | - | 0.3 | .904 |
| | 50-59 years | - | -13.9 | 11.3 | 1.9 | - | 0.7 | .228 |
| | 60-69 years | - | -4.3 | 20.7 | -15.9 | - | -0.5 | .111 |
| **Total** | | - | -1.3 | 4.2 | -4.3 | - | 0.9 | .276 |

1 A= Butter, dripping, ghee, lard or any other animal fat; B= Hard margarine, vegetable oil, blended oil, palm oil or coconut oil; C= Soft margarine, corn oil, soya bean oil, sunflower oil or safflower oil; D= peanut oil, canola oil or olive oil; E= Others; F= Do not cook at home at all

2 Difference (%) = 1998 (%) minus 1993 (%)

3 Options A and E were not included in the 1993 survey

* *p* value for $x^2$ statistic

There is no significant change in the frequency of consumption of deep fried foods [Table 2.20.12]. Among the females, however there is a significant reduction in the frequency of consumption of deep fried food from six or more times to three to five times a week [Table 2.20.13].

**Table 2.20.12 - Weekly consumption of deep fried food: Comparison between 1993 and 1998 surveys**

| Dietary practices | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| Not at all or twice a week or less | 55.4 | 55.2 | ≈ |
| 3 - 5 times a week | 27.8 | 36.3 | ↓ |
| 6 times a week or more | 16.8 | 8.5 | ↑ |

**Table 2.20.13 - Weekly consumption of deep fried food: Difference between 1993 and 1998 surveys**

| | | Frequency[1] | | | | |
|---|---|---|---|---|---|---|
| Difference (%)[2] | | A | B | C | D | *p** |
| **Race:** | Chinese | -0.3 | 7.9 | -8.8 | 1.2 | .956 |
| | Malays | -1.0 | 14.7 | -14.7 | 0.9 | .666 |
| | Indians | 1.3 | 5.2 | -3.9 | -2.6 | .074 |
| **Gender:** | Males | -3.0 | 10.1 | -9.8 | 2.5 | .270 |
| | Females | -0.4 | 7.5 | -6.7 | -0.5 | .008 |
| **Age group:** | 18-29 years | 3.7 | 10.9 | -16.1 | 1.6 | .653 |
| | 30-39 years | -6.1 | 14.9 | -8.7 | -0.1 | .246 |
| | 40-49 years | -4.7 | 6.3 | -1.9 | 0.3 | .384 |
| | 50-59 years | -2.1 | 1.1 | -1.0 | 2.0 | .665 |
| | 60-69 years | -3.4 | 1.9 | 0.3 | 1.1 | .861 |
| **Total** | | -1.2 | 8.5 | -8.3 | 1.0 | .237 |

1 A= 2 times a week or less; B= 3-5 times per week; C= 6 times a week or more; D= Do not eat deep fried food at all
2 Difference (%) = 1998 (%) minus 1993 (%)
* *p* value for $x^2$ statistic

There are no significant changes in the pattern of weekly egg consumption when comparing responses from the 1993 and 1998 surveys [Table 2.0.14 & 2.20.15].

**Table 2.20.14 - Weekly egg consumption: Comparison between 1993 and 1998 surveys**

| Weekly egg consumption | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| Less than one a week or do not eat eggs | 27.3 | 25.8 | ↓ |
| 1 - 2 times a week | 37.7 | 41.2 | ↑ |
| 3 - 5 times a week | 27.1 | 25.5 | ↓ |
| 6 times a week or more | 7.9 | 8.0 | ≈ |

**Table 2.20.15 - Weekly egg consumption: Difference between 1993 and 1998 surveys**

| Difference (%)[2] | | Frequency[1] A | B | C | D | E | *p** |
|---|---|---|---|---|---|---|---|
| **Race:** | Chinese | -4.4 | 5.9 | -1.7 | -0.2 | 0.4 | .374 |
| | Malays | 0.1 | -4.0 | 1.0 | 0.6 | 2.3 | .139 |
| | Indians | 1.5 | -4.9 | 4.3 | 0.9 | -1.9 | .833 |
| **Gender:** | Males | -3.8 | 4.5 | -0.8 | -1.9 | 1.9 | .247 |
| | Females | -3.0 | 1.7 | -1.7 | 2.8 | 0.3 | .722 |
| **Age group:** | 18-29 years | -2.9 | 4.3 | 0.9 | -1.3 | -0.8 | .550 |
| | 30-39 years | 0.1 | 4.3 | -6.9 | 0.4 | 2.1 | .423 |
| | 40-49 years | -1.7 | -0.4 | 3.7 | -1.0 | -0.7 | .327 |
| | 50-59 years | -18.0 | 9.6 | -3.1 | 6.5 | 5.0 | .072 |
| | 60-69 years | -5.8 | -7.6 | 6.5 | 2.9 | 3.9 | .501 |
| **Total** | | -3.2 | 3.5 | -1.6 | 0.1 | 1.2 | .318 |

1 A= Less than one egg a week; B= 1-2 eggs a week; C= 3-5 eggs a week; D= 6 eggs a week or more; E= Do not eat eggs at all

2 Difference (%) = 1998 (%) minus 1993 (%)

* *p* value for $x^2$ statistic

In 1998, there is an increase in the proportion of people who trimmed off some visible fat from meat or skin from poultry, and a decrease in the proportion of those who preferred to have their meat or poultry with the fat or skin [Table 2.20.16]. Compared to the 1993 findings, proportionally more Chinese and males are having these practices [Table 2.20.17].

**Table 2.20.16 - Amount of fat trimmed from meat and amount of skin trimmed from poultry: Comparison between 1993 and 1998 surveys**

| Dietary practices | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| **Amount of fat trimmed from meat:** | | | |
| Some or all of the fat | 72.1 | 86.8 | ↑ |
| None of the fat | 22.0 | 8.2 | ↓ |
| Do not eat meat | 5.8 | 5.0 | ≈ |
| **Amount of skin trimmed from poultry:** | | | |
| Some or all of the skin | 60.3 | 80.7 | ↑ |
| None of the skin | 36.2 | 15.6 | ↓ |
| Do not eat poultry | 3.5 | 3.7 | ≈ |

**Table 2.20.17 - Amount of fat trimmed from meat and amount of skin trimmed from poultry: Difference between 1993 and 1998 surveys**

| | | Amount trimmed[1] | | | | |
|---|---|---|---|---|---|---|
| **Difference (%)[3]** | | **A** | **B** | **C** | **D** | ***p**** |
| **Amount of fat trimmed from meat** | | | | | | |
| **Race:** | Chinese | -0.6 | 17.6 | -15.0 | -2.0 | .004 |
| | Malays | -3.9 | 18.1 | -11.9 | -2.3 | .254 |
| | Indians | -18.8 | 20.2 | -12.2 | -4.4 | .605 |
| **Gender:** | Males | -0.7 | 22.3 | -19.5 | -2.1 | .009 |
| | Females | -4.3 | 11.5 | -7.4 | 0.2 | .176 |
| **Age group:** | 18-29 years | 4.1 | 14.9 | -18.2 | -0.7 | .078 |
| | 30-39 years | -0.5 | 15.6 | -15.4 | 0.2 | .462 |
| | 40-49 years | -3.1 | 17.3 | -9.6 | -4.6 | .006 |
| | 50-59 years | -14.9 | 20.8 | -9.0 | 3.1 | .917 |
| | 60-69 years | -12.6 | 21.2 | -6.1 | -2.4 | .578 |
| **Total** | | -1.8 | 16.5 | -13.8 | -0.8 | .006 |
| | | **Amount trimmed[2]** | | | | |
| **Difference (%)[3]** | | **A** | **B** | **C** | **D** | ***p**** |
| **Amount of skin trimmed from poultry** | | | | | | |
| **Race:** | Chinese | -2.4 | 24.2 | -21.0 | -0.8 | .007 |
| | Malays | -4.0 | 23.3 | -22.1 | 2.8 | .901 |
| | Indians | -7.9 | 11.4 | 2.7 | -6.1 | .112 |
| **Gender:** | Males | 2.2 | 21.5 | -22.9 | -0.6 | .045 |
| | Females | -3.0 | 18.8 | -16.7 | 1.0 | .064 |
| **Age group:** | 18-29 years | 2.1 | 23.4 | -25.1 | -0.5 | .163 |
| | 30-39 years | 2.1 | 17.8 | -20.5 | 0.6 | .382 |
| | 40-49 years | -5.6 | 24.2 | -18.6 | 0.1 | .297 |
| | 50-59 years | -9.7 | 28.8 | -20.0 | 0.8 | .225 |
| | 60-69 years | 4.1 | 1.6 | -4.6 | -1.1 | .067 |
| **Total** | | 0.3 | 20.1 | -20.6 | 0.2 | .007 |

1 A= All the fat; B= Some of the fat; C= None of the fat; D= Do not eat meat at all
2 A= All the skin; B= Some of the skin; C= None of the skin; D= Do not eat poultry at all
3 Difference (%) = 1998 (%) minus 1993 (%)
* *p* value for $x^2$ statistic

In 1998, there appears to be more people reporting that they consumed more sweetened drinks. Although there is a decrease in the proportion of people consuming sweetened drink seven or more times a week, there is an increase in the proportions who consumed sweetened drinks two to six times a week [Table 2.20.18]. The latter are more likely to be males and young adults aged 18-29 years [Table 2.20.19].

There appears to be a trend towards increase of frequency of intake of sweet desserts and snacks from twice a week or less to three to five times a week, especially among older adults aged 50-59 years [Table 2.20.20].

**Table 2.20.18 - Weekly consumption of sweetened drinks and sweet desserts and snacks: Comparison between 1993 and 1998 surveys**

| Dietary practices | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| **Weekly consumption of sweetened drinks** | | | |
| Do not drink | 13.4 | 8.9 | ↓ |
| Once a week or less | 36.4 | 41.3 | ↑ |
| 2 - 6 times a week | 30.9 | 35.5 | ↑ |
| 7 times a week or more | 19.3 | 14.3 | ↓ |
| **Weekly consumption of sweet desserts and snacks** | | | |
| Do not eat | 10.0 | 11.9 | ↑ |
| Twice a week or less | 69.6 | 59.4 | ↓ |
| 3 - 5 times a week | 14.8 | 23.0 | ↑ |
| 6 times a week or more | 5.6 | 5.6 | ≈ |

**Table 2.20.19 - Weekly consumption of sweetened drinks: Difference between 1993 and 1998 surveys**

| Difference (%)[2] | | Frequency[1] A | B | C | D | *p** |
|---|---|---|---|---|---|---|
| **Race:** | Chinese | 2.1 | 6.8 | -6.8 | -2.2 | .114 |
| | Malays | 9.2 | -0.8 | 0.6 | -9.0 | .002 |
| | Indians | 14.5 | 2.0 | -5.7 | -10.8 | .000 |
| **Gender:** | Males | 6.6 | 8.2 | -9.6 | -5.2 | .001 |
| | Females | 2.2 | 1.1 | 0.7 | -4.0 | .013 |
| **Age group:** | 18-29 years | 6.7 | 11.2 | -12.4 | -5.4 | .000 |
| | 30-39 years | -0.2 | 5.5 | -0.4 | -4.9 | .032 |
| | 40-49 years | 3.4 | 1.1 | 1.2 | -5.5 | .116 |
| | 50-59 years | 14.5 | -8.0 | -1.3 | -5.1 | .067 |
| | 60-69 years | -10.7 | 12.7 | -2.3 | 0.3 | .908 |
| **Total** | | 4.9 | 4.6 | -5.0 | -4.5 | .000 |

1 A= Once a week or less; B= 2-6 times per week; C= 7 times a week or more; D= Do not drink sweetened drinks at all
2 Difference (%) = 1998 (%) minus 1993 (%)
* *p* value for $x^2$ statistic

**Table 2.20.20 - Weekly consumption of sweet desserts and snacks: Difference between 1993 and 1998 surveys**

| Difference (%)[2] | | Frequency[1] A | B | C | D | *p** |
|---|---|---|---|---|---|---|
| **Race:** | Chinese | -8.8 | 7.8 | -0.3 | 1.3 | .255 |
| | Malays | -15.8 | 9.9 | 3.3 | 2.5 | .157 |
| | Indians | -8.3 | 6.7 | -2.2 | 3.8 | .365 |
| **Gender:** | Males | -10.4 | 8.6 | 2.4 | -0.8 | .410 |
| | Females | -9.9 | 7.4 | -2.3 | 4.8 | .052 |
| **Age group:** | 18-29 years | -7.0 | 8.9 | 0.1 | -2.0 | .432 |
| | 30-39 years | -9.2 | 9.3 | 1.8 | -1.9 | .961 |
| | 40-49 years | -14.1 | 12.4 | 0.5 | 1.2 | .961 |
| | 50-59 years | -14.3 | 2.8 | 0.1 | 11.5 | .031 |
| | 60-69 years | -17.7 | 6.2 | -4.2 | 15.8 | .044 |
| **Total** | | -10.2 | 8.2 | 0.0 | 1.9 | .055 |

1 A= Once a week or less; B= 2-6 times per week; C= 7 times a week or more; D= Do not drink sweet desserts and snacks at all
2 Difference (%) = 1998 (%) minus 1993 (%)
* *p* value for $x^2$ statistic

Compared to 1993, more people are adding salt/ sauces at the table [Table 2.20.21]. The same pattern is observed among males and females and across all ethnic and age groups [Table 2.20.22].

**Table 2.20.21 - Salt/ sauces addition at the table: Comparison between 1993 and 1998 surveys**

| Salt and sauces addition at the table | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| Before tasting the food | 2.8 | 12.3 | ↑ |
| After tasting the food | 28.5 | 46.9 | ↑ |
| Do not add | 68.7 | 40.8 | ↓ |

**Table 2.20.22 - Salt and sauces addition at the table: Difference between 1993 and 1998 surveys**

| | | Salt or sauces addition[1] | | | |
|---|---|---|---|---|---|
| **Difference (%)[2]** | | **A** | **B** | **C** | ***p**** |
| **Race:** | Chinese | 8.7 | 19.5 | -28.2 | .000 |
| | Malays | 4.9 | 24.3 | -29.2 | .000 |
| | Indians | 16.0 | 28.3 | -44.4 | .000 |
| **Gender**: | Males | 8.4 | 19.4 | -27.7 | .000 |
| | Females | 10.5 | 17.1 | -27.7 | .000 |
| **Age group:** | 18-29 years | 5.8 | 23.6 | -29.3 | .000 |
| | 30-39 years | 9.6 | 21.0 | -30.7 | .000 |
| | 40-49 years | 12.5 | 12.7 | -25.3 | .000 |
| | 50-59 years | 11.6 | 16.1 | -27.7 | .000 |
| | 60-69 years | 10.3 | 11.8 | -22.1 | .002 |
| **Total** | | 9.5 | 18.4 | -27.9 | .000 |

1 A= Before tasting the food; B= When the food is not tasty enough; C= Do not add salt or sauces to my food at the table
2 Difference (%) = 1998 (%) minus 1993 (%)
* *p* value for $x^2$ statistic

There appears to be increasing health-awareness as reflected in the increased proportion of people who modified their diet to have less fatty food, sugar and red meat or to avoid red meat [Table 2.20.23]. More Singaporeans also report to be on occasional, frequent or continual dieting - females, Chinese, Indians and those aged 30-39 years being more likely to report doing so [Table 2.20.24 and 2.20.25].

**Table 2.20.23 - Types of diet and dieting habit: Comparison between 1993 and 1998 surveys**

| Dietary practices | 1993 (%) | 1998 (%) | 1993 vs 1998 |
|---|---|---|---|
| **Types of diet:** | | | |
| Less fatty food | 27.5 | 43.1 | ↑ |
| No red meat | 1.2 | 7.1 | ↑ |
| Fat modified diet | 0.2 | 3.1 | ↑ |
| Strict vegetarian | 0.6 | 0.2 | ↓ |
| Weight loss diet | - | 1.9 | - |
| Lacto-vegetarian | - | 2.3 | - |
| No special diet | 70.6 | 42.2 | ↓ |
| **Frequency of dieting:** | | | |
| Occasionally | 13.9 | 21.0 | ↑ |
| Frequently | 1.4 | 2.9 | ↑ |
| Continually | 1.7 | 5.0 | ↑ |
| Never dieted | 82.9 | 71.1 | ↓ |

### Table 2.20.24 - Types of diet: Difference between 1993 and 1998 surveys

| Difference (%)[2] | | Type of diet[1] A | B | C | D | E[3] | F[3] | G | p* |
|---|---|---|---|---|---|---|---|---|---|
| **Race:** | Chinese | 13.1 | 6.5 | 2.6 | 0.2 | - | - | -24.3 | .000 |
| | Malays | 17.4 | 3.9 | 4.7 | 0.2 | - | - | -30.5 | .000 |
| | Indians | 24.1 | 4.3 | 0.7 | -7.6 | - | - | -31.2 | .000 |
| **Gender:** | Males | 13.3 | 6.7 | 2.9 | -0.4 | - | - | -26.0 | .000 |
| | Females | 17.4 | 5.2 | 2.8 | -0.3 | - | - | -29.8 | .000 |
| **Age group:** | 18-29 years | 21.8 | 4.8 | 2.4 | -0.3 | - | - | -33.0 | .000 |
| | 30-39 years | 22.0 | 7.4 | 2.4 | -0.3 | - | - | -36.7 | .000 |
| | 40-49 years | 3.7 | 6.5 | 3.6 | -0.8 | - | - | -16.8 | .003 |
| | 50-59 years | 7.9 | 6.8 | 3.6 | -0.4 | - | - | -21.6 | .013 |
| | 60-69 years | -1.6 | -1.0 | 2.7 | 0.6 | - | - | -3.9 | .846 |
| **Total** | | 15.6 | 5.9 | 2.9 | -0.4 | - | - | -28.4 | .000 |

1 A= No special diet, but eat less fatty foods, sugar, red meat, etc; B= No special diet, but avoid red meat only; C= Fat modified diet to lower blood lipids or cholesterol levels; D= Strict vegetarian diet; E= A weight loss diet; F= Lacto-vegetarian diet; G= No special diet, eat almost everything
2 Difference (%) = 1998 (%) minus 1993 (%)
3 Options E and F were not included in the 1993 survey
* *p* value for $x^2$ statistic

### Table 2.20.25 - Dieting habits: Difference between 1993 and 1998 surveys

| Difference (%)[2] | | Frequency[1] A | B | C | D | p* |
|---|---|---|---|---|---|---|
| **Race:** | Chinese | 8.1 | 0.3 | 2.2 | -10.6 | .001 |
| | Malays | -1.0 | 3.8 | 4.2 | -7.0 | .301 |
| | Indians | 7.2 | 3.1 | 2.3 | -12.6 | .041 |
| **Gender:** | Males | 3.8 | 1.2 | 2.8 | -7.7 | .068 |
| | Females | 9.5 | 1.5 | 3.5 | -14.6 | .001 |
| **Age group:** | 18-29 years | 5.1 | 3.2 | 3.1 | -11.4 | .155 |
| | 30-39 years | 11.3 | 0.6 | 3.9 | -15.6 | .005 |
| | 40-49 years | 6.8 | 0.8 | 3.1 | -10.8 | .059 |
| | 50-59 years | 2.7 | 1.8 | 1.1 | -5.6 | .763 |
| | 60-69 years | 6.8 | -1.3 | 5.5 | -11.0 | .194 |
| **Total** | | 7.1 | 1.5 | 3.4 | -11.8 | .000 |

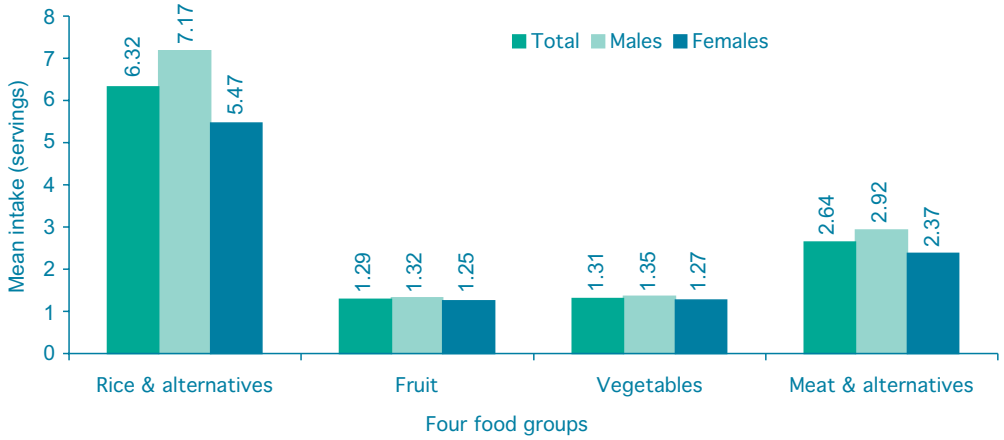
1 A= Have dieted occasionally, in the past; B= Have dieted frequently, in the past; C= Continually dieting to lose weight; D= Never dieted
2 Difference (%) = 1998 (%) minus 1993 (%)
* *p* value for $x^2$ statistic

# 3. Food Frequency

## 3.1 Mean intake of food groups

The mean intakes of the four food groups among Singaporean adults are 6.32 servings of rice & alternatives, 1.29 servings of fruit, 1.31 servings of vegetables and 2.64 servings of meat & alternatives [Fig 3.1.1]. Males have significantly higher number of servings of rice & alternatives (7.17 *vs* 5.46 servings), vegetables (1.35 *vs* 1.27 servings) and meat & alternatives (2.92 *vs* 2.37 servings) than females.

**Figure 3.1.1 - Mean intake of food groups (in number of servings) by gender**




Generally, Indians eat more wholegrain products and fruit compared to their Chinese and Malay counterparts [Tables 3.1.1 and 3.1.2].

**Table 3.1.1 - Mean intake (standard deviation) in number of servings of the 4 food groups by gender and ethnic groups**

| | n | Rice & alternatives | | Fruit | Vegetables | Meat & alternatives |
|---|---|---|---|---|---|---|
| | | Total | Wholegrains | | | |
| **Females** | | | | | | |
| **Chinese** | 799 | 5.43 (1.85) | 0.11 (0.25) | 1.24 (0.99) | 1.27 (0.80) | 2.37 (1.11) |
| **Malays** | 268 | 5.50 (1.95) | 0.09 (0.21) | 1.30 (0.95) | 1.22 (0.65) | 2.43 (1.11) |
| **Indians** | 223 | 5.88 (2.30) | 0.17 (0.30) | 1.37 (1.10) | 1.42 (0.89) | 2.25 (1.02) |
| **All** | 1290 | 5.47 (1.90) | 0.11 (0.25) | 1.25 (1.00) | 1.27 (0.79) | 2.37 (1.11) |
| **Males** | | | | | | |
| **Chinese** | 660 | 7.21 (2.38) | 0.10 (0.31) | 1.32 (1.00) | 1.36 (0.87) | 2.94 (1.29) |
| **Malays** | 241 | 7.08 (3.00) | 0.13 (0.34) | 1.19 (0.93) | 1.27 (0.88) | 2.89 (1.57) |
| **Indians** | 197 | 6.95 (2.52) | 0.20 (0.40) | 1.56 (1.30) | 1.38 (0.83) | 2.66 (1.48) |
| **All** | 1098 | 7.17 (2.48) | 0.11 (0.32) | 1.32 (1.02) | 1.35 (0.86) | 2.92 (1.34) |
| **All** | | | | | | |
| **Chinese** | 1459 | 6.31 (2.31) | 0.11 (0.28) | 1.28 (1.00) | 1.31 (0.84) | 2.66 (1.24) |
| **Malays** | 509 | 6.29 (2.64) | 0.11 (0.29) | 1.24 (0.94) | 1.24 (0.78) | 2.66 (1.38) |
| **Indians** | 420 | 6.43 (2.47) | 0.18 (0.36) | 1.47 (1.21) | 1.40 (0.86) | 2.47 (1.30) |
| **Overall** | 2388 | 6.32 (2.37) | 0.11 (0.29) | 1.29 (1.01) | 1.31 (0.83) | 2.64 (1.26) |

**Table 3.1.2 - Mean intake (standard deviation) in weight (grams) of the 4 food groups by gender and ethnic groups**

| | n | Rice & alternatives | | Fruit | Vegetables | Meat & alternatives |
|---|---|---|---|---|---|---|
| | | Total | Wholegrains | | | |
| **Females** | | | | | | |
| **Chinese** | 799 | 496.8 (170.1) | 6.4 (14.9) | 158.8 (128.3) | 144.6 (90.2) | 374.7 (217.4) |
| **Malays** | 268 | 487.8 (180.6) | 5.6 (12.8) | 166.6 (122.4) | 131.9 (73.7) | 473.7 (269.8) |
| **Indians** | 223 | 515.9 (214.5) | 10.0(18.2) | 176.2 (142.8) | 147.0 (90.7) | 526.1 (294.8) |
| **All** | 1290 | 497.0 (174.9) | 6.5 (14.9) | 161.0 (128.6) | 143.1 (88.3) | 398.0 (235.6) |
| **Males** | | | | | | |
| **Chinese** | 660 | 669.6 (221.7) | 6.3(18.5) | 168.6 (128.7) | 153.0 (98.8) | 463.2 (268.5) |
| **Malays** | 241 | 638.8 (269.1) | 7.7 (20.5) | 152.6 (120.8) | 130.6 (89.0) | 562.3 (369.0) |
| **Indians** | 197 | 623.5 (243.9) | 11.7(23.9) | 200.6 (166.4) | 145.8 (90.2) | 580.4 (342.9) |
| **All** | 1098 | 662.1 (230.3) | 6.9 (19.2) | 169.1 (131.3) | 149.6 (97.2) | 484.9 (292.2) |
| **All** | | | | | | |
| **Chinese** | 1459 | 583.0 (215.6) | 6.3 (16.8) | 163.7 (128.5) | 148.8 (94.7) | 418.9 (248.2) |
| **Malays** | 509 | 563.7 (241.1) | 6.6 (17.1) | 159.6 (121.6) | 131.2 (81.6) | 518.2 (326.0) |
| **Indians** | 420 | 572.2(236.0) | 10.9 (21.3) | 189.0 (155.6) | 146.4 (90.2) | 554.5 (321.1) |
| **Overall** | 2388 | 579.8 (220.5) | 6.7(17.2) | 165.1 (130.0) | 146.4 (92.9) | 441.6 (269.0) |

Young adults (18-29 years) eat more meat & alternatives and rice & alternatives compared to older adults (>29 years old) [Tables 3.1.3 & 3.1.4]. Young adults (18-39 years) are however, less likely to consume adequate amount of fruit. Young and older males (those aged 18 to 29 years and 50 to 69 years) are likely to eat more vegetables than their middle-aged counterparts (30 to 49 years).

**Table 3.1.3 - Mean intake (standard deviation) in number of servings of the 4 food groups by gender and age groups**

| | n | Rice & alternatives | | Fruit | Vegetables | Meat & alternatives |
|---|---|---|---|---|---|---|
| | | Total | Wholegrains | | | |
| **Females** | | | | | | |
| **18-29 yrs** | 310 | 5.78 (1.84) | 0.09 (0.22) | 1.23 (0.94) | 1.25 (0.80) | 2.60 (1.10) |
| **30-39 yrs** | 420 | 5.49 (1.78) | 0.10 (0.24) | 1.22 (0.92) | 1.29 (0.72) | 2.37 (1.08) |
| **40-49 yrs** | 339 | 5.21 (1.96) | 0.13 (0.27) | 1.28 (0.97) | 1.29 (0.75) | 2.34 (1.18) |
| **50-69 yrs** | 221 | 5.35 (2.00) | 0.11 (0.27) | 1.30 (1.18) | 1.26 (0.90) | 2.14 (1.02) |
| **All** | 1290 | 5.47 (1.90) | 0.11 (0.25) | 1.25 (1.00) | 1.27 (0.79) | 2.37 (1.11) |
| **Males** | | | | | | |
| **18-29 yrs** | 256 | 7.58 (2.78) | 0.15 (0.34) | 1.26 (0.88) | 1.51 (0.99) | 3.30 (1.44) |
| **30-39 yrs** | 333 | 7.06 (2.36) | 0.12 (0.35) | 1.23 (1.03) | 1.28 (0.73) | 2.82 (1.26) |
| **40-49 yrs** | 291 | 7.17 (2.37) | 0.06 (0.20) | 1.39 (1.10) | 1.27 (0.81) | 2.90 (1.30) |
| **50-69 yrs** | 218 | 6.80 (2.29) | 0.13 (0.36) | 1.44 (1.07) | 1.34 (0.89) | 2.60 (1.27) |
| **All** | 1098 | 6.32 (2.37) | 0.11 (0.32) | 1.32 (1.02) | 1.35 (0.86) | 2.92 (1.34) |
| **All** | | | | | | |
| **18-29 yrs** | 566 | 6.68 (2.52) | 0.12 (0.29) | 1.24 (0.91) | 1.38 (0.91) | 2.95 (1.32) |
| **30-39 yrs** | 753 | 6.28 (2.23) | 0.11 (0.30) | 1.22 (0.97) | 1.29 (0.73) | 2.59 (1.19) |
| **40-49 yrs** | 630 | 6.21 (2.39) | 0.10 (0.24) | 1.34 (1.03) | 1.28 (0.78) | 2.62 (1.27) |
| **50-69 yrs** | 439 | 6.07 (2.27) | 0.12 (0.32) | 1.37 (1.27) | 1.30 (0.90) | 2.37 (1.18) |
| **Overall** | 2388 | 6.32 (2.37) | 0.11 (0.29) | 1.29 (1.01) | 1.31 (0.83) | 2.64 (1.26) |

**Table 3.1.4 - Mean intake (standard deviation) in weight (grams) of the 4 main food groups by gender and age groups**

| | n | Rice & alternatives | | Fruit | Vegetables | Meat & alternatives |
|---|---|---|---|---|---|---|
| | | Total | Wholegrains | | | |
| **Females** | | | | | | |
| **18-29 yrs** | 310 | 528.7 (174.2) | 5.5 (13.0) | 157.7 (121.8) | 137.2 (84.0) | 420.0 (220.2) |
| **30-39 yrs** | 420 | 502.56(166.3) | 6.0 (14.4) | 157.0 (117.7) | 147.4 (84.9) | 390.5 (230.7) |
| **40-49 yrs** | 339 | 471.2 (179.6) | 8.0 (16.2) | 164.0 (124.4) | 145.4 (84.2) | 400.4 (255.7) |
| **50-69 yrs** | 221 | 479.9 (175.6) | 6.8 (16.2) | 167.0 (152.6) | 142.5 (101.3) | 378.5 (236.1) |
| **All** | 1290 | 497.0 (174.9) | 6.5 (14.9) | 161.0 (128.6) | 143.1 (88.3) | 398.0 (235.6) |
| **Males** | | | | | | |
| **18-29 yrs** | 256 | 696.2 (256.4) | 9.2 (20.5) | 161.9 (114.1) | 159.6 (101.5) | 538.4 (287.9) |
| **30-39 yrs** | 333 | 652.8 (217.1) | 6.9 (21.0) | 156.4 (132.3) | 144.2( 87.9) | 473.2 (292.1) |
| **40-49 yrs** | 291 | 665.0 (225.1) | 3.8 (11.9) | 177.8 (139.3) | 143.7 (94.2) | 476.7 (285.2) |
| **50-69 yrs** | 218 | 629.3 (214.5) | 7.5 (21.7) | 184.5 (138.4) | 151.3 (106.2) | 444.5 (298.4) |
| **All** | 1098 | 662.1 (230.3) | 6.9 (19.2) | 169.1 (131.3) | 149.6 (97.2) | 484.9 (292.3) |
| **All** | | | | | | |
| **18-29 yrs** | 566 | 612.0 (234.3) | 7.3 (17.2) | 159.8 (118.0) | 148.3 (93.7) | 478.9 (262.7) |
| **30-39 yrs** | 753 | 578.2 (207.5) | 6.5 (18.0) | 156.7(125.2) | 145.8 (86.4) | 432.2 (266.5) |
| **40-49 yrs** | 630 | 570.0 (225.8) | 5.9 (14.3) | 171.0 (132.3) | 144.5 (89.4) | 439.3 (273.6) |
| **50-69 yrs** | 439 | 553.7 (209.4) | 7.1 (19.1) | 175.6 (145.9) | 146.8 (103.8) | 411.1 (270.5) |
| **Overall** | 2388 | 579.8 (220.5) | 6.7 (17.2) | 165.1 (130.0) | 146.4 (92.9) | 441.6 (269.0) |

## 3.2 Comparison with Healthy Diet Pyramid guidelines

About half of the Singaporean adult population consumes adequate amounts of rice and alternatives (6 servings and more). Fewer people are able to meet the recommendations for the other food groups [Fig 3.2.1]. Singaporeans fare worst in their vegetable intake with the highest proportion of people (84.2%) not being able to meet the recommended number of servings (2 servings and more). Only 20.1% of the Singaporean adults are eating the recommended number of fruit servings (2 servings and more) while about one-third are able to meet the recommended number of meat servings (3 servings and more).

Significantly more females do not meet the recommended servings for rice & alternatives (65.6% *vs* 33.3%), vegetables (85.6% *vs* 82.7%) and meat & alternatives (76.4% *vs* 58.8%) compared to males. This is probably due to the generally lower dietary intake of females compared to males.

Among the males, Chinese are more likely to consume adequate meat & alternatives (3 servings and more) (43%) compared to Malays (35.9%) and Indians (31.5%) [Table 3.2.1].

Only a small proportion of Singaporean adults (8.3%) consume at least 0.5 serving of wholegrain products daily. Indians are more likely to do so than the Chinese and Malays, with the highest proportion being among the Indian males (15.1%) and young males aged 18-29 years (12.5%). [Tables 3.2.1 & 3.2.2].

Compared to older adults (30 years and above), young adults (aged 18-29 years) are more likely to meet the recommended servings for rice & alternatives (57.1% *vs* 48.3%) and meat & alternatives (42.3% *vs* 28.9%).

However, older adults (aged 40-69 years) are more likely to consume adequate fruit compared to younger adults (aged 18-39 years). More than 80% of young adults (aged 18-39 years) fall short of the recommended servings of fruit [Table 3.2.2].

**Figure 3.2.1 - Percentage of Singaporean adults not meeting the recommended Healthy Diet Pyramid servings by gender**

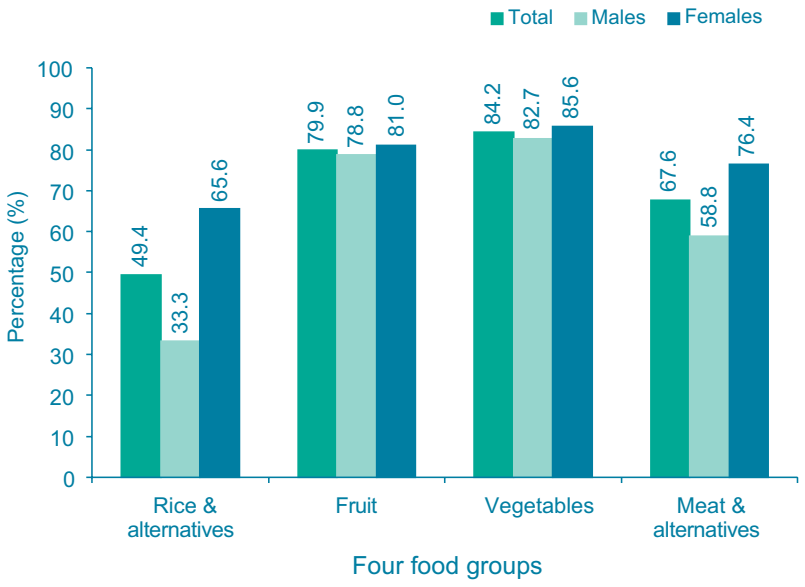


**Table 3.2.1 - Percentage of Singaporean adults meeting the recommended Healthy Diet Pyramid servings by gender and ethnic groups**

| | n | Rice & alternatives | | Fruit | Vegetables | Meat & alternatives |
|---|---|---|---|---|---|---|
| | | Total | Wholegrains | | | |
| | | ( ≥ 6 servings) | ( ≥ 0.5 servings)* | ( ≥ 2 servings) | ( ≥ 2 servings) | ( ≥ 3 servings) |
| **Females** | | | | | | |
| **Chinese** | 799 | 33.7 | 8.3 | 18.1 | 14.3 | 23.6 |
| **Malays** | 268 | 35.1 | 6.0 | 21.9 | 11.3 | 24.5 |
| **Indians** | 223 | 41.2 | 12.9 | 23.8 | 21.2 | 22.4 |
| **All** | 1290 | 34.4 | 8.3 | 19.0 | 14.4 | 23.6 |
| **Males** | | | | | | |
| **Chinese** | 660 | 68.2 | 7.5 | 20.9 | 17.5 | 43.0 |
| **Malays** | 241 | 60.8 | 9.8 | 19.0 | 15.7 | 35.9 |
| **Indians** | 197 | 61.3 | 15.1 | 28.8 | 17.4 | 31.5 |
| **All** | 1098 | 66.7 | 8.3 | 21.2 | 17.3 | 41.2 |
| **All** | | | | | | |
| **Chinese** | 1459 | 50.9 | 7.9 | 19.5 | 15.9 | 33.2 |
| **Malays** | 509 | 48.4 | 7.9 | 20.4 | 13.5 | 30.3 |
| **Indians** | 420 | 51.4 | 13.6 | 26.0 | 19.2 | 27.1 |
| **Overall** | 2388 | 50.6 | 8.3 | 20.1 | 15.8 | 32.4 |

** The Healthy Diet Pyramid recommendation is 1 serving of wholegrains daily. Due to the very low percentage of population consuming 1 serving of wholegrains daily, 0.5 serving is used as a standard for evaluation in this report.*

**Table 3.2.2 - Percentage of adults meeting the recommended Healthy Diet Pyramid servings by gender & age groups**

| | n | Rice & alternatives | | Fruit | Vegetables | Meat & alternatives |
|---|---|---|---|---|---|---|
| | | Total | Wholegrains | | | |
| | | ( ≥ 6 servings) | ( ≥ 0.5 servings)* | ( ≥ 2 servings) | ( ≥ 2 servings) | ( ≥ 3 servings) |
| **Females** | | | | | | |
| **18-29 yrs** | 310 | 41.7 | 5.7 | 19.4 | 12.4 | 31.2 |
| **30-39 yrs** | 420 | 34.6 | 7.5 | 16.0 | 13.3 | 23.8 |
| **40-49 yrs** | 339 | 28.1 | 10.5 | 18.3 | 15.1 | 21.8 |
| **50-69 yrs** | 221 | 32.7 | 10.4 | 23.1 | 17.3 | 16.5 |
| **All** | 1290 | 34.4 | 8.4 | 19.0 | 14.4 | 23.6 |
| **Males** | | | | | | |
| **18-29 yrs** | 256 | 72.7 | 12.5 | 19.7 | 20.6 | 53.7 |
| **30-39 yrs** | 333 | 65.3 | 7.1 | 16.9 | 15.7 | 37.7 |
| **40-49 yrs** | 291 | 69.3 | 4.1 | 24.0 | 15.2 | 41.6 |
| **50-69 yrs** | 218 | 58.1 | 9.4 | 25.6 | 17.7 | 30.3 |
| **All** | 1098 | 66.7 | 8.3 | 21.2 | 17.3 | 41.2 |
| **All** | | | | | | |
| **18-29 yrs** | 566 | 57.1 | 9.0 | 19.6 | 16.3 | 42.3 |
| **30-39 yrs** | 753 | 50.1 | 7.3 | 16.4 | 14.6 | 30.8 |
| **40-49 yrs** | 630 | 49.1 | 7.2 | 21.2 | 15.1 | 31.7 |
| **50-69 yrs** | 439 | 45.1 | 9.9 | 24.3 | 17.5 | 23.3 |
| **Overall** | 2388 | 50.6 | 8.3 | 20.1 | 15.8 | 32.4 |

** The Healthy Diet Pyramid recommendation is 1 serving of wholegrains daily. Due to the very low percentage of population consuming 1 serving of wholegrains daily, 0.5 serving is used as a standard for evaluation in this report.*

## 3.3 Consumption of food types

Pattern of food intake is reported by 11 main food types and 40 sub-food types [Tables 3.3.1 - 3.3.7].

