



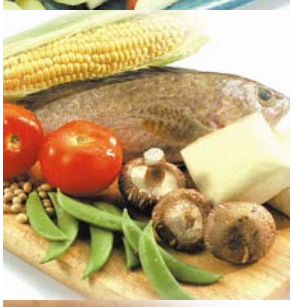


# *Report of the National Nutrition Survey 2004*

SINGAPORE

Health Promotion Board

**RESEARCH & STRATEGIC PLANNING DIVISION**

REPORT OF THE NATIONAL NUTRITION SURVEY 2004
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# *Foreword*

The global epidemic of obesity and its attendant health problems continue unabated into the new millennium. There is now a plethora of direct epidemiological evidence associating obesity with increased risks of adult-onset diabetes, coronary vascular disease, cerebrovascular disease and certain cancers. As standards of living improve in Singapore, our population is also at increasing risk of the public health threats posed by the obesity epidemic. In the National Health Survey (2004), the prevalence of obesity among adult Singaporeans increased to 6.9% compared to 6.0% in 1998. In addition, 25.6% of adults were found to be overweight. In the face of these public health challenges, health promotion efforts to improve the lifestyle behaviour of Singaporeans and disease control programmes were pro-actively promulgated. These interventions have led to significant declines in the prevalence of hypertension, diabetes mellitus and hypercholesterolemia over the past six years.

As the Health Promotion Board continues with our efforts in combating the above epidemic and building a nation of healthy and fit Singaporeans, national guidelines on healthy nutrition need to be based on locally derived evidence. Over the past decade since the first National Nutrition Survey (NNS) in 1993, we have collated much information on the dietary practices and nutrient intakes of Singaporeans. This information has been instrumental in the formulation of guidelines and programmes targeted specifically at Singaporeans.

This publication reports the findings of the third NNS conducted from September to December 2004. The findings provide information on the dietary practices and the intake of the major food groups and nutrients of about 1,400 Singaporean residents aged 18-69 years old. Where relevant, the findings were compared with the NNS in 1998 to analyse trends of dietary practices and nutrient intake over the years. This information, which is based on the local population, forms the basis for the formulation of national nutrition guidelines and nutrition intervention programmes specific to our Singapore population. Research data will also be used for future trend analysis of the dietary practices and nutritional intake of Singaporeans.

I wish to take this opportunity to extend my gratitude and appreciation to all staff of the Research and Evaluation Department for the coordination and implementation of the NNS. Special thanks also to the Department of Epidemiology and Disease Control, Ministry of Health, for their kind assistance and collaboration during the survey.

Lastly, I wish to thank all the survey participants who have contributed to the survey through their invaluable responses, without whom this survey would not have been such a success.

Lam Pin Woon
Chief Executive Officer
Health Promotion Board

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## Glossary of Terms

24-Hour Dietary Recall

An interviewer-administered questionnaire is to assess the dietary intake of an individual over the preceding twenty-four hours. This was used to determine the mean intakes of energy and selected nutrients of Singaporeans.

Blended Oil

Most commonly used oil for cooking in Singapore. Many blended vegetable cooking oils contain palm olein as the main ingredient and have 40-50% saturated fat.

BCS Body Composition Study

A study conducted to investigate the relationship between anthropometric measurements and body fat among adult Singaporeans.

DPQ Dietary Practice Questionnaire

An interviewer-administered questionnaire is to assess usual dietary preferences, usual meal venues and frequency of intake of selected food and beverages of adult Singaporeans.

Eggs Include salted or century eggs.

FCS Food Consumption Study

A nation-wide study conducted in 1993 to determine the dietary levels of energy and nutrients in adult Singaporeans.

FFQ Food Frequency Questionnaire

An interviewer-administered questionnaire to assess the intake of 380 commonly eaten food items identified in previous national nutrition surveys to be significant contributors to the adult Singaporean's intake of energy and nutrients.

Hawker Centres

Include hawker centres, coffee shops and food courts.

Healthy Diet Pyramid

This is a guide to the selection of a variety of food from each of the four basic food groups in appropriate amounts (rice and alternatives, fruit, vegetables and meat and alternatives) to obtain the nutrients needed for optimal health.

NHS National Health Survey

A national cross-sectional survey conducted by the Ministry of Health to assess the level of diabetes, high blood pressure and other risk factors for heart diseases and stroke in Singapore.

Poultry

Include chicken, duck, turkey and pigeon.

RDA Recommended Dietary Allowance

RDAs are levels of energy and nutrients which are set to meet the needs of the majority of people in the population.

Singapore Dietary Guidelines for Adult Singaporeans

These are dietary guidelines intended for healthy Singaporeans aged 18 to 65 years old. The recommendations were developed to meet the nutrient requirements of adult Singaporeans, taking into consideration the local food consumption patterns and prevailing diet-related public health concerns.

Sweetened Drinks

Include soft drinks, fruit drinks, packet drinks, cordials, yoghurt-based drinks and cultured milk drinks.

Sweet Desserts and Snacks

Include cakes, jellies, candies, chocolates, cookies and ice cream.

Wholegrain Products

They are food products containing wholegrains e.g. wholemeal bread and biscuits, brown rice, wholemeal spaghetti. The intake of wholegrain products in this survey is determined by measuring the intake of wholemeal and softmeal bread as a surrogate food item.

Wholegrains

They are unpolished grains containing bran and germs, addition to endosperm. They consist of more vitamins (vitamins B and E), minerals (iron, zinc and magnesium), dietary fibre and phytochemicals than refined grains.

Workplace/School

Include workplace, polytechnic and university canteens, and school canteens.

# Executive Summary

## About the Survey

There is currently a large body of evidence associating dietary patterns and the level of physical activity to existing health levels as well as to the risks of developing chronic diseases such as cancer, cardiovascular disease and diabetes mellitus [(2)].

With increasing affluence among the Singaporean population, significant changes in the patterns of food supply and dietary practices have taken place. As the dietary practices of Singaporeans evolve with time, it is essential to identify these key changes and to monitor the nutritional quality of Singaporean diet. This will allow the identification of important areas for further intervention in order to reduce the incidence of the above chronic diseases.

With this in mind, the National Nutrition Survey (NNS) was conducted in conjunction with the National Health Survey (NHS). Previous surveys were conducted in 1993 and 1998. The main components for the NNS 2004 were the dietary practice questionnaire (DPQ) and the food frequency questionnaire (FFQ). A total of 1381 subjects participated in the DPQ.

## Objectives

The NNS 2004 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) which make up the Healthy Diet Pyramid
- Determine levels of intake for energy and nutrients (i.e. protein, total fat, saturated and unsaturated fats, cholesterol, carbohydrate, dietary fibre, sodium, calcium, iron, vitamins A and C) and
- Track changes in the diet of Singaporeans

## Dietary Practices

The Singapore Dietary Guidelines 2003 for Adult Singaporeans [3] recommend a diet that contains a variety of food using the Healthy Diet Pyramid as a guide, the maintenance of a healthy body weight, the intake of sufficient amounts of grains (especially wholegrains), the consumption of more fruit and vegetables, choosing and preparing food with less fat and salt, choosing beverages with less sugar and moderation in the consumption of alcoholic beverages.

Compared with findings from the NNS 1998, there were positive changes in the dietary practices of adult Singaporeans. These included more adult Singaporeans who reported drinking reduced fat milk compared to full cream milk and having deep fried food less than twice in a week. Also, fewer adult Singaporeans were using butter as a fat spread and adding salt/sauces to food at the table. However, less encouraging trends included fewer adult Singaporeans who reported trimming off visible fat from meat or trimming off skin from poultry. In addition, fewer adult Singaporeans chose wholemeal bread or a mixture of wholemeal and white bread. Finally, more adult Singaporeans reported using blended oil, which has a higher content of saturated fat compared to healthier options such as corn or olive oil [Table A].

**Table A: Comparison of proportion of adult Singaporeans reporting selected dietary practices, 1998 and 2004**

| Dietary practices | NNS 1998 (%) | NNS 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| Drinking reduced-fat milk | 33.7 | 38.7 | ▲ |
| Having deep fried food less than 2 times/ week | 56.6 | 61.7 | ▲ |
| Using butter as a fat spread | 20.2 | 13.6 | ▽ |
| Adding salt/sauces to food at the table | 60.2 | 36.8 | ▽ |
| Trimming fat from meat | 87.0 | 71.9 | ▽ |
| Trimming skin from poultry | 79.6 | 63.8 | ▽ |
| Choosing wholemeal or a mixture of white & wholemeal bread | 28.5 | 28.0 | ▽ |
| Using blended oils for cooking at home | 41.3 | 42.9 | ▲ |

The Healthy Diet Pyramid recommends the intake of a variety of food from the four basic food groups in appropriate number of servings for optimal health. Individuals are encouraged to consume 5-7 servings of rice and alternatives (of which at least one serving should be a wholegrain product), 2 servings of fruit, 2 servings of vegetables and 2-3 servings of meat and alternatives a day [(2)]. Table B shows the percentages of adult Singaporeans who met the above guidelines.

The findings show that females were less likely than males to meet the recommendations for rice and alternatives, vegetables and meat and alternatives. On the other hand, males were less likely to meet the recommended intake for wholegrain products and fruit compared to females. Younger adults (18-49 years) were less likely to consume adequate wholegrain products and fruit compared to older adults (50-69 years) who were less likely to consume sufficient rice and alternatives, vegetables and meat and alternatives.

**Table B: Proportion of adult Singaporeans meeting the Healthy Diet Pyramid Guidelines, by gender, ethnic group and age group**

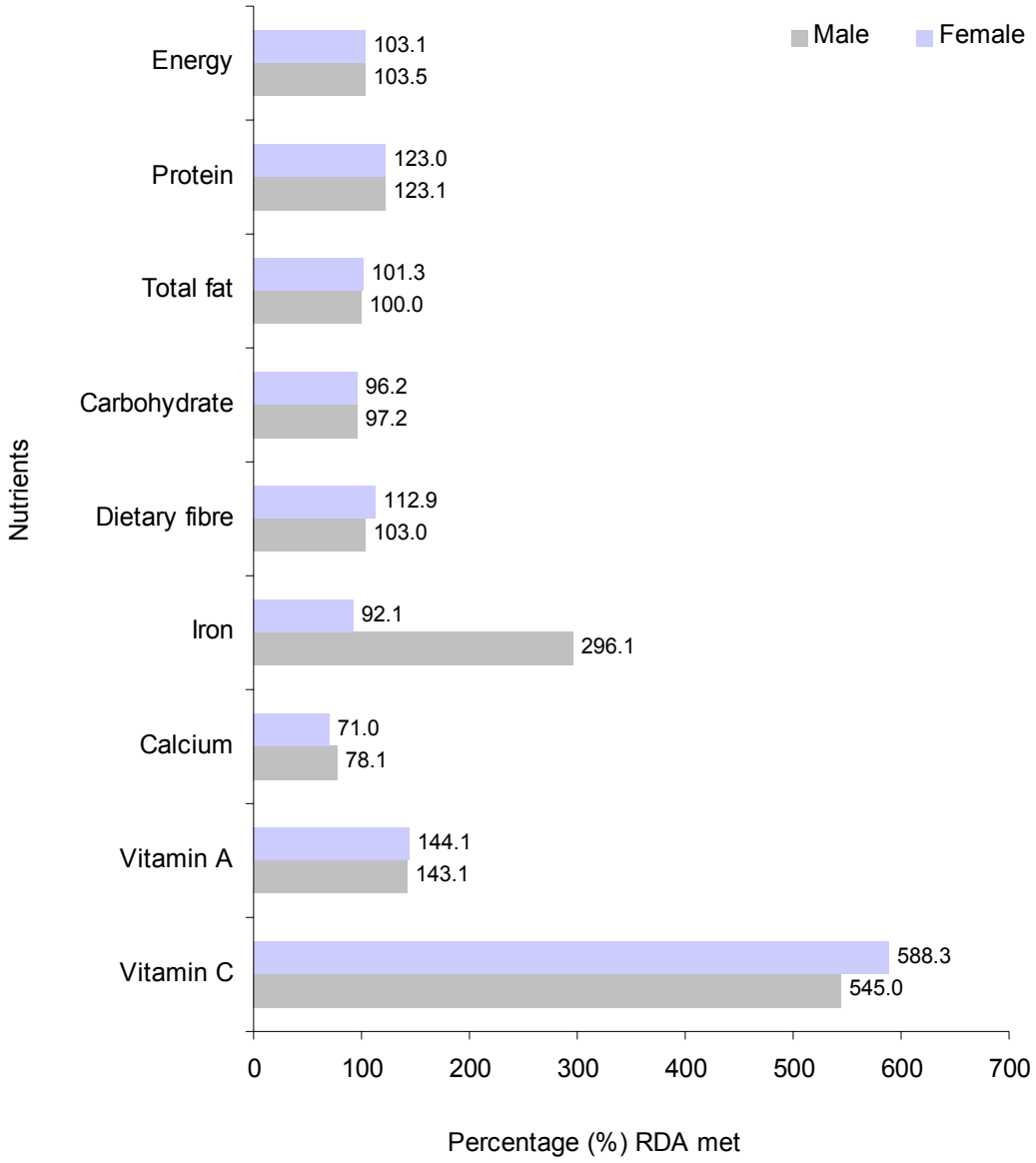
| | | Rice and alternatives | | Fruit | Vegetables | Meat and alternatives |
|---|---|---|---|---|---|---|
| | | Total | Wholegrain products* | | | |
| | N | ≥ 6 servings | ≥ 0.5 servings | ≥ 2 servings | ≥ 2 servings | ≥ 2.5 servings |
| **Gender** | | | | | | |
| Males | 687 | 69.5 | 12.0 | 26.0 | 45.1 | 66.1 |
| Females | 694 | 39.9 | 15.4 | 31.3 | 40.2 | 48.1 |
| **Ethnic group** | | | | | | |
| Chinese | 823 | 55.1 | 13.7 | 28.3 | 44.1 | 58.4 |
| Malay | 274 | 51.7 | 12.6 | 28.2 | 31.6 | 54.0 |
| Indian | 284 | 53.6 | 15.2 | 32.1 | 46.4 | 48.2 |
| **Age group (years)** | | | | | | |
| 18-29 | 354 | 63.0 | 12.7 | 19.2 | 45.4 | 66.2 |
| 30-39 | 370 | 56.4 | 10.9 | 22.3 | 45.7 | 62.8 |
| 40-49 | 377 | 55.6 | 11.5 | 35.1 | 41.0 | 53.7 |
| 50-59 | 177 | 49.0 | 20.7 | 37.6 | 44.8 | 56.0 |
| 60-69 | 103 | 36.5 | 15.7 | 34.1 | 27.8 | 29.9 |
| **Total** | **1381** | **54.6** | **13.7** | **28.6** | **42.7** | **57.0** |