Most main food types (bread & breakfast cereals, rice & porridge, vegetables & beans/ bean products, fruits and milk & dairy products) are consumed regularly (at least once a month) by more than 90% of Singaporean adults, regardless of gender, ethnic groups and age groups [Table 3.3.1(a) & 3.3.1(b)]. Due to the generally higher intake in males compared to females, the amount of food consumed in all main food types is higher in males except for vegetables & beans/ bean products, fruits, milk & dairy products where the amounts consumed are not significantly different between gender [Tables 3.3.2 & 3.3.3].

For milk & dairy products, although the amounts consumed are not significantly different between males and females, consumption habits appear to differ. Males tend to consume more milk as an addition to beverages (eg. added to tea, coffee) while females consume more milk as a drink [Tables 3.3.2(b) & 3.3.3(b)]. But when milk is taken as a drink, both males and females show a preference for reduced fat milk over full cream milk. Mean daily intake of milk & dairy products is highest among the Indians and lowest among the Chinese, the intake of the latter being only half of the former. Interestingly, Malays consume more reduced fat milk as a drink compared to Chinese and Indians [Tables 3.3.2(b) & 3.3.3(b)].

Compared to females, males are more likely to consume cereals & other types of bread (e.g. roti-prata, thosai, chapati), dry noodles, noodles in lemak gravy, poultry with skin, untrimmed meat [Tables 3.3.1(a) & 3.3.1(b)]. The reverse is true for reduced fat dairy products, soup-based noodles and poultry without skin and lean meat suggesting that males prefer the higher fat alternatives.

Among the ethnic groups, Chinese eat the least amount of bread and breakfast cereals and the most rice, porridge and noodles [Tables 3.3.2(a) & 3.3.3(a)]. Proportionately more Indians (45.8%) consume wholemeal bread or bread with fruit and nuts on a regular basis compared to Chinese (34.7%) and Malays (35.5%) [Table 3.3.1(a)]

Preserved or cured meat is regularly eaten by around 25% more Chinese than Malays and Indians [Table 3.3.1(b)]. Fewer Indians (71.8%), especially Indian females (69.0%) consume meat on a regular basis compared to Chinese (94.2%) and Malays (87.5%). Similar pattern is observed for poultry.

Malays consume more fish & seafood and eggs than Chinese and Indians [Table 3.3.2(b) & 3.3.3(b)]. Indians generally prefer poultry without skin to that with skin compared to Chinese and Malays.

While the daily overall consumption of vegetables & beans/ bean products is highest in the Indians, Chinese consume the most dark green leafy vegetables [Tables 3.3.2(a) & 3.3.3(a)].

Across the age groups, younger adults (18-29 years) are most likely to consume flavoured rice/porridge, noodles in lemak gravy, instant noodles, salad dressings, canned fruits, poultry with skin, preserved/cured meat, eggs, fast foods & soft drinks and tibits/snacks and least likely to consume legumes and pulses [Tables 3.3.4. to 3.3.5]. Prevalence of consumption of these items generally decreases with age. This suggests less healthful eating habits among younger Singaporean adults.

For both males and females, the consumption of milk as a beverage and yogurt/ cheese generally decreases in popularity with age [Tables 3.3.4(b) & 3.3.5(b)]. Mean intakes of full cream milk as a beverage and yogurt/ cheese also decrease with age [Tables 3.3.6(b) & 3.3.7(b)]. However, for reduced fat milk, mean intake is not significantly different across the age groups [Table 3.3.6(b)]. This suggests a skewed intake distribution among older adults with some consuming reduced fat milk in much larger amounts than their peers.

**Table 3.3.1(a) - Percentage of Singaporean adult population (by gender and ethnic groups) who consumed from the various food types regularly (at least once a month)**

| Food types | FEMALE | | | | MALE | | | |
|---|---|---|---|---|---|---|---|---|
| | Chinese | Malay | Indian | All | Chinese | Malay | Indian | All |
| n = | 799 | 268 | 223 | 1290 | 660 | 241 | 197 | 1098 |
| **Breads and breakfast cereals** | **96.8** | **100.0** | **100.0** | **97.4** | **96.7** | **98.7** | **97.8** | **97.2** |
| White Bread | 85.2 | 93.4 | 88.1 | 86.4 | 84.5 | 86.3 | 79.6 | 84.4 |
| Wholemeal bread/Bread with fruits and nuts | 37.2 | 37.7 | 51.2 | 38.2 | 32.1 | 33.3 | 40.9 | 33.0 |
| Cereals and other types of breads (eg. roti prata, thosai, chapati) | 65.1 | 87.4 | 92.9 | 69.9 | 79.9 | 93.5 | 95.7 | 83.0 |
| **Rice/ Porridge and dishes** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Plain rice/porridge | 100.0 | 100.0 | 100.0 | 99.9 | 100.0 | 99.3 | 98.9 | 99.9 |
| Flavoured rice/porridge | 88.5 | 90.1 | 81.0 | 88.1 | 93.8 | 94.8 | 86.0 | 93.4 |
| **Noodles dishes (all types)** | **98.7** | **96.7** | **89.3** | **97.8** | **98.4** | **92.8** | **90.3** | **97.2** |
| Noodles in soup | 71.5 | 64.2 | 48.8 | 69.0 | 67.6 | 50.3 | 47.3 | 63.9 |
| Dry noodles | 71.8 | 51.7 | 42.9 | 67.2 | 83.9 | 54.9 | 58.1 | 78.3 |
| Fried noodles | 81.8 | 78.8 | 71.4 | 80.7 | 85.2 | 75.2 | 75.3 | 83.2 |
| Noodles in lemak gravy | 40.7 | 39.7 | 28.6 | 39.8 | 45.7 | 49.7 | 34.4 | 45.4 |
| Instant noodles | 55.9 | 46.4 | 39.3 | 53.5 | 50.6 | 49.7 | 44.1 | 50.0 |
| **Vegetables & beans/bean products and dishes** | **100.0** | **100.0** | **100.0** | **100.0** | **99.8** | **99.3** | **98.9** | **99.7** |
| Pale green leafy vegetables and dishes | 98.1 | 95.4 | 97.6 | 97.6 | 96.4 | 94.1 | 93.5 | 96.0 |
| Dark green leafy vegetables and dishes | 99.3 | 96.7 | 94.0 | 98.5 | 97.0 | 91.5 | 89.2 | 95.8 |
| Tomatoes, carrots, red/yellow peppers and dishes | 84.3 | 86.8 | 95.2 | 85.3 | 78.8 | 79.1 | 92.5 | 79.9 |
| Legumes/pulses and dishes | 81.9 | 90.7 | 91.7 | 83.7 | 80.5 | 84.3 | 87.1 | 81.5 |
| Mixed vegetables and dishes | 48.1 | 51.7 | 57.1 | 49.1 | 51.3 | 49.7 | 53.8 | 51.3 |
| Tofu/beancurd and dishes | 88.4 | 84.8 | 78.6 | 87.2 | 88.9 | 73.9 | 66.7 | 85.2 |
| Others (roots/stems) and dishes | 82.2 | 79.5 | 86.9 | 82.0 | 77.0 | 74.5 | 82.8 | 77.3 |
| **Fruits** | **96.6** | **99.3** | **97.6** | **97.0** | **97.6** | **97.4** | **97.8** | **97.6** |
| Orange/red/yellow fruit & juices | 89.7 | 91.4 | 89.3 | 89.9 | 90.5 | 87.6 | 86.0 | 89.9 |
| Other fruit & juices | 92.5 | 95.4 | 96.4 | 93.0 | 91.2 | 92.2 | 94.6 | 91.6 |
| Canned fruits | 16.0 | 25.2 | 17.9 | 17.3 | 22.5 | 24.2 | 19.4 | 22.4 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table 3.3.1(b) - Percentage of Singaporean adult population (by gender and ethnic groups) who consumed from the various food types regularly (at least once a month)**

| | FEMALE | | | | MALE | | | |
|---|---|---|---|---|---|---|---|---|
| **Food types** | **Chinese** | **Malay** | **Indian** | **All** | **Chinese** | **Malay** | **Indian** | **All** |
| **n =** | 799 | 268 | 223 | 1290 | 660 | 241 | 197 | 1098 |
| **Poultry and dishes** | **95.4** | **93.4** | **84.5** | **94.3** | **95.8** | **92.8** | **90.3** | **95.2** |
| Poultry (without skin) and dishes | 69.3 | 63.6 | 78.6 | 69.2 | 48.0 | 52.9 | 74.2 | 50.7 |
| Poultry (with skin) and dishes | 50.6 | 43.7 | 17.9 | 47.4 | 66.8 | 54.2 | 33.3 | 62.7 |
| **Meat and dishes** | **92.8** | **86.8** | **69.0** | **90.3** | **95.7** | **88.2** | **75.3** | **93.2** |
| Meat (lean) and dishes | 72.5 | 64.9 | 50.0 | 69.8 | 60.8 | 57.5 | 50.5 | 59.7 |
| Meat (lean and fat) and dishes | 25.0 | 23.2 | 20.2 | 24.4 | 47.1 | 35.3 | 26.9 | 44.0 |
| Meat (preserved/cured) and dishes | 66.2 | 41.1 | 36.9 | 61.0 | 69.4 | 43.1 | 48.4 | 64.5 |
| **Fish/ Seafood and dishes** | **98.1** | **100.0** | **89.3** | **97.6** | **97.5** | **96.1** | **90.3** | **96.9** |
| Fish and dishes | 97.2 | 98.0 | 88.1 | 96.6 | 95.8 | 96.1 | 88.2 | 95.3 |
| Other seafood and dishes | 71.8 | 85.4 | 65.5 | 73.1 | 76.6 | 75.8 | 62.4 | 75.4 |
| **Eggs** | **91.7** | **90.1** | **84.5** | **90.9** | **91.4** | **93.5** | **90.3** | **91.7** |
| **Milk and dairy products** | **98.0** | **100.0** | **100.0** | **98.3** | **98.8** | **98.7** | **98.9** | **99.0** |
| Milk used with beverages (eg. in tea, coffee, malt drinks) | 94.2 | 96.0 | 97.6 | 94.6 | 96.0 | 97.4 | 96.8 | 96.3 |
| Full cream milk (as a drink) | 13.6 | 15.9 | 26.2 | 14.8 | 18.6 | 16.3 | 22.6 | 18.5 |
| Reduced fat milk (as a drink) | 41.4 | 53.6 | 31.0 | 42.1 | 33.3 | 39.2 | 30.1 | 33.8 |
| Yogurt/Cheese | 37.6 | 50.3 | 72.6 | 41.6 | 30.0 | 39.9 | 66.7 | 34.3 |
| **Miscellaneous** | **99.7** | **100.0** | **100.0** | **99.7** | **99.7** | **100.0** | **98.9** | **99.7** |
| Bread spreads | 81.4 | 88.1 | 88.1 | 82.6 | 81.3 | 80.4 | 80.6 | 81.1 |
| Salad dressings | 25.1 | 25.2 | 19.0 | 24.7 | 23.5 | 21.6 | 19.4 | 23.0 |
| Desserts in soup | 59.8 | 47.0 | 35.7 | 56.4 | 62.2 | 41.2 | 29.0 | 57.0 |
| Local snacks-kueh kueh (steamed) | 53.1 | 55.0 | 51.2 | 53.1 | 50.2 | 51.0 | 34.4 | 49.1 |
| Other desserts/snacks (eg. dim sum, goreng pisang, Indian rojak) | 67.9 | 69.5 | 65.5 | 67.8 | 71.8 | 63.4 | 64.5 | 70.3 |
| Biscuits, Pastries and cakes | 87.4 | 95.4 | 94.0 | 88.8 | 83.5 | 91.5 | 92.5 | 85.2 |
| Fast foods & Soft drinks | 82.3 | 84.1 | 85.7 | 82.7 | 87.4 | 91.5 | 91.4 | 88.3 |
| Nuts | 33.3 | 37.7 | 47.6 | 34.8 | 46.6 | 40.5 | 46.2 | 45.9 |
| Titbits (eg. fried salty snacks, ice-cream, chocolates) | 67.9 | 76.8 | 76.2 | 69.5 | 62.9 | 74.5 | 71.0 | 65.1 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table 3.3.2(a) - Mean daily intake (standard deviation) in weight (grams) of the various food types eaten by the female adult population (by ethnic groups)**

| Food types | Amount eaten daily (standard deviation) (grams) | | | |
|---|---|---|---|---|
| | FEMALE | | | |
| | Chinese | Malay | Indian | All |
| n = | 799 | 268 | 223 | 1290 |
| **Breads and breakfast cereals** | **44.1 (36.2)** | **60.3 (46.6)** | **71.8 (48.7)** | **48.1 (39.6)** |
| White Bread | 27.5 (30.6) | 36.7 (37.1) | 30.4 (29.8) | 28.9 (31.5) |
| Wholemeal bread/Bread with fruits and nuts | 7.7 (16.9) | 6.8 (13.7) | 10.7 (18.6) | 7.8 (16.6) |
| Cereals and other types of breads (eg. roti prata, thosai, chapati) | 8.8 (17.3) | 16.8 (24.8) | 30.7 (37.0) | 11.4 (21.2) |
| **Rice/ Porridge and dishes** | **414.1 (186.0)** | **377.4 (172.3)** | **391.4 (206.7)** | **407.8 (186.1)** |
| Plain rice/porridge | 302.7 (146.1) | 303.2 (153.8) | 330.4 (193.4) | 304.7 (150.9) |
| Flavoured rice/porridge | 111.4 (118.4) | 74.2 (75.2) | 61.0 (71.8) | 103.1 (112.3) |
| **Noodles dishes (all types)** | **268.9 (197.7)** | **145.2 (139.4)** | **135.4 (148.8)** | **243.7 (194.8)** |
| Noodles in soup | 102.9 (128.1) | 51.2 (77.8) | 41.2 (70.6) | 91.9 (121.5) |
| Dry noodles | 62.4 (79.9) | 23.5 (35.4) | 25.2 (51.8) | 54.8 (75.5) |
| Fried noodles | 78.8 (83.2) | 47.4 (61.8) | 49.6 (63.2) | 72.7 (80.4) |
| Noodles in lemak gravy | 19.1 (36.6) | 17.4 (35.0) | 16.3 (38.8) | 18.7 (36.5) |
| Instant noodles | 5.8 (8.7) | 5.7 (13.2) | 3.1 (5.5) | 5.6 (9.2) |
| **Vegetables & beans/bean products and dishes** | **172.7 (114.5)** | **179.2 (105.7)** | **216.5 (137.5)** | **176.6 (115.7)** |
| Pale green leafy vegetables and dishes | 36.8 (38.4) | 36.8 (35.0) | 34.9 (29.9) | 36.7 (37.4) |
| Dark green leafy vegetables and dishes | 47.9 (42.8) | 42.0 (33.1) | 30.6 (26.7) | 45.9 (41.0) |
| Tomatoes, carrots, red/yellow peppers and dishes | 22.8 (33.1) | 25.4 (32.4) | 50.4 (51.7) | 25.1 (35.4) |
| Legumes/pulses and dishes | 11.9 (16.6) | 18.1 (19.5) | 35.4 (41.2) | 14.4 (20.6) |
| Mixed vegetables and dishes | 5.3 (10.7) | 7.0 (13.0) | 9.2 (16.9) | 5.8 (11.6) |
| Tofu/beancurd and dishes | 11.8 (15.1) | 15.6 (23.4) | 11.7 (14.3) | 12.2 (16.4) |
| Others (roots/stems) and dishes | 36.2 (46.6) | 34.3 (46.3) | 44.3 (63.0) | 36.5 (47.9) |
| **Fruits** | **265.0 (222.7)** | **262.4 (195.1)** | **271.1 (238.1)** | **265.1 (220.4)** |
| Orange/red/yellow fruit & juices | 148.1 (163.9) | 135.3 (130.1) | 126.6 (125.0) | 145.0 (157.6) |
| Other fruit & juices | 116.6 (122.7) | 126.4 (132.7) | 144.0 (165.1) | 119.8 (127.5) |
| Canned fruits | 0.3 (0.9) | 0.7 (1.8) | 0.5 (1.7) | 0.4 (1.1) |

**Table 3.3.2(b) - Mean daily intake (standard deviation) in weight (grams) of the various food types eaten by the female adult population (by ethnic groups)**

| Food types | Amount eaten daily (standard deviation) (grams) FEMALE Chinese | Malay | Indian | All |
|---|---|---|---|---|
| n = | 799 | 268 | 223 | 1290 |
| **Poultry and dishes** | **22.6 (22.7)** | **17.9 (17.1)** | **21.2 (29.9)** | **21.9 (22.7)** |
| Poultry (without skin) and dishes | 13.7 (19.5) | 10.2 (13.9) | 18.3 (25.6) | 13.6 (19.5) |
| Poultry (with skin) and dishes | 8.9 (15.9) | 7.7 (13.8) | 2.9 (17.9) | 8.3 (15.9) |
| **Meat and dishes** | **30.5 (33.6)** | **15.3 (22.5)** | **11.9 (17.8)** | **27.3 (32.1)** |
| Meat (lean) and dishes | 17.4 (26.7) | 8.0 (17.6) | 5.7 (11.8) | 15.4 (25.3) |
| Meat (lean and fat) and dishes | 5.3 (15.1) | 3.1 (9.3) | 1.7 (5.1) | 4.7 (14.1) |
| Meat (preserved/cured) and dishes | 7.9 (12.1) | 4.1 (9.3) | 4.4 (10.7) | 7.2 (11.8) |
| **Fish/ Seafood and dishes** | **44.1 (35.4)** | **62.8 (43.9)** | **40.9 (32.2)** | **46.3 (36.9)** |
| Fish and dishes | 35.7 (31.2) | 50.3 (35.2) | 33.5 (27.7) | 37.4 (31.8) |
| Other seafood and dishes | 8.4 (12.0) | 12.5 (21.2) | 7.4 (10.1) | 8.9 (13.4) |
| **Eggs** | **14.3 (14.0)** | **15.7 (14.8)** | **12.1 (12.1)** | **14.3 (14.0)** |
| **Milk and dairy products** | **96.7 (109.8)** | **152.2 (141.4)** | **200.2 (163.0)** | **111.1 (122.5)** |
| Milk used with beverages (eg. in tea, coffee, malt drinks) | 37.1 (52.3) | 52.8 (62.4) | 88.3 (71.2) | 42.7 (56.8) |
| Full cream milk (as a drink) | 11.1 (43.9) | 15.4 (63.0) | 30.4 (80.9) | 13.0 (50.3) |
| Reduced fat milk (as a drink) | 44.2 (89.8) | 76.7 (121.8) | 46.9 (96.0) | 48.5 (95.4) |
| Yogurt/Cheese | 4.4 (16.5) | 7.3 (16.1) | 34.7 (66.8) | 6.9 (25.0) |
| **Miscellaneous** | **181.9 (157.7)** | **214.0 (188.8)** | **224.2 (271.5)** | **189.0 (172.7)** |
| Bread spreads | 4.0 (6.0) | 4.4 (6.5) | 4.0 (5.3) | 4.1 (6.0) |
| Salad dressings | 0.4 (1.4) | 0.6 (2.1) | 0.6 (2.3) | 0.5 (1.6) |
| Desserts in soup | 32.3 (50.1) | 23.5 (44.5) | 17.3 (48.5) | 30.1 (49.5) |
| Local snacks-kueh kueh (steamed) | 12.3 (23.4) | 17.0 (31.9) | 16.1 (49.2) | 13.2 (27.2) |
| Other desserts/snacks (eg. dim sum, goreng pisang, Indian rojak) | 15.4 (25.4) | 8.9 (15.6) | 8.6 (14.7) | 14.1 (23.9) |
| Biscuits, Pastries and cakes | 18.6 (23.6) | 27.8 (27.3) | 29.7 (29.9) | 20.6 (24.9) |
| Fast foods & Soft drinks | 87.4 (119.5) | 115.1 (152.6) | 130.0 (245.8) | 94.0 (137.2) |
| Nuts | 1.7 (5.0) | 2.1 (6.2) | 4.2 (9.7) | 1.9 (5.6) |
| Titbits (eg. fried salty snacks, ice-cream, chocolates) | 9.7 (17.5) | 14.8 (19.5) | 13.7 (20.2) | 10.7 (18.0) |

**Table 3.3.3(a) - Mean daily intake (standard deviation) in weight (grams) of the various food types eaten by the male adult population (by ethnic groups)**

| Food types | Amount eaten daily (standard deviation) (grams) MALE Chinese | Malay | Indian | All |
|---|---|---|---|---|
| n = | 660 | 241 | 197 | 1098 |
| **Breads and breakfast cereals** | **53.3 (46.9)** | **70.1 (54.2)** | **81.5 (56.4)** | **57.6 (49.4)** |
| White Bread | 29.4 (32.5) | 35.5 (39.9) | 32.3 (33.2) | 30.4 (33.6) |
| Wholemeal bread/Bread with fruits and nuts | 7.4 (20.0) | 8.9 (21.6) | 12.5 (24.3) | 8.0 (20.6) |
| Cereals and other types of breads (eg. roti prata, thosai, chapati) | 16.5 (30.0) | 25.7 (27.3) | 36.7 (40.2) | 19.3 (31.1) |
| **Rice/ Porridge and dishes** | **561.0 (227.1)** | **513.8 (248.5)** | **486.7 (239.3)** | **549.2 (231.9)** |
| Plain rice/porridge | 421.5 (199.4) | 406.0 (201.5) | 396.0 (213.3) | 417.6 (200.8) |
| Flavoured rice/porridge | 139.4 (129.6) | 107.9 (118.7) | 90.7 (92.3) | 131.6 (126.6) |
| **Noodles dishes (all types)** | **309.1 (223.6)** | **161.3 (174.3)** | **168.0 (158.3)** | **279.3 (221.3)** |
| Noodles in soup | 93.8 (121.9) | 38.0 (68.4) | 43.6 (77.9) | 82.8 (115.5) |
| Dry noodles | 87.3 (100.7) | 31.7 (47.5) | 41.1 (57.9) | 76.7 (95.1) |
| Fried noodles | 99.9 (105.5) | 62.8 (118.1) | 62.3 (78.1) | 92.2 (106.3) |
| Noodles in lemak gravy | 22.0 (39.5) | 23.3 (40.3) | 15.6 (33.1) | 21.7 (39.2) |
| Instant noodles | 6.0 (10.7) | 5.6 (9.3) | 5.3 (9.5) | 5.9 (10.4) |
| **Vegetables & beans/bean products and dishes** | **177.5 (117.4)** | **163.7 (119.6)** | **209.6 (131.2)** | **178.2 (119.1)** |
| Pale green leafy vegetables and dishes | 39.8 (41.7) | 35.0 (35.5) | 34.5 (33.4) | 38.8 (40.4) |
| Dark green leafy vegetables and dishes | 46.7 (45.2) | 37.2 (34.7) | 32.3 (38.2) | 44.3 (43.7) |
| Tomatoes, carrots, red/yellow peppers and dishes | 21.7 (33.2) | 25.7 (31.8) | 44.8 (50.2) | 24.0 (35.1) |
| Legumes/pulses and dishes | 12.0 (16.5) | 15.9 (16.4) | 37.9 (49.9) | 14.5 (22.1) |
| Mixed vegetables and dishes | 6.8 (16.1) | 6.0 (10.7) | 10.1 (17.5) | 6.9 (15.7) |
| Tofu/beancurd and dishes | 15.3 (19.2) | 14.1 (23.2) | 11.0 (16.6) | 14.8 (19.6) |
| Others (roots/stems) and dishes | 35.2 (47.9) | 29.7 (56.5) | 39.0 (46.3) | 34.8 (49.0) |
| **Fruits** | **271.7 (218.6)** | **231.5 (196.3)** | **293.5 (268.9)** | **268.3 (220.5)** |
| Orange/red/yellow fruit & juices | 156.0 (166.1) | 122.8 (136.9) | 156.9 (205.7) | 151.9 (166.4) |
| Other fruit & juices | 115.0 (119.0) | 107.8 (120.9) | 135.8 (144.5) | 115.7 (121.5) |
| Canned fruits | 0.7 (1.9) | 0.9 (3.4) | 0.8 (3.2) | 0.7 (2.3) |

**Table 3.3.3(b) - Mean daily intake (standard deviation) in weight (grams) of the various food types eaten by the male adult population (by ethnic groups)**

| Food types | Amount eaten daily (standard deviation) (grams) MALE | | | |
|---|---|---|---|---|
| | Chinese | Malay | Indian | All |
| n = | 660 | 241 | 197 | 1098 |
| **Poultry and dishes** | **29.6 (30.0)** | **24.8 (22.9)** | **26.8 (27.0)** | **28.7 (29.0)** |
| Poultry (without skin) and dishes | 11.8 (19.4) | 11.3 (17.7) | 20.3 (26.8) | 12.4 (20.0) |
| Poultry (with skin) and dishes | 17.8 (28.0) | 13.5 (20.9) | 6.5 (13.1) | 16.4 (26.5) |
| **Meat and dishes** | **43.3 (38.5)** | **22.1 (27.8)** | **23.7 (47.9)** | **39.0 (39.0)** |
| Meat (lean) and dishes | 16.9 (25.6) | 8.3 (13.4) | 9.7 (18.2) | 15.3 (24.1) |
| Meat (lean and fat) and dishes | 14.2 (25.0) | 7.7 (18.1) | 7.8 (42.8) | 12.9 (26.2) |
| Meat (preserved/cured) and dishes | 12.1 (18.1) | 6.1 (13.7) | 6.3 (11.0) | 10.9 (17.3) |
| **Fish/ Seafood and dishes** | **48.2 (38.7)** | **64.9 (43.3)** | **42.8 (42.1)** | **49.9 (40.0)** |
| Fish and dishes | 37.6 (31.8) | 54.4 (38.6) | 33.8 (30.6) | 39.5 (33.1) |
| Other seafood and dishes | 10.6 (15.5) | 10.5 (15.3) | 9.0 (23.6) | 10.5 (16.2) |
| **Eggs** | **21.0 (20.8)** | **26.1 (36.0)** | **19.7 (18.6)** | **21.6 (23.2)** |
| **Milk and dairy products** | **103.1 (115.2)** | **152.9 (143.4)** | **192.5 (176.3)** | **116.4 (127.7)** |
| Milk used with beverages (eg. in tea, coffee, malt drinks) | 53.2 (69.0) | 83.1 (88.1) | 94.2 (78.7) | 60.2 (73.7) |
| Full cream milk (as a drink) | 14.8 (48.6) | 16.4 (62.5) | 25.0 (68.7) | 15.8 (52.4) |
| Reduced fat milk (as a drink) | 32.2 (77.9) | 48.6 (96.6) | 32.0 (90.1) | 34.3 (81.6) |
| Yogurt/Cheese | 2.9 (9.6) | 4.7 (12.0) | 41.3 (108.1) | 6.1 (33.0) |
| **Miscellaneous** | **277.0 (256.8)** | **324.5 (287.5)** | **271.0 (237.2)** | **282.6 (259.8)** |
| Bread spreads | 4.8 (7.5) | 5.2 (10.8) | 4.4 (6.1) | 4.8 (7.9) |
| Salad dressings | 0.4 (1.1) | 0.9 (2.7) | 0.5 (1.6) | 0.5 (1.4) |
| Desserts in soup | 39.6 (63.2) | 22.1 (44.1) | 17.1 (50.2) | 35.7 (60.7) |
| Local snacks-kueh kueh (steamed) | 15.0 (32.0) | 26.3 (49.7) | 14.1 (48.7) | 16.4 (36.4) |
| Other desserts/snacks | 19.6 (28.1) | 9.8 (15.9) | 8.6 (13.9) | 17.5 (26.3) |
| Biscuits, Pastries and cakes | 20.8 (25.1) | 34.3 (44.2) | 28.2 (26.9) | 23.1 (28.7) |
| Fast foods & Soft drinks | 163.4 (207.6) | 204.7 (243.3) | 182.3 (212.9) | 170.1 (213.2) |
| Nuts | 3.2 (6.9) | 4.8 (13.5) | 3.4 (6.9) | 3.4 (8.1) |
| Titbits (eg. fried salty snacks, ice-cream, chocolates) | 10.2 (20.4) | 16.4 (26.8) | 12.5 (17.8) | 11.2 (21.2) |

**Table 3.3.4(a) - Percentage of female adult population (by age groups) who consumed from the various food types regularly (at least once a month)**

| | FEMALE | | | | | |
|---|---|---|---|---|---|---|
| | Age group (years) | | | | | |
| **Food types** | **18-29** | **30-39** | **40-49** | **50-59** | **≥ 60** | **All** |
| **n =** | 310 | 420 | 339 | 136 | 85 | 1290 |
| **Breads and breakfast cereals** | **97.8** | **97.9** | **97.2** | **97.5** | **94.0** | **97.4** |
| White Bread | 86.3 | 89.8 | 84.9 | 84.4 | 83.0 | 86.4 |
| Wholemeal bread/Bread with fruits and nuts | 43.6 | 37.3 | 41.4 | 33.1 | 23.0 | 38.2 |
| Cereals and other types of breads (eg. roti prata, thosai, chapati) | 74.2 | 76.5 | 70.9 | 55.0 | 54.0 | 69.9 |
| **Rice/ Porridge and dishes** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Plain rice/porridge | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 99.9 |
| Flavoured rice/porridge | 91.4 | 91.3 | 87.4 | 81.3 | 81.0 | 88.1 |
| **Noodles dishes (all types)** | **98.4** | **98.5** | **98.2** | **95.6** | **96.0** | **97.8** |
| Noodles in soup | 69.7 | 70.5 | 71.2 | 61.9 | 67.0 | 69.0 |
| Dry noodles | 75.8 | 72.3 | 65.6 | 53.8 | 50.0 | 67.2 |
| Fried noodles | 80.6 | 85.8 | 80.0 | 72.5 | 79.0 | 80.7 |
| Noodles in lemak gravy | 44.6 | 45.2 | 43.2 | 26.9 | 19.0 | 39.8 |
| Instant noodles | 69.1 | 59.3 | 45.6 | 43.8 | 23.0 | 53.5 |
| **Vegetables & beans/bean products and dishes** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Pale green leafy vegetables and dishes | 97.5 | 98.8 | 96.8 | 97.5 | 96.0 | 97.6 |
| Dark green leafy vegetables and dishes | 98.1 | 98.8 | 98.6 | 99.4 | 97.0 | 98.5 |
| Tomatoes, carrots, red/yellow peppers and dishes | 85.0 | 88.0 | 87.7 | 81.9 | 76.0 | 85.3 |
| Legumes/pulses and dishes | 80.6 | 86.7 | 85.6 | 81.9 | 80.0 | 83.7 |
| Mixed vegetables and dishes | 51.0 | 54.2 | 47.7 | 47.5 | 32.0 | 49.1 |
| Tofu/beancurd and dishes | 85.0 | 87.3 | 90.2 | 85.6 | 87.0 | 87.2 |
| Others (roots/stems) and dishes | 78.7 | 82.8 | 84.9 | 82.5 | 81.0 | 82.0 |
| **Fruits** | **97.5** | **97.3** | **98.2** | **94.4** | **94.0** | **97.0** |
| Orange/red/yellow fruit & juices | 93.3 | 91.3 | 93.3 | 82.5 | 77.0 | 89.9 |
| Other fruit & juices | 92.4 | 94.3 | 94.4 | 92.5 | 88.0 | 93.0 |
| Canned fruits | 23.9 | 19.6 | 13.3 | 12.5 | 9.0 | 17.3 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table 3.3.4(b) Percentage of female adult population (by age groups) who consumed from the various food types regularly (at least once a month)**

| | FEMALE | | | | | |
|---|---|---|---|---|---|---|
| | Age group (years) | | | | | |
| **Food types** | **18-29** | **30-39** | **40-49** | **50-59** | **≥ 60** | **All** |
| **n =** | 310 | 420 | 339 | 136 | 85 | 1290 |
| **Poultry and dishes** | **95.9** | **94.0** | **95.1** | **92.5** | **91.0** | **94.3** |
| Poultry (without skin) and dishes | 62.4 | 69.0 | 75.1 | 70.0 | 73.0 | 69.2 |
| Poultry (with skin) and dishes | 59.2 | 47.9 | 43.5 | 40.0 | 31.0 | 47.4 |
| **Meat and dishes** | **90.8** | **91.0** | **90.2** | **91.9** | **83.0** | **90.3** |
| Meat (lean) and dishes | 62.4 | 74.4 | 73.3 | 71.3 | 65.0 | 69.8 |
| Meat (lean and fat) and dishes | 27.1 | 22.0 | 23.5 | 28.1 | 21.0 | 24.4 |
| Meat (preserved/cured) and dishes | 72.0 | 64.2 | 60.0 | 50.6 | 35.0 | 61.0 |
| **Fish/ Seafood and dishes** | **97.8** | **97.3** | **97.9** | **96.9** | **99.0** | **97.6** |
| Fish and dishes | 96.5 | 95.8 | 97.5 | 96.9 | 97.0 | 96.6 |
| Other seafood and dishes | 77.1 | 76.5 | 73.0 | 70.0 | 54.0 | 73.1 |
| **Eggs** | **94.9** | **94.0** | **89.1** | **86.9** | **80.0** | **90.9** |
| **Milk and dairy products** | **98.4** | **97.6** | **98.2** | **98.8** | **100.0** | **98.3** |
| Milk used with beverages (eg. in tea, coffee, malt drinks) | 93.6 | 93.1 | 95.8 | 95.0 | 99.0 | 94.6 |
| Full cream milk (as a drink) | 20.7 | 17.8 | 9.8 | 12.5 | 4.0 | 14.8 |
| Reduced fat milk (as a drink) | 51.3 | 40.7 | 39.6 | 38.1 | 31.0 | 42.1 |
| Yogurt/Cheese | 53.8 | 42.8 | 42.1 | 29.4 | 19.0 | 41.6 |
| **Miscellaneous** | **100.0** | **100.0** | **99.6** | **98.8** | **100.0** | **99.7** |
| Bread spreads | 76.1 | 86.4 | 86.7 | 85.6 | 74.0 | 82.6 |
| Salad dressings | 38.5 | 28.3 | 17.5 | 14.4 | 6.0 | 24.7 |
| Desserts in soup | 59.2 | 63.3 | 56.1 | 46.3 | 43.0 | 56.4 |
| Local snacks-kueh kueh (steamed) (eg. dim sum, goreng pisang, Indian rojak) | 53.2 | 54.2 | 54.0 | 55.6 | 43.0 | 53.1 |
| Other desserts/snacks | 72.3 | 72.0 | 67.7 | 53.8 | 63.0 | 67.8 |
| Biscuits, Pastries and cakes | 86.9 | 91.0 | 89.5 | 90.0 | 85.0 | 88.8 |
| Fast foods & Soft drinks | 96.8 | 91.3 | 78.2 | 61.3 | 57.0 | 82.7 |
| Nuts | 30.3 | 39.8 | 40.7 | 31.3 | 22.0 | 34.8 |
| Titbits (eg. fried salty snacks, ice-cream, chocolates) | 82.5 | 78.3 | 66.7 | 46.3 | 45.0 | 69.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table 3.3.5(a) - Percentage of male adult population (by age groups) who consumed from the various food types regularly (at least once a month)**

| | MALE | | | | | |
|---|---|---|---|---|---|---|
| | Age group (years) | | | | | |
| **Food types** | **18-29** | **30-39** | **40-49** | **50-59** | **≥ 60** | **All** |
| **n =** | 256 | 333 | 291 | 139 | 79 | 1098 |
| **Breads and breakfast cereals** | **98.1** | **97.9** | **96.3** | **98.1** | **94.7** | **97.2** |
| White Bread | 81.4 | 85.5 | 88.5 | 79.9 | 83.2 | 84.4 |
| Wholemeal bread/Bread with fruits and nuts | 41.5 | 28.2 | 29.7 | 37.1 | 24.2 | 33.0 |
| Cereals and other types of breads (eg. roti prata, thosai, chapati) | 84.2 | 88.7 | 80.7 | 83.0 | 64.2 | 83.0 |
| **Rice/ Porridge and dishes** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Plain rice/porridge | 99.7 | 100.0 | 100.0 | 100.0 | 100.0 | 99.9 |
| Flavoured rice/porridge | 96.5 | 94.4 | 94.6 | 88.7 | 82.1 | 93.4 |
| **Noodles dishes (all types)** | **98.4** | **97.9** | **98.6** | **96.2** | **87.4** | **97.2** |
| Noodles in soup | 58.8 | 64.4 | 70.3 | 65.4 | 56.8 | 63.9 |
| Dry noodles | 80.7 | 77.2 | 82.4 | 82.4 | 52.6 | 78.3 |
| Fried noodles | 84.2 | 84.6 | 84.5 | 83.0 | 69.5 | 83.2 |
| Noodles in lemak gravy | 45.3 | 49.6 | 44.9 | 45.9 | 31.6 | 45.4 |
| Instant noodles | 65.3 | 54.6 | 43.9 | 39.6 | 21.1 | 50.0 |
| **Vegetables & beans/bean products and dishes** | **99.7** | **99.7** | **99.3** | **100.0** | **100.0** | **99.7** |
| Pale green leafy vegetables and dishes | 94.5 | 95.0 | 96.6 | 98.1 | 96.8 | 96.0 |
| Dark green leafy vegetables and dishes | 93.9 | 95.8 | 94.6 | 100.0 | 98.9 | 95.8 |
| Tomatoes, carrots, red/yellow | 79.7 | 80.4 | 77.0 | 80.5 | 86.3 | 79.9 |
| Legumes/pulses and dishes peppers and dishes | 73.6 | 81.6 | 83.8 | 89.3 | 84.2 | 81.5 |
| Mixed vegetables and dishes | 54.0 | 55.8 | 50.7 | 41.5 | 43.2 | 51.3 |
| Tofu/beancurd and dishes | 83.6 | 84.9 | 82.4 | 93.1 | 86.3 | 85.2 |
| Others (roots/stems) and dishes | 77.5 | 73.9 | 77.4 | 79.9 | 82.1 | 77.3 |
| **Fruits** | **97.7** | **97.3** | **97.0** | **99.4** | **96.8** | **97.6** |
| Orange/red/yellow fruit & juices | 92.3 | 89.6 | 88.2 | 91.2 | 84.2 | 89.9 |
| Other fruit & juices | 90.4 | 89.3 | 91.9 | 95.0 | 94.7 | 91.6 |
| Canned fruits | 28.9 | 24.9 | 21.3 | 14.5 | 8.4 | 22.4 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table 3.3.5(b) Percentage of male adult population (by age groups) who consumed from the various food types regularly (at least once a month)**

| | MALE | | | | | |
|---|---|---|---|---|---|---|
| | Age group (years) | | | | | |
| **Food types** | **18-29** | **30-39** | **40-49** | **50-59** | **≥ 60** | **All** |
| **n =** | 256 | 333 | 291 | 139 | 79 | 1098 |
| **Poultry and dishes** | **97.4** | **95.5** | **92.9** | **95.6** | **91.6** | **95.2** |
| Poultry (without skin) and dishes | 49.2 | 46.0 | 52.4 | 56.6 | 58.9 | 50.7 |
| Poultry (with skin) and dishes | 72.3 | 67.4 | 59.8 | 50.3 | 42.1 | 62.7 |
| **Meat and dishes** | **94.9** | **93.2** | **93.9** | **90.6** | **88.4** | **93.2** |
| Meat (lean) and dishes | 58.8 | 57.0 | 63.5 | 62.9 | 54.7 | 59.7 |
| Meat (lean and fat) and dishes | 44.1 | 44.5 | 45.3 | 42.1 | 42.1 | 44.0 |
| Meat (preserved/cured) and dishes | 77.8 | 64.7 | 59.8 | 56.0 | 49.5 | 64.5 |
| **Fish/ Seafood and dishes** | **97.1** | **95.5** | **97.3** | **97.5** | **97.9** | **96.9** |
| Fish and dishes | 93.9 | 93.5 | 96.6 | 97.5 | 97.9 | 95.3 |
| Other seafood and dishes | 80.7 | 77.7 | 72.0 | 69.2 | 70.5 | 75.4 |
| **Eggs** | **97.7** | **92.3** | **89.2** | **88.1** | **83.2** | **91.7** |
| **Milk and dairy products** | **99.7** | **97.6** | **98.3** | **100.0** | **100.0** | **99.0** |
| Milk used with beverages | 97.1 | 92.3 | 98.0 | 99.4 | 96.8 | 96.3 |
| Full cream milk (as a drink) (eg. in tea, coffee, malt drinks) | 24.8 | 22.8 | 15.2 | 10.7 | 6.3 | 18.5 |
| Reduced fat milk (as a drink) | 43.1 | 34.1 | 26.4 | 35.2 | 23.2 | 33.8 |
| Yogurt/Cheese | 41.5 | 32.9 | 34.5 | 27.7 | 25.3 | 34.3 |
| **Miscellaneous** | **100.0** | **100.0** | **99.3** | **100.0** | **96.8** | **99.7** |
| Bread spreads | 79.7 | 84.9 | 79.7 | 83.0 | 72.6 | 81.1 |
| Salad dressings | 31.8 | 24.3 | 20.6 | 15.1 | 9.5 | 23.0 |
| Desserts in soup | 63.3 | 53.4 | 55.4 | 61.6 | 45.3 | 57.0 |
| Local snacks-kueh kueh (steamed) | 46.6 | 48.4 | 44.6 | 61.6 | 52.6 | 49.1 |
| Other desserts/snacks (eg. dim sum, goreng pisang, Indian rojak) | 71.7 | 71.2 | 68.2 | 73.6 | 63.2 | 70.3 |
| Biscuits, Pastries and cakes | 88.1 | 84.6 | 82.8 | 86.2 | 84.2 | 85.2 |
| Fast foods & Soft drinks | 97.1 | 94.4 | 87.8 | 75.5 | 61.1 | 88.3 |
| Nuts | 36.0 | 46.6 | 54.7 | 54.7 | 32.6 | 45.9 |
| Titbits (eg. fried salty snacks, ice-cream, chocolates) | 79.7 | 68.2 | 63.5 | 50.3 | 35.8 | 65.1 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table 3.3.6(a) - Mean daily intake (standard deviation) in weight (grams) of the various food types eaten by the female adult population (by age groups)**

| | Amount eaten daily (standard deviation) (grams) | | | | | |
|---|---|---|---|---|---|---|
| | FEMALE | | | | | |
| | Age group (years) | | | | | |
| **Food types** | **18-29** | **30-39** | **40-49** | **50-59** | **≥ 60** | **All** |
| **n =** | 310 | 420 | 339 | 136 | 85 | 1290 |
| **Breads and breakfast cereals** | **46.4 (39.5)** | **46.4 (36.5)** | **47.7 (39.4)** | **51.7 (41.3)** | **54.4 (46.7)** | **48.1 (39.6)** |
| White Bread | 26.0 (29.1) | 27.3 (25.0) | 26.8 (30.9) | 34.2 (36.6) | 40.8 (45.5) | 28.9 (31.5) |
| Wholemeal bread/Bread with fruits and nuts | 7.0 (14.1) | 7.7 (17.9) | 9.1 (17.5) | 9.1 (19.3) | 4.9 (12.0) | 7.8 (16.6) |
| Cereals and other types of breads (eg. roti prata, thosai, chapati) | 13.4 (21.9) | 11.4 (20.0) | 11.9 (24.8) | 8.4 (15.9) | 8.7 (18.1) | 11.4 (21.2) |
| **Rice/ Porridge and dishes** | **413.7 (185.4)** | **411.0 (185.2)** | **382.6 (177.4)** | **388.1 (165.0)** | **482.4 (225.5)** | **407.8 (186.1)** |
| Plain rice/porridge | 295.7 (157.8) | 300.0 (143.1) | 289.0 (147.2) | 316.8 (146.9) | 374.4 (153.6) | 304.7 (150.9) |
| Flavoured rice/porridge | 118.0 (111.7) | 111.0 (118.8) | 93.6 (97.3) | 71.2 (67.7) | 108.0 (165.7) | 103.1 (112.3) |
| **Noodles dishes (all types)** | **283.8 (188.2)** | **261.2 (210.0)** | **232.5 (195.0)** | **199.2 (181.8)** | **163.0 (134.5)** | **243.7 (194.8)** |
| Noodles in soup | 103.5 (123.0) | 95.0 (130.1) | 87.4 (115.3) | 86.0 (123.3) | 67.9 (96.3) | 91.9 (121.5) |
| Dry noodles | 73.8 (89.6) | 60.1 (75.0) | 49.4 (70.7) | 33.4 (53.1) | 28.0 (51.4) | 54.8 (75.5) |
| Fried noodles | 74.8 (77.7) | 81.8 (86.2) | 72.3 (82.2) | 61.7 (77.3) | 55.2 (63.0) | 72.7 (80.4) |
| Noodles in lemak gravy | 22.8 (40.4) | 19.1 (37.1) | 19.4 (33.1) | 13.8 (37.0) | 9.9 (27.7) | 18.7 (36.5) |
| Instant noodles | 8.9 (11.1) | 5.3 (9.5) | 4.0 (7.3) | 4.4 (7.7) | 2.0 (4.9) | 5.6 (9.2) |
| **Vegetables & beans/bean products and dishes** | **156.3 (113.3)** | **181.6 (115.5)** | **182.3 (106.8)** | **189.9 (114.3)** | **186.3 (141.5)** | **176.6 (115.7)** |
| Pale green leafy vegetables and dishes | 34.4 (38.4) | 38.4 (36.9) | 34.5 (31.2) | 42.2 (49.3) | 36.0 (40.9) | 36.7 (37.4) |
| Dark green leafy vegetables and dishes | 38.4 (30.5) | 48.1 (39.8) | 48.3 (44.1) | 50.2 (37.2) | 48.7 (62.5) | 45.9 (41.0) |
| Tomatoes, carrots, red/ yellow peppers and dishes | 23.0 (39.1) | 24.7 (31.4) | 26.3 (31.9) | 25.5 (34.9) | 28.9 (44.4) | 25.1 (35.4) |
| Legumes/pulses and dishes | 12.6 (17.8) | 14.1 (19.1) | 15.4 (18.8) | 14.4 (26.0) | 17.6 (27.8) | 14.4 (20.6) |
| Mixed vegetables and dishes | 6.1 (11.7) | 5.9 (11.9) | 6.2 (11.6) | 5.5 (12.1) | 3.9 (8.7) | 5.8 (11.6) |
| Tofu/ beancurd and dishes | 13.1 (19.5) | 10.9 (13.5) | 11.9 (13.0) | 14.0 (21.2) | 12.1 (13.8) | 12.2 (16.4) |
| Others (roots/stems) and dishes | 28.6 (38.3) | 39.6 (51.9) | 39.9 (46.5) | 37.9 (45.1) | 39.1 (64.7) | 36.5 (47.9) |
| **Fruits** | **266.4 (213.2)** | **262.1 (199.1)** | **271.3 (209.9)** | **277.6 (284.7)** | **234.1 (222.7)** | **265.1 (220.4)** |
| Orange/red/yellow fruit & juices | 154.4 (152.4) | 131.5 (123.4) | 151.7 (152.1) | 147.7 (210.2) | 136.4 (188.7) | 145.0 (157.6) |
| Other fruit & juices | 111.4 (130.8) | 130.2 (139.0) | 119.2 (117.1) | 129.5 (125.1) | 97.6 (105.4) | 119.8 (127.5) |
| Canned fruits | 0.5 (1.2) | 0.4 (1.1) | 0.3 (1.0) | 0.4 (1.2) | 0.2 (0.9) | 0.4 (1.1) |

**Table 3.3.6(b) - Mean daily intake (standard deviation) in weight (grams) of the various food types eaten by the female adult population (by age groups)**

| | Amount eaten daily (standard deviation) (grams) | | | | | |
|---|---|---|---|---|---|---|
| | FEMALE | | | | | |
| | Age group (years) | | | | | |
| **Food types** | **18-29** | **30-39** | **40-49** | **50-59** | **≥ 60** | **All** |
| **n =** | 310 | 420 | 339 | 136 | 85 | 1290 |
| **Poultry and dishes** | **27.2 (21.5)** | **21.6 (25.3)** | **18.8 (20.3)** | **18.8 (19.0)** | **19.8 (26.7)** | **21.9 (22.7)** |
| Poultry (without skin) and dishes | 14.3 (19.2) | 13.6 (21.6) | 11.9 (15.0) | 12.6 (16.7) | 17.6 (26.8) | 13.6 (19.5) |
| Poultry (with skin) and dishes | 12.9 (17.9) | 8.0 (15.4) | 6.9 (16.4) | 6.2 (13.7) | 2.2 (5.2) | 8.3 (15.9) |
| **Meat and dishes** | **31.7 (34.0)** | **26.2 (30.7)** | **26.0 (34.8)** | **24.1 (26.1)** | **25.5 (30.9)** | **27.3 (32.1)** |
| Meat (lean) and dishes | 15.2 (26.5) | 15.2 (25.9) | 15.3 (23.7) | 14.2 (21.8) | 18.8 (28.7) | 15.4 (25.3) |
| Meat (lean and fat) and dishes | 4.7 (10.7) | 4.1 (12.7) | 4.9 (17.6) | 5.9 (15.3) | 4.5 (14.4) | 4.7 (14.1) |
| Meat (preserved/cured) and dishes | 11.9 (16.5) | 6.9 (10.6) | 5.8 (9.0) | 4.1 (6.4) | 2.1 (5.4) | 7.2 (11.8) |
| **Fish/ Seafood and dishes** | **44.7 (35.8)** | **46.7 (39.6)** | **49.2 (38.2)** | **43.8 (33.5)** | **45.2 (32.0)** | **46.3 (36.9)** |
| Fish and dishes | 34.4 (28.3) | 37.0 (34.2) | 41.3 (35.1) | 36.8 (29.5) | 38.1 (27.1) | 37.4 (31.8) |
| Other seafood and dishes | 10.3 (17.0) | 9.8 (13.4) | 7.9 (10.6) | 7.0 (8.9) | 7.0 (13.4) | 8.9 (13.4) |
| **Eggs** | **16.7 (13.0)** | **15.5 (14.1)** | **12.9 (12.9)** | **12.3 (16.7)** | **10.5 (12.6)** | **14.3 (14.0)** |
| **Milk and dairy products** | **112.4 (119.7)** | **101.3 (108.6)** | **112.6 (131.2)** | **123.3 (124.5)** | **115.9 (143.7)** | **111.1 (122.5)** |
| Milk used with beverages (eg. in tea, coffee, malt drinks) | 36.2 (48.6) | 43.7 (59.5) | 48.0 (59.8) | 41.9 (58.5) | 45.8 (59.7) | 42.7 (56.8) |
| Full cream milk (as a drink) | 15.0 (44.9 ) | 13.2 (42.2) | 10.6 (55.6) | 16.4 (60.9) | 7.5 (56.0) | 13.0 (50.3) |
| Reduced fat milk (as a drink) | 52.6 (98.3) | 38.0 (76.0) | 47.6 (98.9) | 58.9 (106.0) | 56.6 (112.6) | 48.5 (95.4) |
| Yogurt/Cheese | 8.5 (28.1) | 6.4 (26.7) | 6.5 (21.1) | 6.1 (21.7) | 5.9 (24.3 ) | 6.9 (25.0) |
| **Miscellaneous** | **266.8 (183.6)** | **189.7 (155.2)** | **165.7 (178.5)** | **128.6 (141.4)** | **105.5 (118.4)** | **189.0 (172.7)** |
| Bread spreads | 3.6 (5.3) | 4.0 (5.9 ) | 4.0 (5.2) | 4.8 (7.9) | 4.5 (7.3) | 4.1 (6.0) |
| Salad dressings | 0.8 (1.8) | 0.4 (1.2) | 0.4 (2.1) | 0.2 (1.1) | 0.1 (0.4) | 0.5 (1.6) |
| Desserts in soup | 34.7 (46.8) | 34.0 (54.1) | 27.1 (46.9) | 23.5 (48.8) | 21.9 (47.9) | 30.1 (49.5) |
| Local snacks-kueh kueh (steamed) | 13.8 (26.8) | 12.3 (29.7) | 13.8 (24.7) | 14.7 (28.9) | 9.7 (23.9) | 13.2 (27.2) |
| Other desserts/snacks (eg. dim sum, goreng pisang, Indian rojak) | 16.5 (20.9) | 15.8 (30.4) | 13.8 (23.9) | 8.5 (14.6) | 10.5 (17.7) | 14.1 (23.9) |
| Biscuits, Pastries and cakes | 23.5 (27.5 ) | 19.8 (22.7) | 19.9 (26.5) | 18.7 (23.3) | 18.6 (19.6) | 20.6 (24.9) |
| Fast foods & Soft drinks | 154.3 (145.6 ) | 91.5 (114.3) | 76.4 (156.2) | 49.5 (114.4) | 33.9 (71.9) | 94.0 (137.2) |
| Nuts | 1.5 (4.2) | 1.7 (4.0) | 2.6 (7.0) | 2.5 (7.1) | 1.4 (6.8) | 1.9 (5.6) |
| Titbits (eg. fried salty snacks, ice-cream, chocolates) | 18.0 (25.3) | 10.1 (13.8) | 7.6 (12.6) | 6.3 (14.4) | 4.9 (13.7) | 10.7 (18.0) |

**Table 3.3.7(a) - Mean daily intake (standard deviation) in weight (grams) of the various food types eaten by the male adult population (by age groups)**

| | Amount eaten daily (standard deviation) (grams) | | | | | |
|---|---|---|---|---|---|---|
| | MALE | | | | | |
| | Age group (years) | | | | | |
| **Food types** | **18-29** | **30-39** | **40-49** | **50-59** | **≥ 60** | **All** |
| **n =** | 256 | 333 | 291 | 139 | 79 | 1098 |
| **Breads and breakfast cereals** | **64.5 (48.3)** | **56.8 (55.3)** | **55.4 (46.0)** | **55.0 (48.7)** | **49.7 (40.2)** | **57.6 (49.4)** |
| White Bread | 28.9 (32.4) | 27.8 (31.0) | 35.2 (36.5) | 27.0 (32.1) | 34.9 (38.1) | 30.4 (33.6) |
| Wholemeal bread/Bread with fruits and nuts | 10.9 (21.3) | 7.6 (21.3) | 5.1 (16.7) | 10.1 (25.7) | 5.1 (15.7) | 8.0 (20.6) |
| Cereals and other types of breads (eg. roti prata, thosai, chapati) | 24.7 (32.0) | 21.3 (39.3) | 15.0 (23.9) | 17.9 (26.1) | 9.7 (15.4) | 19.3 (31.1) |
| **Rice/ Porridge and dishes** | **555.4 (244.3)** | **521.4 (216.5)** | **556.6 (238.0)** | **573.6 (214.4)** | **563.4 (246.9)** | **549.2 (231.9)** |
| Plain rice/porridge | 405.7 (201.3) | 398.7 (189.6) | 420.6 (201.0) | 446.1 (198.6) | 465.9 (229.5) | 417.6 (200.8) |
| Flavoured rice/porridge | 149.7 (131.2) | 122.7 (108.0) | 136.0 (134.9) | 127.5 (142.0) | 97.5 (110.0) | 131.6 (126.6) |
| **Noodles dishes (all types)** | **289.6 (221.1)** | **286.1 (215.0)** | **296.7 (221.0)** | **249.4 (222.1)** | **217.6 (232.7)** | **279.3 (221.3)** |
| Noodles in soup | 72.8 (104.7) | 83.4 (119.4) | 95.9 (119.0) | 76.0 (107.4) | 84.1 (134.4) | 82.8 (115.5) |
| Dry noodles | 83.9 (102.6) | 81.7 (95.6) | 78.7 (83.4) | 67.1 (101.1) | 44.8 (86.2) | 76.7 (95.1) |
| Fried noodles | 103.8 (123.7) | 91.3 (104.2) | 92.3 (93.3) | 81.1 (89.8) | 76.1 (113.7) | 92.2 (106.3) |
| Noodles in lemak gravy | 20.9 (33.8) | 23.7 (39.3) | 23.7 (41.9) | 22.0 (49.6) | 10.4 (21.7) | 21.7 (39.2) |
| Instant noodles | 8.2 (11.9) | 6.0 (9.3) | 5.9 (11.9) | 3.2 (7.0) | 2.2 (6.6) | 5.9 (10.4) |
| **Vegetables & beans/ bean products and dishes** | **178.7 (122.9)** | **171.2 (112.5)** | **171.4 (114.8)** | **211.4 (143.0)** | **166.7 (87.2)** | **178.2 (119.1)** |
| Pale green leafy vegetables and dishes | 40.1 (37.3) | 36.5 (37.7) | 38.1 (42.5 ) | 45.3 (50.0) | 34.3 (34.0) | 38.8 (40.4) |
| Dark green leafy vegetables and dishes | 40.4 (41.7) | 42.3 (41.1) | 42.8 (37.7) | 58.7 (61.4) | 44.9 (36.5) | 44.3 (43.7) |
| Tomatoes, carrots, red/yellow peppers and dishes | 23.2 (38.5) | 23.6 (34.4) | 22.2 (31.4) | 29.2 (39.0) | 25.2 (30.2) | 24.0 (35.1) |
| Legumes/pulses and dishes | 12.8 (19.3) | 14.5 (23.5) | 14.4 (19.8) | 18.2 (28.8) | 13.9 (18.9) | 14.5 (22.1) |
| Mixed vegetables and dishes | 9.0 (19.1) | 7.3 (16.2) | 5.6 (11.4) | 6.0 (14.4) | 4.7 (14.3) | 6.9 (15.7) |
| Tofu/ beancurd and dishes | 14.6 (21.3) | 16.5 (22.2) | 13.5 (16.0) | 16.1 (17.9) | 11.1 (16.3) | 14.8 (19.6) |
| Others (roots/stems) and dishes | 38.6 (55.1) | 30.5 (37.8) | 34.8 (51.9) | 37.8 (55.0) | 32.5 (41.5) | 34.8 (49.0) |
| **Fruits** | **264.6 (198.9)** | **248.2 (221.0)** | **282.0 (231.7)** | **289.4 (233.1)** | **273.1 (226.9)** | **268.3 (220.5)** |
| Orange/red/yellow fruit & juices | 141.4 (138.9) | 139.5 (155.5) | 166.9 (191.8) | 175.0 (185.7) | 144.0 (162.1) | 151.9 (166.4) |
| Other fruit & juices | 122.2 (129.2) | 107.9 (123.3) | 114.3 (116.2) | 114.0 (112.1) | 128.8 (120.3) | 115.7 (121.5) |
| Canned fruits | 1.0 (2.4) | 0.7 (2.2) | 0.8 (2.8) | 0.3 (1.2) | 0.2 (1.2) | 0.7 (2.3) |

**Table 3.3.7(b) - Mean daily intake (standard deviation) in weight (grams) of the various food types eaten by the male adult population (by age groups)**

| | Amount eaten daily (standard deviation) (grams) | | | | | |
|---|---|---|---|---|---|---|
| | MALE | | | | | |
| | Age group (years) | | | | | |
| **Food types** | **18-29** | **30-39** | **40-49** | **50-59** | **≥ 60** | **All** |
| **n =** | 256 | 333 | 291 | 139 | 79 | 1098 |
| **Poultry and dishes** | **38.8 (29.7)** | **28.4 (35.2)** | **25.4 (22.0)** | **23.5 (22.2)** | **16.4 (20.6)** | **28.7 (29.0)** |
| Poultry (without skin) and dishes | 15.7 (24.0) | 10.7 (19.0) | 10.7 (16.0) | 13.3 (19.1) | 11.1 (20.9) | 12.4 (20.0) |
| Poultry (with skin) and dishes | 23.2 (27.7) | 17.6 (34.2) | 14.7 (20.7) | 10.2 (16.0) | 5.3 (10.0) | 16.4 (26.5) |
| **Meat and dishes** | **50.8 (44.8)** | **38.2 (35.8)** | **35.4 (37.2)** | **31.2 (30.9)** | **27.6 (39.1)** | **39.0 (39.0)** |
| Meat (lean) and dishes | 18.1 (27.5) | 14.2 (23.1) | 15.1 (22.0) | 14.9 (21.9) | 11.0 (24.8) | 15.3 (24.1) |
| Meat (lean and fat) and dishes | 15.4 (32.8) | 13.3 (23.7) | 11.9 (23.8) | 11.4 (21.0) | 8.9 (24.8) | 12.9 (26.2) |
| Meat (preserved/cured) and dishes | 17.3 (19.2) | 10.8 (15.3) | 8.5 (17.6) | 5.0 (7.7) | 7.7 (22.0) | 10.9 (17.3) |
| **Fish/ Seafood and dishes** | **47.5 (40.5)** | **43.9 (32.3)** | **56.3 (43.9)** | **56.7 (45.7)** | **47.9 (35.8)** | **49.9 (40.0)** |
| Fish and dishes | 34.1 (29.1) | 34.7 (28.8) | 46.3 (36.9) | 46.6 (39.0) | 40.6 (31.2) | 39.5 (33.1) |
| Other seafood and dishes | 13.4 (20.5) | 9.2 (11.7) | 10.0 (16.9) | 10.0 (16.6) | 7.3 (9.3) | 10.5 (16.2) |
| **Eggs** | **29.6 (31.0)** | **22.9 (19.8)** | **18.1 (18.0)** | **14.7 (18.2)** | **13.1 (17.4)** | **21.6 (23.2)** |
| **Milk and dairy products** | **134.1 (136.5)** | **110.3 (113.7)** | **107.5 (114.3)** | **121.6 (158.4)** | **98.8 (121.8)** | **116.4 (127.7)** |
| Milk used with beverages (eg. in tea, coffee, malt drinks) | 55.2 (61.3) | 59.0 (77.7) | 66.0 (81.8) | 63.6 (73.1) | 57.1 (71.3) | 60.2 (73.7) |
| Full cream milk (as a drink) | 25.3 (73.7) | 16.8 (43.6) | 13.3 (45.6) | 5.2 (23.4) | 6.3 (47.2) | 15.8 (52.4) |
| Reduced fat milk (as a drink) | 44.9 (91.4) | 27.5 (63.3) | 24.0 (64.8) | 48.2 (113.4) | 32.7 (83.0) | 34.3 (81.6) |
| Yogurt/Cheese | 8.7 (54.0) | 6.9 (27.0) | 4.2 (16.3) | 4.5 (18.2) | 2.8 (15.2) | 6.1 (33.0) |
| **Miscellaneous** | **394.5 (284.8)** | **298.0 (247.3)** | **250.1 (264.4)** | **189.8 (173.0)** | **118.6 (127.1)** | **282.6 (259.8)** |
| Bread spreads | 4.8 (7.5) | 5.0 (9.0) | 5.0 (7.8) | 4.6 (8.0) | 4.1 (5.0) | 4.8 (7.9) |
| Salad dressings | 0.6 (1.4) | 0.5 (1.7) | 0.4 (1.4) | 0.3 (0.9) | 0.3 (1.4) | 0.5 (1.4) |
| Desserts in soup | 42.7 (63.5) | 32.1 (53.7) | 39.0 (70.9) | 33.5 (58.5) | 18.9 (34.5) | 35.7 (60.7) |
| Local snacks-kueh kueh (steamed) | 17.5 (37.2) | 20.3 (46.2) | 13.1 (30.0) | 14.4 (24.0) | 12.1 (27.9) | 16.4 (36.4) |
| Other desserts/snacks (eg. dim sum, goreng pisang, Indian rojak) | 23.6 (34.8) | 17.4 (25.8) | 14.8 (19.2) | 14.5 (21.8) | 11.3 (16.4) | 17.5 (26.3) |
| Biscuits, Pastries and cakes | 27.3 (34.4) | 23.2 (28.8) | 21.8 (25.4) | 20.5 (25.3) | 17.7 (21.0) | 23.1 (28.7) |
| Fast foods & Soft drinks | 257.6 (236.5) | 184.8 (201.1) | 141.5 (218.6) | 93.4 (146.2) | 48.9 (101.3) | 170.1 (213.2) |
| Nuts | 2.4 (6.4) | 3.2 (8.6) | 4.6 (9.4) | 4.2 (7.9) | 2.4 (6.1) | 3.4 (8.1) |
| Titbits (eg. fried salty snacks, ice-cream, chocolates) | 18.0 (24.5) | 11.6 (23.6) | 9.9 (20.4) | 4.4 (8.2) | 2.9 (6.3) | 11.2 (21.2) |

## 3.4 Sources of fat and saturated fat

In investigating the main sources of fat and saturated fat in the diet of Singaporean adults, individual food items are grouped based on their main ingredients and cooking methods. The importance of a food item in contributing to fat intake would depend not only on the fat content of the food but also on the frequency and amount eaten. Foods that contribute less than 5% of the total fat or saturated fat intake are excluded. The major contributors of total fat and saturated fat to the adult Singaporean diet are as shown in [Tables 3.4.1 & 3.4.2].

Dishes containing coconut milk/cream account for 9.5% of daily total fat intake and 14.6% of saturated fat intake. Despite starting off almost fat-free, vegetables after stir-frying emerge as a main contributor to both dietary fat (10.8%) and saturated fat (9.4%) intake of Singaporean adults. Although seemingly low in fat, coffee, tea and malt beverages with added condensed milk/evaporated milk/whiteners/creamers are also major dietary contributors of fat (5.4%) and saturated fat (7.6%), partly due to the amounts of these foods consumed [Tables 3.4.1 & 3.4.2].

### Table 3.4.1 - Major contributors to the total fat intake in the diet of Singaporean adults

| Food grouping | Percentage of total fat intake contributed |
|---|---|
| Stir-fried vegetables and dishes (10.8%) | 10.8 |
| Desserts, rice, noodles and meat dishes containing coconut milk/cream | 9.5 |
| Flavoured rice, such as chicken rice, nasi lemak, nasi briyani, claypot rice etc. | 7.2 |
| Fried noodles | 6.6 |
| Coffee, tea and malt beverages with condensed milk/evaporated milk/ whiteners/creamers | 5.4 |

### Table 3.4.2 - Major contributors to the saturated fat intake in the diet of Singaporean adults

| Food grouping | Percentage of total fat intake contributed |
|---|---|
| Desserts, rice, noodles and meat dishes containing coconut milk/cream | 14.6 |
| Stir-fried vegetables and dishes | 9.4 |
| Fried noodles | 8.9 |
| Coffee, tea and malt beverages with condensed milk/evaporated milk/ whiteners/creamers | 7.6 |
| Flavoured rice, such as chicken rice, nasi lemak, nasi briyani, claypot rice etc. | 6.0 |

# 4. 24 Hour Dietary Intakes

## 4.1 Respondent profiles

**Table 4.1.1 - Respondent profiles for the National Nutrition Survey 1998**

| | Males | | Females | | Total | |
|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | (%) |
| **Ethnic group** | | | | | | |
| Chinese | 659 | 27.7 | 797 | 33.5 | 1456 | 61.3 |
| Malay | 238 | 10.0 | 267 | 11.2 | 505 | 21.2 |
| Indian | 196 | 8.2 | 220 | 9.3 | 416 | 17.5 |
| **Total** | **1093** | **45.9** | **1284** | **54.1** | **2377** | **100.0** |
| **Age group** | | | | | | |
| 18 - 29 yrs | 255 | 10.7 | 308 | 13.0 | 563 | 23.7 |
| 30 - 39 yrs | 331 | 13.9 | 418 | 17.6 | 749 | 31.5 |
| 40 - 49 yrs | 290 | 12.2 | 337 | 14.2 | 627 | 26.4 |
| 50 - 59 yrs | 138 | 5.8 | 136 | 5.7 | 274 | 11.5 |
| 60 - 69 yrs | 79 | 3.3 | 85 | 3.6 | 164 | 6.9 |
| **Total** | **1093** | **45.9** | **1284** | **54.1** | **2377** | **100.0** |

## 4.2 Day of week for collection of 24-hour food intakes

Similar percentage of 24-hour food intakes were collected for all weekdays (Monday to Friday) and Sundays. Intakes on Saturdays were not collected as there were no interviews on Sundays and Saturdays are regarded as weekdays because of the six-day workweek for majority of the population.

**Table 4.2.1 - Frequency and percent distribution by day of week on which the 24-hour food intakes are collected**

| Day of intake | Frequency | Percent |
|---|---|---|
| Monday | 397 | 16.7 |
| Tuesday | 384 | 16.2 |
| Wednesday | 427 | 18.0 |
| Thursday | 430 | 18.1 |
| Friday | 400 | 16.8 |
| Sunday | 339 | 14.3 |
| **Total** | **2377** | **100.0** |

## 4.3 Energy intakes

The mean energy intake of Singaporean adults is 1929kcal and the intake of 90% of Singaporean adults lies between 982kcal and 3102kcal.

The mean energy intake of males is 2122kcal whereas that of females is 1695kcal. The difference in energy intake between the genders is statistically significant. Daily energy intake for 90% of the males lies between 1062kcal and 3356kcal, and for females it lies between 880kcal and 2832kcal.

The Malays have significantly lower energy intake (1767kcal) than the Chinese (1936kcal) and Indians (1884kcal).

In general the energy intake declines gradually with age. Those aged 18-29 years have the highest energy intake (1993kcal) while those aged 60-69 years have the lowest energy intake (1691kcal).

**Table 4.3.1 - Mean, SEM and percentile distribution of daily energy (kcal) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 2173 | 25.4 | 1165 | 1404 | 1757 | 2101 | 2550 | 2985 | 3357 |
| Malay | 2032 | 49.2 | 944 | 1109 | 1460 | 2014 | 2518 | 2929 | 3418 |
| Indian | 2057 | 49.6 | 1055 | 1287 | 1554 | 2007 | 2432 | 2976 | 3341 |
| All | 2122 | 20.8 | 1062 | 1284 | 1643 | 2077 | 2524 | 2979 | 3356 |
| **Females** | | | | | | | | | |
| Chinese | 1740 | 20.1 | 971 | 1092 | 1364 | 1677 | 2025 | 2415 | 2768 |
| Malay | 1531 | 38.0 | 658 | 826 | 1109 | 1420 | 1788 | 2387 | 2711 |
| Indian | 1730 | 44.8 | 812 | 989 | 1252 | 1605 | 2143 | 2695 | 2981 |
| All | 1695 | 16.8 | 880 | 1016 | 1283 | 1618 | 2014 | 2451 | 2832 |
| **All** | | | | | | | | | |
| Chinese | 1936 | 16.9 | 1011 | 1185 | 1492 | 1864 | 2294 | 2766 | 3082 |
| Malay | 1767 | 32.6 | 750 | 972 | 1220 | 1616 | 2244 | 2725 | 3065 |
| Indian | 1884 | 34.2 | 878 | 1075 | 1385 | 1803 | 2291 | 2887 | 3097 |
| **Overall** | **1929** | **13.7** | **982** | **1137** | **1457** | **1861** | **2310** | **2784** | **3102** |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 2237 | 49.5 | 1121 | 1311 | 1679 | 2100 | 2719 | 3305 | 3745 |
| 30 - 39 yrs | 2222 | 35.5 | 1151 | 1429 | 1790 | 2225 | 2585 | 3066 | 3368 |
| 40 - 49 yrs | 2052 | 38.4 | 1053 | 1199 | 1606 | 2031 | 2443 | 2830 | 3076 |
| 50 - 59 yrs | 2021 | 51.6 | 1010 | 1379 | 1565 | 2001 | 2406 | 2619 | 3196 |
| 60 - 69 yrs | 1763 | 65.0 | 733 | 1041 | 1314 | 1746 | 2202 | 2547 | 2740 |
| All | 2122 | 20.8 | 1062 | 1284 | 1643 | 2077 | 2524 | 2979 | 3356 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 1791 | 36.2 | 898 | 1040 | 1334 | 1701 | 2147 | 2669 | 2985 |
| 30 - 39 yrs | 1697 | 29.1 | 848 | 1011 | 1270 | 1638 | 2001 | 2556 | 2783 |
| 40 - 49 yrs | 1631 | 28.3 | 892 | 1040 | 1266 | 1593 | 1913 | 2253 | 2630 |
| 50 - 59 yrs | 1672 | 61.9 | 786 | 978 | 1249 | 1561 | 2002 | 2363 | 2719 |
| 60 - 69 yrs | 1624 | 61.4 | 783 | 988 | 1239 | 1568 | 1913 | 2305 | 2750 |
| All | 1695 | 16.8 | 880 | 1016 | 1283 | 1618 | 2014 | 2451 | 2832 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 1993 | 31.3 | 987 | 1125 | 1456 | 1893 | 2416 | 2984 | 3389 |
| 30 - 39 yrs | 1929 | 24.5 | 952 | 1114 | 1429 | 1858 | 2352 | 2814 | 3113 |
| 40 - 49 yrs | 1826 | 24.8 | 963 | 1084 | 1385 | 1755 | 2179 | 2664 | 2967 |
| 50 - 59 yrs | 1848 | 41.5 | 866 | 1045 | 1433 | 1778 | 2268 | 2559 | 2973 |
| 60 - 69 yrs | 1691 | 44.8 | 767 | 1023 | 1263 | 1627 | 2062 | 2484 | 2728 |
| **Overall** | **1929** | **13.7** | **982** | **1137** | **1457** | **1861** | **2310** | **2784** | **3102** |

*SEM - standard error of mean*

## RDA

**Table 4.3.2 - Formulae obtained from the WHO* in calculation of energy requirements for each gender for the various age groups**

| Age group (years) | Energy (kcal) |
|---|---|
| **Males** | |
| 18-29 | (15.3W** + 679) x 1.55 |
| 30-59 | (11.6W + 879) x 1.55 |
| 60-69 | (13.5W + 487) x 1.55 |
| **Females** | |
| 18-29 | (14.7W + 496) x 1.56 |
| 30-59 | (8.7W + 829) x 1.56 |
| 60-69 | (10.5W + 596) x 1.56 |

* Source - Energy and Protein Requirements, WHO Technical Report Series No 724, 1985
** W - Weight in kilograms

The RDA for energy by gender and age groups, based on the above formulae for light activity level, is shown in Table 4.3.3.

According to the National Health Survey 1998, the mean weight for males is 68.3 kilograms while that for females is 57.0 kilograms.

**Table 4.3.3 - RDA for energy (kcal) by gender and age group**

| Age group (years) | 18-29 | 30-39 | 40-49 | 50-59 | ≥60 |
|---|---|---|---|---|---|
| Males | 2672 | 2591 | 2591 | 2591 | 2184 |
| Females | 2081 | 2067 | 2067 | 2067 | 1863 |

## Mean RDA

Calculation for the mean RDA for energy for males:

$$\frac{\sum (\text{Number of males in each age group} \times \text{respective RDA})}{\text{Total number of males}}$$

Similar calculation is used for females.

Based on these calculations, the mean RDA for energy for males is 2580kcal and that for females is 2066kcal. The energy intake of males and females both meet 82% of their mean RDA.

## Comparison with mean RDA

About a quarter (23.1%) of the Singaporean adults meet or exceed the RDA appropriate for their gender and age.

Larger proportions of Chinese (23.6%) and Indians (24.5%) meet or exceed their RDA for energy compared to Malays (19.2%).

Larger proportions of those aged 18-29 years (27.7%) and 60-69 years (28.7%) meet or exceed their RDA compared to people from the other age groups (around 20%).