* *The Healthy Diet Pyramid recommendation is 1 serving of wholegrain products daily. Due to the low percentage of population consuming 1 serving of wholegrain products daily, 0.5 serving is used as a standard for evaluation in this report. The intake of wholegrain products in this survey is determined by measuring the intake of wholemeal and softmeal bread as a surrogate food item.*

## Dietary Adequacy

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

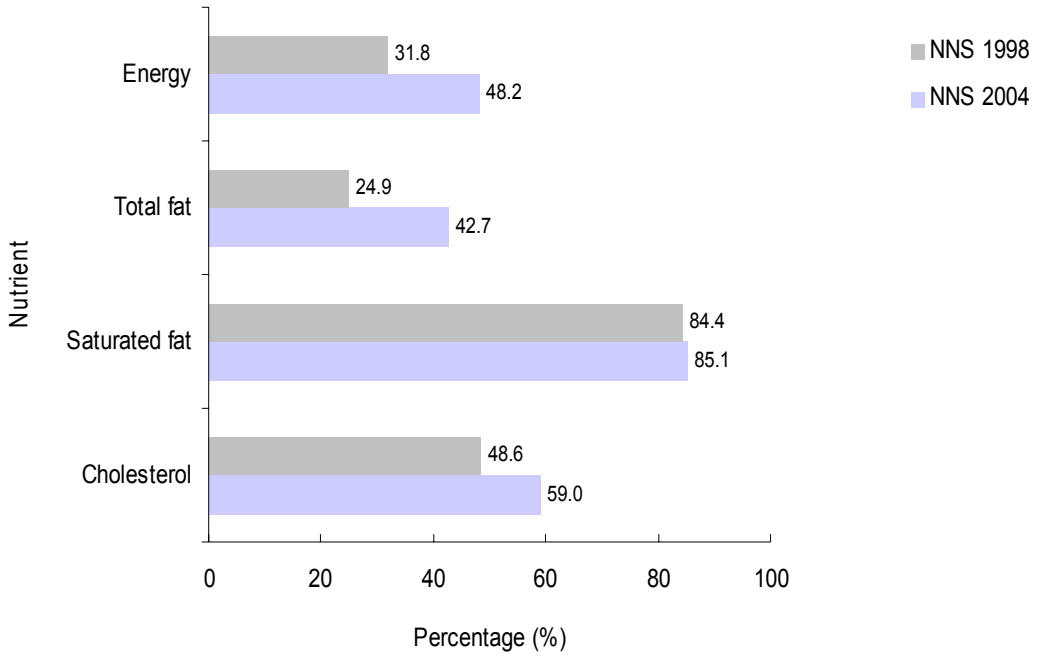
**Figure A: Adequacy of diet: Percent Recommended Dietary Allowances (RDA) met by gender**



## Dietary Excesses

Although the adult Singaporean's diet met the minimum recommendations for various macronutrients and micronutrients, the findings indicated areas of concerns such as the excessive intake of energy, total fat, saturated fat and cholesterol which were above and beyond the recommendations (more than 100% of recommended intake). Compared with 1998, more adult Singaporeans in 2004 had excessive intakes of energy, total fat, saturated fat and cholesterol [Figure B].

**Figure B: Comparison of proportion of adult Singaporeans with excess intake of selected nutrients, 1998 and 2004**



## Fat and Saturated Fat Intake

The average adult Singaporean's fat intake contributed close to 30% of the total energy intake. This is within the Singapore Dietary Guidelines 2003 which recommended that 25% to 30% of energy intake should be from fat [(2)]. Generally, Chinese had a lower intake of fat compared to the Malays and the Indians.

Almost 39% of the total fat in the average adult Singaporean diet was saturated fat which was higher than the recommended intake of saturated fat (no more than one third of total dietary fat) [(2)]. The main sources of saturated fat were flavored rice, fried noodles, meat dishes and desserts coconut milk/cream and cooking oils containing higher content of saturated fat. Malays had the highest intake of saturated fat, with 42.4% of their total dietary fat contributed by saturated fat. They were followed by the Indians, whose saturated fat intake was 40.6% of total dietary fat [Table C]. Compared to the other age groups, those aged 18 to 29 years had the highest intake of saturated fat (contributing 39.5% of total dietary fat).

### Table C: Fat and saturated fat intakes by ethnic group and age group

| | Total fat | | Saturated fat | |
|---|---|---|---|---|
| | Mean fat intake (g) | % Dietary energy | Mean saturated Fat intake (g) | % Total fat intake* |
| **Ethnic group** | | | | |
| Chinese | 76.2 | 28.5 | 29.6 | 38.2 |
| Malay | 85.2 | 29.7 | 36.3 | 42.4 |
| Indian | 83.3 | 29.7 | 34.1 | 40.6 |
| **Age group (years)** | | | | |
| 18-29 | 92.8 | 30.5 | 37.2 | 39.5 |
| 30-39 | 84.4 | 29.8 | 33.8 | 39.3 |
| 40-49 | 72.4 | 28.0 | 28.8 | 39.3 |
| 50-59 | 70.2 | 27.6 | 26.8 | 37.7 |
| 60-69 | 53.5 | 25.6 | 20.2 | 37.2 |
| **Total** | **77.9** | **28.7** | **30.8** | **38.9** |

* *The 2003 Dietary Guidelines recommend:*
- *Restrict total fat intake to 25% to 30% of total energy.*
- *Not more than 1/3 of the total fat intake should come from saturated fat.*

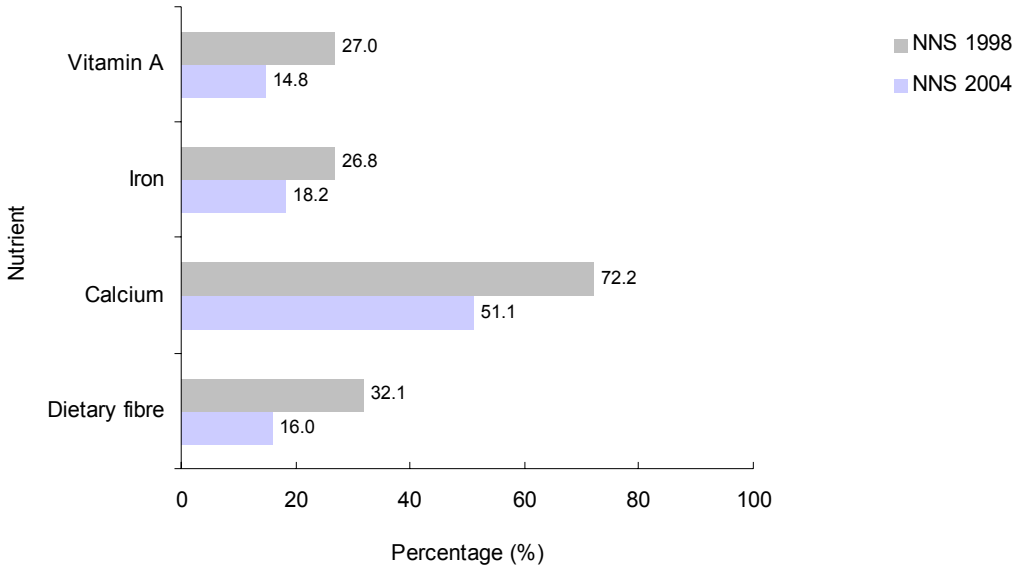
## Dietary Insufficiencies

In 2004, fewer adult Singaporeans had inadequate intakes (less than 70% of the respective RDAs) of dietary fibre, iron, calcium and vitamin A [Figure C] compared to 1998.

A diet adequate in calcium can help to prevent osteoporosis. The recommended daily intake for calcium is 800mg for adult Singaporeans between 18 to 59 years old. Adult Singaporeans who are 60-69 years old require 1,000mg of calcium daily. Females were less likely to meet the recommended calcium intake compared to males [Figure A].

A diet rich in dietary fibre has been proven to be beneficial for health in many ways. It aids in lowering of blood cholesterol, prevents cancer (especially cancer of the colon) and adds bulk to the diet. More Singaporeans met the recommended dietary fibre intake. This could be due to the increasing number of people who consumed adequate servings of rice and alternatives (54.6%), fruit (28.6%) and vegetables (42.7%) as these are good sources of dietary fibre. Males were less likely to meet the recommended dietary fibre intake compared to females [Figure A].

**Figure C: Comparison of proportion of adult Singaporeans whose diets had insufficient selected nutrients, 1998 and 2004**



# Methodology

# Methodology

## Sample

A total of 4,168 respondents participated in the NHS 2004. The sampling methodology for the NHS is described in the NHS 2004 report [2]. From the respondents of NHS 2004, a sub-sample of 1381 subjects was further selected to participate in NNS 2004 using a selection matrix stratified by gender, race and age. The Malay and the Indian participants were over sampled.

## Dietary Assessment Tools

### *Dietary Practices Questionnaire*

Dietary practices were assessed using an interviewer-administered Dietary Practice Questionnaire (DPQ) [Annex II]. The DPQ was developed based on the questionnaires used in the Food Consumption Study 1993 (FCS) and NNS 1998. This was further modified in 2004 to include other key questions on dietary practices.

The DPQ consisted of 31 questions and the topics covered in the questionnaire included the usual food habits, usual venues of meals of Singaporeans and the frequency of their intake of selected food and beverages.

Trained interviewers administered these questionnaires. Respondents were asked to select the answer that most appropriately described their usual dietary practices.

### *Food Frequency Questionnaire*

A validated interviewer-administered Food Frequency Questionnaire (FFQ) [Annex III] was used in the assessment of the intake of various food items. The FFQ consisted of 380 commonly eaten food items which were identified from the FCS 1993 and NNS 1998 to be important contributors to the population's intake of energy and nutrients [4].

The adequacy of dietary intake of various food groups and individual nutrients was assessed by comparing the levels of intake with dietary standards such as the Recommended Dietary Allowances (RDAs) [5] and the Singapore Dietary Guidelines 2003 [2].

A number of aids were used to facilitate the identification type and quantity of food consumed by the survey participants. A Compendium of Food Pictures consisting of 14 photographs on groups of food and 69 photographs on individual food items was used during the interviews [6]. These photographs were produced to reflect the actual size of food items and were useful in helping subjects estimate amounts eaten as fractions or multiples of the illustrated reference portions. Household measures such as graduated bowls, glasses and spoons of varying sizes were also used to estimate the volumes of fluids or the amounts of food consumed.

## Training of Interviewers

All the interviewers were trained to administer the questionnaires and visual aids in a standardised manner. During the duration of the fieldwork, regular assessment of the interviewers was conducted to ensure consistency in the interviewing techniques.

## Fieldwork

The fieldwork was conducted from 10 September to 4 December 2004 at six polyclinics island-wide. Respondents were individually interviewed using the above questionnaires about their dietary practices and usual intakes of various food items with the aid of food pictures and household measures when necessary.

## Data Analysis

### *Data Coding*

Dietary practices and food intake data were coded using the Online Food Information and Nutrient Database (FIND) which was developed jointly by the Nutrition Department and the Health Data Management Department of Health Promotion Board.

### *Statistical Analysis*

The data was analysed using SPSS version 12.0 (SPSS Inc, 2003) with the significance level set at $p < 0.05$.

Comparison of the dietary practices between NNS 1998 and NNS 2004 were performed using *Chi*-square statistics. One-way ANOVA and *t*-test were used to examine the differences in mean intakes of food, energy and nutrients intakes.

The data was weighted to the 2004 mid-year population estimates to account for the over-sampling of Malay and Indian participants and to extrapolate the findings to the general population. Where comparison was made with the results from NNS 1998, the data was standardised using the 2000 census population figures as the standard population. The results were presented by gender, ethnic and age groups.

# Subjects

# Subjects

The profile of the respondents is shown in Table 1.0. The gender distribution was approximately equal (males: 49.7%; females: 50.3%). The majority of participants were the Chinese (59.6%), followed by the Malays (19.8%) and the Indians (20.6%). This subject profile was similar to the 1993 and 1998 surveys. The mid-2004 population estimates for 18-69 year olds is presented as well for comparison.

**Table 1.0: Demographic profile of respondents compared to the Singapore population in 2004[#]**

| Demographic characteristics | Survey sample (Unweighted) | Singapore resident population (As at end June 2004) |
|---|---|---|
| **Gender** | | |
| Males | 49.7 | 49.6 |
| Females | 50.3 | 50.4 |
| **Ethnic Group** | | |
| Chinese | 59.6 | 79.3 |
| Malay | 19.8 | 12.6 |
| Indian | 20.6 | 8.1 |
| **Age group (years)** | | |
| 18-29 | 25.6 | 22.7 |
| 30-39 | 26.8 | 24.8 |
| 40-49 | 27.3 | 25.8 |
| 50-59 | 12.8 | 17.5 |
| 60-69 | 7.5 | 9.2 |

[#] *Source – Department of Statistics, Singapore, 2004*

# Dietary Practices

## 2.1 Breakfast

Most adult Singaporeans consumed breakfast with only 7.2% skipping it. About six in ten adult Singaporeans had home-prepared breakfast. Amongst those who had their breakfast away from home, the most frequent venue was the hawker centre (21.1%) followed by the workplace canteen (13.1%).