**Table 4.3.4 - Distribution by percent RDA met for energy (kcal) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 7.0 | 28.2 | 76.9 | 23.1 | 7.9 | 1.1 | 0.0 |
| Malay | 17.2 | 42.0 | 78.6 | 21.4 | 7.1 | 1.7 | 0.0 |
| Indian | 9.7 | 37.8 | 79.6 | 20.4 | 7.1 | 1.0 | 0.0 |
| All | 9.7 | 32.9 | 77.8 | 22.2 | 7.6 | 1.2 | 0.0 |
| **Females** | | | | | | | |
| Chinese | 6.8 | 30.9 | 76.0 | 24.0 | 9.2 | 2.1 | 0.1 |
| Malay | 18.7 | 52.8 | 82.8- | 17.2 | 7.5 | 2.6 | 0.0 |
| Indian | 12.3 | 39.1 | 71.8 | 28.2 | 14.5 | 2.7 | 0.5 |
| All | 10.2 | 36.8 | 76.7 | 23.3 | 9.7 | 2.3 | 0.2 |
| **All** | | | | | | | |
| Chinese | 6.9 | 29.7 | 76.4 | 23.6 | 8.6 | 1.6 | 0.1 |
| Malay | 18.0 | 47.7 | 80.8 | 19.2 | 7.3 | 2.2 | 0.0 |
| Indian | 11.1 | 38.5 | 75.5 | 24.5 | 11.1 | 1.9 | 0.2 |
| **Overall** | **8.6** | **32.7** | **76.9** | **23.1** | **8.5** | **1.8** | **0.1** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 10.6 | 34.9 | 72.2 | 27.8 | 11.0 | 2.0 | 0.0 |
| 30 - 39 yrs | 6.9 | 26.0 | 75.5 | 24.5 | 9.1 | 1.2 | 0.0 |
| 40 - 49 yrs | 12.1 | 35.5 | 80.3 | 19.7 | 4.1 | 1.0 | 0.0 |
| 50 - 59 yrs | 8.7 | 37.7 | 89.9 | 10.1 | 5.1 | 0.7 | 0.0 |
| 60 - 69 yrs | 11.4 | 38.0 | 74.7 | 25.3 | 7.6 | 0.0 | 0.0 |
| All | 9.7 | 32.9 | 77.8 | 22.2 | 7.6 | 1.2 | 0.0 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 10.1 | 33.4 | 72.4 | 27.6 | 13.0 | 3.2 | 0.0 |
| 30 - 39 yrs | 10.3 | 37.6 | 77.8 | 22.2 | 11.0 | 1.9 | 0.2 |
| 40 - 49 yrs | 9.8 | 39.8 | 81.3 | 18.7 | 5.9 | 1.2 | 0.0 |
| 50 - 59 yrs | 13.2 | 38.2 | 77.2 | 22.8 | 7.4 | 2.9 | 0.7 |
| 60 - 69 yrs | 7.1 | 31.8 | 68.2 | 31.8 | 10.6 | 4.7 | 0.0 |
| All | 10.2 | 36.8 | 76.7 | 23.3 | 9.7 | 2.3 | 0.2 |
| **All** | | | | | | | |
| 18 - 29 yrs | 10.3 | 34.1 | 72.3 | 27.7 | 12.1 | 2.7 | 0.0 |
| 30 - 39 yrs | 8.8 | 32.4 | 76.8 | 23.2 | 10.1 | 1.6 | 0.1 |
| 40 - 49 yrs | 10.8 | 37.8 | 80.9 | 19.1 | 5.1 | 1.1 | 0.0 |
| 50 - 59 yrs | 10.9 | 38.0 | 83.6 | 16.4 | 6.2 | 1.8 | 0.4 |
| 60 - 69 yrs | 9.1 | 34.8 | 71.3 | 28.7 | 9.1 | 2.4 | 0.0 |
| **Overall** | **8.6** | **32.7** | **76.9** | **23.1** | **8.5** | **1.8** | **0.1** |

## 4.4 Protein intakes

The mean protein intake of Singaporean adults is 72.6g and the intake of 90% of the Singaporean adults lies between 32.2g and 129.1g.

The protein intake of males is 78.3g whereas that of females is 62.7g. The difference in mean protein intakes between the genders is statistically significant. Daily protein intake of 90% of the males lies between 33.4g and 134.8g, and for females it lies between 27.8g and 112.9g.

The Chinese have a significantly higher mean protein intake (74.1g) than the Malays (62.8g) and Indians (63.5g).

Those from the youngest age group (18-29 years) have the highest intake of 71.4g while those from the oldest age group (60-69 years) have the lowest intake of 64.1g.

**Table 4.4.1 - Mean, SEM and percentile distribution of daily protein (g) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 83.0 | 1.2 | 40.3 | 46.3 | 63.3 | 80.3 | 99.3 | 122.9 | 137.6 |
| Malay | 71.0 | 2.2 | 29.3 | 33.5 | 46.4 | 64.7 | 88.2 | 112.9 | 142.6 |
| Indian | 71.3 | 2.2 | 30.5 | 36.8 | 51.0 | 66.4 | 88.3 | 114.4 | 132.5 |
| All | 78.3 | 0.9 | 33.4 | 41.4 | 55.7 | 75.3 | 95.5 | 118.7 | 134.8 |
| **Females** | | | | | | | | | |
| Chinese | 66.8 | 0.9 | 33.7 | 38.2 | 48.7 | 63.4 | 79.3 | 97.0 | 117.2 |
| Malay | 55.4 | 1.6 | 23.1 | 26.4 | 37.9 | 51.7 | 65.7 | 86.6 | 100.8 |
| Indian | 56.6 | 1.8 | 22.9 | 28.8 | 37.8 | 50.9 | 68.9 | 96.2 | 108.8 |
| All | 62.7 | 0.7 | 27.8 | 34.2 | 44.6 | 58.5 | 76.1 | 95.0 | 112.9 |
| **All** | | | | | | | | | |
| Chinese | 74.1 | 0.8 | 34.9 | 41.0 | 53.3 | 70.7 | 88.5 | 112.3 | 129.1 |
| Malay | 62.8 | 1.4 | 24.3 | 30.6 | 41.6 | 57.4 | 77.3 | 99.0 | 121.6 |
| Indian | 63.5 | 1.4 | 26.7 | 31.7 | 42.6 | 58.0 | 78.4 | 103.2 | 119.6 |
| **Overall** | **72.6** | **0.6** | **32.2** | **38.5** | **51.0** | **68.9** | **88.0** | **111.8** | **129.1** |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 79.8 | 2.1 | 33.1 | 40.9 | 56.1 | 75.8 | 98.0 | 122.3 | 143.8 |
| 30 - 39 yrs | 81.8 | 1.7 | 39.3 | 46.4 | 59.6 | 78.5 | 100.0 | 124.2 | 136.6 |
| 40 - 49 yrs | 76.5 | 1.8 | 33.0 | 40.9 | 54.8 | 74.8 | 92.3 | 115.3 | 135.8 |
| 50 - 59 yrs | 76.9 | 2.6 | 35.2 | 39.3 | 56.2 | 73.9 | 93.1 | 113.2 | 129.6 |
| 60 - 69 yrs | 67.4 | 3.2 | 27.2 | 32.3 | 43.6 | 64.6 | 90.1 | 103.8 | 111.9 |
| All | 78.3 | 0.9 | 33.4 | 41.4 | 55.7 | 75.3 | 95.5 | 118.7 | 134.8 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 64.5 | 1.6 | 27.8 | 33.7 | 44.8 | 59.0 | 78.8 | 99.4 | 123.8 |
| 30 - 39 yrs | 62.6 | 1.3 | 30.3 | 34.5 | 43.9 | 58.9 | 77.0 | 93.7 | 111.9 |
| 40 - 49 yrs | 60.4 | 1.2 | 26.6 | 33.7 | 45.1 | 57.4 | 73.3 | 91.4 | 106.5 |
| 50 - 59 yrs | 65.4 | 2.7 | 26.6 | 34.6 | 45.8 | 58.7 | 78.4 | 98.9 | 127.9 |
| 60 - 69 yrs | 61.1 | 3.1 | 24.0 | 32.9 | 39.5 | 56.3 | 75.0 | 94.5 | 121.7 |
| All | 62.7 | 0.7 | 27.8 | 34.2 | 44.6 | 58.5 | 76.1 | 95.0 | 112.9 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 71.4 | 1.3 | 29.2 | 35.8 | 48.7 | 66.8 | 88.0 | 113.8 | 134.6 |
| 30 - 39 yrs | 71.1 | 1.1 | 31.8 | 37.3 | 50.1 | 67.2 | 86.6 | 111.9 | 127.8 |
| 40 - 49 yrs | 67.9 | 1.1 | 28.8 | 35.9 | 47.8 | 64.6 | 83.4 | 102.7 | 117.8 |
| 50 - 59 yrs | 71.2 | 1.9 | 30.5 | 38.2 | 50.8 | 65.4 | 85.9 | 110.8 | 128.3 |
| 60 - 69 yrs | 64.1 | 2.2 | 27.4 | 32.6 | 42.2 | 59.8 | 81.1 | 99.8 | 118.3 |
| **Overall** | **72.6** | **0.6** | **32.2** | **38.5** | **51.0** | **68.9** | **88.0** | **111.8** | **129.1** |

*SEM - standard error of mean*

## RDA

The value accepted for the safe level of protein intake for an adult is 0.75g/kg body weight per day (WHO, 1985). As the net protein utilisation (NPU) of a mixed diet in Singapore is estimated to be 70%, the value accepted for a safe level of protein intake for a Singaporean adult is 1.07g/kg body weight per day (Department of Nutrition, Ministry of Health 1994).

According to the National Health Survey 1998, the mean weight for males is 68.3 kg while for females is 57.0 kg. The RDA for protein for adults of 18 years and above is as follows:

Males - 73g
Females - 61g

## Mean RDA

The mean RDA for protein for males is 73g and that for females is 61g. The mean protein intake of males and females meet 107 % and 103% of their mean RDA respectively.

## Comparison with mean RDA

Over half (53.0%) of the Singaporean adults meet their RDA for protein.

Among the ethnic groups, the Malays and Indians are more likely to have intakes below their RDA compared to the Chinese. About a-third of the Malays (32.5%) and Indians (30.3%) consume less than 70% of their RDA for protein.

A larger proportion of Singaporean adults (33.4%) aged 60-69 years have less than 70% of their RDA for protein compared to all the younger age groups.

**Table 4.4.2 - Distribution by percent RDA met for protein (g) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 3.5 | 13.4 | 38.7 | 61.3 | 38.2 | 16.7 | 3.0 |
| Malay | 11.8 | 30.3 | 60.1 | 39.9 | 25.2 | 10.9 | 4.2 |
| Indian | 9.7 | 25.5 | 58.7 | 41.3 | 25.5 | 12.2 | 2.0 |
| All | 6.4 | 19.2 | 46.9 | 53.1 | 33.1 | 14.6 | 3.1 |
| **Females** | | | | | | | |
| Chinese | 2.6 | 15.7 | 46.7 | 53.3 | 34.4 | 13.0 | 3.5 |
| Malay | 13.5 | 34.5 | 67.0 | 33.0 | 18.4 | 7.1 | 3.4 |
| Indian | 11.8 | 34.5 | 66.4 | 33.6 | 20.0 | 11.4 | 1.8 |
| All | 6.5 | 22.8 | 54.3 | 45.7 | 28.6 | 11.5 | 3.2 |
| **All** | | | | | | | |
| Chinese | 3.0 | 14.6 | 43.1 | 56.9 | 36.1 | 14.7 | 3.3 |
| Malay | 12.7 | 32.5 | 63.8 | 36.2 | 21.6 | 8.9 | 3.8 |
| Indian | 10.8 | 30.3 | 62.7 | 37.3 | 22.6 | 11.8 | 1.9 |
| **Overall** | **5.1** | **18.4** | **47.0** | **53.0** | **33.5** | **14.0** | **3.3** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 6.3 | 20.0 | 46.3 | 53.7 | 35.3 | 16.9 | 3.9 |
| 30 - 39 yrs | 4.2 | 14.5 | 42.6 | 57.4 | 36.3 | 18.4 | 3.3 |
| 40 - 49 yrs | 6.6 | 20.3 | 48.3 | 51.7 | 31.4 | 11.7 | 2.8 |
| 50 - 59 yrs | 6.5 | 17.4 | 48.6 | 51.4 | 29.0 | 13.0 | 2.9 |
| 60 - 69 yrs | 15.2 | 35.4 | 59.5 | 40.5 | 26.6 | 5.1 | 1.3 |
| All | 6.4 | 19.2 | 46.9 | 53.1 | 33.1 | 14.6 | 3.1 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 7.1 | 21.8 | 52.9 | 47.1 | 30.8 | 14.3 | 4.9 |
| 30 - 39 yrs | 5.0 | 23.4 | 51.7 | 48.3 | 29.4 | 10.3 | 2.9 |
| 40 - 49 yrs | 6.8 | 22.0 | 57.3 | 42.7 | 25.2 | 9.5 | 0.9 |
| 50 - 59 yrs | 7.4 | 19.9 | 55.1 | 44.9 | 30.1 | 14.0 | 5.1 |
| 60 - 69 yrs | 8.2 | 31.8 | 58.8 | 41.2 | 27.1 | 11.8 | 4.7 |
| All | 6.5 | 22.8 | 54.3 | 45.7 | 28.6 | 11.5 | 3.2 |
| **All** | | | | | | | |
| 18 - 29 yrs | 6.7 | 21.0 | 49.9 | 50.1 | 32.9 | 15.5 | 4.4 |
| 30 - 39 yrs | 4.7 | 19.5 | 47.7 | 52.3 | 32.4 | 13.9 | 3.1 |
| 40 - 49 yrs | 6.7 | 21.2 | 53.1 | 46.9 | 28.1 | 10.5 | 1.8 |
| 50 - 59 yrs | 6.9 | 18.6 | 51.8 | 48.2 | 29.6 | 13.5 | 4.0 |
| 60 - 69 yrs | 11.6 | 33.5 | 59.1 | 40.9 | 26.8 | 8.5 | 3.0 |
| **Overall** | **5.1** | **18.4** | **47.0** | **53.0** | **33.5** | **14.0** | **3.3** |

## 4.5 Fat intakes

The mean fat intake for Singaporean adults is 66.6g and the intake of 90% of Singaporean adults lies between 22.8g and 127.1g.

The fat intake for males is 72.0g whereas that for females is 58.8g. The difference in mean intakes of fat between the genders is statistically significant. Daily fat intake of 90% of the males lies between 23.6g and 135.4g, and for females it lies between 20.7g and 115.5g.

The Chinese have a significantly higher fat intake (67.4g) than the Malays (61.0g) and Indians (60.9g).

In general, the fat intake decreases with age. Those aged 60-69 years have significantly lower fat intake (52.4g) than those from the other younger age groups.

**Table 4.5.1 - Mean, SEM and percentile distribution of daily fat (g) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 74.1 | 1.3 | 28.2 | 36.3 | 51.4 | 71.3 | 93.9 | 117.1 | 137.6 |
| Malay | 69.8 | 2.3 | 21.1 | 29.3 | 44.5 | 63.9 | 89.0 | 121.1 | 139.4 |
| Indian | 65.8 | 2.3 | 19.2 | 27.7 | 44.5 | 60.5 | 82.7 | 109.0 | 132.9 |
| All | 72.0 | 1.0 | 23.6 | 32.3 | 48.3 | 67.7 | 91.0 | 117.3 | 135.4 |
| **Females** | | | | | | | | | |
| Chinese | 61.3 | 1.1 | 23.7 | 28.8 | 40.1 | 58.0 | 77.2 | 98.6 | 113.6 |
| Malay | 53.1 | 2.0 | 15.7 | 20.3 | 30.9 | 44.7 | 67.2 | 94.7 | 130.1 |
| Indian | 56.6 | 2.1 | 20.2 | 24.0 | 34.4 | 49.2 | 74.4 | 96.3 | 116.1 |
| All | 58.8 | 0.9 | 20.7 | 26.7 | 37.6 | 52.6 | 75.2 | 97.2 | 115.5 |
| **All** | | | | | | | | | |
| Chinese | 67.4 | 0.8 | 24.4 | 30.8 | 44.2 | 63.2 | 84.1 | 109.0 | 125.0 |
| Malay | 61.0 | 1.5 | 17.0 | 23.3 | 36.5 | 52.5 | 78.1 | 111.8 | 132.7 |
| Indian | 60.9 | 1.6 | 20.1 | 25.2 | 37.7 | 54.0 | 77.8 | 103.3 | 125.5 |
| **Overall** | **66.6** | **0.7** | **22.8** | **29.9** | **43.1** | **61.9** | **83.5** | **109.7** | **127.1** |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 78.2 | 2.4 | 26.7 | 34.3 | 49.7 | 72.1 | 102.4 | 128.1 | 144.5 |
| 30 - 39 yrs | 76.8 | 1.8 | 30.2 | 40.0 | 53.1 | 74.1 | 92.3 | 117.0 | 136.9 |
| 40 - 49 yrs | 67.9 | 1.9 | 21.1 | 28.5 | 45.6 | 63.7 | 84.5 | 111.0 | 133.4 |
| 50 - 59 yrs | 68.6 | 2.7 | 22.8 | 34.8 | 48.2 | 62.3 | 83.3 | 109.8 | 131.7 |
| 60 - 69 yrs | 53.4 | 3.2 | 11.7 | 15.8 | 34.3 | 49.4 | 70.6 | 94.4 | 106.6 |
| All | 72.0 | 1.0 | 23.6 | 32.3 | 48.3 | 67.7 | 91.0 | 117.3 | 135.4 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 63.0 | 1.8 | 21.7 | 28.1 | 41.0 | 55.9 | 80.0 | 104.9 | 131.2 |
| 30 - 39 yrs | 60.7 | 1.5 | 21.3 | 27.3 | 39.0 | 54.3 | 77.8 | 104.7 | 124.0 |
| 40 - 49 yrs | 55.4 | 1.4 | 22.5 | 26.7 | 36.9 | 50.8 | 70.3 | 85.9 | 101.7 |
| 50 - 59 yrs | 56.6 | 3.2 | 14.9 | 21.7 | 34.6 | 48.3 | 72.7 | 93.6 | 110.6 |
| 60 - 69 yrs | 51.6 | 3.4 | 15.8 | 17.6 | 31.4 | 44.9 | 65.6 | 91.2 | 113.5 |
| All | 58.8 | 0.9 | 20.7 | 26.7- | 37.6 | 52.6 | 75.2 | 97.2 | 115.5 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 69.9 | 1.5 | 23.8 | 29.9 | 44.0 | 63.5 | 90.6 | 119.2 | 137.4 |
| 30 - 39 yrs | 67.8 | 1.2 | 24.7 | 30.2 | 43.4 | 63.4 | 85.7 | 111.5 | 128.3 |
| 40 - 49 yrs | 61.2 | 1.2 | 22.0 | 27.3 | 39.3 | 58.2 | 76.2 | 100.1 | 119.8 |
| 50 - 59 yrs | 62.7 | 2.1 | 18.4 | 26.7 | 41.4 | 56.8 | 78.5 | 101.0 | 118.6 |
| 60 - 69 yrs | 52.4 | 2.3 | 13.3 | 17.1 | 32.1 | 47.5 | 67.1 | 93.8 | 109.9 |
| **Overall** | **66.6** | **0.7** | **22.8** | **29.9** | **43.1** | **61.9** | **83.5** | **109.7** | **127.1** |

*SEM - standard error of mean*

## Dietary Guidelines Recommendation

The dietary guidelines recommend fat to contribute 20%-30% of dietary energy intake. The recommended level used in this section is 25% (mid-point of the recommended range) of energy requirement of each age group (refer to Table 4.3.3) divided by the factor 9 based on the estimation that a gram of fat provides around 9kcal of energy.

**Table 4.5.2 - Recommended intake for fat (g) by gender and age group**

| Age group (years) | 18-29 | 30-39 | 40-49 | 50-59 | ≥60 |
|---|---|---|---|---|---|
| Males | 74.2 | 72.0 | 72.0 | 72.0 | 60.7 |
| Females | 57.8 | 57.4 | 57.4 | 57.4 | 51.7 |

## Mean Recommended Intake

Calculation of the mean recommended intake for fat for males:

$$\frac{\sum (\text{Number of males in each age group} \times \text{respective recommended intake})}{\text{Total number of males}}$$

Similar calculation is used for females.

Based on these calculations, the mean recommended intake of fat for males is 71.7g and that for females is 57.1g. The mean fat intake of males and females meet 100% and 103% of their mean recommendations respectively.

## Comparison with mean recommended intake

Almost half (47.1%) of the Singaporean adults meet or exceed their recommended intake for fat. Around one-third (31.0%) of the population has fat intake meeting or exceeding 120% of the recommendation.

A larger proportion of Chinese (49.7%) than Malays (37.8%) and Indians (37.3%) has fat intake meeting or exceeding the recommendation. One-third of the Chinese (32.6%) has fat intake meeting or exceeding 120% of the recommended fat intake.

The proportion of those meeting or exceeding their recommended intakes for fat decreases gradually with age and is lowest for those aged 60-69 years (35.4%). The proportion of those consuming at least 1.2 times more than their recommended intake for fat is highest among those aged 18-29 years (36.6%).

**Table 4.5.3 - Distribution by percent recommendation met for fat (g) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 9.3 | 23.1 | 51.3 | 48.7 | 31.7 | 14.7 | 3.5 |
| Malay | 15.5 | 34.5 | 58.4 | 41.6 | 26.1 | 15.1 | 3.4 |
| Indian | 16.8 | 33.7 | 63.3 | 36.7 | 22.4 | 10.7 | 2.6 |
| All | 12.0 | 27.4 | 55.0 | 45.0 | 28.8 | 14.1 | 3.3 |
| **Females** | | | | | | | |
| Chinese | 9.7 | 25.1 | 49.4 | 50.6 | 33.4 | 15.8 | 4.6 |
| Malay | 20.2 | 39.3 | 65.5 | 34.5 | 23.2 | 12.7 | 6.4 |
| Indian | 17.3 | 33.2 | 62.3 | 37.7 | 32.3 | 14.5 | 5.0 |
| All | 13.2 | 29.4 | 55.0 | 45.0 | 31.1 | 15.0 | 5.1 |
| **All** | | | | | | | |
| Chinese | 9.5 | 24.2 | 50.3 | 49.7 | 32.6 | 15.3 | 4.1 |
| Malay | 18.0 | 37.0 | 62.2 | 37.8 | 24.6 | 13.9 | 5.0 |
| Indian | 17.1 | 33.4 | 62.7 | 37.3 | 27.6 | 12.7 | 3.8 |
| **Overall** | **11.2** | **26.5** | **52.9** | **47.1** | **31.0** | **14.9** | **4.1** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 11.4 | 25.9 | 52.9 | 47.1 | 36.5 | 18.8 | 4.3 |
| 30 - 39 yrs | 6.9 | 21.5 | 45.3 | 54.7 | 32.9 | 14.8 | 3.3 |
| 40 - 49 yrs | 16.9 | 32.8 | 61.7 | 38.3 | 23.1 | 11.4 | 3.1 |
| 50 - 59 yrs | 10.1 | 26.8 | 62.3 | 37.7 | 21.0 | 10.1 | 2.9 |
| 60 - 69 yrs | 20.3 | 39.2 | 64.6 | 35.4 | 21.5 | 12.7 | 1.3 |
| All | 12.0 | 27.4 | 55.0 | 45.0 | 28.8 | 14.1 | 3.3 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 11.0 | 24.4 | 50.3 | 49.7 | 36.7 | 18.8 | 7.1 |
| 30 - 39 yrs | 12.0 | 27.3 | 54.1 | 45.9 | 32.3 | 17.2 | 6.7 |
| 40 - 49 yrs | 13.9 | 31.5 | 56.4 | 43.6 | 27.6 | 9.8 | 2.7 |
| 50 - 59 yrs | 16.2 | 34.6 | 58.8 | 41.2 | 29.4 | 14.7 | 2.2 |
| 60 - 69 yrs | 18.8 | 42.4 | 64.7 | 35.3 | 21.2 | 10.6 | 3.5 |
| All | 13.2 | 29.4 | 55.0 | 45.0 | 31.1 | 15.0 | 5.1 |
| **All** | | | | | | | |
| 18 - 29 yrs | 11.2 | 25.0 | 51.5 | 48.5 | 36.6 | 18.8 | 5.9 |
| 30 - 39 yrs | 9.7 | 24.7 | 50.2 | 49.8 | 32.6 | 16.2 | 5.2 |
| 40 - 49 yrs | 15.3 | 32.1 | 58.9 | 41.1 | 25.5 | 10.5 | 2.9 |
| 50 - 59 yrs | 13.1 | 30.7 | 60.6 | 39.4 | 25.2 | 12.4 | 2.6 |
| 60 - 69 yrs | 19.5 | 40.9 | 64.6 | 35.4 | 21.3 | 11.6 | 2.4 |
| **Overall** | **11.2** | **26.5** | **52.9** | **47.1** | **31.0** | **14.9** | **4.1** |

## 4.6 Carbohydrate intakes

The mean carbohydrate intake of Singaporean adults is 259.7g and the intake of 90% of Singaporean adults lies between 130.2g and 421.4g.

The carbohydrate intake of males is 290.0g whereas that of females is 228.7g. The difference in carbohydrate intakes between the genders is statistically significant. Daily carbohydrate intake of 90% of the males lies between 150.4g and 471.3g, and for females it lies between 115.1g and 375.7g.

The Malays have a significantly lower carbohydrate intake (241.9g) than the Chinese (258.3g) and Indians (270.4g).

There is a gradual decrease in carbohydrate intake with age. The highest carbohydrate intake of 269.7g is found among those aged 18-29 years and the lowest intake of 240.6g is found among those aged 60-69 years.

**Table 4.6.1 - Mean, SEM and percentile distribution of daily carbohydrate (g) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 292.2 | 3.5 | 163.7 | 187.7 | 232.0 | 280.8 | 343.3 | 404.5 | 471.2 |
| Malay | 280.1 | 7.0 | 126.8 | 156.2 | 201.8 | 271.8 | 339.5 | 406.1 | 472.7 |
| Indian | 295.0 | 7.5 | 131.5 | 178.2 | 223.3 | 282.5 | 360.5 | 427.3 | 475.7 |
| All | 290.0 | 2.9 | 150.4 | 179.5 | 224.9 | 279.5 | 343.4 | 407.6 | 471.3 |
| **Females** | | | | | | | | | |
| Chinese | 230.2 | 2.5 | 126.6 | 145.4 | 183.1 | 223.2 | 269.9 | 312.5 | 362.4 |
| Malay | 207.8 | 4.8 | 97.3 | 115.7 | 155.1 | 192.8 | 253.0 | 307.9 | 347.7 |
| Indian | 248.5 | 6.6 | 106.6 | 136.4 | 184.5 | 238.3 | 297.9 | 378.6 | 443.0 |
| All | 228.7 | 2.2 | 115.1 | 138.8 | 177.5 | 219.8 | 269.9 | 321.5 | 375.7 |
| **All** | | | | | | | | | |
| Chinese | 258.3 | 2.2 | 137.2 | 162.0 | 198.0 | 248.0 | 302.4 | 372.6 | 415.3 |
| Malay | 241.9 | 4.5 | 104.8 | 128.3 | 171.4 | 226.1 | 301.1 | 364.2 | 420.4 |
| Indian | 270.4 | 5.1 | 123.5 | 148.5 | 201.8 | 257.8 | 328.1 | 405.0 | 452.0 |
| **Overall** | 259.7 | 1.8 | 130.2 | 157.3 | 197.0 | 249.1 | 306.5 | 379.5 | 421.4 |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 303.5 | 6.8 | 158.9 | 188.8 | 228.1 | 288.9 | 363.9 | 465.0 | 509.6 |
| 30 - 39 yrs | 300.9 | 5.2 | 161.1 | 189.1 | 241.0 | 286.6 | 356.9 | 411.9 | 473.5 |
| 40 - 49 yrs | 283.7 | 5.4 | 130.8 | 172.4 | 223.5 | 275.8 | 335.8 | 405.3 | 435.9 |
| 50 - 59 yrs | 274.0 | 7.4 | 143.8 | 178.2 | 212.3 | 263.8 | 330.5 | 388.0 | 432.2 |
| 60 - 69 yrs | 253.2 | 9.3 | 106.7 | 151.5 | 201.8 | 244.3 | 315.3 | 354.7 | 379.2 |
| All | 290.0 | 2.9 | 150.4 | 179.5 | 224.9 | 279.5 | 343.4 | 407.6 | 471.3 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 241.7 | 4.9 | 113.1 | 143.1 | 186.4 | 233.4 | 284.4 | 356.5 | 397.3 |
| 30 - 39 yrs | 225.0 | 3.7 | 113.9 | 135.7 | 175.8 | 218.7 | 268.8 | 310.6 | 362.4 |
| 40 - 49 yrs | 222.8 | 4.0 | 120.3 | 140.9 | 174.8 | 214.4 | 260.1 | 313.4 | 362.0 |
| 50 - 59 yrs | 225.1 | 7.4 | 111.6 | 129.2 | 170.3 | 216.6 | 261.1 | 322.0 | 381.8 |
| 60 - 69 yrs | 228.9 | 7.6 | 117.0 | 137.6 | 182.2 | 219.9 | 269.3 | 333.5 | 361.0 |
| All | 228.7 | 2.2 | 115.1 | 138.8 | 177.5 | 219.8 | 269.9 | 321.5 | 375.7 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 269.7 | 4.3 | 127.6 | 160.9 | 199.6 | 258.9 | 312.8 | 398.4 | 476.0 |
| 30 - 39 yrs | 258.6 | 3.4 | 126.9 | 147.6 | 191.9 | 249.7 | 307.8 | 380.2 | 423.6 |
| 40 - 49 yrs | 250.9 | 3.5 | 125.8 | 146.2 | 190.3 | 242.9 | 300.9 | 366.5 | 410.2 |
| 50 - 59 yrs | 249.7 | 5.4 | 120.3 | 144.3 | 186.7 | 240.5 | 302.1 | 371.3 | 404.5 |
| 60 - 69 yrs | 240.6 | 6.0 | 113.3 | 139.2 | 187.1 | 231.5 | 292.9 | 347.5 | 367.2 |
| **Overall** | 259.7 | 1.8 | 130.2 | 157.3 | 197.0 | 249.1 | 306.5 | 379.5 | 421.4 |

*SEM - standard error of mean*

## Dietary Guidelines Recommendation

The dietary guidelines recommend carbohydrates to contribute 55%-65% of dietary energy. The recommended intake used in this section is 60% (mid-point of the recommended range) of the mean energy requirement for each age group (refer to Table 4.3.3) divided by the factor 4 based on the estimation that a gram of carbohydrate provides around 4kcal of energy.

**Table 4.6.2 - Recommended intake for carbohydrate (g) by gender and age group**

| Age group (years) | 18-29 | 30-39 | 40-49 | 50-59 | ≥60 |
|---|---|---|---|---|---|
| Males | 400.8 | 388.7 | 388.7 | 388.7 | 327.6 |
| Females | 312.1 | 310.0 | 310.0 | 310.0 | 280.0 |

## Mean Recommended Intake

Calculation of mean recommended intake for carbohydrate for males:

$$\frac{\sum (\text{Number of males in each age group} \times \text{respective recommended intake})}{\text{Total number of males}}$$

Similar calculation is used for females.

Based on these calculations, the mean recommended intake of carbohydrate for males is 387.1g and that for females is 308.5g. The mean carbohydrate intake of males and females meet 75% and 74% of their mean recommended intakes respectively.

## Comparison with mean recommended intake

Similar proportions of males (13.8%) and females (12.2%) meet or exceed their recommended intakes for carbohydrate.

One-fifth of the Indian females (20.5%) have carbohydrate intake meeting or exceeding the recommendation and this proportion is double the proportion of Chinese females (10.7%) and Malay females (10.1%) having such intake.

**Table 4.6.3 - Distribution by percent recommendation met for carbohydrate (g) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 11.7 | 44.9 | 86.2 | 13.8 | 5.2 | 0.2 | 0.0 |
| Malay | 22.3 | 50.0 | 87.0 | 13.0 | 5.0 | 1.7 | 0.0 |
| Indian | 12.8 | 43.9 | 85.2 | 14.8 | 5.1 | 1.5 | 0.0 |
| All | 14.2 | 45.8 | 86.2 | 13.8 | 5.1 | 0.7 | 0.0 |
| **Females** | | | | | | | |
| Chinese | 12.5 | 45.3 | 89.3 | 10.7 | 4.5 | 0.6 | 0.1 |
| Malay | 24.7 | 61.0 | 89.9 | 10.1 | 3.7 | 1.1 | 0 |
| Indian | 14.5 | 40.5 | 79.5 | 20.5 | 11.4 | 2.7 | 0.5 |
| All | 15.4 | 47.7 | 87.8 | 12.2 | 5.5 | 1.1 | 0.2 |
| **All** | | | | | | | |
| Chinese | 12.2 | 45.1 | 87.9 | 12.1 | 4.8 | 0.4 | 0.1 |
| Malay | 23.6 | 55.8 | 88.5 | 11.5 | 4.4 | 1.4 | 0.0 |
| Indian | 13.7 | 42.1 | 82.2 | 17.8 | 8.4 | 2.2 | 0.2 |
| **Overall** | **13.9** | **46.1** | **87.6** | **12.4** | **5.2** | **0.7** | **0.1** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 14.5 | 45.5 | 85.1 | 14.9 | 8.2 | 0.8 | 0.0 |
| 30 - 39 yrs | 11.5 | 41.1 | 84.6 | 15.4 | 5.4 | 1.5 | 0.0 |
| 40 - 49 yrs | 14.8 | 47.9 | 88.3 | 11.7 | 3.4 | 0.3 | 0.0 |
| 50 - 59 yrs | 18.8 | 55.1 | 90.6 | 9.4 | 2.9 | 0.0 | 0.0 |
| 60 - 69 yrs | 13.9 | 43.0 | 81.0 | 19.0 | 3.8 | 0.0 | 0.0 |
| All | 14.2 | 45.8 | 86.2 | 13.8 | 5.1 | 0.7 | 0.0 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 12.3 | 43.8 | 84.7 | 15.3 | 8.4 | 1.9 | 0.3 |
| 30 - 39 yrs | 17.2 | 49.0 | 90.0 | 10.0 | 4.3 | 1.0 | 0.0 |
| 40 - 49 yrs | 15.7 | 52.5 | 89.6 | 10.4 | 3.6 | 0.9 | 0.0 |
| 50 - 59 yrs | 17.6 | 50.0 | 89.7 | 10.3 | 5.9 | 0.7 | 0.7 |
| 60 - 69 yrs | 12.9 | 32.9 | 77.6 | 22.4 | 8.2 | 0.0 | 0.0 |
| All | 15.4 | 47.7 | 87.8 | 12.2 | 5.5 | 1.1 | 0.2 |
| **All** | | | | | | | |
| 18 - 29 yrs | 13.3 | 44.6 | 84.9 | 15.1 | 8.3 | 1.4 | 0.2 |
| 30 - 39 yrs | 14.7 | 45.5 | 87.6 | 12.4 | 4.8 | 1.2 | 0.0 |
| 40 - 49 yrs | 15.3 | 50.4 | 89.0 | 11.0 | 3.5 | 0.6 | 0.0 |
| 50 - 59 yrs | 18.2 | 52.6 | 90.1 | 9.9 | 4.4 | 0.4 | 0.4 |
| 60 - 69 yrs | 13.4 | 37.8 | 79.3 | 20.7 | 6.1 | 0.0 | 0.0 |
| **Overall** | **13.9** | **46.1** | **87.6** | **12.4** | **5.2** | **0.7** | **0.1** |

## 4.7 Cholesterol intakes

The mean cholesterol intake of Singaporean adults is 280mg and the intake of 90% of Singaporean adults lies between 44mg and 707mg.

The intake of cholesterol for males is 307mg whereas that for females is 234mg. The difference in mean cholesterol intake between the genders is statistically significant. Daily cholesterol intake of 90% of the males lies between 44mg and 775mg, and for females it lies between 31mg and 589mg.

The Indians have significantly lower mean cholesterol intake (211mg) than the Chinese (283mg) and Malays (272mg).

Generally, cholesterol intake declines with age. Those aged 18-29 years have the highest cholesterol intake (297mg) while those aged 60-69 years have the lowest intake (209mg).

**Table 4.7.1 - Mean, SEM and percentile distribution of daily cholesterol (mg) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 324 | 8.9 | 59 | 89 | 161 | 273 | 418 | 629 | 772 |
| Malay | 319 | 16.4 | 42 | 71 | 133 | 263 | 428 | 650 | 836 |
| Indian | 238 | 14.5 | 20 | 41 | 89 | 194 | 319 | 506 | 647 |
| All | 307 | 7.0 | 44 | 70 | 138 | 258 | 407 | 620 | 775 |
| **Females** | | | | | | | | | |
| Chinese | 249 | 7.0 | 49 | 64 | 115 | 198 | 343 | 493 | 612 |
| Malay | 230 | 12.1 | 32 | 48 | 92 | 181 | 317 | 460 | 583 |
| Indian | 187 | 12.8 | 7 | 23 | 50 | 122 | 265 | 448 | 567 |
| All | 234 | 5.5 | 31 | 51 | 95 | 182 | 330 | 480 | 589 |
| **All** | | | | | | | | | |
| Chinese | 283 | 5.6 | 52 | 72 | 129 | 233 | 375 | 559 | 701 |
| Malay | 272 | 10.2 | 34 | 54 | 106 | 212 | 370 | 569 | 745 |
| Indian | 211 | 9.7 | 14 | 28 | 61 | 154 | 303 | 487 | 618 |
| **Overall** | **280** | **4.5** | **44** | **66** | **124** | **228** | **372** | **565** | **707** |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 351 | 16.1 | 60 | 94 | 167 | 291 | 447 | 675 | 870 |
| 30 - 39 yrs | 330 | 13.2 | 42 | 71 | 144 | 277 | 462 | 652 | 795 |
| 40 - 49 yrs | 288 | 12.7 | 49 | 72 | 130 | 235 | 370 | 580 | 751 |
| 50 - 59 yrs | 270 | 17.0 | 18 | 55 | 128 | 231 | 352 | 558 | 645 |
| 60 - 69 yrs | 212 | 19.0 | 19 | 40 | 90 | 165 | 321 | 483 | 579 |
| All | 307 | 7.0 | 44 | 70 | 138 | 258 | 407 | 620 | 775 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 253 | 11.3 | 41 | 65 | 106 | 197 | 359 | 500 | 624 |
| 30 - 39 yrs- | 239 | 9.1 | 32 | 53 | 100 | 199 | 338 | 476 | 603 |
| 40 - 49 yrs | 216 | 9.0 | 33 | 46 | 90 | 172 | 308 | 480 | 566 |
| 50 - 59 yrs | 240 | 18.1 | 20 | 38 | 80 | 179 | 333 | 548 | 716 |
| 60 - 69 yrs | 207 | 33.1 | 12 | 25 | 60 | 143 | 260 | 380 | 529 |
| All | 234 | 5.5 | 31 | 51 | 95 | 182 | 330 | 480 | 589 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 297 | 9.8 | 49 | 73 | 127 | 248 | 393 | 577 | 779 |
| 30 - 39 yrs | 279 | 7.9 | 40 | 57 | 118 | 233 | 375 | 567 | 715 |
| 40 - 49 yrs | 249 | 7.7 | 36 | 53 | 104 | 200 | 340 | 526 | 628 |
| 50 - 59 yrs | 256 | 12.4 | 20 | 52 | 104 | 213 | 344 | 548 | 705 |
| 60 - 69 yrs | 209 | 19.4 | 16 | 33 | 69 | 150 | 284 | 438 | 560 |
| **Overall** | **280** | **4.5** | **44** | **66** | **124** | **228** | **372** | **565** | **707** |

*SEM - standard error of mean*

## Dietary Guidelines Recommendation

The dietary guidelines recommend that dietary cholesterol should not exceed 100mg per 1000kcal of energy requirement (refer to Table 4.3.3 for energy requirement).