**Figure 2.1: Distribution by breakfast venues frequented among adult Singaporeans**

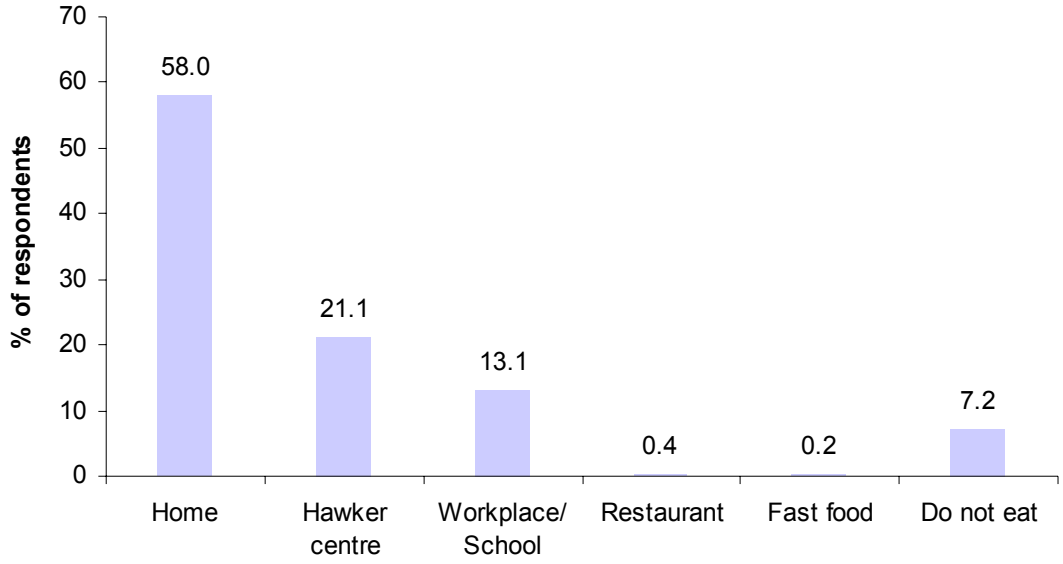


Table 2.1 shows the distribution of breakfast venues by gender, ethnic and age groups. Most of the ethnic groups consumed their breakfast at home or packed them from home. However compared with the other ethnic groups, the Chinese (24.4%) were more likely to have breakfast at hawker centres/coffee shops/food courts. Respondents aged 60-69 years were most likely to consume their breakfast at home. Those aged 18-29 years were most likely to skip breakfast. Among those aged 18-29 years (23.8%) who reported having breakfast away from home, the majority had it at the workplace or tertiary institutions. Those aged 30-69 years who had breakfast away from home preferred the hawker centre.

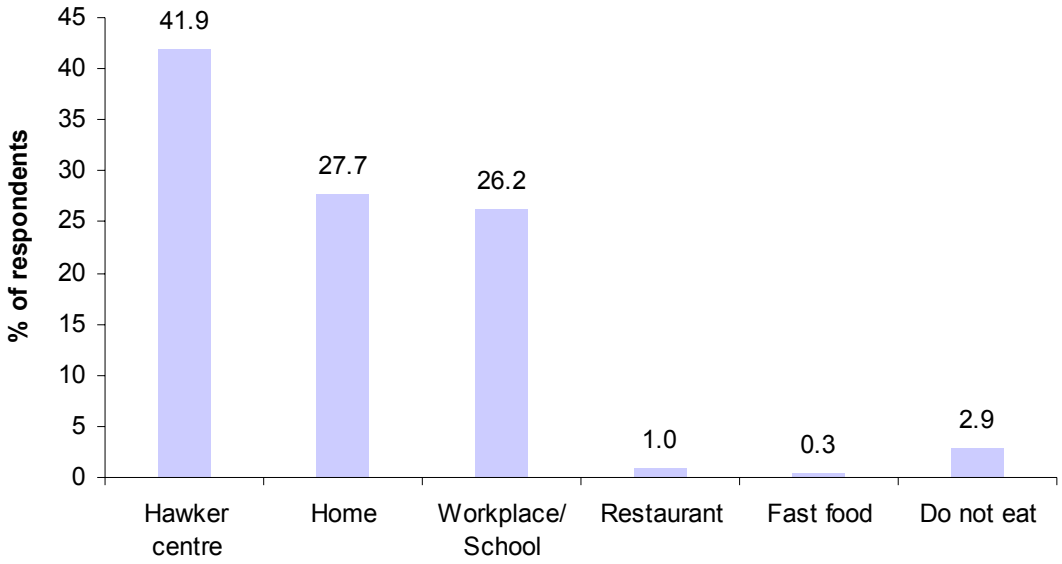
**Table 2.1: Distribution of breakfast venues frequented by adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | Home | Hawker centre | Workplace/ School | Restaurant | Fast food | Do not eat breakfast |
|---|---|---|---|---|---|---|
| **Gender** | | | | | | |
| Males | 351 (51.3) | 173 (25.3) | 105 (15.3) | 4 (0.6) | 0 (0.0) | 51 (7.5) |
| Females | 449 (64.5) | 119 (17.1) | 76 (11.0) | 1 (0.2) | 2 (0.3) | 48 (6.9) |
| **Ethnic group** | | | | | | |
| Chinese | 611 (55.9) | 267 (24.4) | 138 (12.6) | 4 (0.4) | 2 (0.2) | 71 (6.5) |
| Malay | 111 (63.9) | 16 (9.4) | 31 (17.9) | 0 (0.0) | 0 (0.0) | 15 (8.8) |
| Indian | 78 (69.6) | 9 (7.9) | 12 (10.3) | 1 (1.0) | 0 (0.0) | 13 (11.2) |
| **Age group (years)** | | | | | | |
| 18-29 | 159 (50.3) | 40 (12.6) | 75 (23.8) | 0 (0.0) | 1 (0.4) | 41 (13.0) |
| 30-39 | 177 (51.8) | 75 (21.9) | 57 (16.8) | 2 (0.5) | 1 (0.4) | 29 (8.6) |
| 40-49 | 218 (61.3) | 88 (24.6) | 29 (8.1) | 2 (0.6) | 0 (0.0) | 19 (5.4) |
| 50-59 | 157 (65.3) | 60 (24.7) | 17 (6.9) | 2 (0.8) | 0 (0.0) | 6 (2.3) |
| 60-69 | 90 (70.8) | 30 (23.8) | 3 (2.3) | 0 (0.0) | 0 (0.0) | 4 (3.1) |
| **Total** | **801 (58.0)** | **292 (21.1)** | **181 (13.1)** | **6 (0.4)** | **2 (0.2)** | **99 (7.2)** |

## 2.2 Lunch

The majority of adult Singaporeans had their lunch away from home. The most frequented lunch venues away from home were the hawker centres (41.9%) followed by the workplace canteens or tertiary institutions (26.2%).

**Figure 2.2: Distribution by lunch venues frequented among adult Singaporeans**



Females (38.2%) were more likely to have home-prepared lunch compared with males (17.0%). The Chinese (22.2%) were more likely to eat lunch away from home compared with the Malays and the Indians. The most common lunch venue for the Chinese (47.9%) was the hawker centre. Adult Singaporeans aged 60-69 years were most likely to consume their lunch at home. Those aged 18-59 years tended to have lunch at the workplace or hawker centres.

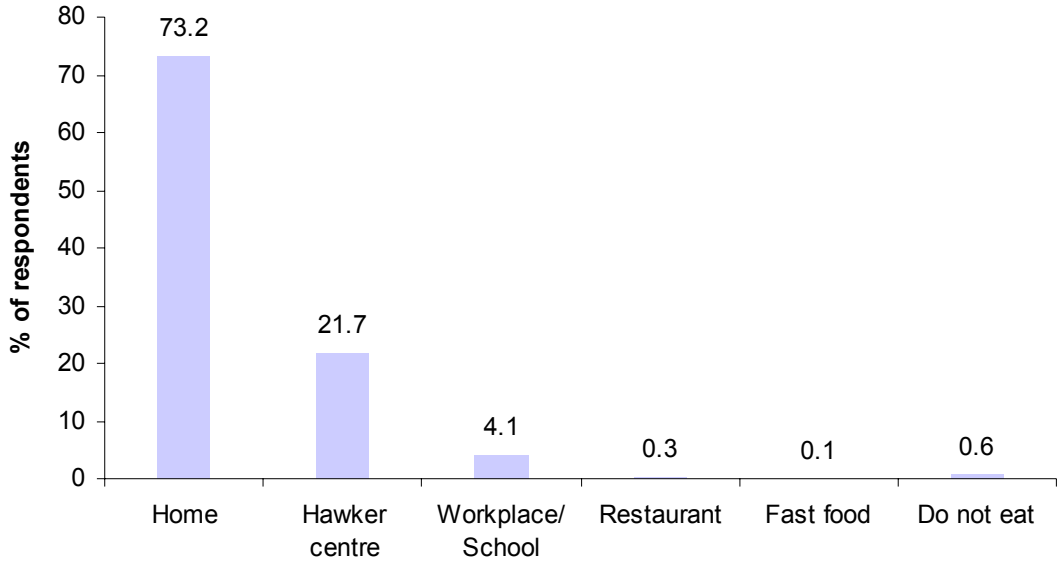
**Table 2.2: Distribution of lunch venues frequented by adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | Hawker centre | Home | Workplace/ School | Restaurant | Fast food | Do not eat lunch |
|---|---|---|---|---|---|---|
| **Gender** | | | | | | |
| Males | 347 (50.7) | 116 (17.0) | 196 (28.6) | 6 (0.8) | 2 (0.3) | 18 (2.6) |
| Female | 231 (33.2) | 266 (38.2) | 196 (23.9) | 8 (1.1) | 3 (0.4) | 23 (3.3) |
| **Ethnic group** | | | | | | |
| Chinese | 524 (47.9) | 243 (22.2) | 287 (26.2) | 11 (1.0) | 3 (0.3) | 27 (2.5) |
| Malay | 31 (17.6) | 81 (46.5) | 50 (28.9) | 0 (0.0) | 2 (1.0) | 10 (5.9) |
| Indian | 23 (20.5) | 58 (51.6) | 25 (22.4) | 3 (2.5) | 0 (0.0) | 3 (3.0) |
| **Age group (years)** | | | | | | |
| 18-29 | 114 (36.0) | 38 (11.9) | 152 (48.0) | 3 (0.8) | 3 (0.9) | 7 (2.3) |
| 30-39 | 172 (50.5) | 77 (22.5) | 80 (23.5) | 3 (1.0) | 0 (0.0) | 8 (2.4) |
| 40-49 | 167 (46.9) | 101 (28.3) | 72 (20.2) | 5 (1.4) | 0 (0.0) | 12 (3.2) |
| 50-59 | 89 (37.0) | 87 (36.1) | 54 (22.2) | 2 (0.8) | 2 (0.8) | 7 (3.1) |
| 60-69 | 36 (28.2) | 80 (62.9) | 5 (3.8) | 0 (0.4) | 0 (0.0) | 6 (4.8) |
| **Total** | **578 (41.9)** | **382 (27.7)** | **362 (26.2)** | **13 (1.0)** | **5 (0.3)** | **41 (2.9)** |

## 2.3 Dinner

Seven in ten adult Singaporeans had their dinner at home (73.2%). Among those who eat out, the hawker centre was their most frequent venue (21.7%).

**Figure 2.3: Distribution by dinner venues frequented among adult Singaporeans**



More females (80.1%) have dinner at home than males (66.2%). The Chinese (70.2%) were less likely to have their dinner at home than the Malays (82.3%) or the Indians (87.9%). Across demographic groups, the usual venue for adult Singaporeans who ate out for dinner was the hawker centre.

**Table 2.3: Distribution of dinner venues frequented by adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | Home | Hawker centre | Workplace/ School | Restaurant | Fast food | Do not eat dinner |
|---|---|---|---|---|---|---|
| **Gender** | | | | | | |
| Males | 453 (66.2) | 184 (26.9) | 43 (6.2) | 2 (0.3) | 1 (0.1) | 2 (0.3) |
| Females | 558 (80.1) | 116 (16.6) | 14 (2.0) | 2 (0.3) | 0 (0.0) | 7 (1.0) |
| **Ethnic group** | | | | | | |
| Chinese | 769 (70.2) | 280 (25.6) | 43 (4.0) | 2 (0.2) | 0 (0.0) | 0 (0.0) |
| Malay | 143 (82.3) | 12 (6.7) | 10 (5.6) | 1 (0.7) | 1 (0.4) | 7 (4.3) |
| Indian | 99 (87.9) | 8 (7.5) | 3 (3.0) | 0 (0.3) | 0 (0.0) | 1 (1.3) |
| **Age group (years)** | | | | | | |
| 18-29 | 208 (65.8) | 76 (24.0) | 29 (9.1) | 1 (0.4) | 1 (0.2) | 2 (0.5) |
| 30-39 | 246 (72.2) | 81 (23.7) | 11 (3.1) | 1 (0.2) | 0 (0.0) | 3 (0.8) |
| 40-49 | 264 (74.2) | 77 (21.5) | 9 (2.6) | 2 (0.6) | 0 (0.0) | 4 (1.0) |
| 50-59 | 185 (76.7) | 50 (20.8) | 6 (2.5) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| 60-69 | 107 (84.8) | 16 (13.0) | 2 (1.5) | 0 (0.0) | 0 (0.0) | 1 (0.6) |
| **Total** | **1011 (73.2)** | **300 (21.7)** | **57 (4.1)** | **4 (0.3)** | **1 (0.1)** | **9 (0.6)** |

## 2.4 Frequency of Dining at Hawker Centres and Fast Food Restaurants

Adult Singaporeans dined at hawker centres an average of 7 times per week and at fast food restaurants less than once a week. Almost half (49.3%) of adult Singaporeans have their meals at hawker centres 6 times or more a week.

Males frequented hawker centres more often compared to females. The Chinese dined most often at hawker centres compared to the other ethnic groups. Those aged 60-69 years were least likely to dine at hawker centres.

**Figure 2.4 (a): Distribution by frequency (times per week) of adult Singaporeans dining at hawker centres**

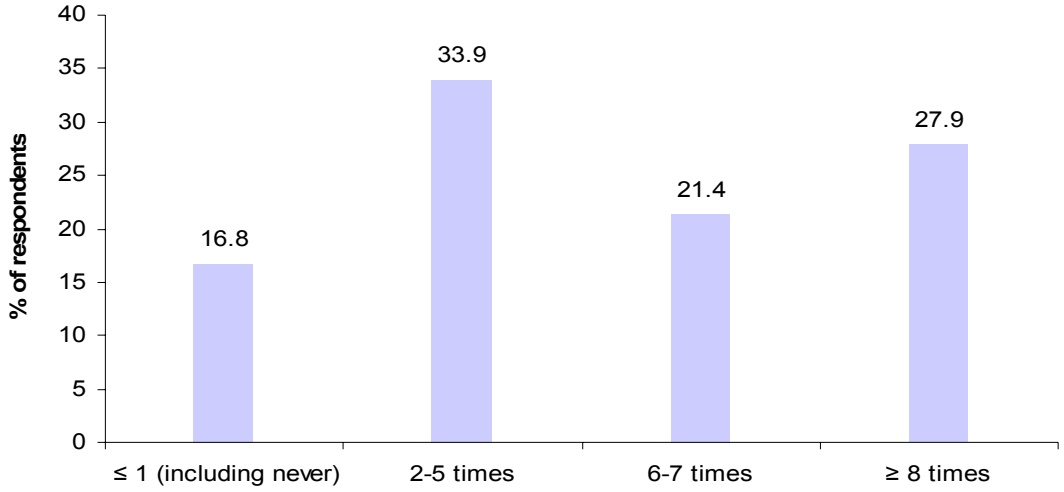
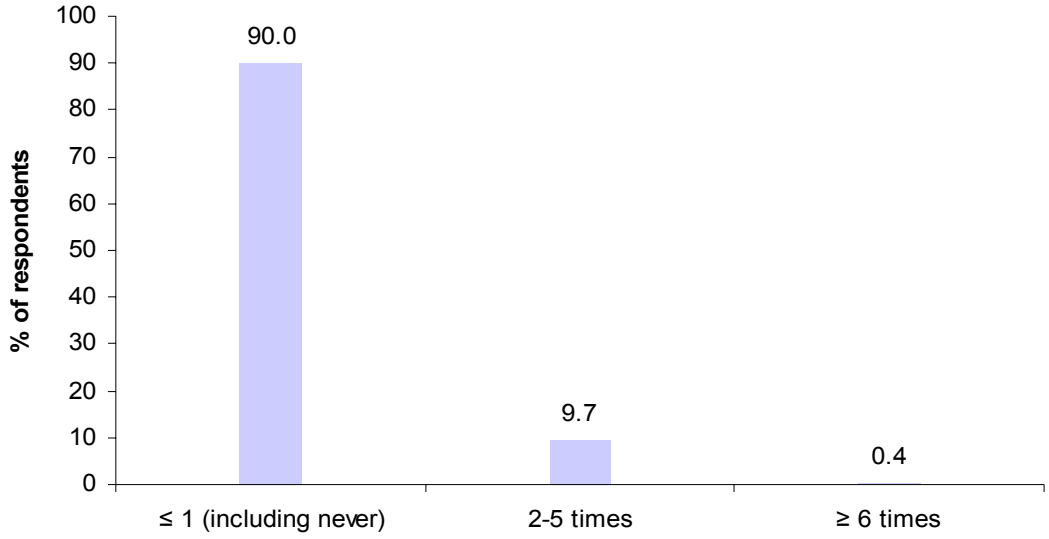



**Figure 2.4 (b): Distribution by frequency (times per week) of adult Singaporeans eating at western fast food restaurants**



The younger age groups (18-49 years) have their meals at hawker centres more often compared to the older age groups (50-69 years). Those aged 18-29 years tend to dine at fast food restaurant (once a week) compared to the other age groups.

**Table 2.4: Mean (CI) frequency (times per week) of adult Singaporeans dining at hawker centres and fast food restaurants, by gender, ethnic and age (years) groups**

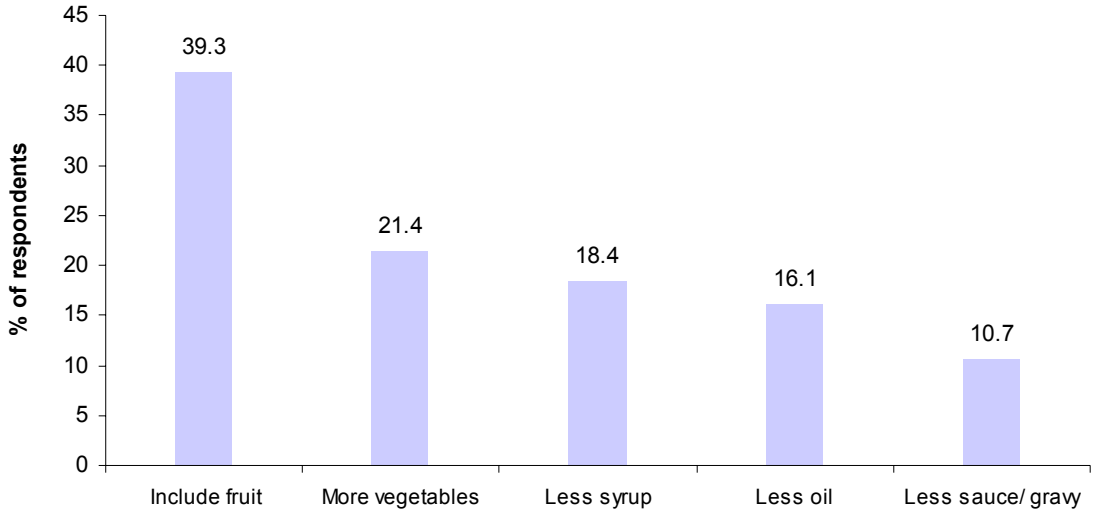
| | Hawker centres | Fast food restaurants |
|---|---|---|
| **Gender** | | |
| Males | 7.6 (7.16, 7.97) | 0.5 (0.46, 0.58) |
| Females | 5.4 (5.00, 5.73) | 0.5 (0.44, 0.58) |
| **Ethnic group** | | |
| Chinese | 7.2 (6.86, 7.49) | 0.5 (0.44, 0.54) |
| Malay | 3.8 (3.14, 4.45) | 0.7 (0.57, 0.90) |
| Indian | 3.5 (2.80, 4.26) | 0.5 (0.32, 0.60) |
| **Age group** | | |
| 18-29 | 6.9 (6.35, 7.52) | 1.1 (0.96, 1.20) |
| 30-39 | 7.0 (6.44, 7.55) | 0.6 (0.55, 0.72) |
| 40-49 | 6.9 (6.29, 7.45) | 0.3 (0.23, 0.40) |
| 50-59 | 5.5 (4.88, 6.09) | 0.2 (0.11, 0.21) |
| 60-69 | 4.5 (3.61, 5.30) | 0.0 (0.00, 0.00) |
| **Total** | **6.5 (6.18, 6.73)** | **0.5 (0.47, 0.56)** |

## 2.5 Ask for Healthier Choices

The "Ask For" programme was launched in 1998 to provide patrons dining at hawker centres and food courts the option to ask for healthier choices in their food when they eat out at these food outlets. These healthier choices included asking for more vegetables, less oil, less sugar/syrup, less sauce/gravy, for skin to be removed from poultry dishes and for fruit to be included at every meal. Food vendors were encouraged to participate in the programme by offering one appropriate healthier choice to their customers. The public was also encouraged to ask for these healthier choices when eating out.

Respondents from the NNS 2004 were asked about how frequently they asked for healthier choices in their food when they eat out. The most common healthier choices found was to include fruit in their diet (39.3%).

**Figure 2.5: Proportion of adult Singaporeans who ask for healthier choices (at least once a week)**



Females were more likely to ask for healthier choices compared to males except for the inclusion of fruit in the diet.

**Table 2.5: Proportion of adult Singaporeans who ask for healthier choices (at least once a week), by gender, ethnic and age groups, n (%)**

| | Include fruit | More vegetable | Less syrup | Less oil | Less sauce/gravy |
|---|---|---|---|---|---|
| **Gender** | | | | | |
| Males | 287 (41.9) | 138 (20.2) | 116 (16.9) | 91 (13.3) | 63 (9.3) |
| Females | 255 (36.7) | 157 (22.5) | 138 (19.9) | 131 (18.8) | 85 (12.2) |
| **Ethnic group** | | | | | |
| Chinese | 430 (39.3) | 237 (21.6) | 216 (19.7) | 185 (16.9) | 124 (11.3) |
| Malay | 72 (41.3) | 30 (17.1) | 19 (11.1) | 19 (10.8) | 11 (6.6) |
| Indian | 41 (36.2) | 28 (25.3) | 19 (16.9) | 18 (16.3) | 13 (11.7) |
| **Age group (years)** | | | | | |
| 18-29 | 160 (50.7) | 72 (22.8) | 44 (13.9) | 36 (11.3) | 21 (6.5) |
| 30-39 | 144 (42.1) | 68 (19.8) | 58 (17.1) | 59 (17.3) | 38 (11.2) |
| 40-49 | 138 (38.9) | 79 (22.3) | 76 (21.5) | 59 (16.6) | 44 (12.3) |
| 50-59 | 72 (30.0) | 60 (25.0) | 52 (21.5) | 47 (19.5) | 28 (11.6) |
| 60-69 | 27 (21.6) | 16 (12.4) | 24 (18.7) | 21 (16.5) | 18 (13.9) |
| **Total** | **542 (39.3)** | **295 (21.4)** | **254 (18.4)** | **222 (16.1)** | **148 (10.7)** |