**Table 4.7.2 - Recommended intake for cholesterol (mg) by gender and age group**

| Age group (years) | 18-29 | 30-39 | 40-49 | 50-59 | ≥60 |
|---|---|---|---|---|---|
| Males | 267 | 259 | 259 | 259 | 218 |
| Females | 208 | 207 | 207 | 207 | 186 |

## Mean Recommended Intake

Calculation of mean recommended intake for cholesterol for males:

$$\frac{\sum (\text{Number of males in each age group} \times \text{respective recommended intake})}{\text{Total number of males}}$$

Similar calculation is used for females.

Based on the above calculation, the mean recommended intake for cholesterol for males is 258 mg and that for females is 206 mg. The cholesterol intake of males and females meet 119% and 114% of their mean recommended intakes respectively.

## Comparison with mean recommended intake

Almost half (47.4%) of the Singaporean adults have intakes meeting or exceeding the recommended intakes for cholesterol. High proportions of males (39.5%) and females (37.7%) have intakes at least 1.2 times of their recommended intakes for cholesterol.

Among ethnic groups, the highest proportion of Singaporean adults having cholesterol intakes meeting or exceeding 120% of their recommended intakes is among the Chinese (41.6%) followed by the Malays (38.6%) and Indians (27.9%).

Over two-fifths (43.3%) of the younger Singaporean adults (18-29 years) have at least 1.2 times of their recommended intakes for cholesterol. Among Singaporean adults in this age group, 30.7% of them have cholesterol intakes meeting or exceeding 1.5 times of their recommended intakes.

**Table 4.7.3 - Distribution by percent recommendation met for cholesterol (mg) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 17.6 | 29.7 | 46.4 | 53.6 | 42.6 | 28.5 | 17.1 |
| Malay | 23.5 | 34.9 | 49.2 | 50.8 | 41.2 | 29.0 | 17.2 |
| Indian | 36.2 | 48.0 | 63.8 | 36.2 | 27.0 | 18.4 | 9.7 |
| All | 22.2 | 34.1 | 50.1 | 49.9 | 39.5 | 26.8 | 15.8 |
| **Females** | | | | | | | |
| Chinese | 21.1 | 35.6 | 51.3 | 48.7 | 40.7 | 30.0 | 15.8 |
| Malay | 28.5 | 42.3 | 55.8 | 44.2 | 36.3 | 26.2 | 14.6 |
| Indian | 40.9 | 55.9 | 65.5 | 34.5 | 28.6 | 20.5 | 10.5 |
| All | 26.0 | 40.5 | 54.7 | 45.3 | 37.7 | 27.6 | 14.6 |
| **All** | | | | | | | |
| Chinese | 19.5 | 33.0 | 49.1 | 50.9 | 41.6 | 29.3 | 16.4 |
| Malay | 26.1 | 38.8 | 52.7 | 47.3 | 38.6 | 27.5 | 15.8 |
| Indian | 38.7 | 52.2 | 64.7 | 35.3 | 27.9 | 19.5 | 10.1 |
| **Overall** | **24.3** | **37.6** | **52.6** | **47.4** | **38.5** | **27.2** | **15.2** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 18.0 | 29.0 | 43.9 | 56.1 | 45.5 | 29.8 | 17.6 |
| 30 - 39 yrs | 19.6 | 31.7 | 44.7 | 55.3 | 43.8 | 31.7 | 19.0 |
| 40 - 49 yrs | 24.8 | 36.9 | 53.4 | 46.6 | 35.2 | 23.4 | 13.8 |
| 50 - 59 yrs | 24.6 | 36.2 | 59.4 | 40.6 | 32.6 | 20.3 | 10.9 |
| 60 - 69 yrs | 32.9 | 46.8 | 64.6 | 35.4 | 30.4 | 20.3 | 12.7 |
| All | 22.2 | 34.1 | 50.1 | 49.9 | 39.5 | 26.8 | 15.8 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 21.1 | 37.7 | 53.2 | 46.8 | 41.6 | 31.5 | 17.9 |
| 30 - 39 yrs | 24.4 | 38.5 | 51.2 | 48.8 | 40.0 | 28.9 | 14.8 |
| 40 - 49 yrs | 28.5 | 43.6 | 57.9 | 42.1 | 32.6 | 24.0 | 13.1 |
| 50 - 59 yrs | 30.9 | 41.2 | 55.9 | 44.1 | 37.5 | 27.2 | 14.0 |
| 60 - 69 yrs | 34.1 | 47.1 | 62.4 | 37.6 | 32.9 | 21.2 | 9.4 |
| All | 26.0 | 40.5 | 54.7 | 45.3 | 37.7 | 27.6 | 14.6 |
| **All** | | | | | | | |
| 18 - 29 yrs | 19.7 | 33.7 | 49.0 | 51.0 | 43.3 | 30.7 | 17.8 |
| 30 - 39 yrs | 22.3 | 35.5 | 48.3 | 51.7 | 41.7 | 30.2 | 16.7 |
| 40 - 49 yrs | 26.8 | 40.5 | 55.8 | 44.2 | 33.8 | 23.8 | 13.4 |
| 50 - 59 yrs | 27.7 | 38.7 | 57.7 | 42.3 | 35.0 | 23.7 | 12.4 |
| 60 - 69 yrs | 33.5 | 47.0 | 63.4 | 36.6 | 31.7 | 20.7 | 11.0 |
| **Overall** | **24.3** | **37.6** | **52.6** | **47.4** | **38.5** | **27.2** | **15.2** |

## 4.8 Dietary fibre intakes

The mean dietary fibre intake of Singaporean adults is 15.7g daily and the intake of 90% of Singaporean adults lies between 6.0g and 30.1g.

The intake of dietary fibre for males is 17.1g whereas that for females is 14.6g and the mean difference between genders is statistically significant. Dietary fibre intake of 90% of the males lies between 6.4g and 32.9g and for females, it lies between 5.7g and 28.6g.

The three ethnic groups have significantly different dietary fibre intakes. The Indians have the highest dietary fibre intake (18.1g) followed by the Chinese (15.6g) and Malays (14.3g).

**Table 4.8.1 - Mean, SEM and percentile distribution of daily dietary fibre (g) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 16.7 | 0.3 | 7.2 | 9.0 | 11.9 | 15.4 | 20.2 | 25.8 | 30.5 |
| Malay | 16.1 | 0.5 | 5.1 | 6.5 | 9.5 | 14.6 | 20.7 | 26.6 | 33.9 |
| Indian | 19.8 | 0.7 | 6.7 | 9.7 | 13.2 | 17.8 | 24.6 | 33.2 | 38.3 |
| All | 17.1 | 0.3 | 6.4 | 8.5 | 11.8 | 15.6 | 20.8 | 27.2 | 32.9 |
| **Females** | | | | | | | | | |
| Chinese | 14.8 | 0.3 | 5.9 | 7.2 | 10.0 | 13.7 | 17.8 | 23.5 | 28.4 |
| Malay | 12.6 | 0.4 | 4.2 | 5.8 | 8.3 | 11.6 | 15.5 | 20.8 | 24.9 |
| Indian | 16.5 | 0.6 | 6.0 | 7.5 | 10.7 | 15.1 | 20.8 | 27.6 | 33.4 |
| All | 14.6 | 0.2 | 5.7 | 6.9 | 9.7 | 13.4 | 17.7 | 23.5 | 28.6 |
| **All** | | | | | | | | | |
| Chinese | 15.6 | 0.2 | 6.4 | 7.8 | 10.8 | 14.5 | 18.8 | 24.8 | 29.5 |
| Malay | 14.3 | 0.3 | 4.8 | 6.2 | 8.8 | 12.4 | 18.2 | 24.3 | 28.4 |
| Indian | 18.1 | 0.5 | 6.2 | 8.4 | 11.9 | 16.3 | 22.2 | 30.5 | 35.3 |
| **Overall** | **15.7** | **0.2** | **6.0** | **7.5** | **10.6** | **14.5** | **19.0** | **25.2** | **30.1** |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 16.0 | 0.5 | 6.2 | 8.2 | 10.8 | 14.4 | 19.7 | 26.2 | 29.5 |
| 30 - 39 yrs | 18.2 | 0.5 | 7.1 | 9.4 | 12.5 | 16.6 | 21.4 | 28.8 | 34.2 |
| 40 - 49 yrs | 17.2 | 0.5 | 5.9 | 7.8 | 11.8 | 16.2 | 21.2 | 27.1 | 32.0 |
| 50 - 59 yrs | 17.7 | 0.7 | 6.2 | 8.2 | 12.3 | 16.0 | 22.1 | 29.5 | 36.9 |
| 60 - 69 yrs | 14.9 | 0.7 | 5.5 | 7.4 | 10.3 | 14.8 | 18.0 | 22.9 | 28.2 |
| All | 17.1 | 0.3 | 6.4 | 8.5 | 11.8 | 15.6 | 20.8 | 27.2 | 32.9 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 14.9 | 0.4 | 5.3 | 6.8 | 9.5 | 13.4 | 17.9 | 24.6 | 31.3 |
| 30 - 39 yrs | 14.2 | 0.3 | 5.7 | 7.0 | 9.8 | 12.9 | 17.7 | 22.6 | 26.7 |
| 40 - 49 yrs | 15.0 | 0.4 | 5.9 | 7.0 | 9.7 | 13.6 | 18.4 | 24.2 | 29.9 |
| 50 - 59 yrs | 15.1 | 0.8 | 5.4 | 6.8 | 10.4 | 13.5 | 17.2 | 25.9 | 30.3 |
| 60 - 69 yrs | 13.7 | 0.8 | 5.0 | 6.4 | 8.3 | 12.8 | 16.9 | 20.7 | 26.1 |
| All | 14.6 | 0.2 | 5.7 | 6.9 | 9.7 | 13.4 | 17.7 | 23.5 | 28.6 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 15.4 | 0.3 | 5.7 | 7.4 | 10.1 | 13.8 | 19.1 | 25.8 | 30.6 |
| 30 - 39 yrs | 16.0 | 0.3 | 6.3 | 7.6 | 10.6 | 14.6 | 19.4 | 25.8 | 30.8 |
| 40 - 49 yrs | 16.0 | 0.3 | 5.9 | 7.4 | 10.7 | 14.7 | 19.7 | 26.4 | 31.1 |
| 50 - 59 yrs | 16.4 | 0.5 | 5.8 | 7.6 | 11.2 | 14.5 | 20.0 | 26.4 | 33.7 |
| 60 - 69 yrs | 14.3 | 0.5 | 5.6 | 6.7 | 9.2 | 13.5 | 17.4 | 21.9 | 27.0 |
| **Overall** | **15.7** | **0.2** | **6.0** | **7.5** | **10.6** | **14.5** | **19.0** | **25.2** | **30.1** |

*SEM - standard error of mean*

## Dietary Guidelines Recommendation

The dietary guidelines recommend that dietary fibre intake should be 10g per 1000kcal of energy requirement for both genders (refer to Table 4.3.3 for energy requirements).

**Table 4.8.2 - Recommended intake for dietary fibre (g) by gender and age group**

| Age group (years) | 18-29 | 30-39 | 40-49 | 50-59 | ≥60 |
|---|---|---|---|---|---|
| Males | 26.7 | 25.9 | 25.9 | 25.9 | 21.8 |
| Females | 20.8 | 20.7 | 20.7 | 20.7 | 18.6 |

## Mean Recommended Intake

Calculation for mean recommended intake for dietary fibre for males:

$$\frac{\sum (\text{Number of males in each age group} \times \text{respective recommended intake})}{\text{Total number of males}}$$

Similar calculation is used for females.

Based on these calculations, the mean recommended intake of dietary fibre for males is 25.8g and that for females is 20.6g. The mean dietary fibre intake of males and females meet 66% and 71% of their mean recommended intakes respectively.

## Comparison with mean recommended intake

As much as 87.0% of Singaporean adults do not meet the recommendation for dietary fibre. The largest proportion of Singaporean adults not meeting the recommended intake is found among the Chinese males (90.1%) followed by the Malay females (89.9%).

Among the ethnic groups, the highest proportion of Singaporean adults not meeting the recommended intake is found among the Malays (89.3%) followed by the Chinese (87.2%) and Indians (76.0%). As much as 41.6% of the Malays do not meet even 50% of the recommended intake for dietary fibre.

Among the age groups, the highest proportion of Singaporean adults not meeting the recommended intake for dietary fibre is found among the younger males (18-29 years), with 42.0% of them not even meeting 50% of their recommended intake.

**Table 4.8.3 - Distribution by percent recommendation met for dietary fibre (g) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 32.5 | 64.0 | 90.1 | 9.9 | 5.0 | 1.7 | 0.2 |
| Malay | 43.7 | 61.3 | 88.7 | 11.3 | 6.3 | 2.1 | 0.0 |
| Indian | 22.4 | 51.0 | 78.1 | 21.9 | 11.7 | 4.6 | 1.0 |
| All | 33.1 | 61.1 | 87.6 | 12.4 | 6.5 | 2.3 | 0.3 |
| **Females** | | | | | | | |
| Chinese | 26.5 | 55.0 | 84.8 | 15.2 | 8.5 | 3.5 | 0.8 |
| Malay | 39.7 | 71.9 | 89.9 | 10.1 | 4.9 | 2.2 | 0.7 |
| Indian | 23.2 | 46.4 | 74.1 | 25.9 | 14.5 | 5.5 | 1.8 |
| All | 28.7 | 57.0 | 84.0 | 16.0 | 8.8 | 3.6 | 0.9 |
| **All** | | | | | | | |
| Chinese | 29.2 | 59.1 | 87.2 | 12.8 | 6.9 | 2.7 | 0.5 |
| Malay | 41.6 | 66.9 | 89.3 | 10.7 | 5.5 | 2.2 | 0.4 |
| Indian | 22.8 | 48.6 | 76.0 | 24.0 | 13.2 | 5.0 | 1.4 |
| **Overall** | **30.7** | **59.9** | **87.0** | **13.0** | **7.0** | **2.6** | **0.5** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 42.0 | 69.0 | 91.8 | 8.2 | 3.9 | 0.8 | 0.4 |
| 30 - 39 yrs | 28.4 | 58.0 | 84.9 | 15.1 | 8.5 | 3.3 | 0.3 |
| 40 - 49 yrs | 33.4 | 59.0 | 87.2 | 12.8 | 5.5 | 2.4 | 0.3 |
| 50 - 59 yrs | 30.4 | 61.6 | 87.7 | 12.3 | 8.7 | 2.9 | 0.0 |
| 60 - 69 yrs | 27.8 | 55.7 | 87.3 | 12.7 | 6.3 | 1.3 | 0.0 |
| All | 33.1 | 61.1 | 87.6 | 12.4 | 6.5 | 2.3 | 0.3 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 28.9 | 58.1 | 83.4 | 16.6 | 9.4 | 4.9 | 1.6 |
| 30 - 39 yrs | 30.6 | 58.1 | 84.9 | 15.1 | 7.4 | 1.7 | 0.5 |
| 40 - 49 yrs | 27.6 | 54.9 | 83.7 | 16.3 | 9.5 | 4.7 | 0.6 |
| 50 - 59 yrs | 25.0 | 59.6 | 83.8 | 16.2 | 10.3 | 3.7 | 1.5 |
| 60 - 69 yrs | 28.2 | 51.8 | 83.5 | 16.5 | 8.2 | 3.5 | 1.2 |
| All | 28.7 | 57.0 | 84.0 | 16.0 | 8.8 | 3.6 | 0.9 |
| **All** | | | | | | | |
| 18 - 29 yrs | 34.8 | 63.1 | 87.2 | 12.8 | 6.9 | 3.0 | 1.1 |
| 30 - 39 yrs | 29.6 | 58.1 | 84.9 | 15.1 | 7.9 | 2.4 | 0.4 |
| 40 - 49 yrs | 30.3 | 56.8 | 85.3 | 14.7 | 7.7 | 3.7 | 0.5 |
| 50 - 59 yrs | 27.7 | 60.6 | 85.8 | 14.2 | 9.5 | 3.3 | 0.7 |
| 60 - 69 yrs | 28.0 | 53.7 | 85.4 | 14.6 | 7.3 | 2.4 | 0.6 |
| **Overall** | **30.7** | **59.9** | **87.0** | **13.0** | **7.0** | **2.6** | **0.5** |

## 4.9 Iron intakes

The mean daily iron intake of Singaporean adults is 16.9mg and the intake of 90% of Singaporean adults lies between 6.5mg and 30.0mg.

The iron intake for males is 18.7mg whereas that for females is 15.2mg and the mean difference in the intakes between the genders is statistically significant. Daily iron intake of 90% of the males lies between 7.1mg and 32.5mg, and for females it lies between 5.9mg and 27.1mg.

The iron intakes of Indian males and Indian females are both significantly higher (20.4mg for Indian males and 16.9mg for Indian females) than intakes of Singaporean adults from other ethnic groups of the same gender.

There is no significant difference in iron intake among the different age groups.

**Table 4.9.1 - Mean, SEM and percentile distribution of iron (mg) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 18.5 | 0.3 | 7.1 | 9.3 | 13.6 | 17.9 | 22.6 | 28.3 | 31.9 |
| Malay | 18.0 | 0.5 | 6.9 | 8.9 | 12.9 | 16.6 | 22.0 | 27.4 | 33.4 |
| Indian | 20.4 | 0.8 | 7.7 | 10.6 | 14.5 | 18.6 | 24.4 | 30.0 | 35.6 |
| All | 18.7 | 0.3 | 7.1 | 9.5 | 13.6 | 17.8 | 22.7 | 28.9 | 32.5 |
| **Females** | | | | | | | | | |
| Chinese | 15.2 | 0.3 | 6.4 | 7.7 | 10.4 | 13.9 | 18.1 | 23.7 | 26.9 |
| Malay | 13.9 | 0.3 | 5.5 | 6.8 | 10.0 | 13.8 | 17.1 | 21.2 | 24.4 |
| Indian | 16.9 | 0.7 | 5.4 | 7.7 | 11.6 | 15.6 | 20.3 | 26.2 | 31.1 |
| All | 15.2 | 0.3 | 5.9 | 7.6 | 10.5 | 14.2 | 18.2 | 23.7 | 27.1 |
| **All** | | | | | | | | | |
| Chinese | 16.7 | 0.2 | 6.6 | 8.2 | 11.3 | 15.4 | 20.4 | 26.0 | 29.7 |
| Malay | 15.8 | 0.3 | 5.8 | 7.6 | 11.1 | 14.8 | 19.3 | 24.9 | 28.8 |
| Indian | 18.6 | 0.5 | 6.6 | 8.8 | 12.8 | 16.9 | 22.0 | 28.9 | 32.1 |
| **Overall** | **16.9** | **0.2** | **6.5** | **8.2** | **11.5** | **15.7** | **20.6** | **26.3** | **30.0** |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 18.1 | 0.5 | 7.0 | 8.8 | 12.6 | 16.6 | 22.1 | 28.7 | 33.8 |
| 30 - 39 yrs | 19.1 | 0.4 | 6.9 | 9.8 | 13.6 | 18.5 | 23.2 | 29.5 | 32.2 |
| 40 - 49 yrs | 18.5 | 0.4 | 7.3 | 9.6 | 13.7 | 17.3 | 22.7 | 28.1 | 32.1 |
| 50 - 59 yrs | 20.1 | 1.0 | 6.8 | 10.0 | 15.2 | 18.4 | 23.1 | 29.6 | 34.8 |
| 60 - 69 yrs | 17.8 | 0.8 | 6.7 | 8.9 | 12.7 | 16.5 | 22.6 | 28.3 | 34.8 |
| All | 18.7 | 0.3 | 7.1 | 9.5 | 13.6 | 17.8 | 22.7 | 28.9 | 32.5 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 14.6 | 0.4 | 5.4 | 6.8 | 9.3 | 13.4 | 18.2 | 23.8 | 28.2 |
| 30 - 39 yrs | 14.9 | 0.4 | 5.6 | 7.6 | 10.4 | 13.9 | 17.8 | 23.9 | 27.1 |
| 40 - 49 yrs | 15.8 | 0.7 | 6.2 | 7.6 | 10.9 | 14.4 | 18.0 | 23.0 | 27.5 |
| 50 - 59 yrs | 16.0 | 0.8 | 6.2 | 7.9 | 11.7 | 15.1 | 19.1 | 22.8 | 25.8 |
| 60 - 69 yrs | 15.8 | 0.6 | 7.2 | 9.1 | 11.4 | 15.0 | 19.3 | 24.6 | 26.6 |
| All | 15.2 | 0.3 | 5.9 | 7.6 | 10.5 | 14.2 | 18.2 | 23.7 | 27.1 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 16.2 | 0.3 | 5.6 | 7.7 | 10.5 | 15.2 | 19.9 | 26.1 | 30.6 |
| 30 - 39 yrs | 16.7 | 0.3 | 6.4 | 8.4 | 11.4 | 15.4 | 20.8 | 26.7 | 30.2 |
| 40 - 49 yrs | 17.0 | 0.4 | 6.8 | 8.1 | 11.7 | 15.6 | 20.0 | 26.0 | 30.2 |
| 50 - 59 yrs | 18.1 | 0.6 | 6.6 | 8.8 | 12.8 | 17.0 | 21.4 | 26.5 | 31.2 |
| 60 - 69 yrs | 16.8 | 0.5 | 6.9 | 9.1 | 12.1 | 15.4 | 21.2 | 26.3 | 28.5 |
| **Overall** | **16.9** | **0.2** | **6.5** | **8.2** | **11.5** | **15.7** | **20.6** | **26.3** | **30.0** |

*SEM - standard error of mean*

## RDA

Requirements of iron are obtained from the Report of the Joint FAO/WHO Expert Group, FAO, Rome, 1970.

**Table 4.9.2 - RDA for iron (mg) by gender and age group**

| Age group (years) | 18-29 | 30-39 | 40-49 | 50-59 | ≥60 |
|---|---|---|---|---|---|
| Males | 6 | 6 | 6 | 6 | 6 |
| Females | 19 | 19 | 19 | 19 | 6 |

## Mean RDA

Calculation of mean RDA for iron for males:

$$\frac{\sum (\text{Number of males in each age group} \times \text{respective RDA})}{\text{Total number of males}}$$

Similar calculation is used for females.

Based on these calculations, the mean RDA for iron for males is 6.0mg and that for females is 18.1mg. The mean iron intake of males and females meet 312% and 84% of their mean RDA respectively.

**Comparison with mean recommended RDA**

Almost all (97.1%) of the males meet their RDA for iron whereas only 26.2% of the females do so. A substantial proportion of females (40.9%) consume less than 70% of their RDA for iron.

A higher proportion of Chinese females (42.0%) and Malay females (44.6%) consume less than 70% of their RDA for iron compared to Indian females (32.3%).

Almost half (48.7%) of the females aged 18-29 years consume less than 70% of their RDA for iron. More than a quarter (25.3%) of females aged 18-29 years do not meet even 50% of their RDA.

**Table 4.9.3 - Distribution by percent RDA met for iron (mg) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 0.3 | 1.5 | 3.0 | 97.0 | 94.8 | 91.4 | 81.9 |
| Malay | 0.8 | 1.3 | 3.4 | 96.6 | 94.1 | 89.9 | 78.6 |
| Indian | 1.0 | 1.0 | 2.0 | 98.0 | 95.4 | 93.9 | 86.2 |
| All | 0.5 | 1.4 | 2.9 | 97.1 | 94.8 | 91.5 | 82.0 |
| **Females** | | | | | | | |
| Chinese | 18.1 | 42.0 | 73.7 | 26.3 | 17.3 | 9.7 | 6.4 |
| Malay | 22.8 | 44.6 | 79.4 | 20.6 | 11.6 | 7.1 | 4.1 |
| Indian | 15.0 | 32.3 | 67.7 | 32.3 | 19.5 | 10.0 | 5.0 |
| All | 18.5 | 40.9 | 73.8 | 26.2 | 16.5 | 9.2 | 5.7 |
| **All** | | | | | | | |
| Chinese | 10.0 | 23.7 | 41.7 | 58.3 | 52.4 | 46.6 | 40.6 |
| Malay | 12.5 | 24.2 | 43.6 | 56.4 | 50.5 | 46.1 | 39.2 |
| Indian | 8.4 | 17.5 | 36.8 | 63.2 | 55.3 | 49.5 | 43.3 |
| **Overall** | **9.4** | **21.3** | **37.8** | **62.2** | **56.4** | **51.1** | **44.5** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 0.8 | 2.0 | 3.5 | 96.5 | 94.5 | 89.0 | 79.2 |
| 30 - 39 yrs | 0.9 | 1.5 | 3.3 | 96.7 | 94.9 | 93.1 | 82.8 |
| 40 - 49 yrs | 0.3 | 0.7 | 1.7 | 98.3 | 95.5 | 91.7 | 81.7 |
| 50 - 59 yrs | 0.0 | 0.7 | 3.6 | 96.4 | 94.2 | 92.8 | 86.2 |
| 60 - 69 yrs | 0.0 | 2.5 | 2.5 | 97.5 | 93.7 | 89.9 | 81.0 |
| All | 0.5 | 1.4 | 2.9 | 97.1 | 94.8 | 91.5 | 82.0 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 25.3 | 48.7 | 76.9 | 23.1 | 11.0 | 4.2 | 1.0 |
| 30 - 39 yrs | 18.7 | 45.0 | 80.4 | 19.6 | 12.0 | 2.6 | 1.0 |
| 40 - 49 yrs | 17.2 | 40.7 | 80.4 | 19.6 | 10.1 | 3.6 | 1.2 |
| 50 - 59 yrs | 17.6 | 36.0 | 74.3 | 25.7 | 9.6 | 2.9 | 1.5 |
| 60 - 69 yrs | 0.0 | 1.2 | 3.5 | 96.5 | 95.3 | 91.8 | 70.6 |
| All | 18.5 | 40.9 | 73.8 | 26.2 | 16.5 | 9.2 | 5.7 |
| **All** | | | | | | | |
| 18 - 29 yrs | 14.2 | 27.5 | 43.7 | 56.3 | 48.8 | 42.6 | 36.4 |
| 30 - 39 yrs | 10.8 | 25.8 | 46.3 | 53.7 | 48.6 | 42.6 | 37.1 |
| 40 - 49 yrs | 9.4 | 22.2 | 44.0 | 56.0 | 49.6 | 44.3 | 38.4 |
| 50 - 59 yrs | 8.8 | 18.2 | 38.7 | 61.3 | 52.2 | 48.2 | 44.2 |
| 60 - 69 yrs | 0.0 | 1.8 | 3.0 | 97.0 | 94.5 | 90.9 | 75.6 |
| **Overall** | **9.4** | **21.3** | **37.8** | **62.2** | **56.4** | **51.1** | **44.5** |

## 4.10 Calcium intakes

The mean daily calcium intake of Singaporean adults is 482mg and the intake of 90% of Singaporean adults lies between 162mg and 985mg .

The calcium intake of males is 510mg whereas that for females is 458mg. The mean difference in the intakes between the genders is statistically significant. Daily calcium intake of 90% of the males lies between 166mg and 1025mg, and for females it lies between 146mg and 985mg.

The calcium intake of Malay females (406mg) is significantly lower than intake of females from the other ethnic groups (460mg for Chinese and 515mg for Indians). The calcium intake of Indian males (561mg) is significantly higher than intake of males from the other ethnic groups (502mg for Chinese and 491mg for Malays).

Among the age groups, calcium intake is lowest among those aged 60-69 years (447mg).

**Table 4.10.1 - Mean, SEM and percentile distribution of daily calcium (mg) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 502 | 9.9 | 177 | 224 | 316 | 463 | 631 | 827 | 989 |
| Malay | 491 | 19.0 | 162 | 189 | 288 | 445 | 632 | 857 | 961 |
| Indian | 561 | 25.4 | 144 | 217 | 331 | 473 | 725 | 943 | 1194 |
| All | 510 | 8.6 | 166 | 210 | 312 | 461 | 644 | 875 | 1025 |
| **Females** | | | | | | | | | |
| Chinese | 460 | 10.0 | 163 | 200 | 275 | 404 | 561 | 778 | 938 |
| Malay | 406 | 16.0 | 106 | 145 | 234 | 338 | 518 | 752 | 922 |
| Indian | 515 | 22.8 | 151 | 219 | 291 | 411 | 646 | 968 | 1243 |
| All | 458 | 8.1 | 146 | 186 | 265 | 395 | 564 | 791 | 985 |
| **All** | | | | | | | | | |
| Chinese | 479 | 7.1 | 168 | 209 | 291 | 430 | 602 | 795 | 973 |
| Malay | 446 | 12.4 | 122 | 166 | 246 | 387 | 555 | 809 | 943 |
| Indian | 537 | 17.0 | 148 | 219 | 307 | 436 | 672 | 943 | 1218 |
| **Overall** | **482** | **5.7** | **162** | **202** | **289** | **430** | **608** | **815** | **985** |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 510 | 19.4 | 153 | 200 | 298 | 443 | 649 | 881 | 1008 |
| 30 - 39 yrs | 523 | 16.6 | 161 | 204 | 335 | 475 | 648 | 889 | 1079 |
| 40 - 49 yrs | 513 | 15.8 | 181 | 216 | 311 | 471 | 644 | 845 | 1062 |
| 50 - 59 yrs | 509 | 20.3 | 195 | 226 | 331 | 473 | 669 | 870 | 963 |
| 60 - 69 yrs | 445 | 28.4 | 139 | 177 | 276 | 395 | 543 | 775 | 914 |
| All | 510 | 8.6 | 166 | 210 | 312 | 461 | 644 | 875 | 1025 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 455 | 15.3 | 128 | 173 | 265 | 390 | 590 | 813 | 1039 |
| 30 - 39 yrs | 446 | 12.3 | 151 | 191 | 261 | 402 | 556 | 780 | 904 |
| 40 - 49 yrs | 462 | 18.0 | 160 | 196 | 273 | 389 | 535 | 779 | 981 |
| 50 - 59 yrs | 503 | 28.0 | 146 | 201 | 266 | 444 | 649 | 896 | 1113 |
| 60 - 69 yrs | 448 | 34.8 | 132 | 154 | 246 | 371 | 547 | 744 | 1239 |
| All | 458 | 8.1 | 146 | 186 | 265 | 395 | 564 | 791 | 985 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 480 | 12.2 | 141 | 186 | 279 | 420 | 625 | 844 | 1035 |
| 30 - 39 yrs | 480 | 10.1 | 152 | 197 | 283 | 430 | 608 | 821 | 986 |
| 40 - 49 yrs | 486 | 12.2 | 168 | 210 | 293 | 418 | 593 | 813 | 1009 |
| 50 - 59 yrs | 506 | 17.2 | 176 | 217 | 297 | 455 | 654 | 873 | 1011 |
| 60 - 69 yrs | 447 | 22.6 | 140 | 171 | 262 | 386 | 543 | 762 | 1019 |
| **Overall** | **482** | **5.7** | **162** | **202** | **289** | **430** | **608** | **815** | **985** |

*SEM - standard error of mean*

## RDA

The RDA for calcium for adults of both genders from 18 to 69 years old is 500 milligrams. This is obtained from the Report of the Joint FAO/WHO Expert Group, FAO, Rome, 1961. The mean calcium intake of males and females meet 102% and 92% of their mean RDA respectively.

## Comparison with RDA

More than one-third (36.3%) of Singaporean adults do not meet 70% of the RDA for calcium. A larger proportion of females (41.6%) than males (31.7%) reported having such intake.

Among ethnic groups, the largest proportion of females not meeting 70% of the RDA for calcium is found among the Malays. About half of the Malay females (51.3%) do not meet 70% of the RDA and almost one-third (29.2%) do not meet even 50% of their RDA.

Among the age groups, the highest proportion of Singaporean adults not meeting 70% of their RDA for calcium is found among those aged 60-69 years (43.9%). Close to a quarter (23.2%) of this age group do not meet even 50% of their RDA.

**Table 4.10.2 - Distribution by percent RDA met for calcium (mg) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 14.4 | 31.3 | 56.6 | 43.4 | 30.0 | 13.8 | 4.7 |
| Malay | 21.0 | 34.9 | 59.7 | 40.3 | 27.7 | 14.7 | 4.6 |
| Indian | 13.3 | 29.1 | 52.6 | 47.4 | 36.7 | 24.0 | 8.7 |
| All | 15.6 | 31.7 | 56.5 | 43.5 | 30.7 | 15.8 | 5.4 |
| **Females** | | | | | | | |
| Chinese | 19.2 | 40.3 | 66.1 | 33.9 | 21.2 | 11.0 | 3.9 |
| Malay | 29.2 | 51.3 | 73.8 | 26.2 | 16.5 | 10.1 | 3.7 |
| Indian | 19.1 | 34.5 | 60.0 | 40.0 | 30.0 | 18.2 | 8.6 |
| All | 21.3 | 41.6 | 66.7 | 33.3 | 21.7 | 12.1 | 4.7 |
| **All** | | | | | | | |
| Chinese | 17.0 | 36.2 | 61.8 | 38.2 | 25.2 | 12.3 | 4.3 |
| Malay | 25.3 | 43.6 | 67.1 | 32.9 | 21.8 | 12.3 | 4.2 |
| Indian | 16.3 | 32.0 | 56.5 | 43.5 | 33.2 | 20.9 | 8.7 |
| **Overall** | **17.8** | **36.3** | **61.5** | **38.5** | **25.9** | **13.2** | **4.6** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 16.5 | 34.5 | 57.6 | 42.4 | 31.8 | 18.0 | 5.1 |
| 30 - 39 yrs | 16.3 | 29.0 | 55.0 | 45.0 | 31.4 | 16.6 | 6.0 |
| 40 - 49 yrs | 14.5 | 30.3 | 54.8 | 45.2 | 31.0 | 14.8 | 5.9 |
| 50 - 59 yrs | 13.0 | 29.7 | 55.8 | 44.2 | 34.1 | 14.5 | 4.3 |
| 60 - 69 yrs | 19.0 | 41.8 | 67.1 | 32.9 | 17.7 | 11.4 | 3.8 |
| All | 15.6 | 31.7 | 56.5 | 43.5 | 30.7 | 15.8 | 5.4 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 22.1 | 41.6 | 65.9 | 34.1 | 24.4 | 12.3 | 6.2 |
| 30 - 39 yrs | 21.3 | 42.1 | 66.3 | 33.7 | 21.1 | 11.0 | 2.9 |
| 40 - 49 yrs | 18.7 | 41.8 | 70.9 | 29.1 | 18.4 | 11.0 | 4.7 |
| 50 - 59 yrs | 22.1 | 36.8 | 58.8 | 41.2 | 27.2 | 19.1 | 5.9 |
| 60 - 69 yrs | 27.1 | 45.9 | 67.1 | 32.9 | 20.0 | 9.4 | 5.9 |
| All | 21.3 | 41.6 | 66.7 | 33.3 | 21.7 | 12.1 | 4.7 |
| **All** | | | | | | | |
| 18 - 29 yrs | 19.5 | 38.4 | 62.2 | 37.8 | 27.7 | 14.9 | 5.7 |
| 30 - 39 yrs | 19.1 | 36.3 | 61.3 | 38.7 | 25.6 | 13.5 | 4.3 |
| 40 - 49 yrs | 16.7 | 36.5 | 63.5 | 36.5 | 24.2 | 12.8 | 5.3 |
| 50 - 59 yrs | 17.5 | 33.2 | 57.3 | 42.7 | 30.7 | 16.8 | 5.1 |
| 60 - 69 yrs | 23.2 | 43.9 | 67.1 | 32.9 | 18.9 | 10.4 | 4.9 |
| **Overall** | **17.8** | **36.3** | **61.5** | **38.5** | **25.9** | **13.2** | **4.6** |

## 4.11 Sodium intakes

The mean sodium intake of Singaporean adults is 3527mg and the intake of 90% of Singaporean adults lies between 1157mg and 6403mg.

The sodium intake for males is 3584mg whereas that for females is 3055mg. The mean difference in the intakes of the genders is statistically significant. Daily sodium intake of 90% of the males lies between 1140mg and 6702mg, and for females it lies between 885mg and 5897mg.

Both genders from the Chinese ethnic group have significantly higher sodium intakes (4025mg for males and 3477 for females) than their counterparts from the other ethnic groups.

Generally, sodium intake decreases with age. Those aged 18-29 years have the highest mean sodium intake (3490mg) while those aged 60-69 years have the lowest sodium intake (2887mg).