## 2.6 Consumption of eggs, fried food, sweetened drinks, dessert and snacks

**Figure 2.6(a): Distribution by frequency (times per week) of eggs consumed among adult Singaporeans**

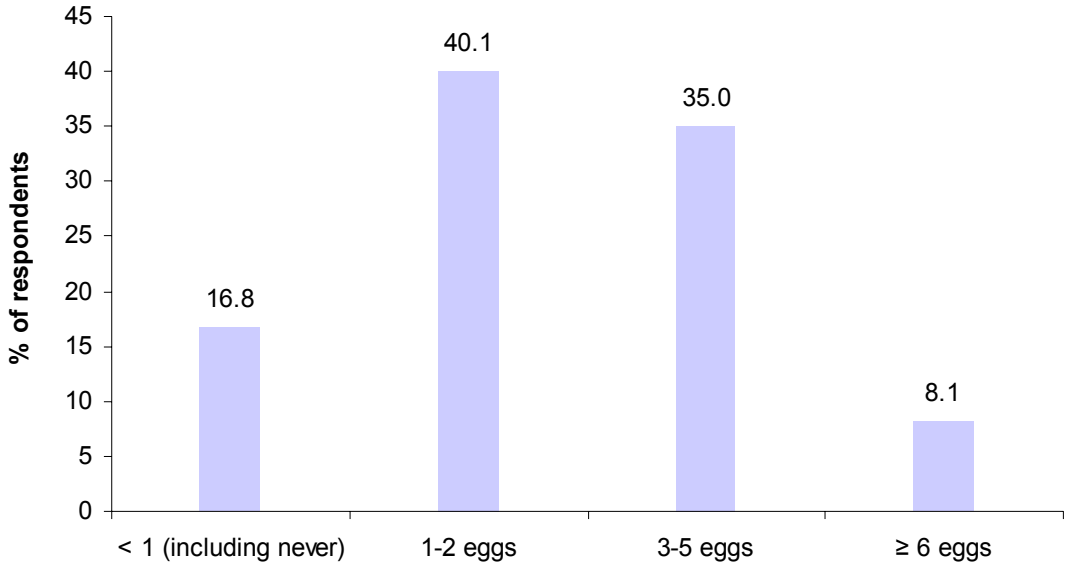



**Figure 2.6(b): Distribution by frequency (times per week) of deep fried food consumed among adult Singaporeans**

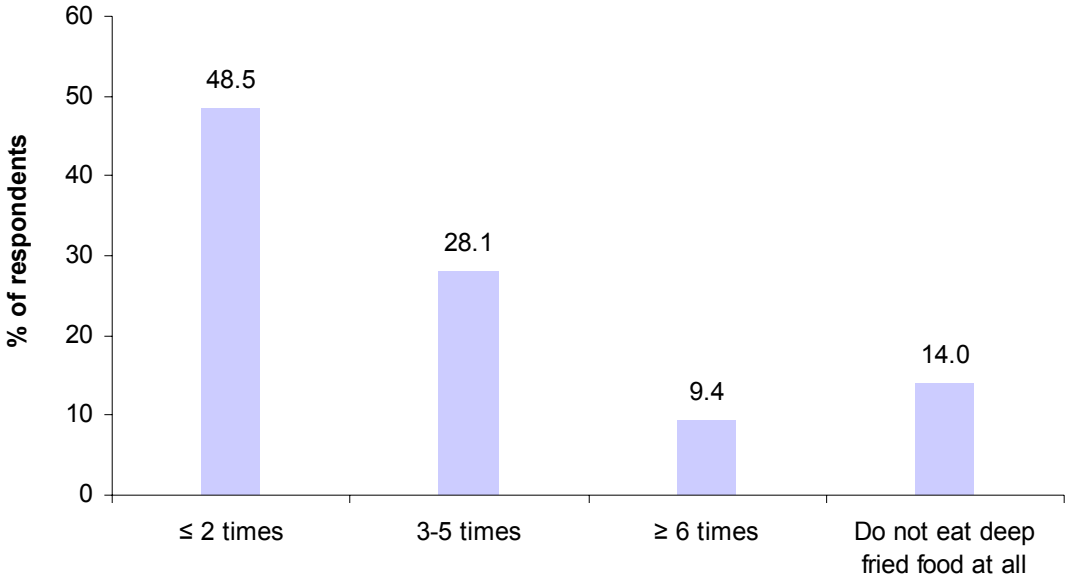


**Figure 2.6(c): Distribution by frequency (times per week) of sweetened drinks consumed among adult Singaporeans**

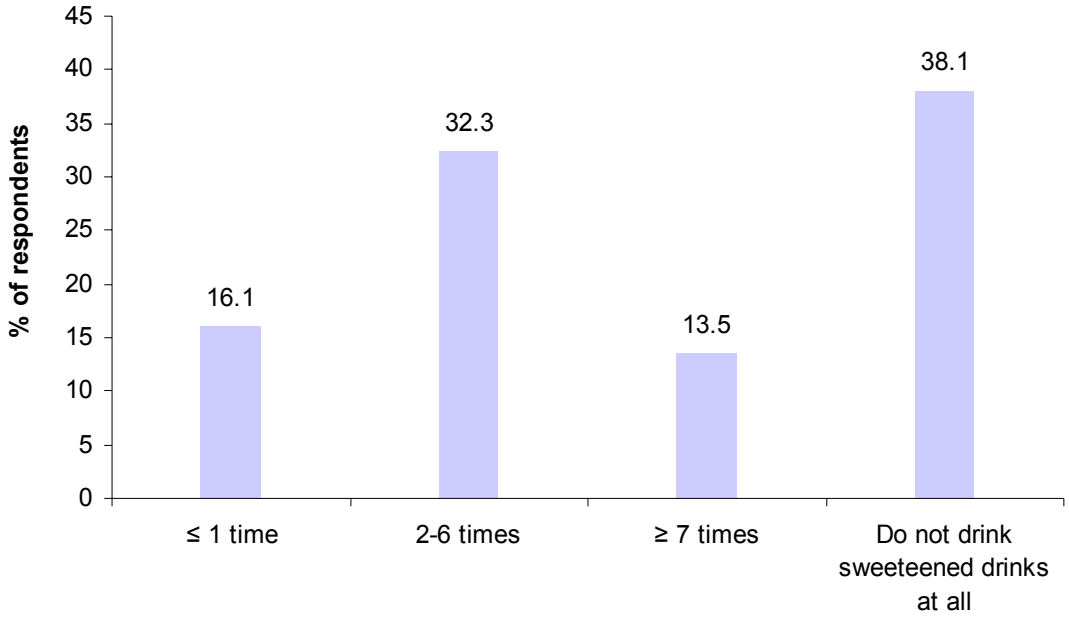
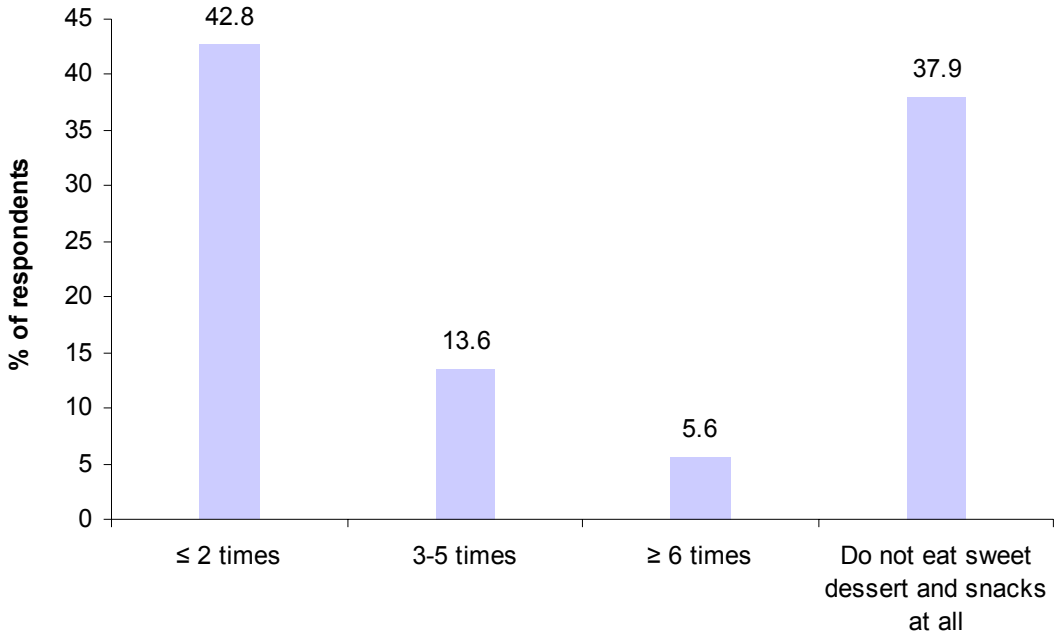



**Figure 2.6(d): Distribution by frequency (times per week) of sweet dessert and snacks among adult Singaporeans**



On average, adult Singaporeans ate two eggs per week, deep fried food twice per week, sweetened drinks twice per week and sweet desserts and snacks once a week.

Males ate more eggs per week compared to females. Males also ate deep fried food and sweetened drinks more frequently compared to females.

The Malays ate the most number of eggs per week and also ate deep fried food, sweetened drinks and sweet desserts and snacks more frequently compared to the other ethnic groups.

The younger age groups (18-29 and 30-39 years) ate more eggs and had deep fried food, sweetened drinks and sweet desserts and snacks more frequently compared to the other age groups.

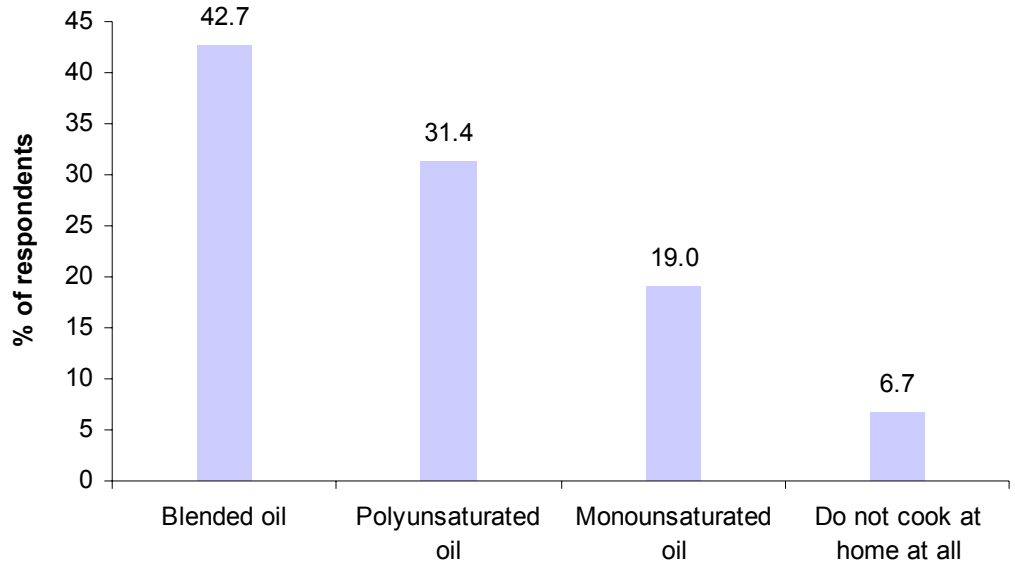
**Table 2.6: Mean (CI) frequency (times per week) of eggs, fried food, sweetened drinks, dessert and snacks consumed by adult Singaporeans, by gender, ethnic and age (years) groups**

| | Eggs (no. of eggs per week) | Deep fried food (no. of times per week) | Sweetened drinks (no. of times per week) | Sweet desserts and snacks (no. of times per week) |
|---|---|---|---|---|
| **Gender** | | | | |
| Males | 3.0 (2.83, 3.24) | 2.6 (2.44, 2.80) | 2.8 (2.52, 3.02) | 1.4 (1.30, 1.58) |
| Females | 2.2 (2.07, 2.34) | 2.2 (2.07, 2.39) | 1.8 (1.62, 2.01) | 1.4 (1.30, 1.57) |
| **Ethnic group** | | | | |
| Chinese | 2.6 (2.51, 2.76) | 2.3 (2.17, 2.43) | 2.2 (2.00, 2.34) | 1.4 (1.32, 1.54) |
| Malay | 2.9 (2.36, 3.38) | 3.3 (2.83, 3.71) | 3.1 (2.54, 3.72) | 1.6 (1.30, 1.87) |
| Indian | 2.1 (1.60, 2.57) | 2.3 (1.91, 2.70) | 2.2 (1.63, 2.75) | 1.3 (1.00, 1.68) |
| **Age group** | | | | |
| 18-29 | 3.4 (3.11, 3.76) | 2.9 (2.68, 3.18) | 4.1 (3.67, 4.54) | 2.1 (1.85, 2.29) |
| 30-39 | 2.8 (2.55, 3.01) | 2.7 (2.43, 2.93) | 2.6 (2.32, 2.94) | 1.6 (1.36, 1.76) |
| 40-49 | 2.4 (2.18, 2.61) | 2.4 (2.14, 2.64) | 1.6 (1.34, 1.78) | 1.2 (1.01, 1.39) |
| 50-59 | 2.1 (1.82, 2.32) | 2.0 (1.70, 2.20) | 1.3 (1.04, 1.61) | 1.1 (0.89, 1.30) |
| 60-69 | 1.8 (1.49, 2.09) | 1.4 (1.09, 1.79) | 0.7 (0.42, 1.02) | 0.9 (0.64, 1.13) |
| **Total** | **2.6 (2.49, 2.74)** | **2.4 (2.30, 2.54)** | **2.3 (2.13, 2.45)** | **1.4 (1.34, 1.54)** |

## 2.7 Types of Cooking Oil

The most common oil used for cooking at home was blended oil (42.7%) followed by poly-unsaturated oil (31.4%) and mono-unsaturated oil (19.0%).

**Figure 2.7: Distribution by types of oil used for cooking at home among adult Singaporeans**



The Malays (70.3%) were more likely to use blended oil for cooking compared to the Chinese (39.4%) and the Indians (32.7%) who tended to use poly-unsaturated and mono-unsaturated oils instead.

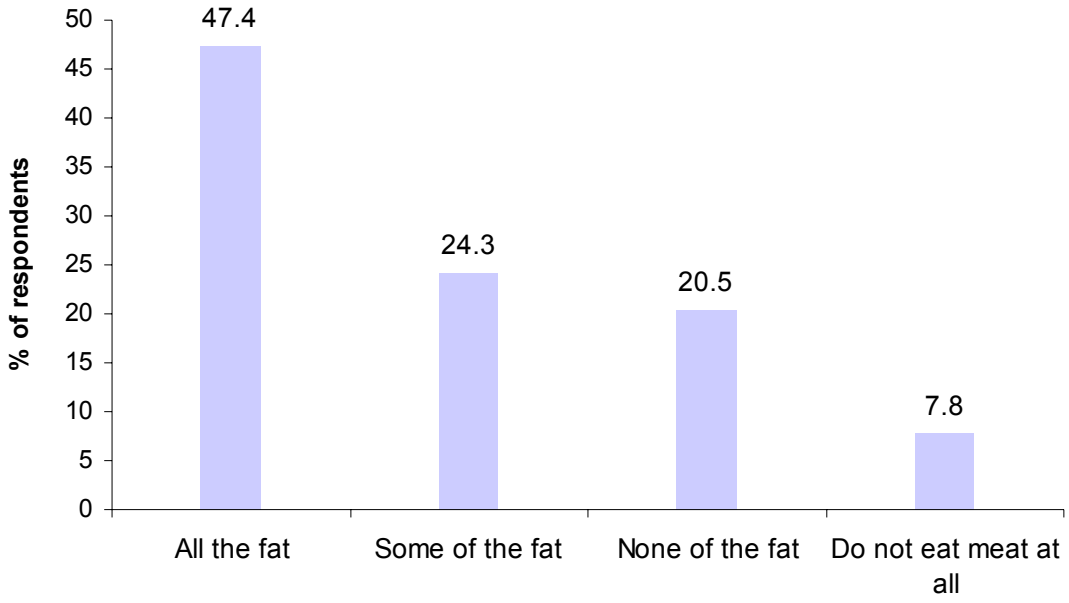
**Table 2.7: Distribution of types of oil used for cooking at home among adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | Blended oil | Polyunsaturated oil | Monounsaturated oil | Do not cook at home at all |
|---|---|---|---|---|
| **Gender** | | | | |
| Males | 309 (45.1) | 209 (30.6) | 96 (14.1) | 69 (10.1) |
| Females | 281 (40.4) | 225 (32.3) | 166 (23.9) | 23 (3.3) |
| **Ethnic group** | | | | |
| Chinese | 431 (39.4) | 337 (30.8) | 238 (21.7) | 88 (8.0) |
| Malay | 122 (70.3) | 41 (23.6) | 9 (5.3) | 1 (0.8) |
| Indian | 37 (32.7) | 56 (50.1) | 16 (13.9) | 3 (2.8) |
| **Age group (years)** | | | | |
| 18-29 | 166 (52.4) | 81 (25.6) | 42 (13.1) | 27 (8.5) |
| 30-39 | 133 (39.0) | 120 (35.2) | 64 (18.9) | 23 (6.8) |
| 40-49 | 147 (41.3) | 118 (33.2) | 66 (18.4) | 25 (7.0) |
| 50-59 | 96 (39.8) | 68 (28.2) | 66 (27.5) | 10 (4.2) |
| 60-69 | 48 (37.8) | 47 (37.0) | 25 (19.5) | 7 (5.7) |
| **Total** | **590 (42.7)** | **434 (31.4)** | **263 (19.0)** | **92 (6.7)** |

## 2.8 Fat Trimmed from Meat

Most adult Singaporeans (71.7%) trimmed off all or some of the visible fat from the meat that they consume. One quarter (20.5%) of them did not trim off any visible fat.

**Figure 2.8: Distribution by amount of visible fat trimmed from meat among adult Singaporeans**



Females (56.2%) were more likely to trim off all the visible fat compared to males (38.5%). A quarter of all the Indians (25.5%) did not eat meat compared to the Chinese (6.1%) and the Malays (6.8%). The Indians (53.0%) were most likely to trim off all the visible fat compared to the Chinese (46.4%) and the Malays (49.9%). The oldest age group (61.1%) was most likely to trim off all the visible fat compared to the other age groups.

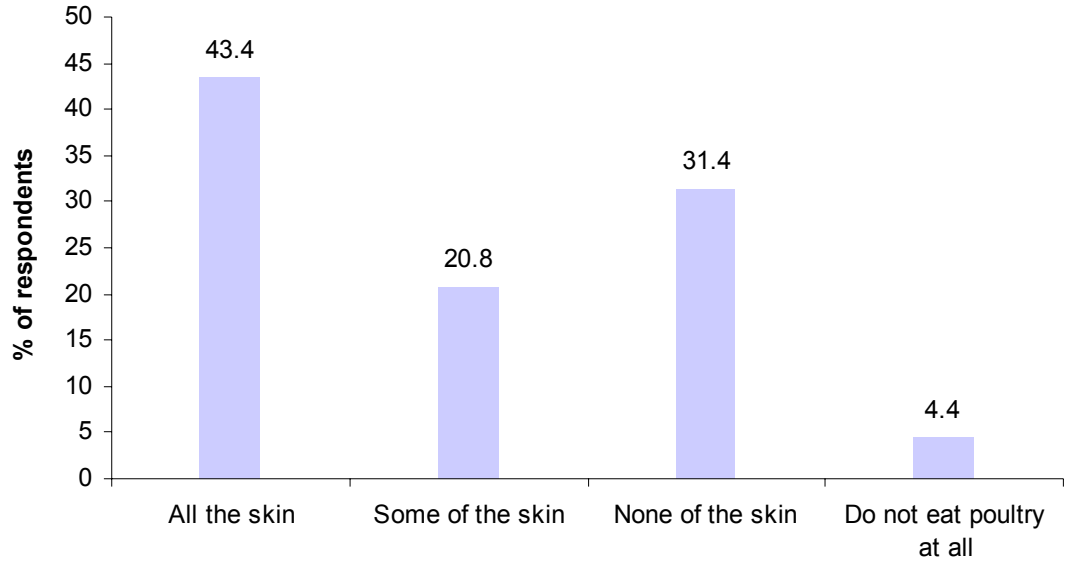
**Table 2.8: Distribution by amount of visible fat trimmed from meat among adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | All the fat | Some of the fat | None of the fat | Do not eat meat at all |
|---|---|---|---|---|
| **Gender** | | | | |
| Males | 263 (38.5) | 178 (26.0) | 204 (29.8) | 40 (5.8) |
| Females | 391 (56.2) | 158 (22.8) | 79 (11.4) | 67 (9.7) |
| **Ethnic group** | | | | |
| Chinese | 508 (46.4) | 286 (26.2) | 233 (21.3) | 67 (6.1) |
| Malay | 87 (49.9) | 40 (22.8) | 36 (20.5) | 12 (6.8) |
| Indian | 60 (53.0) | 10 (9.1) | 14 (12.5) | 29 (25.5) |
| **Age group (years)** | | | | |
| 18-29 | 133 (41.9) | 101 (32.0) | 60 (19.0) | 22 (7.1) |
| 30-39 | 156 (45.8) | 89 (26.0) | 74 (21.7) | 22 (6.5) |
| 40-49 | 178 (50.0) | 80 (22.4) | 73 (20.4) | 26 (7.2) |
| 50-59 | 111 (45.9) | 49 (20.3) | 54 (22.3) | 28 (11.4) |
| 60-69 | 77 (61.1) | 18 (13.9) | 23 (17.8) | 9 (7.2) |
| **Total** | **655 (47.4)** | **336 (24.3)** | **283 (20.5)** | **107 (7.8)** |

## 2.9 Skin Trimmed from Poultry

The majority of adult Singaporeans (64.2%) trimmed all or some of the skin from the poultry that they consumed. Almost one third (31.4%) of them did not trim any skin from poultry.

**Figure 2.9: Distribution by amount of skin trimmed from poultry among adult Singaporeans**



Similar to above findings for visible fat trimmed from meat, females (50.3%) were more likely than males (36.3%) to trim off all the skin from poultry eaten. Over one-tenth of the Indians (13.8%) did not eat poultry compared to the Chinese (3.7%) and the Malays (2.9%). More Indians (66.1%) trimmed off all the skin from poultry eaten than the Chinese (40.5%) and the Malays (46.7%). Those aged 50-59 years (54.7%) were most likely to trim all the fat compared to the other age groups.

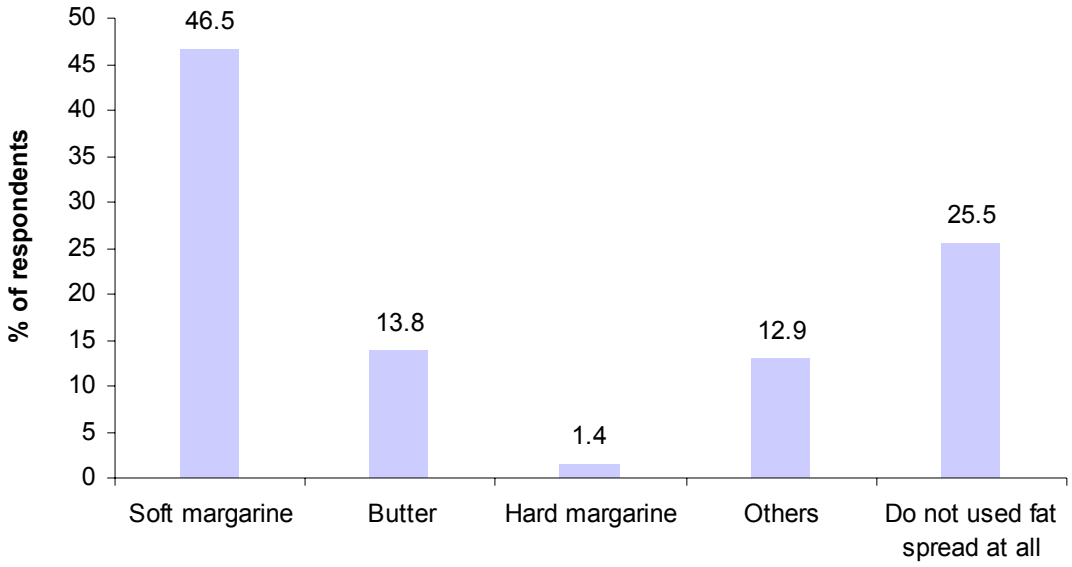
**Table 2.9: Distribution by amount of skin trimmed from poultry among adult Singaporeans by gender, ethnic and age groups, n (%)**

| | All the skin | Some of the skin | None of the skin | Do not eat poultry at all |
|---|---|---|---|---|
| **Gender** | | | | |
| Males | 249 (36.3) | 129 (18.9) | 286 (41.7) | 21 (3.0) |
| Females | 350 (50.3) | 158 (22.7) | 147 (21.1) | 40 (5.8) |
| **Ethnic group** | | | | |
| Chinese | 444 (40.5) | 244 (22.3) | 367 (33.5) | 41 (3.7) |
| Malay | 81 (46.7) | 36 (20.4) | 52 (29.9) | 5 (2.9) |
| Indian | 74 (66.1) | 8 (7.4) | 14 (12.7) | 15 (13.8) |
| **Age group (years)** | | | | |
| 18-29 | 116 (36.7) | 89 (28.0) | 103 (32.4) | 9 (2.9) |
| 30-39 | 115 (33.8) | 80 (23.3) | 131 (38.4) | 15 (4.5) |
| 40-49 | 175 (49.2) | 65 (18.2) | 98 (27.5) | 18 (5.1) |
| 50-59 | 132 (54.7) | 38 (15.9) | 62 (25.6) | 9 (3.8) |
| 60-69 | 61 (48.1) | 16 (13.0) | 40 (31.4) | 10 (7.5) |
| **Total** | **599 (43.4)** | **288 (20.8)** | **433 (31.4)** | **61 (4.4)** |

## 2.10 Types of Fat Spread

Most adult Singaporeans (74.5%) used some form of fat spread on bread or crackers. The most common fat spread used was soft margarine (46.5%) followed by butter (13.8%).

**Figure 2.10: Distribution of types of fat spread used among adult Singaporeans**



The Chinese (14.7%) were more likely to use other types of fat spread (e.g. peanut butter or cheese spread) compared to the Malays (6.9%) or the Indians (4.9%).

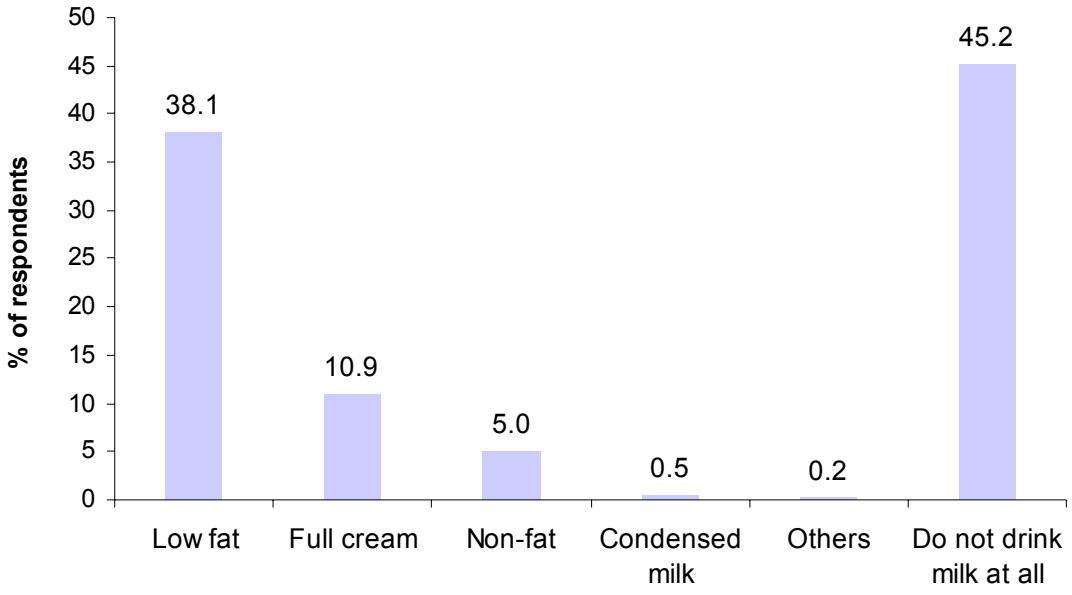
**Table 2.10: Distribution by types of fat spread used among adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | Soft margarine | Butter | Hard margarine | Others | Do not use fat spread at all |
|---|---|---|---|---|---|
| **Gender** | | | | | |
| Males | 298 (43.5) | 100 (14.7) | 6 (0.9) | 93 (13.6) | 187 (27.3) |
| Females | 344 (49.4) | 90 (12.9) | 13 (1.8) | 85 (12.2) | 165 (23.7) |
| **Ethnic group** | | | | | |
| Chinese | 501 (45.7) | 138 (12.6) | 14 (1.3) | 161 (14.7) | 280 (25.6) |
| Malay | 88 (50.6) | 31 (17.7) | 3 (1.8) | 12 (6.9) | 40 (23.0) |
| Indian | 53 (47.0) | 21 (18.9) | 1 (1.3) | 6 (4.9) | 31 (27.9) |
| **Age group (years)** | | | | | |
| 18-29 | 118 (37.4) | 42 (13.3) | 2 (0.5) | 57 (17.9) | 98 (30.9) |
| 30-39 | 170 (49.8) | 41 (12.0) | 6 (1.6) | 49 (14.3) | 76 (22.3) |
| 40-49 | 176 (49.4) | 54 (15.1) | 5 (1.4) | 33 (9.2) | 88 (24.8) |
| 50-59 | 121 (50.0) | 37 (15.5) | 5 (1.9) | 30 (12.4) | 49 (20.2) |
| 60-69 | 57 (45.0) | 16 (13.0) | 2 (1.6) | 10 (7.9) | 41 (32.6) |
| **Total** | **642 (46.5)** | **190 (13.8)** | **19 (1.4)** | **178 (12.9)** | **352 (25.5)** |

## 2.11 Types of Milk Consumed

Almost half of the adult Singaporeans (45.2%) did not drink milk or milk-based beverages at all. The most common type of milk consumed was low fat milk (38.1%) followed by full cream milk (10.9%).

**Figure 2.11: Distribution by types of milk consumed among adult Singaporeans**



Males (48.9%) were more likely not to drink milk at all compared to females (41.6%). Chinese (49.0%) were also more likely not to drink milk at all compared to the Malays (26.2%) and the Indians (37.4%). The majority of those aged 60-69 years (64.2%) did not drink milk at all compared to only 28.7% amongst those aged 18-29 years.

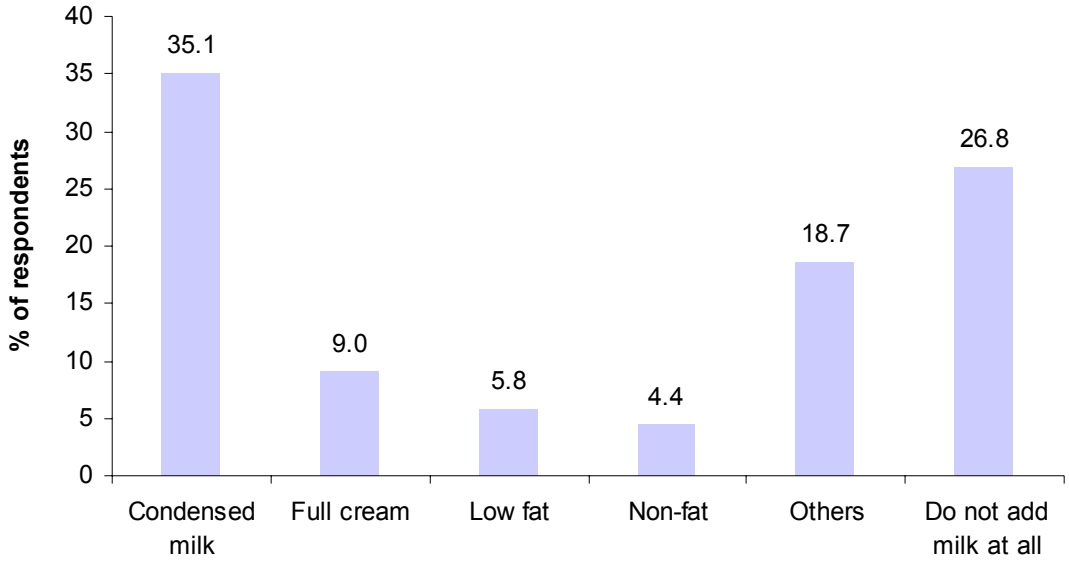
**Table 2.11: Distribution of types of milk consumed among adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | Low fat | Full cream | Non-fat | Condensed milk | Others | Do not drink milk at all |
|---|---|---|---|---|---|---|
| **Gender** | | | | | | |
| Males | 247 (36.0) | 84 (12.2) | 14 (2.1) | 5 (0.7) | 1 (0.2) | 335 (48.9) |
| Female | 280 (40.2) | 67 (9.6) | 55 (7.9) | 3 (0.4) | 2 (0.3) | 290 (41.6) |
| **Ethnic group** | | | | | | |
| Chinese | 394 (36.0) | 102 (9.3) | 54 (4.9) | 5 (0.5) | 3 (0.3) | 537 (49.0) |
| Malay | 91 (52.4) | 28 (16.2) | 7 (4.1) | 2 (1.1) | 0 (0.0) | 46 (26.2) |
| Indian | 41 (36.8) | 20 (18.1) | 8 (7.4) | 0 (0.3) | 0 (0.0) | 42 (37.4) |
| **Age group (years)** | | | | | | |
| 18-29 | 174 (55.0) | 41 (13.0) | 7 (2.2) | 3 (0.9) | 1 (0.4) | 91 (28.7) |
| 30-39 | 132 (38.8) | 45 (13.3) | 7 (2.0) | 0 (0.0) | 0 (0.0) | 156 (45.9) |
| 40-49 | 114 (32.1) | 39 (11.1) | 18 (5.1) | 2 (0.6) | 0 (0.0) | 182 (51.0) |
| 50-59 | 82 (33.9) | 15 (6.3) | 27 (11.2) | 1 (0.3) | 2 (0.8) | 114 (47.4) |
| 60-69 | 24 (19.1) | 10 (7.5) | 10 (7.8) | 2 (1.3) | 0 (0.0) | 81 (64.2) |
| **Total** | **526 (38.1)** | **151 (10.9)** | **69 (5.0)** | **7 (0.5)** | **3 (0.2)** | **624 (45.2)** |

## 2.12 Types of Milk Added to Beverages

Condensed milk (35.1%) was the most common type of milk added to beverages. More than a quarter of the population (26.8%) did not add any milk to their beverages.