**Table 4.11.1 - Mean, SEM and percentile distribution of daily sodium (mg) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 4025 | 64.7 | 1603 | 1984 | 2856 | 3860 | 4657 | 6119 | 7062 |
| Malay | 2885 | 103.0 | 959 | 1156 | 1682 | 2555 | 3776 | 5151 | 5687 |
| Indian | 2952 | 111.0 | 861 | 1213 | 1844 | 2736 | 3701 | 4984 | 6072 |
| All | 3584 | 51.8 | 1140 | 1498 | 2329 | 3408 | 4664 | 5727 | 6702 |
| **Females** | | | | | | | | | |
| Chinese | 3477 | 55.4 | 1330 | 1661 | 2349 | 3263 | 4384 | 5566 | 6134 |
| Malay | 2293 | 84.1 | 528 | 789 | 1343 | 2023 | 2967 | 4202 | 4776 |
| Indian | 2453 | 94.5 | 713 | 906 | 1434 | 2277 | 3135 | 4219 | 4809 |
| All | 3055 | 44.5 | 885 | 1252 | 1881 | 2841 | 3926 | 5082 | 5897 |
| **All** | | | | | | | | | |
| Chinese | 3725 | 42.7 | 1411 | 1760 | 2580 | 3519 | 4703 | 5762 | 6608 |
| Malay | 2572 | 67.1 | 636 | 936 | 1468 | 2308 | 3377 | 4684 | 5305 |
| Indian | 2688 | 73.3 | 760 | 1065 | 1609 | 2429 | 3467 | 4576 | 5404 |
| **Overall** | **3527** | **34.4** | **1157** | **1529** | **2296** | **3313** | **4534** | **5683** | **6403** |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 3733 | 116.4 | 1140 | 1340 | 2298 | 3616 | 4796 | 6188 | 6985 |
| 30 - 39 yrs | 3806 | 92.2 | 1374 | 1702 | 2680 | 3554 | 4815 | 5874 | 7142 |
| 40 - 49 yrs | 3445 | 97.9 | 1020 | 1363 | 2245 | 3203 | 4652 | 5573 | 6225 |
| 50 - 59 yrs | 3410 | 122.3 | 1261 | 1625 | 2346 | 3245 | 4394 | 5487 | 5916 |
| 60 - 69 yrs | 2992 | 203.8 | 522 | 966 | 1609 | 2766 | 4056 | 5281 | 7060 |
| All | 3584 | 51.8 | 1140 | 1498 | 2329 | 3408 | 4664 | 5727 | 6702 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 3289 | 100.5 | 1119 | 1413 | 2046 | 2989 | 4074 | 5702 | 6525 |
| 30 - 39 yrs | 3080 | 73.8 | 909 | 1281 | 1933 | 2910 | 4053 | 5161 | 5722 |
| 40 - 49 yrs | 2939 | 79.2 | 807 | 1140 | 1780 | 2821 | 3822 | 4813 | 5592 |
| 50 - 59 yrs | 2904 | 144.8 | 838 | 1240 | 1731 | 2571 | 3608 | 4781 | 6421 |
| 60 - 69 yrs | 2789 | 177.9 | 603 | 797 | 1502 | 2513 | 3748 | 4901 | 6190 |
| All | 3055 | 44.5 | 885 | 1252 | 1881 | 2841 | 3926 | 5082 | 5897 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 3490 | 76.7 | 1147 | 1413 | 2112 | 3239 | 4491 | 5953 | 6771 |
| 30 - 39 yrs | 3401 | 59.4 | 1147 | 1404 | 2228 | 3264 | 4400 | 5581 | 6186 |
| 40 - 49 yrs | 3173 | 62.9 | 928 | 1218 | 2030 | 2989 | 4248 | 5214 | 5973 |
| 50 - 59 yrs | 3159 | 95.7 | 997 | 1415 | 2002 | 2900 | 4112 | 5214 | 5981 |
| 60 - 69 yrs | 2887 | 134.5 | 547 | 867 | 1560 | 2552 | 3828 | 5078 | 6235 |
| **Overall** | **3527** | **34.4** | **1157** | **1529** | **2296** | **3313** | **4534** | **5683** | **6403** |

*SEM - standard error of mean*

## Dietary Guidelines Recommendation

The dietary guidelines recommend that sodium intake should not exceed 667mg per 1000kcal of energy requirements for both genders (refer to Table 4.3.3 for energy requirements)

**Table 4.11.2 - Recommended intake for sodium (mg) by gender and age group**

| Age group (years) | 18-29 | 30-39 | 40-49 | 50-59 | ≥60 |
|---|---|---|---|---|---|
| Males | 1782 | 1728 | 1728 | 1728 | 1457 |
| Females | 1388 | 1379 | 1379 | 1379 | 1243 |

## Mean Recommended Intake

Calculation for mean recommended intake for sodium for males:

$$\frac{\sum (\text{Number of males in each age group} \times \text{respective recommended intake})}{\text{Total number of males}}$$

Similar calculation is used for females.

Based on these calculations, the mean recommended intake for sodium for males is 1721mg and that for females is 1372mg. The mean sodium intake of males and females meet 208% and 223% of their mean recommendations respectively.

## Comparison with mean recommended intake

Almost all of the population (90.1%) exceed their recommendation for sodium.

Almost 95% of the Chinese have sodium intake meeting or exceeding the recommendation. Around 90% of the Chinese have their sodium intakes at least 1.2 times higher than the recommendation. Almost two-thirds of the Chinese (63.3%) have intakes double the recommendation for sodium.

The proportion of people exceeding their recommended intake for sodium is consistently high (over 80%) across all age groups although there appears to be a slight reduction with advancing age.

**Table 4.11.3 - Distribution by percent recommendation met for sodium (mg) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 1.1 | 2.9 | 6.2 | 93.8 | 89.1 | 81.6 | 60.7 |
| Malay | 4.6 | 11.3 | 26.9 | 73.1 | 66.0 | 49.6 | 29.0 |
| Indian | 4.1 | 10.2 | 22.4 | 77.6 | 68.4 | 54.6 | 32.7 |
| All | 2.4 | 6.0 | 13.6 | 86.4 | 80.3 | 69.8 | 48.8 |
| **Females** | | | | | | | |
| Chinese | 0.3 | 1.4 | 5.6 | 94.4 | 90.3 | 81.7 | 65.5 |
| Malay | 8.2 | 15.7 | 25.5 | 74.5 | 62.2 | 47.9 | 31.1 |
| Indian | 4.5 | 10.9 | 22.7 | 77.3 | 70.0 | 58.2 | 30.5 |
| All | 2.6 | 6.0 | 12.7 | 87.3 | 81.0 | 70.6 | 52.3 |
| **All** | | | | | | | |
| Chinese | 0.6 | 2.1 | 5.9 | 94.1 | 89.8 | 81.7 | 63.3 |
| Malay | 6.5 | 13.7 | 26.1 | 73.9 | 64.0 | 48.7 | 30.1 |
| Indian | 4.3 | 10.6 | 22.6 | 77.4 | 69.2 | 56.5 | 31.5 |
| **Overall** | **1.7** | **4.3** | **9.9** | **90.1** | **84.7** | **75.4** | **56.4** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 2.7 | 8.6 | 14.5 | 85.5 | 78.0 | 69.4 | 51.4 |
| 30 - 39 yrs | 1.5 | 2.1 | 10.6 | 89.4 | 84.9 | 77.3 | 53.8 |
| 40 - 49 yrs | 2.4 | 7.6 | 15.2 | 84.8 | 79.7 | 65.2 | 44.1 |
| 50 - 59 yrs | 1.4 | 3.6 | 13.0 | 87.0 | 81.2 | 65.9 | 42.8 |
| 60 - 69 yrs | 6.3 | 12.7 | 19.0 | 81.0 | 69.6 | 63.3 | 46.8 |
| All | 2.4 | 6.0 | 13.6 | 86.4 | 80.3 | 69.8 | 48.8 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 1.6 | 3.2 | 8.8 | 91.2 | 84.7 | 73.4 | 54.9 |
| 30 - 39 yrs | 2.4 | 5.5 | 12.9 | 87.1 | 81.3 | 72.5 | 53.8 |
| 40 - 49 yrs | 3.0 | 7.4 | 14.8 | 85.2 | 79.5 | 69.7 | 51.3 |
| 50 - 59 yrs | 3.7 | 6.6 | 12.5 | 87.5 | 78.7 | 64.0 | 44.9 |
| 60 - 69 yrs | 4.7 | 11.8 | 17.6 | 82.4 | 75.3 | 65.9 | 51.8 |
| All | 2.6 | 6.0 | 12.7 | 87.3 | 81.0 | 70.6 | 52.3 |
| **All** | | | | | | | |
| 18 - 29 yrs | 2.1 | 5.7 | 11.4 | 88.6 | 81.7 | 71.6 | 53.3 |
| 30 - 39 yrs | 2.0 | 4.0 | 11.9 | 88.1 | 82.9 | 74.6 | 53.8 |
| 40 - 49 yrs | 2.7 | 7.5 | 15.0 | 85.0 | 79.6 | 67.6 | 48.0 |
| 50 - 59 yrs | 2.6 | 5.1 | 12.8 | 87.2 | 79.9 | 65.0 | 43.8 |
| 60 - 69 yrs | 5.5 | 12.2 | 18.3 | 81.7 | 72.6 | 64.6 | 49.4 |
| **Overall** | **1.7** | **4.3** | **9.9** | **90.1** | **84.7** | **75.4** | **56.4** |

## 4.12 Vitamin A intakes

The mean daily vitamin A intake of Singaporean adults is 702mcg and the intake of 90% of Singaporean adults lies between 84mcg and 2046mcg.

The vitamin A intake of males is 720mcg whereas that of females is 690mcg. The mean difference in vitamin A intakes between the genders is not statistically significant. Daily vitamin A intake of 90% of the males lies between 94mcg and 2128mcg, and for females it lies between 82mcg and 2077mcg.

Both males and females of Malay ethnicity have lower vitamin A intakes (656mcg for males and 576mcg for females) than their counterparts from the Chinese and Indian ethnic groups.

The older Singaporeans (50-59 years) have significantly higher vitamin A intake (844mcg) than the younger population (18-29 years) (621 mcg).

**Table 4.12.1 - Mean, SEM and percentile distribution of daily vitamin A (mcg) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 704 | 36.3 | 102 | 150 | 279 | 479 | 774 | 1329 | 2008 |
| Malay | 656 | 55.2 | 83 | 121 | 249 | 483 | 749 | 1327 | 1651 |
| Indian | 849 | 85.3 | 107 | 145 | 298 | 512 | 918 | 1610 | 2687 |
| All | 720 | 29.3 | 94 | 138 | 279 | 484 | 784 | 1410 | 2128 |
| **Females** | | | | | | | | | |
| Chinese | 719 | 43.1 | 81 | 128 | 221 | 428 | 790 | 1298 | 2119 |
| Malay | 576 | 44.5 | 71 | 102 | 207 | 363 | 671 | 1139 | 1892 |
| Indian | 723 | 59.0 | 106 | 155 | 296 | 465 | 783 | 1516 | 2208 |
| All | 690 | 30.1 | 82 | 126 | 230 | 423 | 760 | 1337 | 2077 |
| **All** | | | | | | | | | |
| Chinese | 712 | 28.7 | 84 | 137 | 241 | 456 | 783 | 1312 | 2076 |
| Malay | 613 | 35.1 | 83 | 105 | 231 | 420 | 705 | 1201 | 1744 |
| Indian | 782 | 50.9 | 107 | 153 | 298 | 482 | 869 | 1562 | 2674 |
| **Overall** | **702** | **21.4** | **84** | **135** | **242** | **457** | **774** | **1328** | **2046** |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 668 | 56.0 | 86 | 136 | 243 | 473 | 714 | 1201 | 2271 |
| 30 - 39 yrs | 700 | 47.2 | 89 | 135 | 295 | 469 | 824 | 1302 | 2059 |
| 40 - 49 yrs | 794 | 72.0 | 106 | 160 | 270 | 493 | 796 | 1514 | 2110 |
| 50 - 59 yrs | 688 | 64.7 | 88 | 127 | 288 | 449 | 816 | 1616 | 2469 |
| 60 - 69 yrs | 748 | 100.5 | 46 | 146 | 310 | 529 | 842 | 1423 | 2475 |
| All | 720 | 29.3 | 94 | 138 | 279 | 484 | 784 | 1410 | 2128 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 582 | 46.2 | 83 | 100 | 203 | 389 | 662 | 1239 | 1662 |
| 30 - 39 yrs | 678 | 44.7 | 79 | 121 | 233 | 440 | 768 | 1279 | 2076 |
| 40 - 49 yrs | 684 | 51.6 | 92 | 140 | 230 | 426 | 768 | 1292 | 2119 |
| 50 - 59 yrs | 1003 | 177.1 | 117 | 157 | 279 | 464 | 955 | 1992 | 2837 |
| 60 - 69 yrs | 661 | 81.3 | 52 | 110 | 234 | 409 | 813 | 1473 | 2405 |
| All | 690 | 30.1 | 82 | 126 | 230 | 423 | 760 | 1337 | 2077 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 621 | 35.8 | 84 | 121 | 215 | 436 | 694 | 1219 | 1864 |
| 30 - 39 yrs | 688 | 32.5 | 83 | 134 | 254 | 450 | 786 | 1276 | 2063 |
| 40 - 49 yrs | 735 | 43.4 | 95 | 145 | 249 | 469 | 775 | 1434 | 2094 |
| 50 - 59 yrs | 844 | 94.0 | 100 | 157 | 280 | 459 | 856 | 1747 | 2662 |
| 60 - 69 yrs | 703 | 64.1 | 52 | 129 | 241 | 511 | 822 | 1435 | 2440 |
| **Overall** | **702** | **21.4** | **84** | **135** | **242** | **457** | **774** | **1328** | **2046** |

*SEM - standard error of mean*

## RDA

Requirement for vitamin A is obtained from the Report of the Joint FAO/WHO Expert Group, FAO, Rome, 1965. The requirement is 750mcg for adults of both genders aged 18 to 69 years old. The mean intake of vitamin A of males and females meet 96% and 92% of their RDA respectively.

## Comparison with RDA

Over half (57.5%) of the population do not meet 70% of their RDA for vitamin A. Higher proportion of females (60.1%) than males (54.8%) have such intake.

The largest proportion of people not meeting 70% of their RDA for vitamin A is among the Malay females (65.2%). More than half (51.7%) of Malay females do not meet even 50% of their RDA for vitamin A.

Among the age groups, the largest proportion of those not meeting 70% of their RDA for vitamin A is among the females aged 18-29 years (64.3%). Almost half (48.7%) of this group of people do not meet even 50% of their RDA.

**Table 4.12.2 - Distribution by percent RDA met for vitamin A (mcg) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 35.7 | 54.9 | 73.9 | 26.1 | 19.0 | 12.3 | 8.2 |
| Malay | 37.8 | 57.6 | 75.2 | 24.8 | 16.8 | 11.3 | 8.0 |
| Indian | 35.7 | 51.0 | 66.3 | 33.7 | 26.0 | 17.3 | 10.7 |
| All | 36.1 | 54.8 | 72.8 | 27.2 | 19.8 | 13.0 | 8.6 |
| **Females** | | | | | | | |
| Chinese | 44.0 | 59.0 | 73.5 | 26.5 | 20.5 | 13.8 | 7.9 |
| Malay | 51.7 | 65.2 | 80.1 | 19.9 | 14.6 | 10.1 | 6.4 |
| Indian | 35.9 | 58.2 | 72.7 | 27.3 | 21.8 | 15.9 | 10.9 |
| All | 44.2 | 60.1 | 74.8 | 25.2 | 19.5 | 13.4 | 8.1 |
| **All** | | | | | | | |
| Chinese | 40.2 | 57.1 | 73.7 | 26.3 | 19.8 | 13.1 | 8.0 |
| Malay | 45.1 | 61.6 | 77.8 | 22.2 | 15.6 | 10.7 | 7.1 |
| Indian | 35.8 | 54.8 | 69.7 | 30.3 | 23.8 | 16.6 | 10.8 |
| **Overall** | **40.3** | **57.5** | **73.9** | **26.1** | **19.5** | **13.2** | **8.2** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 37.6 | 55.3 | 77.3 | 22.7 | 16.9 | 10.2 | 7.1 |
| 30 - 39 yrs | 35.6 | 54.7 | 70.1 | 29.9 | 20.5 | 12.4 | 7.9 |
| 40 - 49 yrs | 36.9 | 54.9 | 72.8 | 27.2 | 21.0 | 15.5 | 10.0 |
| 50 - 59 yrs | 37.0 | 58.0 | 73.2 | 26.8 | 18.8 | 13.8 | 10.1 |
| 60 - 69 yrs | 29.1 | 48.1 | 69.6 | 30.4 | 22.8 | 13.9 | 8.9 |
| All | 36.1 | 54.8 | 72.8 | 27.2 | 19.8 | 13.0 | 8.6 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 48.7 | 64.3 | 79.2 | 20.8 | 15.3 | 11.4 | 5.5 |
| 30 - 39 yrs | 43.1 | 60.0 | 74.9 | 25.1 | 20.6 | 12.7 | 7.7 |
| 40 - 49 yrs | 43.3 | 59.3 | 74.5 | 25.5 | 19.0 | 13.1 | 8.0 |
| 50 - 59 yrs | 39.7 | 55.9 | 66.2 | 33.8 | 26.5 | 21.3 | 14.7 |
| 60 - 69 yrs | 44.7 | 55.3 | 72.9 | 27.1 | 20.0 | 12.9 | 9.4 |
| All | 44.2 | 60.1 | 74.8 | 25.2 | 19.5 | 13.4 | 8.1 |
| **All** | | | | | | | |
| 18 - 29 yrs | 43.7 | 60.2 | 78.3 | 21.7 | 16.0 | 10.8 | 6.2 |
| 30 - 39 yrs | 39.8 | 57.7 | 72.8 | 27.2 | 20.6 | 12.6 | 7.7 |
| 40 - 49 yrs | 40.4 | 57.3 | 73.7 | 26.3 | 19.9 | 14.2 | 8.9 |
| 50 - 59 yrs | 38.3 | 56.9 | 69.7 | 30.3 | 22.6 | 17.5 | 12.4 |
| 60 - 69 yrs | 37.2 | 51.8 | 71.3 | 28.7 | 21.3 | 13.4 | 9.1 |
| **Overall** | **40.3** | **57.5** | **73.9** | **26.1** | **19.5** | **13.2** | **8.2** |

## 4.13 Vitamin C intakes

The mean daily vitamin C intake of Singaporean adults is 88mg and the intake of 90% of Singaporean adults lies between 1mg and 270mg.

The vitamin C intakes of males and females are similar (83mg vs 84 mg). Daily vitamin C intake of 90% of the males lies between 1mg and 267mg, and for females it lies between 1mg and 252mg.

The Malays have a significantly lower mean vitamin C intake (58mg) than the Chinese (93mg) and Indians (81mg).

Among age groups, those aged 18-29 years have the lowest intake (75mg) while those aged 60-69 years have the highest intake (99mg).

**Table 4.13.1 - Mean, SEM and percentile distribution of daily vitamin C (mg) intake by gender, ethnic group and age group**

| | Mean | SEM | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 93 | 5.3 | 1 | 5 | 21 | 52 | 119 | 193 | 278 |
| Malay | 57 | 5.6 | 1 | 3 | 10 | 30 | 64 | 135 | 230 |
| Indian | 81 | 6.4 | 4 | 10 | 24 | 54 | 101 | 184 | 282 |
| All | 83 | 3.6 | 1 | 5 | 18 | 46 | 104 | 179 | 267 |
| **Females** | | | | | | | | | |
| Chinese | 94 | 4.9 | 1 | 5 | 20 | 54 | 113 | 203 | 285 |
| Malay | 60 | 5.6 | 1 | 4 | 12 | 31 | 75 | 132 | 182 |
| Indian | 80 | 6.4 | 1 | 5 | 19 | 51 | 102 | 192 | 236 |
| All | 84 | 3.4 | 1 | 4 | 17 | 47 | 103 | 188 | 252 |
| **All** | | | | | | | | | |
| Chinese | 93 | 3.6 | 1 | 5 | 21 | 53 | 114 | 200 | 282 |
| Malay | 58 | 4.0 | 1 | 3 | 11 | 31 | 69 | 133 | 189 |
| Indian | 81 | 4.5 | 2 | 7 | 22 | 53 | 101 | 187 | 246 |
| **Overall** | **88** | **2.6** | **1** | **5** | **18** | **49** | **110** | **190** | **270** |
| **Males** | | | | | | | | | |
| 18 - 29 yrs | 79 | 8.2 | 1 | 4 | 14 | 37 | 90 | 170 | 262 |
| 30 - 39 yrs | 83 | 6.6 | 1 | 4 | 19 | 47 | 108 | 180 | 271 |
| 40 - 49 yrs | 83 | 7.3 | 1 | 4 | 19 | 47 | 98 | 169 | 260 |
| 50 - 59 yrs | 82 | 7.9 | 4 | 6 | 23 | 48 | 119 | 173 | 326 |
| 60 - 69 yrs | 95 | 12.3 | 2 | 10 | 22 | 53 | 135 | 246 | 335 |
| All | 83 | 3.6 | 1 | 5 | 18 | 46 | 104 | 179 | 267 |
| **Females** | | | | | | | | | |
| 18 - 29 yrs | 71 | 6.6 | 1 | 3 | 12 | 35 | 89 | 143 | 218 |
| 30 - 39 yrs | 82 | 6.0 | 1 | 4 | 15 | 44 | 99 | 185 | 253 |
| 40 - 49 yrs | 90 | 6.3 | 3 | 6 | 22 | 56 | 107 | 208 | 297 |
| 50 - 59 yrs | 95 | 12.5 | 1 | 6 | 25 | 56 | 122 | 192 | 238 |
| 60 - 69 yrs | 103 | 15.5 | 4 | 7 | 23 | 56 | 120 | 221 | 530 |
| All | 84 | 3.4 | 1 | 4 | 17 | 47 | 103 | 188 | 252 |
| **All** | | | | | | | | | |
| 18 - 29 yrs | 75 | 5.2 | 1 | 4 | 14 | 36 | 90 | 152 | 248 |
| 30 - 39 yrs | 82 | 4.4 | 1 | 4 | 17 | 45 | 101 | 181 | 263 |
| 40 - 49 yrs | 87 | 4.8 | 1 | 5 | 21 | 51 | 103 | 197 | 273 |
| 50 - 59 yrs | 89 | 7.4 | 1 | 6 | 24 | 54 | 120 | 183 | 243 |
| 60 - 69 yrs | 99 | 9.9 | 4 | 9 | 22 | 54 | 123 | 223 | 357 |
| **Overall** | **88** | **2.6** | **1** | **5** | **18** | **49** | **110** | **190** | **270** |

*SEM - standard error of mean*

## RDA

Requirement of vitamin C for adults of both genders and all ages is 30mg. This is obtained from the Report of the Joint FAO/WHO Expert Group, FAO, Rome, 1970. The mean intake of vitamin C for males and females meet 277% and 280% of their RDA respectively.

## Comparison with RDA

Around two-thirds (64.4%) of the population meet or exceed their RDA for vitamin C. Similar proportion of males (62.9%) and females (63.4%) meet or exceed their RDA for vitamin C.

The largest proportion of people not meeting their RDA for vitamin C is among the Malays (49.7%) followed by the Indians (34.1%) and Chinese (33.1%).

The proportion of people not meeting their RDA for vitamin C declines with age. Around 40% of those aged 18-39 years have vitamin C intake that is less than their RDA while around 30% of those aged 40-69 years have such intake.

**Table 4.13.2 - Distribution by percent RDA met for vitamin C (mg) by gender, ethnic group and age group**

| | <50% | <70% | <100% | =>100% | =>120% | =>150% | =>200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 20.0 | 25.2 | 33.5 | 66.5 | 61.2 | 54.6 | 46.3 |
| Malay | 32.8 | 40.8 | 50.0 | 50.0 | 44.1 | 36.6 | 27.3 |
| Indian | 14.3 | 21.9 | 33.2 | 66.8 | 62.2 | 55.1 | 45.9 |
| All | 21.8 | 28.0 | 37.1 | 62.9 | 57.6 | 50.8 | 42.1 |
| **Females** | | | | | | | |
| Chinese | 20.5 | 25.5 | 32.7 | 67.3 | 61.1 | 55.3 | 46.9 |
| Malay | 31.5 | 37.1 | 49.4 | 50.6 | 46.1 | 40.1 | 30.0 |
| Indian | 21.4 | 26.8 | 35.0 | 65.0 | 59.1 | 52.7 | 45.5 |
| All | 22.9 | 28.1 | 36.6 | 63.4 | 57.6 | 51.7 | 43.1 |
| **All** | | | | | | | |
| Chinese | 20.3 | 25.3 | 33.1 | 66.9 | 61.1 | 55.0 | 46.6 |
| Malay | 32.1 | 38.8 | 49.7 | 50.3 | 45.1 | 38.4 | 28.7 |
| Indian | 18.0 | 24.5 | 34.1 | 65.9 | 60.6 | 53.8 | 45.7 |
| **Overall** | **21.9** | **27.2** | **35.6** | **64.4** | **58.6** | **52.5** | **44.1** |
| **Males** | | | | | | | |
| 18 - 29 yrs | 27.1 | 35.7 | 44.7 | 55.3 | 50.2 | 47.1 | 39.2 |
| 30 - 39 yrs | 22.4 | 27.8 | 36.9 | 63.1 | 57.7 | 51.1 | 39.6 |
| 40 - 49 yrs | 19.7 | 25.5 | 34.1 | 65.9 | 60.3 | 51.4 | 44.5 |
| 50 - 59 yrs | 18.8 | 21.7 | 30.4 | 69.6 | 63.0 | 52.9 | 46.4 |
| 60 - 69 yrs | 15.2 | 24.1 | 35.4 | 64.6 | 62.0 | 55.7 | 45.6 |
| All | 21.8 | 28.0 | 37.1 | 62.9 | 57.6 | 50.8 | 42.1 |
| **Females** | | | | | | | |
| 18 - 29 yrs | 28.2 | 35.4 | 45.5 | 54.5 | 49.4 | 45.1 | 37.0 |
| 30 - 39 yrs | 24.9 | 28.9 | 37.8 | 62.2 | 55.7 | 49.5 | 42.3 |
| 40 - 49 yrs | 18.7 | 24.3 | 32.0 | 68.0 | 62.3 | 56.7 | 47.2 |
| 50 - 59 yrs | 18.4 | 21.3 | 28.7 | 71.3 | 66.2 | 57.4 | 47.1 |
| 60 - 69 yrs | 17.6 | 23.5 | 29.4 | 70.6 | 64.7 | 57.6 | 47.1 |
| All | 22.9 | 28.1 | 36.6 | 63.4 | 57.6 | 51.7 | 43.1 |
| **All** | | | | | | | |
| 18 - 29 yrs | 27.7 | 35.5 | 45.1 | 54.9 | 49.7 | 46.0 | 38.0 |
| 30 - 39 yrs | 23.8 | 28.4 | 37.4 | 62.6 | 56.6 | 50.2 | 41.1 |
| 40 - 49 yrs | 19.1 | 24.9 | 33.0 | 67.0 | 61.4 | 54.2 | 45.9 |
| 50 - 59 yrs | 18.6 | 21.5 | 29.6 | 70.4 | 64.6 | 55.1 | 46.7 |
| 60 - 69 yrs | 16.5 | 23.8 | 32.3 | 67.7 | 63.4 | 56.7 | 46.3 |
| **Overall** | **21.9** | **27.2** | **35.6** | **64.4** | **58.6** | **52.5** | **44.1** |

## 4.14 Fatty acid ratios relative to saturated fatty acid intakes

The recommended polyunsaturated fat, monounsaturated fat and saturated fat ratio (P: M: S ratio) for adults of both genders is 1.00 : 1.00 : 1.00.

The P: M: S ratio for Singaporean adults is 0.58: 0.96: 1.00. This indicates that the population has its fat intake made up mostly of saturated fat followed by monounsaturated fat and polyunsaturated fat. This observation holds true for all sub-groups of the population.

**Table 4.14.1 - Fatty acid ratios relative to saturated fatty acid intakes by gender, ethnic group and age group**

| | Mean Fat Intake (g) | PUFA/ SFA | MUFA/ SFA | SFA/ SFA |
|---|---|---|---|---|
| **Males** | | | | |
| Chinese | 74.7 | 0.54 | 0.97 | 1.00 |
| Malay | 69.8 | 0.44 | 0.84 | 1.00 |
| Indian | 65.8 | 0.55 | 0.85 | 1.00 |
| All | 72.0 | 0.52 | 0.92 | 1.00 |
| **Females** | | | | |
| Chinese | 61.3 | 0.63 | 1.00 | 1.00 |
| Malay | 53.1 | 0.56 | 0.89 | 1.00 |
| Indian | 56.6 | 0.69 | 0.86 | 1.00 |
| All | 58.8 | 0.63 | 0.96 | 1.00 |
| **All** | | | | |
| Chinese | 67.4 | 0.59 | 0.99 | 1.00 |
| Malay | 61.0 | 0.50 | 0.87 | 1.00 |
| Indian | 61.0 | 0.62 | 0.86 | 1.00 |
| **Overall** | **66.6** | **0.58** | **0.96** | **1.00** |
| **Males** | | | | |
| 18-29 yrs | 78.2 | 0.46 | 0.93 | 1.00 |
| 30-39 yrs | 76.8 | 0.50 | 0.92 | 1.00 |
| 40-49 yrs | 67.9 | 0.50 | 0.91 | 1.00 |
| 50-59 yrs | 68.6 | 0.60 | 0.93 | 1.00 |
| 60-69 yrs | 53.4 | 0.75 | 0.96 | 1.00 |
| All | 72.0 | 0.52 | 0.92 | 1.00 |
| **Females** | | | | |
| 18-29 yrs | 63.0 | 0.56 | 0.92 | 1.00 |
| 30-39 yrs | 60.7 | 0.59 | 0.95 | 1.00 |
| 40-49 yrs | 55.4 | 0.64 | 0.96 | 1.00 |
| 50-59 yrs | 56.6 | 0.76 | 0.99 | 1.00 |
| 60-69 yrs | 51.6 | 0.80 | 1.01 | 1.00 |
| All | 58.8 | 0.63 | 0.96 | 1.00 |
| **All** | | | | |
| 18-29 yrs | 69.9 | 0.51 | 0.92 | 1.00 |
| 30-39 yrs | 67.8 | 0.55 | 0.94 | 1.00 |
| 40-49 yrs | 61.2 | 0.57 | 0.94 | 1.00 |
| 50-59 yrs | 62.7 | 0.68 | 0.96 | 1.00 |
| 60-69 yrs | 52.4 | 0.77 | 0.99 | 1.00 |
| **Overall** | **66.6** | **0.58** | **0.96** | **1.00** |

The mean intakes of saturated fat, monounsaturated fat and polyunsaturated fat of Singaporean adults are 26.9g, 23.4g and 12.6g respectively. The mean percent of energy contributed by polyunsaturated fat, monounsaturated fat and saturated fat is 5.8%, 10.6%, and 12.1% respectively.

Males and females have similar percent of energy contributed by polyunsaturated fat (5.4% for males and 6.0% for females), monounsaturated fat (10.4% for males and 10.3% for females) and saturated fat (12.7% for males and 12.2% for females).

Malays have the highest percent of energy (15.3%) contributed by saturated fat, followed by the Indians (12.2%) and Chinese (11.6%).

Compared to other age groups, the youngest age group (18-29 years) has the highest percent of energy contributed by saturated fat (13.6%).

**Table 4.14.2 - Mean fatty acid intakes and mean percent contribution to total energy intakes by gender, ethnic group and age group**

| | Mean Intake(g) (SEM) | | | Energy Contribution(%) (SEM) | | |
|---|---|---|---|---|---|---|
| | PUFA | MUFA | SFA | PUFA | MUFA | SFA |
| **Males** | | | | | | |
| Chinese | 13.7 (0.3) | 26.7 (0.5) | 29.3 (0.7) | 5.6 (0.1) | 10.8 (0.1) | 11.8 (0.2) |
| Malay | 11.1 (0.4) | 23.7 (0.8) | 36.5 (4.0) | 4.9 (0.2) | 10.2 (0.2) | 15.2 (1.4) |
| Indian | 12.4 (0.5) | 21.8 (0.9) | 32.8 (5.9) | 5.3 (0.2) | 9.3 (0.3) | 13.0 (1.2) |
| All | 12.9 (0.2) | 25.2 (0.4) | 31.5 (1.4) | 5.4 (0.1) | 10.4 (0.1) | 12.7 (0.4) |
| **Females** | | | | | | |
| Chinese | 12.3 (0.3) | 21.6 (0.4) | 22.8 (0.5) | 6.2 (0.1) | 10.9 (0.1) | 11.4 (0.1) |
| Malay | 9.3 (0.4) | 17.7 (0.7) | 27.2 (3.2) | 5.4 (0.2) | 10.0 (0.2) | 15.4 (2.0) |
| Indian | 12.2 (0.6) | 17.5 (0.7) | 22.8 (1.1) | 6.3 (0.2) | 8.9 (0.2) | 11.4 (0.4) |
| All | 11.6 (0.2) | 20.1 (0.3) | 23.7 (0.7) | 6.0 (0.1) | 10.3 (0.1) | 12.2 (0.4) |
| **All** | | | | | | |
| Chinese | 12.9 (0.2) | 24.0 (0.3) | 25.7 (0.4) | 5.9 (0.1) | 10.8 (0.1) | 11.6 (0.1) |
| Malay | 10.2 (0.3) | 20.5 (0.5) | 31.6 (2.5) | 5.2 (0.1) | 10.1 (0.2) | 15.3 (1.2) |
| Indian | 12.3 (0.4) | 19.6 (0.6) | 27.5 (2.8) | 5.8 (0.2) | 9.1 (0.2) | 12.2 (0.6) |
| **Overall** | **12.6 (0.2)** | **23.4 (0.3)** | **26.9 (0.6)** | **5.8 (0.1)** | **10.6 (0.1)** | **12.1 (0.2)** |
| **Males** | | | | | | |
| 18-29 yrs | 13.0 (0.5) | 28.0 (0.9) | 36.9 (4.7) | 5.2 (0.1) | 11.0 (0.2) | 13.5 (1.0) |
| 30-39 yrs | 13.5 (0.4) | 27.0 (0.7) | 32.6 (2.1) | 5.4 (0.1) | 10.8 (0.2) | 12.9 (0.7) |
| 40-49 yrs | 12.1 (0.5) | 23.5 (0.7) | 28.7 (1.4) | 5.1 (0.2) | 10.0 (0.2) | 12.4 (0.5) |
| 50-59 yrs | 13.5 (0.8) | 23.3 (1.0) | 26.9 (1.2) | 5.9 (0.3) | 10.1 (0.3) | 11.8 (0.4) |
| 60-69 yrs | 12.0 (1.0) | 17.8 (1.2) | 27.0 (8.0) | 5.8 (0.4) | 8.7 (0.4) | 12.6 (3.1) |
| All | 12.9 (0.2) | 25.2 (0.4) | 31.5 (1.4) | 5.4 (0.1) | 10.4 (0.1) | 12.7 (0.4) |
| **Females** | | | | | | |
| 18-29 yrs | 11.7 (0.4) | 21.7 (0.7) | 27.5 (2.2) | 5.8 (0.2) | 10.6 (0.2) | 13.6 (1.2) |
| 30-39 yrs | 11.5 (0.4) | 20.9 (0.6) | 25.0 (1.4) | 6.0 (0.1) | 10.7 (0.2) | 13.0 (0.9) |
| 40-49 yrs | 11.2 (0.4) | 18.9 (0.5) | 21.2 (0.7) | 6.0 (0.2) | 10.2 (0.2) | 11.4 (0.2) |
| 50-59 yrs | 12.7 (0.8) | 18.9 (1.2) | 20.8 (1.4) | 6.7 (0.3) | 9.7 (0.3) | 10.5 (0.4) |
| 60-69 yrs | 12.1 (1.1) | 17.1 (1.3) | 18.4 (1.3) | 6.2 (0.4) | 9.0 (0.4) | 9.8 (0.5) |
| All | 11.6 (0.2) | 20.1 (0.3) | 23.7 (0.7) | 6.0 (0.1) | 10.3 (0.1) | 12.2 (0.4) |
| **All** | | | | | | |
| 18-29 yrs | 12.3 (0.3) | 24.6 (0.5) | 31.8 (2.4) | 5.5 (0.1) | 10.8 (0.1) | 13.6 (0.8) |
| 30-39 yrs | 12.4 (0.3) | 23.6 (0.5) | 28.4 (1.2) | 5.7 (0.1) | 10.8 (0.1) | 12.9 (0.6) |
| 40-49 yrs | 11.6 (0.3) | 21.0 (0.5) | 24.7 (0.7) | 5.6 (0.1) | 10.1 (0.1) | 11.8 (0.2) |
| 50-59 yrs | 13.1 (0.5) | 21.1 (0.8) | 23.9 (1.0) | 6.3 (0.2) | 9.9 (0.2) | 11.1 (0.3) |
| 60-69 yrs | 12.1 (0.8) | 17.4 (0.9) | 22.6 (3.9) | 6.0 (0.3) | 8.9 (0.3) | 11.1 (1.5) |
| **Overall** | **12.6 (0.2)** | **23.4 (0.3)** | **26.9 (0.6)** | **5.8 (0.1)** | **10.6 (0.1)** | **12.1 (0.2)** |

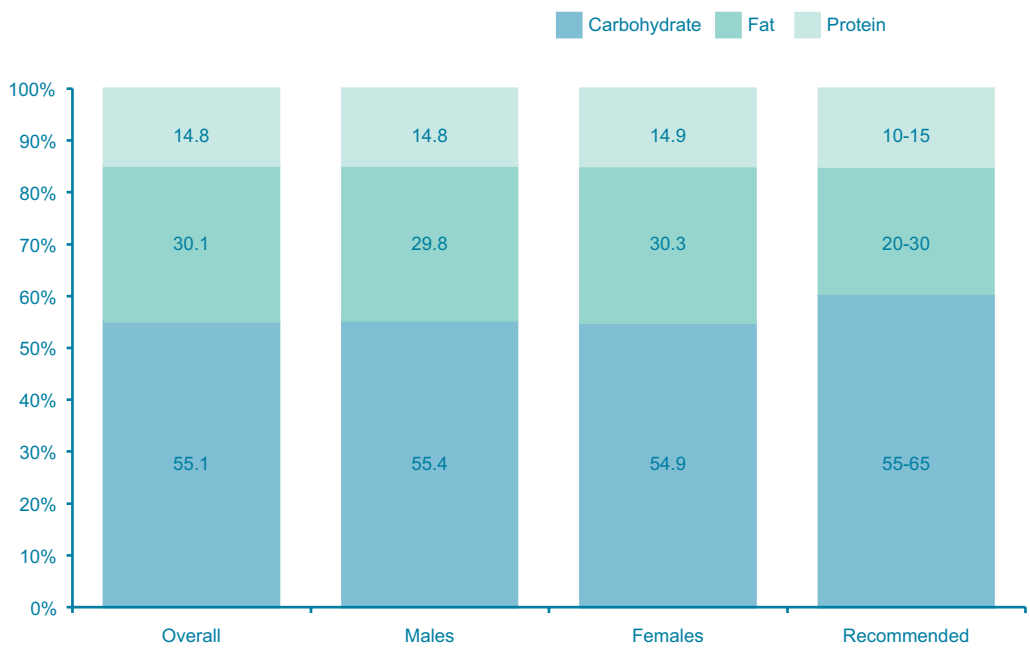
*SEM - standard error of mean*

## 4.15 Percent contribution of macronutrients to total energy intakes

The recommended contribution of carbohydrate to total energy intake is 55-65%, for fat is 20-30% and for protein is 10-15%.