**Figure 12: Distribution by types of milk added to beverages among adult Singaporeans**



The Chinese (29.4%) were most likely not to add any milk to their beverages compared to the Malays (19.0%) and the Indians (14.1%). The Malays (51.6%) were most likely to add condensed milk to their beverages compared to the Chinese (32.6%) and the Indians (33.9%). Those aged 18-29 years (41.2%) were most likely to add condensed milk to their beverages compared to the other age groups.

**Table 2.12: Distribution of types of milk added to beverages among adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | Condensed milk | Full cream | Low fat | Non-fat | Others | Do not add milk at all |
|---|---|---|---|---|---|---|
| **Gender** | | | | | | |
| Males | 255 (37.3) | 69 (10.0) | 27 (3.9) | 24 (3.5) | 122 (17.8) | 189 (27.6) |
| Females | 230 (33.0) | 56 (8.0) | 54 (7.8) | 37 (5.3) | 137 (19.7) | 182 (26.1) |
| **Ethnic group** | | | | | | |
| Chinese | 357 (32.6) | 81 (7.4) | 62 (5.7) | 48 (4.4) | 224 (20.5) | 322 (29.4) |
| Malay | 90 (51.6) | 15 (8.5) | 5 (2.6) | 6 (3.5) | 26 (14.7) | 33 (19.0) |
| Indian | 38 (33.9) | 29 (25.5) | 14 (12.5) | 7 (5.8) | 9 (8.1) | 16 (14.1) |
| **Age group (years)** | | | | | | |
| 18-29 | 130 (41.2) | 13 (4.2) | 13 (4.2) | 17 (5.4) | 50 (15.9) | 92 (29.0) |
| 30-39 | 118 (34.5) | 40 (11.8) | 17 (4.9) | 20 (5.8) | 70 (20.4) | 77 (22.5) |
| 40-49 | 130 (36.7) | 33 (9.4) | 20 (5.6) | 11 (3.1) | 64 (18.1) | 97 (27.2) |
| 50-59 | 69 (28.5) | 27 (11.1) | 20 (8.2) | 10 (4.1) | 52 (21.4) | 65 (26.7) |
| 60-69 | 38 (29.8) | 11 (8.6) | 11 (8.7) | 4 (2.8) | 23 (18.2) | 40 (31.9) |
| **Total** | **485 (35.1)** | **125 (9.0)** | **81 (5.8)** | **61 (4.4)** | **259 (18.7)** | **371 (26.8)** |

## 2.13 Sweetening Agents

About half of adult Singaporeans (52.2%) added sugar to their beverages. The usage of artificial sweeteners or other sweetening agents was low.

There were no obvious differences based on gender, ethnic or age groups in the type of sweetening agent added to beverages.

**Table 2.13: Distribution of types of sweetening agent added to beverages among adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | Sugar | Artificial sweeteners | Others | Do not add sweetening agent |
|---|---|---|---|---|
| **Gender** | | | | |
| Males | 355 (51.8) | 3 (0.5) | 1 (0.2) | 325 (47.5) |
| Females | 366 (52.6) | 7 (1.0) | 3 (0.5) | 320 (45.9) |
| **Ethnic group** | | | | |
| Chinese | 577 (52.7) | 7 (0.6) | 4 (0.4) | 506 (46.2) |
| Malay | 83 (47.5) | 1 (0.7) | 0 (0.0) | 90 (51.8) |
| Indian | 62 (54.8) | 2 (2.0) | 0 (0.0) | 49 (43.3) |
| **Age group (years)** | | | | |
| 18-29 | 164 (52.0) | 2 (0.5) | 0 (0.0) | 150 (47.6) |
| 30-39 | 186 (54.5) | 2 (0.5) | 2 (0.7) | 151 (44.2) |
| 40-49 | 193 (54.3) | 1 (0.3) | 0 (0.0) | 162 (45.4) |
| 50-59 | 109 (45.4) | 6 (2.4) | 2 (0.8) | 124 (51.4) |
| 60-69 | 68 (53.9) | 0 (0.3) | 0 (0.0) | 58 (45.8) |
| **Total** | **721 (52.2)** | **11 (0.8)** | **4 (0.3)** | **645 (46.7)** |

## 2.14 Addition of Salt and Sauces at the Table

Most adult Singaporeans did not add any salt or sauces to their food at the table (63.7%). Among those who do, the majority added salt and sauces after tasting the food.

More Indians (74.8%) did not add any salt or sauces to their food compared to the Chinese (61.5%) and the Malays (70.5%).

**Table 2.14: Distribution of salt and sauces added at the table among adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | Before tasting the food | After tasting the food | Do not add salt or sauces at the table |
|---|---|---|---|
| **Gender** | | | |
| Males | 55 (8.0) | 164 (24.0) | 466 (68.0) |
| Females | 64 (9.2) | 218 (31.3) | 414 (59.5) |
| **Ethnic group** | | | |
| Chinese | 104 (9.5) | 318 (29.1) | 673 (61.5) |
| Malay | 9 (5.1) | 42 (24.4) | 123 (70.5) |
| Indian | 6 (5.6) | 22 (19.6) | 84 (74.8) |
| **Age group (years)** | | | |
| 18-29 | 26 (8.1) | 102 (32.3) | 188 (59.5) |
| 30-39 | 29 (8.5) | 107 (31.3) | 205 (60.2) |
| 40-49 | 27 (7.6) | 86 (24.2) | 243 (68.2) |
| 50-59 | 16 (6.7) | 49 (20.5) | 176 (72.8) |
| 60-69 | 21 (16.8) | 38 (29.8) | 68 (53.4) |
| **Total** | **119 (8.6)** | **383 (27.7)** | **880 (63.7)** |

## 2.15 Types of Bread Consumed

The respondents were asked the types of bread that they usually consumed. Most adult Singaporeans (64.2 %) consumed enriched or ordinary white bread. Wholemeal or high fibre bread was the usual choice for 17.9% of adult Singaporeans.

**Figure 2.15: Distribution by types of bread consumed among adult Singaporeans**

Females (20.9%) were more likely to consume wholemeal bread compared to males (14.9%). The Malays (13.2%) were less likely to consume wholemeal bread compared to the Chinese (18.4%) or the Indians (20.8%). Those aged 30-39 years (14.1%) were also least likely to consume wholemeal bread compared to the other age groups.

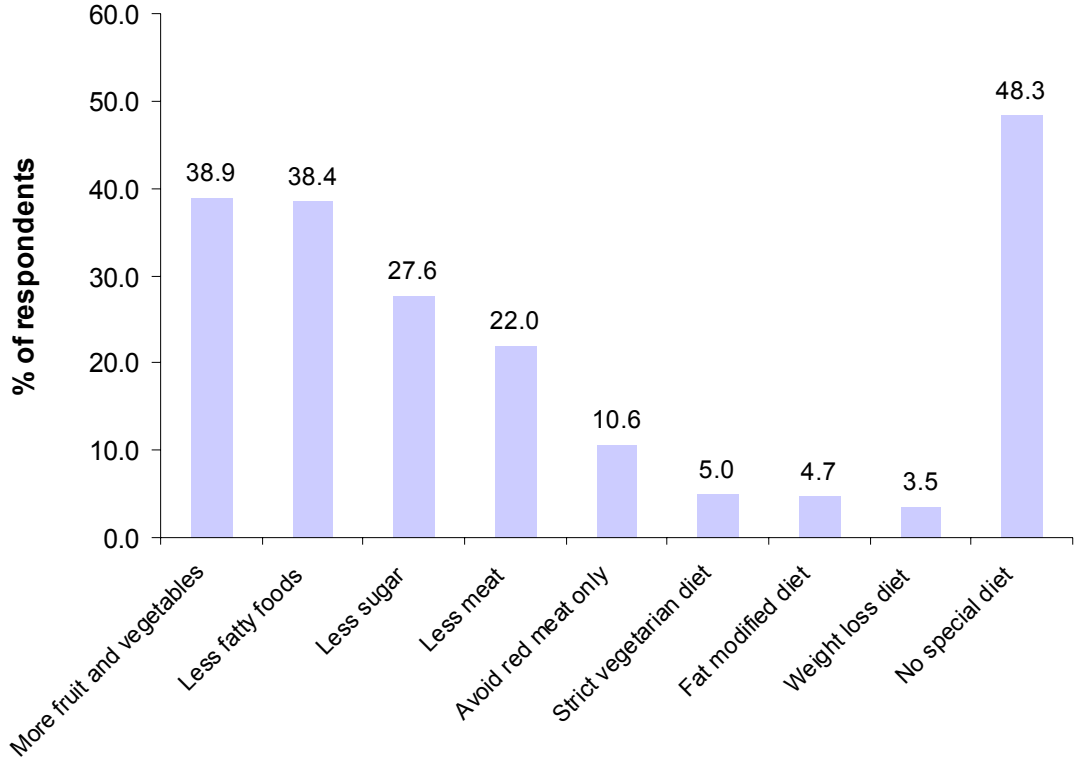
**Table 2.15: Distribution of types of bread consumed among adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | Enriched white bread | Ordinary white bread | Wholemeal /high fibre bread | Mixture of ordinary/ enriched/ wholemeal bread | Others | Do not eat bread |
|---|---|---|---|---|---|---|
| **Gender** | | | | | | |
| Males | 266 (38.9) | 197 (28.7) | 102 (14.9) | 57 (8.3) | 10 (1.5) | 53 (7.7) |
| Females | 222 (31.9) | 202 (28.9) | 146 (20.9) | 88 (12.6) | 8 (1.1) | 31 (4.5) |
| **Ethnic group** | | | | | | |
| Chinese | 381 (34.8) | 300 (27.4) | 202 (18.4) | 119 (10.9) | 17 (1.6) | 76 (6.9) |
| Malay | 65 (37.2) | 67 (38.6) | 23 (13.2) | 15 (8.8) | 1 (0.3) | 3 (1.9) |
| Indian | 43 (38.1) | 31 (27.7) | 23 (20.8) | 10 (8.8) | 0 (0.0) | 5 (4.6) |
| **Age group (years)** | | | | | | |
| 18-29 | 127 (40.2) | 81 (25.4) | 54 (17.1) | 30 (9.5) | 4 (1.3) | 21 (6.5) |
| 30-39 | 127 (37.3) | 101 (29.6) | 48 (14.1) | 38 (11.1) | 7 (2.1) | 20 (5.8) |
| 40-49 | 132 (37.1) | 110 (30.8) | 54 (15.2) | 34 (9.5) | 5 (1.4) | 21 (5.9) |
| 50-59 | 64 (26.4) | 61 (25.1) | 68 (28.1) | 35 (14.5) | 2 (0.8) | 12 (5.1) |
| 60-69 | 38 (30.4) | 47 (36.8) | 24 (18.7) | 8 (5.9) | 0 (0.0) | 10 (8.2) |
| **Total** | **489 (35.4)** | **398 (28.8)** | **248 (17.9)** | **144 (10.5)** | **18 (1.3)** | **84 (6.1)** |

## 2.16 Types of Diet Modification

Respondents were asked if they adhered to any special modifications to their diet. About half of adult Singaporeans adhered to at least one dietary modification. The most common healthier dietary modifications adopted were the consumption of more fruit and vegetables, less fatty food and less sugar in the diet.

**Figure 2.16: Distribution by types of diet modification among adult Singaporeans**



Females were more likely to adopt healthier dietary modifications compared to males. More Indians chose healthier dietary modifications compared to the other races. Those aged 50-59 years were most likely to adhere to at least one healthier dietary modification compared to the other age groups.