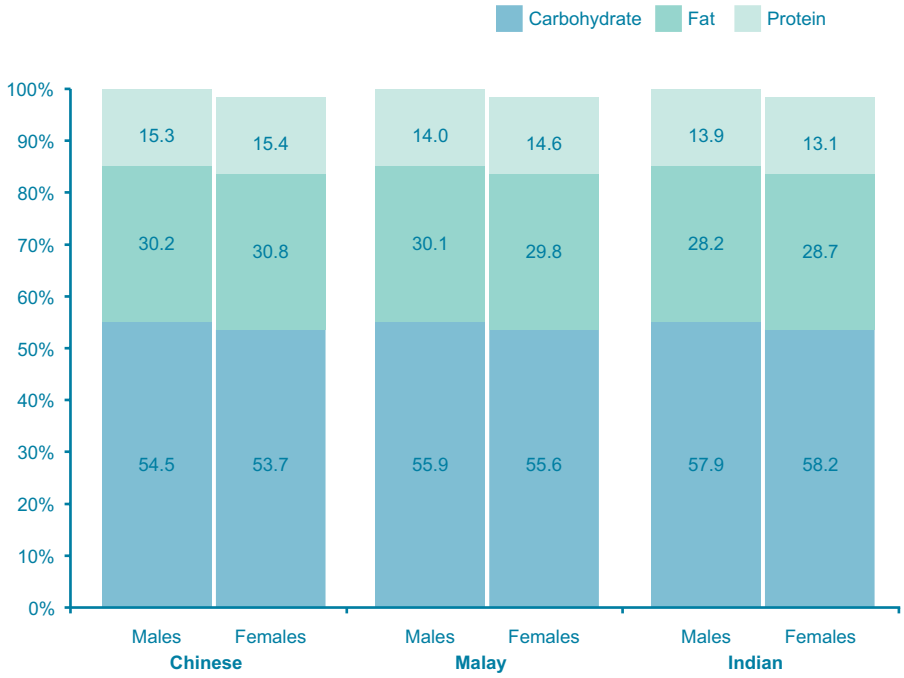
In general, the percent contribution of carbohydrate, protein and protein to total energy intake of Singaporean adults follows closely to the recommended ranges. The distribution of energy contribution of macronutrients to total energy intake is similar between males and females.

**Fig 4.15.1 - Percent distribution of energy contribution of macronutrients to total energy intake by gender**



The percent contribution of carbohydrate to total energy intake is highest among the Indian females (58.2%) and lowest among the Chinese females (53.7%). On the other hand, percent contribution of protein to energy intake is highest among the Chinese females (15.4%) and lowest among the Indian females (13.1%). The percent contribution of fat to total energy intake is highest among Chinese females (30.8%) and lowest among Indian males (28.2%).

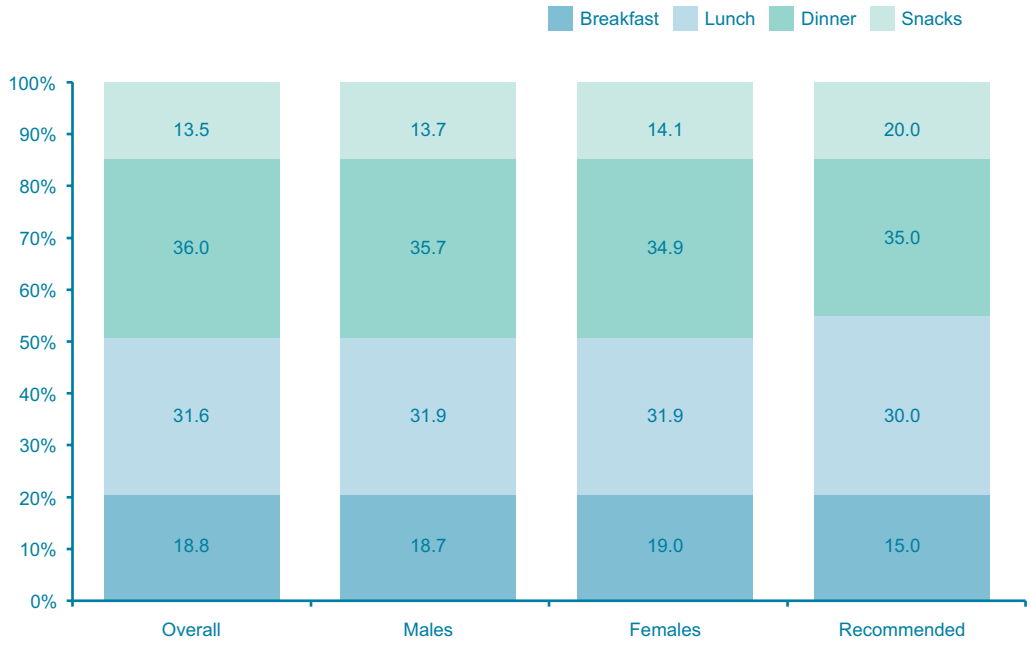
**Fig 4.15.2 - Percent distribution of energy contribution of macronutrients to total energy intake by ethnic groups**



## 4.16 Percent distribution of energy contribution from meals and snacks

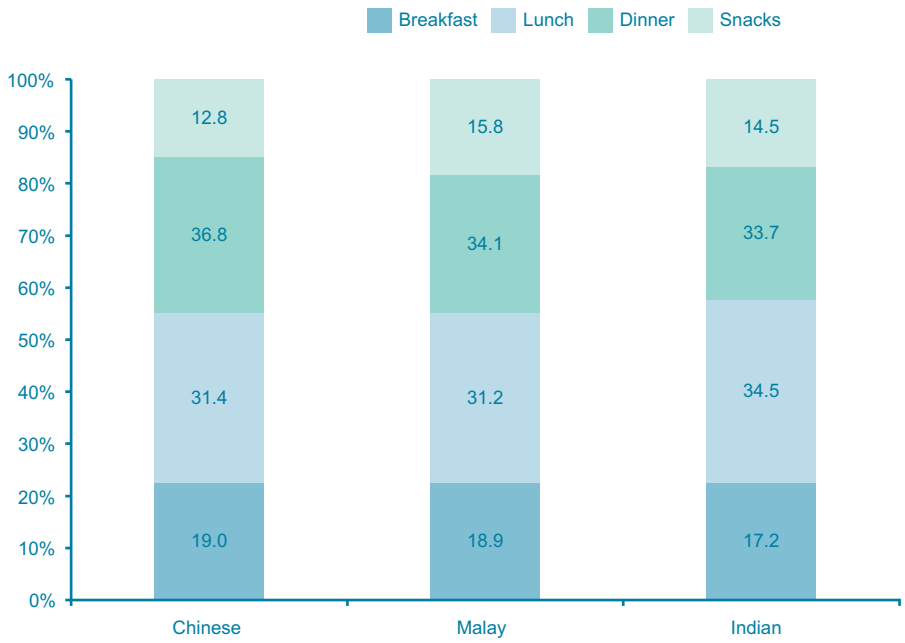
The recommended distribution of energy among meals for breakfast, lunch, dinner and snacks is 15%, 30%, 35% and 20 %. The energy distribution among meals and snacks is similar for both genders and follows closely to the recommended distribution.

**Fig 4.16.1 - Percent distribution of energy from meals and snacks by gender**



Chinese and Malays consume the highest proportion of dietary energy from dinner while Indians consume the highest proportion of energy from lunch compared to the energy contribution by other meals and snacks.

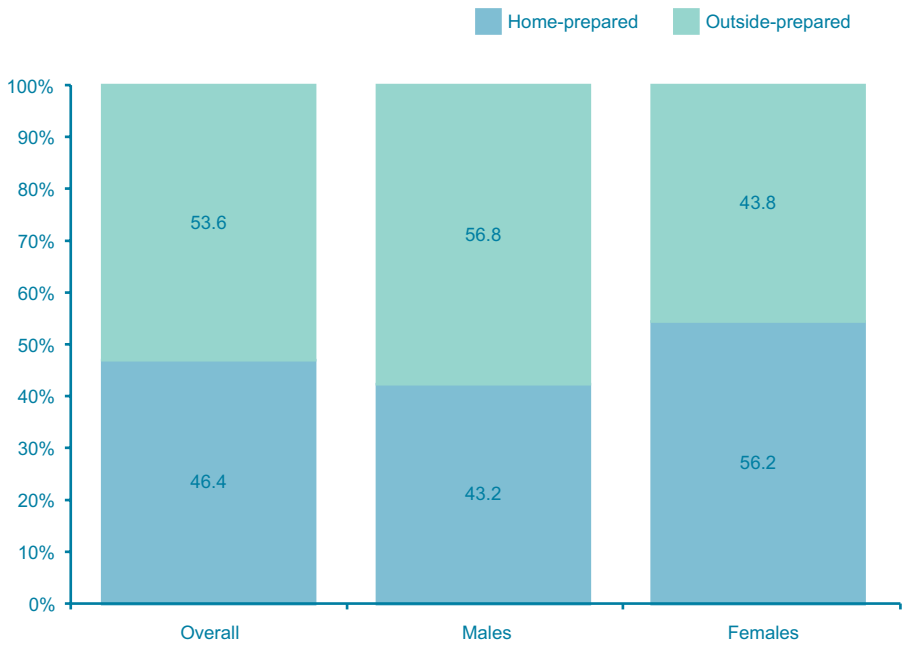
**Fig 4.16.2 - Percent distribution of energy contribution from meals and snacks by ethnic groups**



## 4.17 Percent distribution of energy by venue of food preparation*

Singaporeans generally have more than half of their dietary energy (53.6%) consumed from bought food. Males have more of their dietary energy (56.8%) consumed from bought food while females have more of their dietary energy (56.2%) consumed from home-prepared food.

**Fig 4.17.1 - Percent distribution of energy by venue of food preparation by gender**

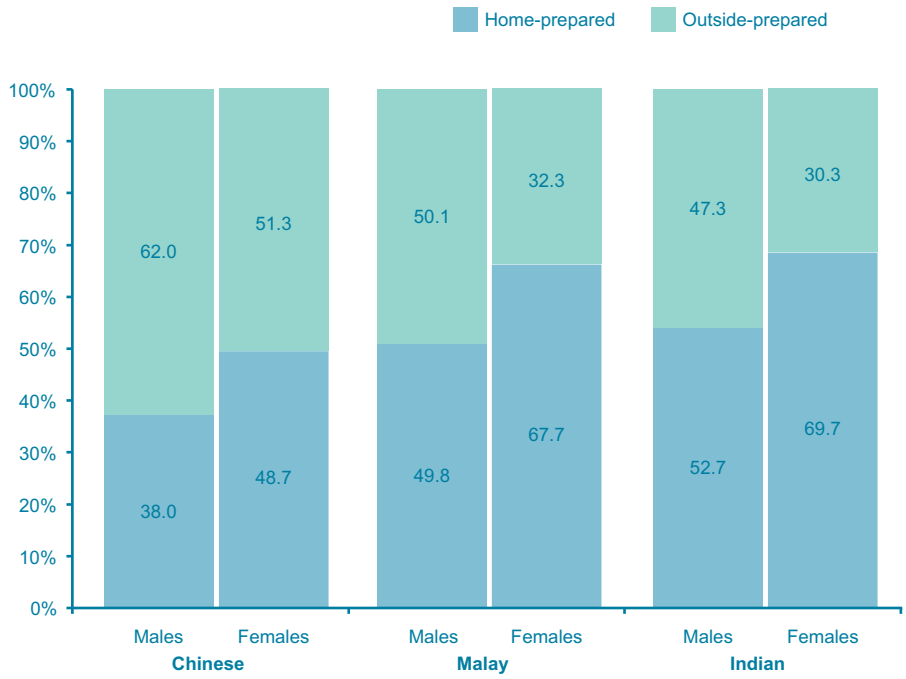



** Venue of food preparation is defined as where the food was prepared e.g. food packed from hawker centre but eaten at home is considered eating out.*

Chinese males have most of their energy (62.0%) consumed from bought food. The Malay males have almost equivalent amount of energy consumed from bought and home-prepared food. The Indian males have more than half of their energy (52.7%) consumed from home-prepared food.

Chinese females have more than half (51.3%) of their energy taken from bought food. Malay and Indian females have majority of their energy taken from home-prepared food (67.7% and 69.7% for Malay and Indian females respectively).

**Fig 4.17.2 - Percent distribution of energy by venue of food preparation by ethnic groups**



## 4.18 Comparisons of energy and nutrient intake findings with the 1993 Food Consumption Study (age-standardised)

The energy intake of females has increased significantly over the last five years. There is no significant change in the energy intake among the other sub-groups of the population.

**Table 4.18.1 - Energy intake (kcal) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (kcal) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 2155 | 2207 *(2109, 2304)* | 2122 | 2157 *(2118, 2196)* | -50 |
| Females | 1625 | 1620 *(1549, 1691)* | 1695 | 1722 *(1688, 1757)* | 102* |
| **Ethnic group:** | | | | | |
| Chinese | 1919 | 1935 *(1862, 2008)* | 1936 | 1968 *(1938, 1998)* | 33 |
| Malay | 1787 | 1819 *(1639, 2000)* | 1767 | 1806 *(1723, 1888)* | -13 |
| Indian | 1836 | 1876 *(1566, 2186)* | 1884 | 1918 *(1808, 2028)* | 42 |
| **Overall** | **1872** | **1915** ***(1845, 1981)*** | **1891** | **1942** ***(1915, 1967)*** | **27** |

*p<0.05

*Age-std: Age standardised*
*CI: Confidence Interval*

The protein intake of females has increased significantly by 4.9g over the five-year period. There is no significant change in the protein intake among the other sub-groups of the population.

**Table 4.18.2 - Protein intake (g) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (g) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 78 | 81.2 (77.1, 85.3) | 78 | 80.6 (78.8, 82.3) | -0.6 |
| Females | 59 | 60.1 (56.5, 63.7) | 63 | 65.0 (63.4, 66.5) | 4.9* |
| **Ethnic group:** | | | | | |
| Chinese | 72 | 72.7 (69.5, 75.9) | 74 | 75.1 (73.7, 76.4) | 2.4 |
| Malay | 63 | 64.1 (57.0, 71.3) | 63 | 64.3 (60.6, 67.9) | -0.2 |
| Indian | 61 | 61.2 (47.0, 75.4) | 64 | 64.8 (60.2, 69.4) | 42 |
| **Overall** | **68** | **70.7 (67.8, 73.6)** | **70** | **72.9 (71.6, 74.1)** | **2.2** |

*p<0.05

*Age-std: Age standardised*
*CI: Confidence Interval*

The fat intake of females has increased significantly by 5.8g from 1993 to 1998. There is no significant change in fat intake among the other sub-groups of the population.

**Table 4.18.3 - Fat intake (g) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (g) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 73 | 75.3 (70.7, 79.9) | 72 | 74.0 (72.1, 76.0) | -1.3 |
| Females | 54 | 54.6 (51.1, 58.2) | 59 | 60.4 (58.6, 62.1) | 5.8* |
| **Ethnic group:** | | | | | |
| Chinese | 65 | 66.2 (62.8, 69.6) | 67 | 68.6 (67.1, 70.1) | 2.4 |
| Malay | 60 | 60.8 (52.0, 69.5) | 61 | 62.5 (58.6, 66.3) | 1.7 |
| Indian | 59 | 60.4 (47.4, 73.4) | 61 | 62.0 (56.9, 67.1) | 1.6 |
| **Overall** | **63** | **65.0 (62.0, 68.1)** | **65** | **67.3 (65.9, 68.6)** | **2.3** |

*p<0.05

*Age-std: Age standardised*
*CI: Confidence Interval*

The saturated fat intake of the population has not changed significantly from 1993 to 1998.

**Table 4.18.4 - Saturated fat intake (g) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (g) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 30 | 30.9 (28.6, 33.1) | 29 | 29.3 (28.4, 30.2) | -1.6 |
| Females | 22 | 21.5 (19.8, 23.2) | 23 | 23.0 (22.2, 23.8) | 1.5 |
| **Ethnic group:** | | | | | |
| Chinese | 26 | 26.1 (24.6, 27.7) | 26 | 26.1 (25.4, 26.7) | -0.1 |
| Malay | 27 | 27.2 (21.8, 32.5) | 26 | 27.0 (24.9, 29.0) | -0.2 |
| Indian | 25 | 25.0 (18.7, 31.4) | 25 | 25.5 (22.8, 28.1) | 0.4 |
| **Overall** | **26** | **26.2 (24.7, 27.7)** | **26** | **26.1 (25.5, 26.8)** | **-0.1** |

*Age-std: Age standardised*
*CI: Confidence Interval*

Intake of monounsaturated fat from 1993 to 1998 has remained largely the same for most sub-groups, except in the females where intake has increased significantly.

**Table 4.18.5 - Monounsaturated fat intake (g) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (g) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 25 | 26.3 (24.6, 28.0) | 25 | 26.3 (25.5, 27.0) | 0.0 |
| Females | 18 | 19.0 (17.7, 20.4) | 20 | 21.0 (20.3, 21.7) | 2.0* |
| **Ethnic group:** | | | | | |
| Chinese | 23 | 23.4 (22.1, 24.6) | 24 | 24.4 (23.8, 25.0) | 1.0 |
| Malay | 20 | 20.7 (17.9, 23.5) | 21 | 21.1 (19.7, 22.5) | 0.4 |
| Indian | 19 | 19.1 (14.8, 23.4) | 20 | 20.1 (18.2, 22.0) | 1.1 |
| **Overall** | **21** | **22.7 (21.6, 23.8)** | **22** | **23.6 (23.1, 24.2)** | **1.0** |

*p<0.05

*Age-std: Age standardised*
*CI: Confidence Interval*

Females have increased their polyunsaturated fat intake significantly over the five-year period. The polyunsaturated fat intake of other population sub-groups remain largely similar from 1993 to 1998.

**Table 4.18.6 - Polyunsaturated fat intake (g) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (g) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 13 | 13.3 (12.3, 14.2) | 13 | 13.3 (12.9, 13.8) | 0.0 |
| Females | 10 | 10.5 (9.6, 11.4) | 12 | 11.9 (11.5, 12.4) | 1.4* |
| **Ethnic group:** | | | | | |
| Chinese | 12 | 12.3 (11.6, 13.1) | 13 | 13.1 (12.7, 13.4) | 0.7 |
| Malay | 9 | 9.1 (7.9, 10.3) | 10 | 10.3 (9.5, 11.0) | 1.2 |
| Indian | 12 | 12.1 (9.1, 15.1) | 12 | 12.3 (11.2, 13.5) | 0.2 |
| **Overall** | **11** | **11.9 (11.2, 12.5 )** | **12** | **12.6 (12.3, 13.0)** | **0.7** |

*p<0.05

*Age-std: Age standardised*
*CI: Confidence Interval*

The carbohydrate intake of the population has not changed significantly from 1993 to 1998.

**Table 4.18.7 - Carbohydrate intake (g) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (g) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 295 | 299.9 (285.5, 314.3) | 290 | 292.1 (286.7, 297.5) | -7.8 |
| Females | 226 | 223.0 (213.1, 232.9) | 229 | 230.0 (225.6, 234.4) | 7.0 |
| **Ethnic group:** | | | | | |
| Chinese | 261 | 262.4 (251.9, 272.9) | 258 | 262.6 (258.6, 266.6) | 0.2 |
| Malay | 250 | 254.4 (228.0, 280.8) | 242 | 246.8 (235.6, 258.0) | -7.6 |
| Indian | 261 | 267.4 (228.0, 306.8) | 270 | 275.2 (259.2, 291.2) | 7.8 |
| **Overall** | **258** | **261.7 (252.3, 271.1)** | **257** | **261.4 (257.7, 265.1)** | **-0.3** |

*Age-std: Age standardised*
*CI: Confidence Interval*

There is a general trend of a decrease in intake of dietary cholesterol over the five-year period although the decreases were not statistically significant.

**Table 4.18.8 - Cholesterol intake (g) by gender and ethnic group: Comparison between 1993 and 1998 surveys.**

| | 1993 | | 1998 | | Mean difference (mg) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 339 | 347.2 (312.4, 381.9) | 307 | 321.1 (307.7, 334.5) | -26.0 |
| Females | 232 | 245.6 (219.9, 271.4) | 234 | 244.6 (233.1, 256.2) | -1.0 |
| **Ethnic group:** | | | | | |
| Chinese | 299 | 300.3 (276.3, 324.3) | 283 | 289.3 (279.3, 299.3) | -11.0 |
| Malay | 299 | 315.6 (248.3, 383.0) | 272 | 281.3 (254.9, 307.7) | -34.3 |
| Indian | 212 | 223.3 (127.8, 318.9) | 211 | 221.7 (189.9, 253.4) | -1.7 |
| **Overall** | **282** | **296.7 (274.6, 318.8)** | **268** | **283.3 (274.3, 292.3)** | **-13.4** |

*Age-std: Age standardised*
*CI: Confidence Interval*

All sub-groups of the population have significantly increased their dietary fibre intakes over the years, except for the Indians where there was no significant change.

**Table 4.18.9 - Dietary fibre intake (g) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (g) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 14 | 14.3 (13.4, 15.3) | 17 | 16.7 (16.3, 17.2) | 2.4*** |
| Females | 12 | 11.4 (10.5, 12.3) | 15 | 14.6 (14.2, 15.0) | 3.2*** |
| **Ethnic group:** | | | | | |
| Chinese | 13 | 13.0 (12.3, 13.7) | 16 | 15.7 (15.4, 16.0) | 2.7*** |
| Malay | 11 | 11.1 (9.3, 12.9) | 14 | 14.2 (13.3, 15.1) | 3.1** |
| Indian | 15 | 15.1 (11.4, 18.8) | 18 | 18.2 (16.8, 19.7) | 3.1 |
| **Overall** | **13** | **12.9 (12.2, 13.5)** | **16** | **15.7 (15.4, 16.0)** | **2.8*** ** |

**p<0.01
***p<0.001

*Age-std: Age-standardised*
*CI: Confidence Interval*

All sub-groups of the population have significantly increased their iron intakes over the years.

**Table 4.18.10 - Iron intake (mg) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (mg) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 15 | 14.8 (14.0, 15.7) | 19 | 18.6 (18.1, 19.0) | 3.7*** |
| Females | 12 | 11.5 (10.7, 12.2) | 15 | 15.1 (14.6, 15.6) | 3.6*** |
| **Ethnic group:** | | | | | |
| Chinese | 13 | 12.9 (12.3, 13.5) | 17 | 16.8 (16.4, 17.2) | 3.8*** |
| Malay | 13 | 13.5 (11.8, 15.2) | 16 | 15.9 (15.1, 16.8) | 2.4* |
| Indian | 14 | 14.8 (11.7, 17.9) | 19 | 18.9 (17.3, 20.6) | 4.1* |
| **Overall** | **13** | **13.2 (12.6, 13.7)** | **17** | **16.8 (16.5, 17.2)** | **3.7*** ** |

*p<0.05
***p<0.001

*Age-std: Age-standardised*
*CI: Confidence Interval*

Sodium intake among the females has increased significantly from 1993 to 1998. There are no significant changes in sodium intake among other sub-groups of the population.

**Table 4.18.11 - Sodium intake (mg) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (mg) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 3544 | 3832.6 (3596.2, 4069.0) | 3584 | 3798.8 (3700.5, 3897.0) | -33.8 |
| Females | 2822 | 2999.7 (2814.1, 3185.3) | 3055 | 3269.4 (3175.9, 3362.9) | 269.7* |
| **Ethnic group:** | | | | | |
| Chinese | 3598 | 3620.7 (3445.2, 3795.5) | 3725 | 3764.1 (3688.8, 3839.4) | 143.4 |
| Malay | 2517 | 2600.0 (2236.4, 2963.5) | 2572 | 2627.3 (2456.6, 2798.0) | 27.3 |
| Indian | 2656 | 2738.7 (2238.1, 3239.2) | 2688 | 2735.8 (2493.7, 2978.0) | -2.8 |
| **Overall** | **3158** | **3418.9 (3264.1, 3573.8)** | **3298** | **3536.9 (3468.3, 3605.6)** | **118.0** |

*p<0.05

*Age-std: Age standardised*
*CI: Confidence Interval*

Calcium intake of the females has increased significantly over the five-year period. There are no significant changes in calcium intake among other sub-groups of the population.

**Table 4.18.12 - Calcium intake (mg) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (mg) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 535 | 524.8 (489.2, 560.3) | 510 | 504.9 (489.2, 520.5) | -19.9 |
| Females | 442 | 414.0 (383.0, 445.1) | 458 | 457.5 (441.2, 473.7) | 43.4* |
| **Ethnic group:** | | | | | |
| Chinese | 456 | 456.5 (432.2, 480.9) | 479 | 481.9 (469.6, 494.1) | 25.4 |
| Malay | 473 | 486.2 (416.1, 556.3) | 446 | 450.4 (419.0, 481.7) | -35.8 |
| Indian | 585 | 583.4 (429.9, 737.0) | 537 | 533.6 (479.3, 587.9) | -49.8 |
| **Overall** | **486** | **469.8 (445.7, 493.9)** | **482** | **481.4 (470.1, 492.7)** | **11.6** |

*p<0.05

*Age-std: Age standardised*
*CI: Confidence Interval*

Vitamin A intakes have significantly increased for most sub-groups, except among the Malays and Indians where vitamin A intakes have not changed significantly from 1993 to 1998.

**Table 4.18.13 - Vitamin A intake (g) by gender and ethnic group: Comparison between 1993 and 1998 surveys**

| | 1993 | | 1998 | | Mean difference (g) ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender:** | | | | | |
| Males | 590 | 560.0 (469.8, 650.1) | 720 | 700.1 (648.1, 752.1) | 140.1* |
| Females | 514 | 457.0 (391.0, 523.1) | 690 | 696.3 (629.1, 763.4) | 239.2** |
| **Ethnic group:** | | | | | |
| Chinese | 465 | 465.9 (403.5, 528.4) | 712 | 708.5 (659.0, 758.1) | 242.6*** |
| Malay | 690 | 695.6 (526.5, 864.6) | 613 | 590.1 (506.9, 673.3) | -105.5 |
| Indian | 625 | 630.2 (463.9, 796.5) | 782 | 784.4 (632.6, 936.1) | 154.0 |
| **Overall** | **549** | **508.9 (452.9, 564.8)** | **704** | **698.2 (655.9, 740.5)** | **189.3*** ** |

*p<0.05
**p<0.01
***p<0.001

*Age-std: Age-standardised*
*CI: Confidence Interval*

## 4.19 Comparisons of proportion of population meeting their recommendations for energy and nutrients with the 1993 Food Consumption Study (age-standardised)

The proportion of Singaporean adults having energy intake exceeding the RDA has not changed significantly from 1993 to 1998.

**Table 4.19.1 - Proportion of population having ≥ 100% of RDA for energy: Comparison between 1993 and 1998 surveys**

| | 1993 (%) | | 1998 (%) | | Difference In Age-std prop ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Males** | 24.9 | 27.3 (21.5, 33.1) | 22.2 | 23.2 (20.8, 25.6) | -4.1 |
| **Females** | 18.1 | 18.2 (13.1, 23.3) | 23.3 | 24.2 (21.7, 26.6) | 6.0 |
| **Overall** | **21.3** | **22.8 (18.9, 26.7)** | **22.8** | **23.6 (21.9, 25.4)** | **0.8** |

*Age-std prop: Age-standardised proportion*
*CI: Confidence Interval*

The proportion of males having protein intake below 70% of the RDA has increased significantly by 6.7% from 1993 to 1998 while that of females has not changed significantly.

**Table 4.19.2 - Proportion of population having < 70% of RDA for protein: Comparison between 1993 and 1998 surveys**

| | 1993 (%) | | 1998 (%) | | Difference In Age-std prop ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Males** | 14.1 | 10.1 (6.2, 14.1) | 19.2 | 16.8 (14.7, 18.9) | 6.7* |
| **Females** | 25.1 | 21.7 (16.2, 27.1) | 22.8 | 19.6 (17.3, 21.9) | -2.1 |
| **Overall** | **20.0** | **15.8 (12.5, 19.2)** | **21.2** | **18.2 (16.6, 19.7)** | **2.4** |

*p<0.05

*Age-std prop: Age-standardised proportion*
*CI: Confidence Interval*

The proportion of females consuming excess fat (contributing more than 30% of dietary energy) has increased significantly by 7.5% from 1993 to 1998 while that of males has remained relatively constant.

**Table 4.19.3 - Proportion of population consuming excess fat (≤ 30% of energy contribution from fat) : Comparison between 1993 and 1998 surveys**

| | 1993 (%) | | 1998 (%) | | Difference In Age-std prop ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Males** | 30.0 | 34.6 (28.3, 40.8) | 28.8 | 31.3 (28.6, 33.9) | -3.3 |
| **Females** | 25.9 | 25.6 (19.9, 31.5) | 31.5 | 33.1 (30.4, 35.8) | 7.5* |
| **Overall** | **27.9** | **30.2 (25.9, 34.4)** | **30.3** | **32.2 (30.3, 34.1)** | **2.0** |

*p<0.05

*Age-std prop: Age-standardised proportion*
*CI: Confidence Interval*

The proportion of Singaporean adults meeting the recommended intake of carbohydrate has not changed significantly over the 5-year period.

**Table 4.19.4 - Proportion of population meeting the recommendation for carbohydrate (≥ 60% of energy contribution from carbohydrate) : Comparison between 1993 and 1998 surveys**

| | 1993 (%) | | 1998 (%) | | Difference In Age-std prop ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Males** | 16.9 | 17.3 (12.3, 22.2) | 13.8 | 13.9 (11.9, 15.8) | -3.4 |
| **Females** | 11.9 | 10.7 (6.6, 14.8) | 12.2 | 11.7 (9.9, 13.6) | 1.0 |
| **Overall** | **14.3** | **14.0 (10.8, 17.2)** | **13.0** | **12.8 (11.5, 14.2)** | **-1.2** |

*Age-std prop: Age-standardised proportion*
*CI: Confidence Interval*

The proportion of Singaporean adults consuming excess cholesterol has not changed significantly from 1993 to 1998.

**Table 4.19.5 - Proportion of population consuming excess cholesterol (≥ 100mg of cholesterol per 1000kcal of energy requirement) : Comparison between 1993 and 1998 surveys**

| | 1993 (%) | | 1998 (%) | | Difference In Age-std prop ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Males** | 54.0 | 56.3 (49.8, 62.8) | 49.9 | 52.6 (49.7, 55.4) | -3.7 |
| **Females** | 44.9 | 48.1 (41.5, 54.7) | 45.3 | 47.3 (44.4, 50.1) | -0.8 |
| **Overall** | 49.1 | 52.3 (47.6, 56.9) | 47.4 | 49.9 (47.9, 51.9) | -2.4 |

*Age-std prop: Age-standardised proportion*
*CI: Confidence Interval*

Compared to five years ago, there is a significant drop of 5.1% in the proportion of Singaporean adults failing to meet the recommended intake of dietary fibre. Between genders, the drop is more significant among the females as compared to the males.

**Table 4.19.6 - Proportion of population not meeting the recommendation for dietary fibre (10g per 1000kcal of energy requirement) : Comparison between 1993 and 1998 surveys**

| | 1993 (%) | | 1998 (%) | | Difference In Age-std prop ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Males** | 92.0 | 93.1 (89.7, 96.4) | 87.6 | 89.5 (87.7, 91.2) | -3.6 |
| **Females** | 89.7 | 91.4 (87.7, 95.1) | 84.0 | 84.8 (82.7, 86.8) | -6.6** |
| **Overall** | **90.8** | **92.2 (89.7, 94.7)** | **85.7** | **87.8 (85.8, 88.5)** | **-5.1**** |

**p<0.01

*Age-std prop: Age-standardised proportion*
*CI: Confidence Interval*

The proportion of males consuming inadequate iron (<70% of RDA) has not changed significantly from 1993 to 1998. There is however, a considerable drop of 22.4% in the proportion of females not consuming adequate iron over the 5-year period.

**Table 4.19.7 - Proportion of population having < 70% of RDA for iron: Comparison between 1993 and 1998 surveys**

| | 1993 (%) | | 1998 (%) | | Difference In Age-std prop ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Males** | 1.9 | 2.3 (0.4, 4.3) | 1.4 | 1.5 (0.8, 2.2) | -0.8 |
| **Females** | 64.6 | 64.3 (58.0, 70.6) | 40.9 | 41.9 (39.1, 44.8) | -22.4*** |
| **Overall** | **35.3** | **33.0 (28.6, 37.3)** | **22.7** | **21.5 (19.8, 23.2)** | **-11.5*** ** |

***p<0.001

*Age-std prop: Age-standardised proportion*
*CI: Confidence Interval*

The proportion of Singaporean adults consuming excess sodium (≥667mg cholesterol per 1000kcal of energy requirement) has not changed significantly from 1993 to 1998.

**Table 4.19.8 - Proportion of population consuming excess sodium (≥ 667mg of sodium per 1000kcal of energy requirement): Comparison between 1993 and 1998 surveys**

| | 1993 (%) | | 1998 (%) | | Difference In Age-std prop ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Males** | 88.7 | 91.7 (88.1, 95.3) | 86.4 | 89.4 (87.7, 91.2) | -2.3 |
| **Females** | 83.5 | 88.3 (84.0, 92.5) | 87.3 | 90.9 (89.3, 92.6) | 2.6 |
| **Overall** | **86.0** | **90.0 (87.3, 92.8)** | **86.9** | **90.2 (89.0, 91.4)** | **0.2** |

*Age-std prop: Age-standardised proportion*
*CI: Confidence Interval*

The proportion of females consuming inadequate calcium (<70% RDA) has dropped significantly by 7.1% from 1993 to 1998 while that of males has increased significantly by 7%.

**Table 4.19.9 - Proportion of population having < 70% of RDA for calcium: Comparison between 1993 and 1998 surveys**

| | 1993 (%) | | 1998 (%) | | Difference In Age-std prop ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Males** | 25.4 | 24.9 (19.2, 30.5) | 31.7 | 31.9 (29.2, 34.5) | 7.0* |
| **Females** | 43.6 | 48.4 (41.8, 55.0) | 41.6 | 41.3 (38.5, 44.1) | -7.1* |
| **Overall** | **35.1** | **36.5 (32.0, 41.0)** | **37.0** | **36.5 (34.6, 38.5)** | **0** |

*p<0.05

*Age-std prop: Age-standardised proportion*
*CI: Confidence Interval*

There is a significant drop in the proportion of Singaporean adults consuming inadequate vitamin A (<70% RDA) among both genders (9.1% for males and 12.0% for females).

**Table 4.19.10 - Proportion of population having < 70% of RDA for vitamin A: Comparison between 1993 and 1998 surveys**

| | 1993 (%) | | 1998 (%) | | Difference In Age-std prop ['98-'93] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Males** | 63.8 | 64.0 (57.7, 70.2) | 57.7 | 54.9 (52.1, 57.7) | -9.1* |
| **Females** | 63.8 | 72.1 (66.2, 78.1) | 57.7 | 60.1 (57.3, 63.0) | -12.0*** |
| **Overall** | **60.6** | **68.0 (63.7, 72.3)** | **54.8** | **57.5 (55.5, 59.5)** | **-10.5*** |

*p<0.05
***p<0.001

*Age-std prop: Age-standardised proportion*
*CI: Confidence Interval*

# Discussion & Recommendations

## Comparability of findings

Findings from the survey demonstrate comparability between the information collected by the different dietary assessment methods. Based on self-reports of dietary practices, Singaporean adults fare well in practices influencing total fat intake e.g. trimming of visible fat, preference for reduced fat milk and moderate consumption of deep-fried foods. Consistent with these findings, the 24-hr dietary recalls find the mean fat intake to be in line with recommendation, contributing 30% of dietary energy. Similarly, the prevalence of low fibre intake is in line with the food-based observation that large proportions of people fail to consume adequate servings of grains, fruit and vegetables. The survey findings thus demonstrate evidence of internal validity.

## Dietary status

The mean energy intake is well within recommended levels. However, there are large proportions of people who fall short of the recommended levels for dietary fibre, vitamin A, calcium and iron, and who consume excessive saturated fat and sodium. The main dietary concern thus lies more with the choice rather than amounts of food eaten.

## Socio-demographic differences

Distinct differences in dietary patterns are seen among the different sectors of the population e.g. among the various ethnic groups, younger *vs* older adults, and men *vs* women.

Women eat proportionately more fruit, vegetables, beans and bean products, and milk and milk products than males. Conversely, men are more likely than women to prefer butter to soft margarine, frequently consume deep-fried foods, eggs and sweetened drinks, and not to trim off any fat or skin when eating meat or poultry. Men also have a higher energy intake than women - an observation that is compatible with men having a higher proportion of lean body tissues (13). Lean body tissues are more metabolically active than body fat. With a lower energy intake among women, the intake of many nutrients tends to be lower. This may partly explain why proportionately

more women than men fall short of the recommended levels for calcium (41.6% *vs* 31.7%) and iron (40.9% *vs* 1.4%). It is also more difficult for women to meet the recommended level for iron because it is twice that of men.

Similarly, the reduction in energy intake with age is attributable to a decrease in energy expenditure with aging, as a consequence of the loss in lean tissues mass and reduction in physical activity (14). However, the diet of those in the middle (40-59 years) and older (60 years and above) age groups tends to be more nutrient-dense compared to that of their younger counterparts (18-39 years). Middle-aged and older adults are more likely to report eating fruit and vegetables and less fatty foods or red meat. They are also more likely to remove all skin when eating poultry and not to add salt or sauces at the table. In contrast, younger adults eat out and frequent fast food restaurants more often. They also consume sweetened drinks and deep-fried foods more frequently.

The Chinese have a higher proportion of energy consumed from bought food (56.2%) than Malays (40.8%) and Indians (38.3%). The Chinese also have an acquired taste for salty foods being more likely to add salt or sauces to their food at the table. The Malays are most likely to eat at home. They have however, the highest proportion (42.1%) of their dietary fat in the form of saturated fat suggesting the common use of high saturated-fat cooking oils or ingredients such as coconut milk for food preparation.

The highest prevalence of excessive body weight and hypertension is observed among the Malay women (54.5% and 35.4% respectively). Mean energy and sodium intakes of Malay women are however, significantly lower than those of their Chinese and Indian counterparts. This may be due to underreporting of food. Almost half of Malay women (49%) report that they diet at least occasionally, and findings from a number of studies (15-17) suggest that there is a tendency for dieters to underreport their food intake.

Indians have higher mean iron intake (18.6mg $\pm$ 0.5mg) compared to the Chinese (16.7 $\pm$ 0.2mg) and Malays (15.8 $\pm$ 0.3 mg). The proportion of women meeting at least 70% of the recommended level for iron is highest among the Indians (68%) followed by the Chinese (58%) and Malays (55%). However, a study conducted among 876 premenopausal women aged 18 to 69 years found iron deficiency anaemia to be highest among Indian women (17.8%) followed by Malay and Chinese women (10.1%

and 9.7% respectively) (18). The seemingly conflicting observation could be partly due to the different bioavailability of iron in the diet of women from the various ethnic groups. It is well-established that non-haem iron (derived mainly from plant-based sources) tends to be less readily available than haem iron (abundant in animal food and fish) (19). Indeed, mean intakes of meat, poultry and fish are lower among Indian women than their Chinese and Malay counterparts.

## Comparison between countries

Comparison of dietary survey findings between countries is made difficult by different sample characteristics, data collection and analysis methods and varying classification of food and socio-demographic groups. These factors are acknowledged in the interpretation of data and this section is intended to provide a qualitative rather than a strictly quantitative comparison.

It is observed that the patterns of dietary practices and food and nutrient intakes of Singaporeans share greater similarity with those of Hong Kong Chinese (20) than our Western counterparts (21-24). In addition, findings from the present survey that women and older adults consume more fruit, less meat, and are more likely to adopt healthful practices (e.g. trimming fat/ skin from meat/ poultry) and a fat-modified diet appear quite universal, being consistent with findings in other populations (21, 23). These observations provide evidence of convergent validity for the survey findings.

The relative contribution of carbohydrate, protein and fat to total dietary energy of Singaporeans (carbohydrate: 55%, protein: 15%, fat: 30%) is comparable to that of the Hong Kong Chinese (carbohydrate: 53%, protein 18%, fat: 29%) (20). Singaporeans consume proportionately more carbohydrate and less fat compared to their Western counterparts such as the Australians (carbohydrate: 45%, protein: 17%, fat: 32%) (21) and British (carbohydrate: 45%, protein: 16%, fat: 39%) (23), and proportionately less carbohydrate and more fat than the Japanese (carbohydrate: 59%, protein: 25%, fat: 16%) (25).

Singaporeans consume proportionately more fat as saturated fat compared to Hong Kong Chinese (39.4% *vs* 32.2%) (20). Whereas Singaporeans cook mainly with blended vegetable oil (high in saturated fat), Hong Kong Chinese prefer peanut oil (high in monounsaturated fat). It is interesting to note that in Hong Kong, the age-

standardised death rates for cardiovascular diseases for people aged 65 years is approximately half that of Singapore.

Dietary factors such as low calcium, high sodium and protein intakes have been associated with increased bone loss with age (5). Singaporeans and Hong Kong Chinese (20) consume comparable level of protein as their western counterparts (21-24), but less calcium and more sodium. Based on these nutritional considerations, higher incidence rates of osteoporosis-related fractures would be expected among Singaporeans and Hong Kong Chinese. In fact, the age-adjusted incidence rates of hip fractures are not higher among these Asian populations compared to Caucasians (26). It has been suggested that genetic factors (e.g. polymorphism of the vitamin D receptor gene) may partly account for this difference, perhaps by increasing fractional calcium absorption or reducing the rate of bone loss among certain ethnic groups (27). However, the rate of hip fractures in Singapore has been rising steadily, from 41.7 cases per 100,000 population in 1991 to 57.7 cases per 100,000 population in 1999, a rise of 38% over the last nine years (6). This suggests the role of lifestyle factors.

There is good evidence to suggest that adequate intake of foods rich in calcium and increased weight-bearing exercises not only increase the peak bone mass that is attainable, but also slow down bone loss in middle-aged and elderly people (14). In light of the findings that 32% men and 42% women fail to meet the recommended calcium intake, and large proportions of people (45% men, 63% women) do not engage in any form of exercise, it is important to encourage these lifestyle changes.

## Some limitations

A concern is that the sequential administration of the dietary practice questionnaire followed by the food frequency questionnaire and 24-hr dietary recall could produce response bias. However, in a separate study validating the performance of the food frequency questionnaire against three 24-hr dietary recalls conducted at least three weeks after the completion of the questionnaire, the questionnaire has been found to be an adequate tool for measuring dietary intakes of energy, total and the various types of fat (28).

Data interpretation is also limited by unavailable food composition information. For example, it is not possible to determine the relative contribution of sugar and starch within the carbohydrate component. Although there is growing evidence to suggest a protective role of non-nutrients (e.g. carotenoids, flavonoids) in the development of chronic degenerative diseases (e.g. heart disease and certain cancers) (29), laboratory methods are only being developed to isolate many of these components from foods (30).

## Recommendations

Findings from the survey show that the diet of Singaporeans is shifting towards being more consistent with dietary guidelines. There are however, pockets of at risk groups and there is a need for future interventions to:

- Tailor public education to the needs of specific population groups.
- Intensify nutrition education in schools to cultivate healthful eating habits early in life.
- Strengthen the link between nutrition and physical activity in intervention programmes.
- Strengthen facilitator training to encourage grassroot participation.
- Enhance collaboration with the relevant public and private sectors to promote availability and affordability of healthier food choices.
- Increase the availability of different forms of nutrition information at points of sale.
- Undertake research to provide a scientific basis for dietary recommendations and intervention strategies.
- Maintain a nutrition surveillance system to provide accurate, reliable and timely data to assess status and trends, and to be responsive to emerging issues.

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# Annexes

# Annex I

# Healthy Diet Pyramid

The Healthy Diet Pyramid translates nutrient needs into actual foods and is intended as a guide to facilitate food choice and meal planning to achieve a nutritionally balanced diet for average healthy Singaporeans aged two years and above. Being food-based, the Healthy Diet Pyramid provides a useful tool for assessment of dietary adequacy.

It is also increasingly recognised that foods provide not only nutrients, but also a combination of other dietary components that appear to be protective against chronic degenerative diseases. This has led to recent interest in monitoring population intakes of foods and food groups, not just nutrients.

As foods have varying nutrients, the Healthy Diet Pyramid broadly segments foods with similar nutrient profiles into four main food groups as described below.

**Rice & alternatives**

The recommendation is to include five to seven daily servings of rice and alternatives, of which at least one serving should be wholegrain varieties. Alternatives to rice include noodles, bread, pasta, breakfast cereals and biscuits.

Being good sources of complex carbohydrates (starch and dietary fibre) and the B vitamins, rice and alternatives provide bulk to a meal and serve as main energy sources for the body. The starches in these foods are metabolised into energy in the availability of the B vitamins, and the dietary fibre promotes satiety and bowel regularity.

Examples of one serving (based on the carbohydrate equivalent) include:

- 1/2 bowl of rice (100g)
- 2 slices of bread (60g)
- 1/2 bowl of noodles (100g)
- 1 piece of thosai (60g)
- 2 small pieces of chapati (60g)

**Fruit and vegetables**

Two servings each of fruit and vegetables are encouraged daily. A diet adequate in fruit and vegetables is rich in phytochemicals (e.g. vitamins A and C, carotenoids and flavonoids). Phytochemicals are potent antioxidants and provide protection against certain cancers, coronary heart disease and stroke.

Examples of one serving of fruit include:

- 1 small apple/orange/mango (130g)
- 1 wedge papaya/pineapple/watermelon (130g)
- 10 grapes/*longans* (50g flesh only)
- 6 *lychees*/*dukus* (70g flesh only)

Examples of one serving of vegetable include:

- 1 cup cooked leafy vegetables e.g. spinach, *chye sim*, cabbages, mustard greens, etc (150g).
- $^1/_2$ cup cooked non-leafy vegetables e.g. carrots, pumpkin, potato, mushrooms, tomatoes, etc (75g).

Fruit is distinguished as a group from vegetables as it is used differently in the diet. A study among Singaporean Chinese found that unlike vegetables, fruit is rarely seen as part of a meal. Conversely, although fruit is acceptable as a snack, vegetables are rarely eaten as such.

**Meat & alternatives**

Popularly known as protein foods needed for growth and tissue repair, meat and alternatives are also main dietary sources of several other nutrients. Meat, poultry, fish and seafood are rich in iron - an essential nutrient for healthy blood formation; milk and milk products provide readily available calcium, and dried peas and beans and bean-based products provide an alternative to animal protein. For many foods (mainly the meats, certain seafood and dairy products) within this food group, the essential nutrients often come accompanied with other food components linked to diseases of current public health concerns - total fat, saturated fat and cholesterol.

The recommendation is to include moderate amounts (two to three servings) of these foods in the diet daily.

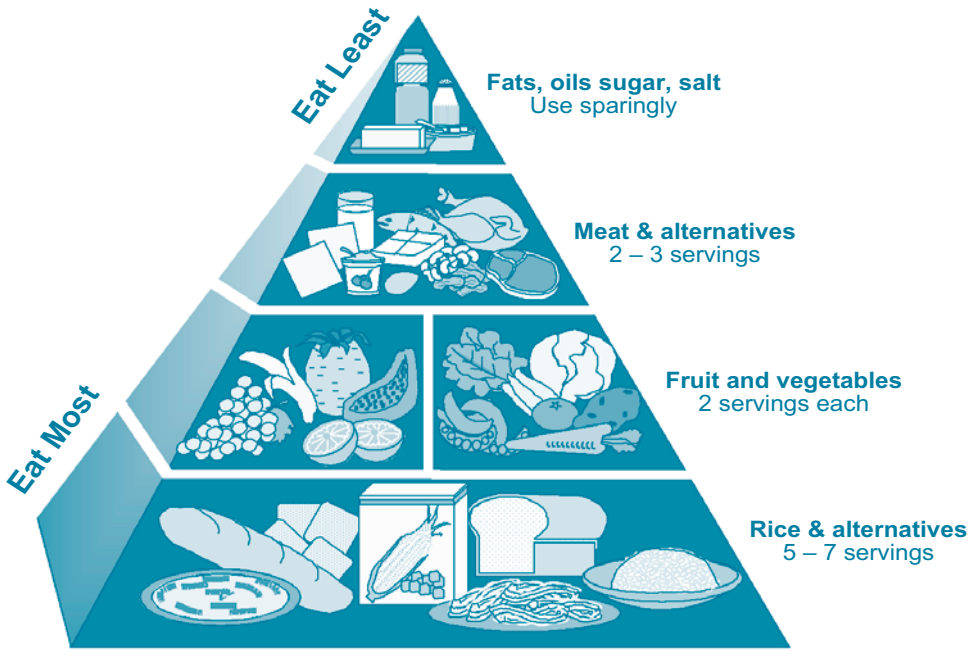
Examples of one serving (based on the protein equivalent) include:

- 1 piece of palm-size meat/fish/poultry (90g)
- 3 eggs (150g)
- 5 medium prawns (90g)
- 2 small squares of soft beancurd (170g)
- 2 glasses of milk (500ml)

## Tip of Pyramid

In addition to the four groups of food, the Healthy Diet Pyramid has a tip comprising cooking oils, fat spreads, sugars and salty seasonings. These are not intended to provide nutrients, but serve more as "extras" to add interest and variety to a diet. Being at the tip, it is recommended that these ingredients be consumed sparingly.

**Figure D - Pictorial illustration of the Healthy Diet Pyramid**




A Balanced Diet – The Pyramid Way

# Annex II

# NATIONAL NUTRITION SURVEY 1998

Dietary Practices Questionnaire (DPQ)

For Official Use Only

Respondent ID: _____

Interviewer ID: _____ Interviewed: _____

Coded ID: _____ Coded: _____

Reviewer ID: _____ Reviewed: _____

Department of Nutrition
Ministry of Health
Singapore

Answer questionnaire in ONE language only.

Please circle ONE most appropriate answer for questions 1 to 19.

1. Where do you **USUALLY** eat breakfast?
   1 Home
   2 Packed from home
   3 Restaurant / coffee house
   4 Workplace / polytechnic/ university canteen
   5 School / JC canteen
   6 Hawker centre / coffee shop stall / food court
   7 Fast food restaurant
   8 Others (please specify _____)
   9 Do not eat breakfast at all

2. Where do you **USUALLY** eat lunch?
   1 Home
   2 Packed from home
   3 Restaurant / coffee house
   4 Workplace / polytechnic/ university canteen
   5 School / JC canteen
   6 Hawker centre / coffee shop stall / food court
   7 Fast food restaurant
   8 Others (please specify _____)
   9 Do not eat lunch at all

3. Where do you **USUALLY** eat dinner?
   1 Home
   2 Packed from home
   3 Restaurant / coffee house
   4 Workplace / polytechnic/ university canteen
   5 School / JC canteen
   6 Hawker centre / coffee shop stall / food court
   7 Fast food restaurant
   8 Others (please specify _____)
   9 Do not eat dinner at all

4. How often do you eat at hawker centres, coffee shops or other food stalls?
   1 Once a week
   2 2 - 5 times a week
   3 6 - 7 times a week
   4 8 times a week or more
   9 Never

Please circle ONE most appropriate answer for questions 1 to 19.

5. How often do you eat at western fast food restaurants
(e.g. KFC, McDonald's, Burger King, A & W, etc.)?
1 Once a week
2 2 - 5 times a week
3 6 - 7 times a week
4 8 times a week or more
9 Never

6. What type of bread or bread roll do you **USUALLY** eat?
1 Ordinary / enriched
2 Wholemeal / high fibre
3 A mixture of ordinary / enriched / wholemeal and high fibre
4 Others (please specify _____)
9 Do not eat bread or bread roll at all

7. What kind of fat spread do you **USUALLY** use on bread or crackers?
1 Butter
2 Hard margarines (please state brand _____)
3 Soft margarine (please state brand _____)
4 Others (please specify _____)
9 Do not fat spread at all

8. What types of milk or milk-based drinks (e.g. hot chocolate) do you **USUALLY** drink?
1 Whole milk / full cream
2 Low fat
3 Skimmed / non-fat
4 Sweetened condensed milk
5 Others (please specify _____)
9 Do not drink milk or milk-based drinks at all

9. What types of milk do you **USUALLY** add to tea, coffee or other beverages?
1 Whole milk / full cream
2 Low fat
3 Skimmed / non-fat
4 Sweetened condensed milk
5 Others (please specify _____)
9 Do not add milk at all

10. What many eggs (including salted or century egg) do you **USUALLY** eat per week?
1 Less than one egg a week
2 1 - 2 eggs a week
3 3 - 5 eggs a week
4 6 eggs a week or more
9 Do not eat eggs at all

Please circle ONE most appropriate answer for questions 1 to 19.

11. How often do you drink sweetened drinks? (e.g. soft drinks, fruit drinks, packet drinks, cordials, yoghurt-based drinks and cultured milk drinks, etc.)
    1 Once a week or less
    2 2 - 6 times a week
    3 7 times a week or more
    9 Do not drink sweetened drinks at all

12. How often do you eat sweet desserts and snacks?
    (e.g. cakes, jellies, candies, chocolates, cookies, ice-cream, etc.)
    1 2 times a week or less
    2 3 - 5 times a week
    3 6 times a week or more
    9 Do not eat sweetened dessert and snacks at all

13. How often do you eat deep fried foods?
    1 2 times a week or less
    2 3 - 5 times a week
    3 6 times a week or more
    9 Do not eat deep fried foods at all

14. When you eat meat with visible fat, how much visible fat will you trim off?
    1 All the fat
    2 Some of the fat
    3 None of the fat
    9 Do not eat meat at all

15. When you eat poultry (e.g. chicken, duck, turkey, pigeon, etc.), how much skin do you remove?
    1 All the skin
    2 Some of the skin
    3 None of the skin
    9 Do not eat poultry at all

16. What kind of fat or oil is **USUALLY** used **FOR COOKING** at home?
    1 Butter, dripping, ghee, lard or any other animal fat
    2 Hard margarine, vegetable oil, blended oil, palm oil or coconut oil
    3 Soft margarine, corn oil, soya bean oil, sunflower oil or safflower oil
    4 Peanut oil, canola oil, olive oil
    5 Others (please specify _____)
    9 Do not cook at home at all

Please circle ONE most appropriate answer for questions 1 to 19.

17. **AT THE TABLE**, when do you **USUALLY** add salt or sauces to your food?
    1 Before tasting food
    2 When the food is not tasty enough
    9 Do not add salt or sauces to my food at the table

18. Which of the following best describes your diet?
    1 No special diet, but I eat less fatty foods, sugar, red meat, etc.
    2 No special diet, but I avoid red meat only
    3 Fat modified diet to lower blood lipids or cholesterol levels
    4 Strict vegetarian diet
    5 A weight loss diet
    9 No special diet, I eat almost everything

19. Have you ever been on a diet to lose weight?
    1 Have dieted occasionally, in the past
    2 Have dieted frequently, in the past
    3 Continually dieting to lose weight
    9 Never dieted

~END~

# Annex III

# NATIONAL NUTRITION SURVEY 1998

Food Frequency Questionnaire (FFQ)

For Official Use Only

Respondent ID: _____

Interviewer ID: _____ Interviewed: _____

Coded ID: _____ Coded: _____

Reviewer ID: _____ Reviewed: _____

Department of Nutrition
Ministry of Health
Singapore

## PART A

### Breads and Breakfast Cereals

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| Bread | | | | | |
| 1. White bread, including naan | 1 slice or 1 piece | | | | |
| 2. Wholemeal bread/ softmeal bread | 1 slice or 1 piece | | | | |
| 3. Bread with fruits and nuts | 1 slice or 1 piece | | | | |
| Bread spreads used | | | | | |
| 4. Butter | 1 tsp (D2) | | | | |
| 5. Margarine | 1 tsp (D2) | | | | |
| 6. Peanut butter | 1 tsp (D2) | | | | |
| 7. Jams/ Honey | 1 tsp (D2) | | | | |
| 8. Kaya | 1 tsp (D2) | | | | |
| Other types of breads | | | | | |
| 9. Roti prata/ murtabak | 1 piece | | | | |
| 10. Chapati/ dosai | 1 piece | | | | |
| 11. French toast/ roti telur/ roti john | 1 piece | | | | |
| 12. Bread buns with coconut/ curry/ meat fillings | 1 piece | | | | |
| 13. Plain cereal | 4 dsp (D1) | | | | |
| 14. Mixed cereal | 4 dsp (D1) | | | | |

**Rice and Porridge**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| 15. Plain rice (white or brown) | 1 B1 | | | | |
| 16. Plain rice | 1 B2 | | | | |
| Flavoured rice | | | | | |
| 17. Fried rice | 1 B1 | | | | |
| 18. Chicken/ duck rice | 1 portion | | | | |
| 19. Mui fan | 1 portion | | | | |
| 20. Nasi briyani | 1 portion | | | | |
| 21. Nasi lemak | 1 portion | | | | |
| 22. Claypot rice | 1 portion | | | | |
| 23. Glutinous rice | 1 portion | | | | |
| 24. Flavoured poridge (e.g. chicken, pork, duck, fish) | 1 portion | | | | |

**Noodles (rice noodles, wheat noodles, bean noodles, pasta)**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| Noodles in soup | | | | | |
| 25. Fishball/ niang dou fu/ wanton/ prawn/ beef/ chicken | 1 portion | | | | |
| 26. Penang laksa | 1 portion | | | | |
| Dry noodles | | | | | |
| 27. Fishball/ niang dou fu/ wanton/ minced meat & mushrooms/ prawn/ beef/ chicken | 1 portion | | | | |
| 28. Lor mee/ mee rebus | 1 portion | | | | |
| Fried noodles | | | | | |
| 29. Fried kway teow with cockles | 1 portion | | | | |
| 30. Fried mee/ hor fun (with gravy) | 1 portion | | | | |
| 31. Fried wet noodles (incl. Hokkien mee, mee goreng) | 1 portion | | | | |
| 32. Fried dry noodles (incl. Vegetarian bee hoon) | 1 portion | | | | |
| Noodles in lemak gravy | | | | | |
| 33. Laksa lemak | 1 portion | | | | |
| 34. Mee siam (with coconut milk) | 1 portion | | | | |
| Other noodles | | | | | |
| 35. Instant noodles (plain) | 1 portion | | | | |

**Vegetables and Beancurd**

| Food Item | Venue | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|---|
| **How often do you eat the following:** | | | **Per day** | **Per week** | **Per month** | **Rarely / Never** |
| Pale green leafy vegetables (cabbage, pak choy, lettuce, beansprouts, cauliflower, etc) | | | | | | |
| 36. Stir fried, plain | | ½ cup | | | | |
| 40. Stir fried, with meat/ seafood | | ½ cup | | | | |
| 44. Stir fried in oyster sauce | | ½ cup | | | | |
| 48. Curry/ lemak | | ½ cup | | | | |
| 52. Raw/ steamed/ in soup | | 1 cup | | | | |
| Dark green leafy vegetables (spinach, kai lan, chye sim, kangkong, broccoli, etc) | | | | | | |
| 53. Stir fried, plain | | ½ cup | | | | |
| 57. Stir fried, with meat/ seafood | | ½ cup | | | | |
| 61. Stir fried in oyster sauce | | ½ cup | | | | |
| 65. Stir fried in sambal belacan/ dried prawns | | ½ cup | | | | |
| 69. Raw/ steamed/ in soup | | 1 cup | | | | |
| Tomatoes, carrots, red/ yellow peppers | | | | | | |
| 70. Stir fried, plain | | ½ cup | | | | |
| 74. Stir fried, with meat/ seafood | | ½ cup | | | | |
| 78. Curry/ lemak | | ½ cup | | | | |
| 82. Raw/ steamed/ in soup | | 1 cup | | | | |

**Vegetables and Beancurd**

| Food Item | Venue | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|---|
| **How often do you eat the following:** | | | **Per day** | **Per week** | **Per month** | **Rarely / Never** |
| Fresh legumes/ pulses e.g beans, peas | | | | | | |
| 83. Stir fried, plain | | 1/2 cup | | | | |
| 87. Stir fried in oyster sauce | | 1/2 cup | | | | |
| 91. Stir fried in sambal belacan | | 1/2 cup | | | | |
| 95. Dried legumes (e.g. dhal, dried beans) in gravy | | 1/2 cup | | | | |
| Mixed vegetables | | | | | | |
| 99. Stir fried, plain | | 1/2 cup | | | | |
| 103. Stir fried with meat/ seafood | | 1/2 cup | | | | |
| 107. Stir fried with oyster sauce | | 1/2 cup | | | | |
| 111. Curry/ lemak | | 1/2 cup | | | | |
| 115. Raw/ steamed in soup/ Chinese rojak | | 1 cup or 1 serving | | | | |
| Tofu/ beancurd | | | | | | |
| 116. Fried | | 1/2 square | | | | |
| 120. Steamed/ in soups | | 1/2 square | | | | |
| Others (roots/ stems) | | | | | | |
| 121. Curry lemak | | 1 cup | | | | |
| 125. Soups with meat stock | | 1 cup | | | | |
| 126. Stews | | 1 cup | | | | |

**Salad dressings**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| 130. Creamy dressing - regular (thousand island, mayonnaise, salad cream, etc) | 2 dsp (D1) | | | | |
| 131. Creamy dressing - light/ low fat | 2 dsp (D1) | | | | |
| 132. Oil-based dressing | 2 dsp (D1) | | | | |

**Fruits**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| 133. Orange/ red/ yellow fresh fruits, fruit juices | 1 serving* | | | | |
| 134. Other fresh fruits, fruit juices | 1 serving* | | | | |
| 135. Bananas | 1 medium* | | | | |
| 136. Durians | 5 seeds | | | | |
| 137. Canned fruits | $^1/_2$ cup (M1) | | | | |

**1 serving is 1 medium fruit - e.g. apple or orange; 5 seeds e.g. duku or rambutan; 1 slice of cut fruit e.g. melon or papaya or 1 mug (M1) of fruit juice**

**Poultry**

| Food Item | Venue | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|---|
| **How often do you eat the following:** | | | **Per day** | **Per week** | **Per month** | **Rarely / Never** |
| Poultry - without skin | | | | | | |
| 138. Stir fried | | 1 serving | | | | |
| 142. Pan/ deep fried | | 1 serving | | | | |
| 146. Coconut curry | | 1 serving | | | | |
| 150. Curry without coconut | | 1 serving | | | | |
| 154. Stew/ braised/ roasted | | 1 serving | | | | |
| 158. Steamed | | 1 serving | | | | |
| Poultry - with skin | | | | | | |
| 159. Stir fried | | 1 serving | | | | |
| 163. Pan/ deep fried | | 1 serving | | | | |
| 167. Coconut curry | | 1 serving | | | | |
| 171. Curry without coconut | | 1 serving | | | | |
| 175. Stew/ braised/ roasted | | 1 serving | | | | |
| 179. Steamed | | 1 serving | | | | |

**Meat**

| Food Item | Venue | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|---|
| **How often do you eat the following:** | | | **Per day** | **Per week** | **Per month** | **Rarely / Never** |
| Meat- lean | | | | | | |
| 180. Stir fried | | 1 serving | | | | |
| 184. Pan/ deep fried | | 1 serving | | | | |
| 188. Coconut curry/ rendang | | 1 serving | | | | |
| 192. Curry without coconut | | 1 serving | | | | |
| 196. Stewed/ braised | | 1 serving | | | | |
| 200. Roast/ grilled/ BBQ | | 1 serving | | | | |
| 204. Steamed/ soup | | 1 serving | | | | |
| Meat - lean and fat | | | | | | |
| 205. Stir fried | | 1 serving | | | | |
| 209. Pan/ deep fried | | 1 serving | | | | |
| 213. Coconut curry/ rendang | | 1 serving | | | | |
| 217. Curry without coconut | | 1 serving | | | | |
| 221. Stewed/ braised | | 1 serving | | | | |
| 225. Roast/ grilled/ BBQ | | 1 serving | | | | |
| 229. Steamed/ soup | | 1 serving | | | | |
| Meat - preserved/ cured | | | | | | |
| 230. Sausages | | 1 serving | | | | |
| 231. Ham | | 1 serving | | | | |
| 232. Bacon | | 1 serving | | | | |
| 233. Canned (luncheon, corned) | | 1 serving | | | | |
| 234. Liver and other innards | | 1 serving | | | | |

**Fish/Seafood**

| Food Item | Venue | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|---|
| **How often do you eat the following:** | | | **Per day** | **Per week** | **Per month** | **Rarely / Never** |
| Fish | | | | | | |
| 235. Stir fried/ pan fried/ deep fried | | 1 serving | | | | |
| 239. Deep fried with batter | | 1 serving | | | | |
| 243. Steamed | | 1 serving | | | | |
| 247. Assam pedas | | 1 serving | | | | |
| 251. Coconut curry | | 1 serving | | | | |
| 255. Curry without coconut | | 1 serving | | | | |
| 259. Grilled | | 1 serving | | | | |
| Other seafood | | | | | | |
| 263. Stir fried/ pan fried/ deep fried | | 1 serving | | | | |
| 267. Deep fried with batter | | 1 serving | | | | |
| 271. Steamed | | 1 serving | | | | |
| 275. Assam pedas | | 1 serving | | | | |
| 279. Coconut curry | | 1 serving | | | | |
| 283. Curry without coconut | | 1 serving | | | | |
| 287. Grilled | | 1 serving | | | | |

**Eggs**

| Food Item | Venue | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|---|
| **How often do you eat the following:** | | | **Per day** | **Per week** | **Per month** | **Rarely / Never** |
| Whole eggs (including salted and century eggs) | | | | | | |
| 291. Boiled/ poached/ in soups / steamed | | 1 egg | | | | |
| 292. Fried/ scrambled | | 1 egg | | | | |

**Desserts/Local Snack**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| Desserts in soup | | | | | |
| 296. With coconut milk/ cream (e.g. pulot hitam, bubor cha cha) | 1 B1 | | | | |
| 297. Without coconut milk (e.g.green bean soup, tau suan) | 1 B1 | | | | |
| Kueh kueh - steamed | | | | | |
| 298. With coconut/ coconut milk/ coconut cream (e.g. kueh sarlat, kueh dadar, putu mayam, idli) | 1 piece | | | | |
| 299. Without coconut milk (kueh tutu, soon kway) | 1 piece | | | | |
| Others | | | | | |
| 300. Fried snacks (e.g. you tiao, goreng pisang, Indian rojak) | 1 piece | | | | |
| 301. Dim sum - steamed (e.g. chee cheong fun, dumplings, rice dumplings) | 1 serving | | | | |
| 302. Dim sum - fried/ deep fried (e.g. fried carrot cake, wanton, char siew puff) | 1 piece | | | | |
| 303. Sweet Indian snacks (e.g. puri) | 1 piece | | | | |

**Biscuits, Pastries and Cakes**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| 304. Plain crackers | 2 pieces | | | | |
| 305. Cream filled biscuits/ shortbread | 2 pieces | | | | |
| 306. Puff/ flaky pastries (croissants, curry puffs, etc) | 1 piece | | | | |
| 307. Plain butter cake/ fruit cake | 1 piece | | | | |
| 308. Sponge cakes | 1 piece | | | | |
| 309. Cream cakes | 1 piece | | | | |

### Fast Foods and Soft Drinks

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| 310. Burgers, with beef or chicken | 1 serving | | | | |
| 311. Burgers, fish | 1 serving | | | | |
| 312. French fries | 1 small serving | | | | |
| 313. Pizza | 2 slices | | | | |
| 314. Soft drinks (incl. Packet drinks and yoghurt drinks) | 1 can or 1 pack | | | | |

### Nuts

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| All types of nuts | | | | | |
| 315. Dry roasted | $^1/_2$ M1 or small pkt | | | | |
| 316. Fried | $^1/_2$ M1 or small pkt | | | | |

### Tidbits/Snacks

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| 317. Fried salty snacks (crisps, prawn crackers, keropok, salted biscuits, etc) | 1 small packet of equivalent | | | | |
| 318. Ice cream | 1 scoop | | | | |
| 319. Chocolate | 4 squares | | | | |

### Milk used with beverages

| Food Item | | Number of times eaten | | | |
|---|---|---|---|---|---|
| **What milk do you usually use with the following:** | **Milk used (see below)** | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| 320. Coffee* | | | | | |
| 327. Tea* | | | | | |
| 334. Malt beverages (e.g. hot chocolate, Horlicks®, Milo®, Ovaltine®) | | | | | |

| Types of milk | Portion |
|---|---|
| 0. Creamer/ whitener | 2 tsp |
| 1. Sweetened condensed milk | 1 M1-D |
| 2. Evaporated milk | 1 M1-D |
| 3. Full cream milk/ powder | 1 M1-D / 2 tsp |
| 4. Low fat milk/ powder | 1 M1-D / 2 tsp |
| 5. Skimmed milk/ powder | 1 M1-D / 2 tsp |
| 6. No added milk or sugar | Nil |

***Assume 1 tsp of sugar added**

### Milk & Diary Products

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| Milk (as a drink) | | | | | |
| 341. Full cream milk* (fresh, UHT, powder) | 1 G2* | | | | |
| 342. Low fat milk* (fresh, UHT, powder) | 1 G2* | | | | |
| 343. Skimmed milk* (fresh, UHT, powder) | 1 G2* | | | | |
| Yoghurt | | | | | |
| 344. Regular | 1 G1 | | | | |
| 345. Low fat (including frozen yoghurt) | 1 G1 | | | | |
| 346. Cheese/ cheese spread | 1 slice/4 dsp | | | | |
| 347. Low fat cheese | 1 slice | | | | |

*this could be liquid milk or powdered milk made up to the same amount using instructions on tin.

**Additional Items**

| Food Item | Venue | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|---|
| **How often do you eat the following:** | | | **Per day** | **Per week** | **Per month** | **Rarely / Never** |
| 348. Laksa without gravy | | 1 portion | | | | |
| 348. Stir fried/ Deep fried potato | | 1 cup | | | | |
| 349. Sugar | | 1 tsp (D2) | | | | |
| 350. Legumes and pulses Raw/ steamed/ boiled | | 1/2 cup | | | | |

## PART B

A. What type of oil/ fat do you/ your family use for cooking (stir frying, pan frying, deep frying, stewing)? Choose from list.

*0. Blended vegetable oil*

*1. Polyunsaturated oil (corn, soya, sunflower, safflower)*

*2. Monounsaturated oil (olive, peanut, canola)*

*3. Saturated fat (lard, ghee, tallow, cooking margarine, butter, shortening)*

*4. Others, please specify* _____

B. What type of oil/ fat do you/ your family use for baking/ roasting? Choose from list.

*0. Blended vegetable oil*

*1. Polyunsaturated oil (corn, soya, sunflower, safflower)*

*2. Monounsaturated oil (olive, peanut, canola)*

*3. Saturated fat (lard, ghee, tallow, cooking margarine, butter, shortening)*

*4. Others, please specify* _____

C. On average, how many alcoholic drinks (beers, stout, wine, hard liquor) do you consume per month?

_____

## Instructions for interviewers

**Questions about the diet:**

1. Have you changed your diet in the past one month? Yes/ No*

2. If yes, why did you do so?

_____

_____

_____

_____

_____

3. What were the changes you made?

_____

_____

_____

_____

_____

**Information to be obtained from NHS 98 survey questionnaire:**

Gender: M / F* Race: C/ M / I / O* ***(from page 1, items 3 & 4)***

Contact No: _____(H) _____(O) _____(Pg / HP)

Weight: _____(kg) Height: _____(cm) ***(from page 2, item 9)***

**For female respondents only:**

1. Have you had menopause? If yes, proceed to #2

2. What was your age when you had menopause? _____ Years

*Please circle appropriate one(s).

## Instructions for interviewers

### Thank the respondent and invite him/ her to participate in the Body Composition Study

Thanks for your invaluable information. We would like to invite you to take part in the Body Composition Study. It will be held between mid-November to mid-December (16 Nov - 18 Dec).

This study will take place at School of Physical Education (SPE), Bukit Timah road. This study can find out the amount of fat, water and bone in your body. It is expensive to do these assessments at your own cost, but now they are all free for you.

You just need to go to SPE once. You can choose either morning or evening session. You will be given working leave on that day. You need to fast for four hours before the assessments. A meal will be provided at SPE canteen afterwards. You will be reimbursed $20 as transportation fee. You will also receive some attractive souvenirs on the same day.

A detailed report will be given to you a few months after the study is completed. All information is strictly confidential and will be used in planning health policies and intervention programmes.

If you are interested, please choose three days that is convenient for you to go to SPE. We will randomly select 400 interested individuals and send more information to the selected ones about the study in due time.

Thank you.

## Instructions for interviwers

**Is the respondent interested in the Body Composition Study?**

Yes / No*

**Which days of the week is he/ she available?**

Any day / Mon / Tue / Wed / Thu / Fri / Sat / (preferably to have 3 days or more)*

**What time of day is he/ she available?**

Any time / Morning (8am - 12 noon) / Afternoon (1pm - 5pm) / Evening (MUST specify time _____)*

**Language spoken:**

English / Mandarin Chinese / Malay / Tamil /

Others (please specify _____)*

Language read: English / Chinese / Malay / Tamil*

Please circle appropriate one(s).

# CHECKLIST

**Please check for completeness of the following questionnaires and include ALL of then in the envelope provided.**

1. ☐ Dietary Practices Questionnaire (DPQ)

2. ☐ Food Frequency Questionnaire (FFQ)

3. ☐ 24-hour Food Intake Booklet

# National Nutrition Survey 1998

## 24 Hours Food Intake Questionnaire

Respondent ID: ☐☐☐☐

Interviewer ID:

Date of Interview (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

Day of Intake: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

Date of Intake (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

Coder ID:

Reviewer ID:

Department of Nutrition
Ministry of Health
Singapore

# Annex IV

## Introduction

1. Start by introducing yourself.

2. Record subject's number, date of interview, day of recall (e.g. Wednesday if the day of the interview is Thursday), and your interviewer code.

3. Briefly tell the subject what the interview is about (for the first 24-hour recall).

   ***"This interview is to enable us to find out what you have eaten the previous day. All that you have eaten including drinks, tidbits, sauces, gravies, spices, salad dressings, medications and supplements will need to be recalled in order for the records to be complete and data useful for our research.***

   ***There is no right or wrong answer in this interview, you only need to let me know what you have actually eaten. Your data will be used together with 300 other subjects for analysis and confidentiality will be maintained always.***

   ***To help you in your recall, I have some utensils and food models here that may be useful. When telling me how much of each food you have eaten, you may wish to use these."***

## Stages for the interview:

**Q1**: Quickly record all food and drink items consumed in the previous day. Do not interrupt unnecessarily. Allow respondent to recall all items eaten in the previous day.

a. ***What time did you go to bed the night before last? (e.g. if the interview is on Monday, the night before last was Saturday).***
b. ***Did you eat anything after midnight on that night? (either before bedtime or waking up for a snack)***
c. ***What time did you wake up yesterday (i.e. Sunday) morning?***
d. ***What was the first time you had anything to eat or drink? What did you have?*** WHEN RESPONDENT STOPS. ASK ***"Anything else?"***
e. ***When did you eat again? (after coming back from work, while watching TV)... What did you eat? Did you eat while preparing food?***

**AFTER COMPLETION OF QUICK LIST, PERFORM STEPS 1-6.**

| | | |
|---|---|---|
| **Step 1** | **Q2:** | ***About what time did you consume the food/ drink?*** |
| **Step 2** | **Q3**: | ***Please tell me what you would call this meal?***<br>1 Breakfast 2 Lunch 3 Lunch 4 Snacks 5 Supplements |
| **Step 3** | **Q4**: | ***Where was the food/ drink prepared?***<br>1 Home 2 Outside of home |
| **Step 4** | **Q5**: | Transfer Quick List Food (**Q1**) to Food/Drink and Additions (**Q5**) column.<br>Check off food in Quick List as it is transferred. |
| **Step 5** | **Q6:** | Refer to FIM for food probes.<br>Be sure to request food labels if subject cannot answer probes for Q6. |
| **Step 6** | **Q7**: | Refer to FIM for amount questions. |

**REPEAT STEPS 1-6 FOR ALL ITEMS LISTED ON THE QUICK FOOD LIST.**

| Q1. Quick List of Food Items | | Q2. Time Taken | Q3. Meal | Q4. Venue | Q5. Food/Drink and Additions |
|---|---|---|---|---|---|
| L1. | | A | | | 1. |
| L2. | | P | | | |
| L3. | | A | | | 2. |
| L4. | | P | | | |
| L5. | | A | | | 3. |
| L6. | | P | | | |
| L7. | | A | | | 4. |
| L8. | | P | | | |
| L9. | | A | | | 5. |
| L10. | | P | | | |
| L11. | | A | | | 6. |
| L12. | | P | | | |
| L13. | | A | | | 7. |
| L14. | | P | | | |
| L15. | | A | | | 8. |
| L16. | | P | | | |
| L17. | | A | | | 9. |
| L18. | | P | | | |
| L19. | | A | | | 10. |
| L20. | | P | | | |
| L21. | | A | | | 11. |
| L22. | | P | | | |
| L23. | | A | | | 12. |
| L24. | | P | | | |
| L25. | | A | | | 13. |
| L26. | | P | | | |
| L27. | | A | | | 14. |
| L28. | | P | | | |
| L29. | | A | | | 15. |
| L30. | | P | | | |
| L31. | | A | | | 16. |
| L32. | | P | | | |

| Q6. Description of Food/Drink and Ingredients | Q7. Actual Amount Consmed |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

**4. At the end of the interview, review the 24-hour recall.**

***"Now let's see if I have everything. I'd like you to try to remember anything else you ate or drank yesterday, that you haven't already told me about, including food supplements and anything you ate or drank while preparing a meal or while waiting to eat."***

5. Go through the quick list one more time.

6. Thank the respondent for providing the information.

7. See respondent off before completing interviewer observation form.

8. Return form to registration clerk.

## INTERVIEWER OBSERVATION FORM

A Did you or the sample person have difficulty with the 24-hour food intake interview?

☐ Yes (Please complete B)

☐ No

B What was the reason for this difficulty?

_____

_____

_____

_____

_____

_____

# Acknowledgements

# Acknowledgements

## Co-ordination Team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