**Table 2.16: Distribution of types of diet modification among adult Singaporeans, by gender, ethnic and age groups, n (%)**

| | More fruit and vege-tables | Less fatty food | Less sugar | Less meat | Avoid red meat only | Strict vege-tarian diet | Fat modified diet | Weight loss diet | No special diet |
|---|---|---|---|---|---|---|---|---|---|
| **Gender** | | | | | | | | | |
| Males | 233 (34.1) | 234 (34.2) | 166 (24.3) | 126 (18.5) | 56 (8.1) | 31 (4.5) | 32 (4.7) | 15 (2.2) | 364 (53.2) |
| Females | 304 (43.6) | 296 (42.5) | 215 (30.9) | 178 (25.6) | 90 (13.0) | 38 (5.5) | 33 (4.7) | 33 (4.8) | 303 (43.5) |
| **Ethnic group** | | | | | | | | | |
| Chinese | 435 (39.8) | 437 (39.9) | 300 (27.4) | 240 (21.9) | 106 (9.7) | 48 (4.4) | 50 (4.5) | 28 (2.6) | 536 (48.9) |
| Malay | 55 (31.4) | 47 (27.3) | 40 (23.3) | 34 (19.8) | 17 (9.5) | 2 (1.1) | 6 (3.4) | 11 (6.6) | 98 (56.5) |
| Indian | 47 (41.9) | 46 (40.5) | 41 (36.0) | 30 (27.1) | 24 (21.1) | 19 (17.0) | 9 (8.2) | 9 (8.0) | 33 (29.7) |
| **Age group (years)** | | | | | | | | | |
| 18-29 | 114 (36.0) | 114 (36.0) | 72 (22.8) | 44 (13.9) | 27 (8.5) | 20 (6.3) | 7 (2.2) | 17 (5.4) | 162 (51.2) |
| 30-39 | 113 (33.1) | 109 (31.9) | 88 (25.7) | 55 (16.2) | 31 (9.0) | 16 (4.8) | 14 (4.0) | 17 (5.1) | 180 (52.9) |
| 40-49 | 149 (41.9) | 146 (41.2) | 98 (27.5) | 85 (23.8) | 41 (11.5) | 17 (4.8) | 16 (4.4) | 9 (2.4) | 160 (44.9) |
| 50-59 | 109 (45.1) | 102 (42.1) | 77 (32.0) | 75 (31.1) | 31 (12.8) | 13 (5.3) | 19 (8.0) | 3 (1.3) | 114 (47.3) |
| 60-69 | 52 (41.4) | 59 (46.5) | 46 (36.7) | 46 (36.1) | 17 (13.4) | 3 (2.2) | 10 (7.5) | 2 (1.9) | 51 (40.6) |
| **Total** | **537 (38.9)** | **530 (38.4)** | **381 (27.6)** | **304 (22.0)** | **146 (10.6)** | **69 (5.0)** | **65 (4.7)** | **48 (3.5)** | **667 (48.3)** |

## 2.17 Dieting

The majority of Singaporeans (72.8%) had never dieted before to lose weight. 15.0% reported that they have dieted occasionally in the past and 7.7% were continually dieting.

Females were more likely to have dieted compared to males. The Malays and the Indians were more likely to have dieted compared to the Chinese. The younger age groups (18-39 years and 30-39 years) were more likely to have dieted compared to the other age groups.

**Table 2.17: Distribution of history of dieting for weight loss among adult Singaporeans, by gender, ethnic group and age group, n (%)**

| | Occasionally | Frequently | Continually | Never dieted |
|---|---|---|---|---|
| **Gender** | | | | |
| Males | 66 (9.7) | 25 (3.7) | 38 (5.6) | 555 (81.1) |
| Females | 141 (20.3) | 38 (5.4) | 67 (9.7) | 450 (64.6) |
| **Ethnic group** | | | | |
| Chinese | 156 (14.3) | 41 (3.8) | 74 (6.8) | 823 (75.2) |
| Malay | 29 (16.8) | 16 (9.0) | 18 (10.4) | 111 (63.8) |
| Indian | 22 (19.8) | 6 (4.9) | 14 (12.2) | 71 (63.1) |
| **Age group (years)** | | | | |
| 18-29 | 59 (18.5) | 22 (6.9) | 28 (8.7) | 208 (65.8) |
| 30-39 | 74 (21.8) | 16 (4.7) | 24 (7.0) | 227 (66.5) |
| 40-49 | 42 (11.7) | 13 (3.7) | 27 (7.7) | 273 (76.8) |
| 50-59 | 29 (12.2) | 7 (3.0) | 20 (8.1) | 185 (76.7) |
| 60-69 | 4 (2.8) | 4 (3.2) | 7 (5.7) | 112 (88.3) |
| **Total** | **208 (15.0)** | **63 (4.5)** | **106 (7.7)** | **1005 (72.8)** |

## 2.20 Comparison of Dietary Practices, NNS 1998 and NNS 2004

### 2.2.1 Usual Meal Venues for Breakfast, Lunch and Dinner

From 1998 to 2004, more Singaporeans did not take breakfast and lunch. Compared to 1998, fewer adult Singaporeans ate lunch and dinner at home in 2004. More adult Singaporeans had their dinner at hawker centres in 2004 compared to 1998.

**Table 2.2.1: Comparison of usual meal venues frequented among adult Singaporeans**

| Usual meal venues | NNS 1998 (%) | NNS 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| **Breakfast :** | | | |
| Home | 59.5 | 57.3 | - |
| Restaurant | 2.2 | 0.4 | ▽ |
| Workplace | 11.8 | 13.7 | - |
| Hawker centre | 21.2 | 20.9 | - |
| Others | 0.2 | 0.2 | - |
| Do not eat breakfast | 5.2 | 7.5 | ▲ |
| **Lunch :** | | | |
| Home | 30.3 | 26.6 | ▽ |
| Restaurant | 2.7 | 0.9 | ▽ |
| Workplace | 26.5 | 26.9 | - |
| Hawker centre | 39.0 | 42.3 | - |
| Others | 0.4 | 0.4 | - |
| Do not eat lunch | 1.1 | 2.9 | ▲ |
| **Dinner :** | | | |
| Home | 81.3 | 72.6 | ▽ |
| Restaurant | 1.5 | 0.3 | ▽ |
| Workplace | 3.1 | 4.3 | - |
| Hawker centre | 13.4 | 22.1 | ▲ |
| Others | 0.5 | 0.1 | ▽ |
| Do not eat dinner | 0.3 | 0.7 | - |

▲ Significant increase
▽ Significant decrease
- No significant difference

## 2.2.2 Frequency of Dining at Hawker Centres

Adult Singaporeans ate more frequently at hawker centres in 2004 compared to 1998. Significantly more people ate at hawker centres 6 times a week or more in 2004 (49.9%) compared to 1998 (37.0%).

**Table 2.2.2: Comparison by frequency (times per week) of adult Singaporeans dining at hawker centres**

| Number of times | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| Never or once a week or less | 24.2 | 16.2 | ▽ |
| 2-5 times a week | 38.7 | 33.9 | ▽ |
| 6 times a week or more | 37.0 | 49.9 | ▲ |

## 2.2.3 Types of Bread Consumed

Compared to 1998, the results indicate an increase in the intake of wholemeal breads in 2004 compared to 1998 [Table 2.2.3]. In 2004, 17.6% of adult Singaporeans ate wholemeal bread compared to 9.3% in 1998. There was also a significant increase in the number of people who do not eat bread 6.2% in 2004 compared to 3.6% in 1998.

**Table 2.2.3: Comparison of types of bread consumed among adult Singaporeans**

| Types of bread consumed | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| Enriched or ordinary white bread | 67.8 | 64.6 | ▽ |
| Wholemeal or high fibre bread | 9.3 | 17.6 | ▲ |
| Mixture of enriched/ordinary/ wholemeal bread | 19.2 | 10.4 | ▽ |
| Others | 0.2 | 1.4 | ▲ |
| Do not eat bread | 3.6 | 6.2 | ▲ |

▲ Significant increase
▽ Significant decrease
- No significant difference

## 2.2.4 Types of Milk Consumed and Milk Added to Beverages

More adult Singaporeans consumed low fat milk in 2004 compared to 1998. Fewer of them drank full cream, non-fat and condensed milk in 2004 compared to 1998. Significantly more adult Singaporeans did not drink milk at all in 2004 (44.9%) compared to 1998 (32.8%).

Fewer adult Singaporeans in 2004 reported adding condensed milk and full cream milk to their beverages (Table 2.2.4) compared to 1998.

**Table 2.2.4: Comparison of types of milk consumed and types of milk added to beverages among adult Singaporeans**

| Dietary practices | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| **Types of milk consumed :** | | | |
| Full cream | 19.1 | 11.1 | ▽ |
| Low fat | 33.7 | 38.7 | ▲ |
| Non fat | 6.3 | 4.7 | ▽ |
| Condensed | 7.2 | 0.5 | ▽ |
| Others | 0.9 | 0.2 | ▽ |
| Do not drink milk | 32.8 | 44.9 | ▲ |
| **Types of milk added to beverages :** | | | |
| Full cream | 14.7 | 8.8 | ▽ |
| Low fat | 5.0 | 5.6 | - |
| Non fat | 2.4 | 4.4 | ▲ |
| Condensed | 45.3 | 35.5 | ▽ |
| Others (e.g. sweetener, creamer) | 11.5 | 18.7 | ▲ |
| Do not add milk | 21.1 | 26.9 | ▲ |

▲ Significant increase
▽ Significant decrease
- No significant difference

## 2.2.5 Types of Fat Spread Used

There was a decline in the number of adult Singaporeans who used butter and hard margarine on bread or crackers [Table 2.2.5] from 1998 to 2004. More adult Singaporeans reported using other fat spreads such as peanut butter or cheese spread in 2004 (13.1%) compared to 1998 (1.0%).

**Table 2.2.5: Comparison of types of fat spread used among adult Singaporeans**

| Types of fat spread used | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| Butter | 20.2 | 13.6 | ▽ |
| Hard margarine | 4.3 | 1.4 | ▽ |
| Soft margarine | 48.0 | 46.2 | - |
| Others (e.g. peanut butter, cheese spread) | 1.0 | 13.1 | ▲ |
| Do not use fat spread at all | 26.5 | 25.7 | - |

## 2.2.6 Types of Fat and Oil Used for Cooking at Home

Compared to 1998, there was a significant increase in the use of monounsaturated oils and a decrease in the use of polyunsaturated oils in 2004 [Table 2.2.6].

**Table 2.2.6: Comparison of types of fat or oil used for cooking at home among adult Singaporeans**

| Types of oil used | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| Saturated | 0.2 | 0.1 | - |
| Blended | 41.3 | 42.9 | - |
| Polyunsaturated | 41.8 | 31.4 | ▽ |
| Monounsaturated | 14.2 | 18.7 | ▲ |
| Others | 0.2 | 0.0 | - |
| Do not cook at home | 2.3 | 6.9 | ▲ |

▲ Significant increase
▽ Significant decrease
- No significant difference

## 2.2.7 Energy-dense Food Consumption

More adult Singaporeans ate 3-5 eggs a week in 2004 compared to 1998 [Table 2.2.7(a)].

**Table 2.2.7(a): Comparison of frequency (times per week) of egg consumed among adult Singaporeans**

| Number of eggs | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| Less than 1 egg a week or do not eat | 25.1 | 16.1 | ▽ |
| 1-2 eggs a week | 40.9 | 39.7 | - |
| 3-5 eggs a week | 26.1 | 35.8 | ▲ |
| 6 eggs a week or more | 8.0 | 8.3 | - |

Fewer adult Singaporeans consumed deep fried food 3-5 times a week in 2004 compared to 1998 [Table 2.2.7(b)].

**Table 2.2.7(b): Comparison of frequency (times per week) of deep fried food consumed among adult Singaporeans**

| Number of times | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| Do not eat or less than twice a week | 56.5 | 61.7 | ▲ |
| 3-5 times a week | 35.8 | 28.8 | ▽ |
| 6 times a week or more | 7.7 | 9.5 | - |

▲ Significant increase
▽ Significant decrease
- No significant difference

In 2004, there was a marked increase in the number of people who reported that they do not drink sweetened drinks (36.6%) compared to 1998 (10.5%). Significantly more people reported not eating sweet desserts and snacks in 2004 (37.3%) when compared to 1998 (12.6%) [Table 2.2.7(c)].

**Table 2.2.7(c): Comparison of frequency (times per week) of sweetened drinks, sweet dessert and snacks consumed among adult Singaporeans**

| Dietary practices | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| **Weekly consumption of sweetened drinks:** | | | |
| Once a week or less | 40.1 | 16.1 | ▽ |
| 2-6 times a week | 35.6 | 33.2 | - |
| 7 times a week or more | 13.7 | 14.0 | - |
| Do not drink | 10.6 | 36.6 | ▲ |
| **Weekly consumption of sweetened desserts and snacks:** | | | |
| Twice a week or less | 59.6 | 42.9 | ▽ |
| 3-5 times a week | 22.3 | 14.0 | ▽ |
| 6 times a week or more | 5.4 | 5.8 | - |
| Do not eat | 12.6 | 37.3 | ▲ |

## 2.2.8 Fat Trimmed from Meat and Poultry

Fewer adult Singaporeans trimmed off visible fat from meat or skin from poultry eaten in 2004 compared to 1998 [Table 2.2.8].

**Table 2.2.8: Comparison of amount of fat trimmed from meat and skin trimmed from poultry among adult Singaporeans**

| Dietary practices | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| **Amount of visible fat trimmed from meat:** | | | |
| All or some of the fat | 87.0 | 71.9 | ▽ |
| None of the fat | 9.3 | 20.6 | ▲ |
| Do not eat meat | 3.7 | 7.5 | ▲ |
| **Amount of skin trimmed from poultry:** | | | |
| All or some of the skin | 79.6 | 63.8 | ▽ |
| None of the skin | 17.6 | 31.9 | ▲ |
| Do not eat poultry | 2.8 | 4.3 | ▲ |

▲ Significant increase
▽ Significant decrease
- No significant difference

## 2.2.9 Addition of Salt/Sauces at the Table

The results showed an increase in the proportion of adult Singaporeans who do not add salt to their food at the table in 2004 (63.2%) compared to 1998 (39.8%).

**Table 2.2.9: Comparison of salt/sauces added at the table among adult Singaporeans**

| Dietary practices | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| Before tasting the food | 11.7 | 8.7 | ▽ |
| After tasting the food | 48.5 | 28.1 | ▽ |
| Do not add | 39.8 | 63.2 | ▲ |

## 2.2.10 Dieting

In 2004, significantly more adult Singaporeans reported to have dieted frequently (4.6%) or were continually dieting for weight loss (7.6%) compared to 1998 (2.2% and 4.1%).

**Table 2.2.10: Comparison of history of dieting for weight loss among adult Singaporeans**

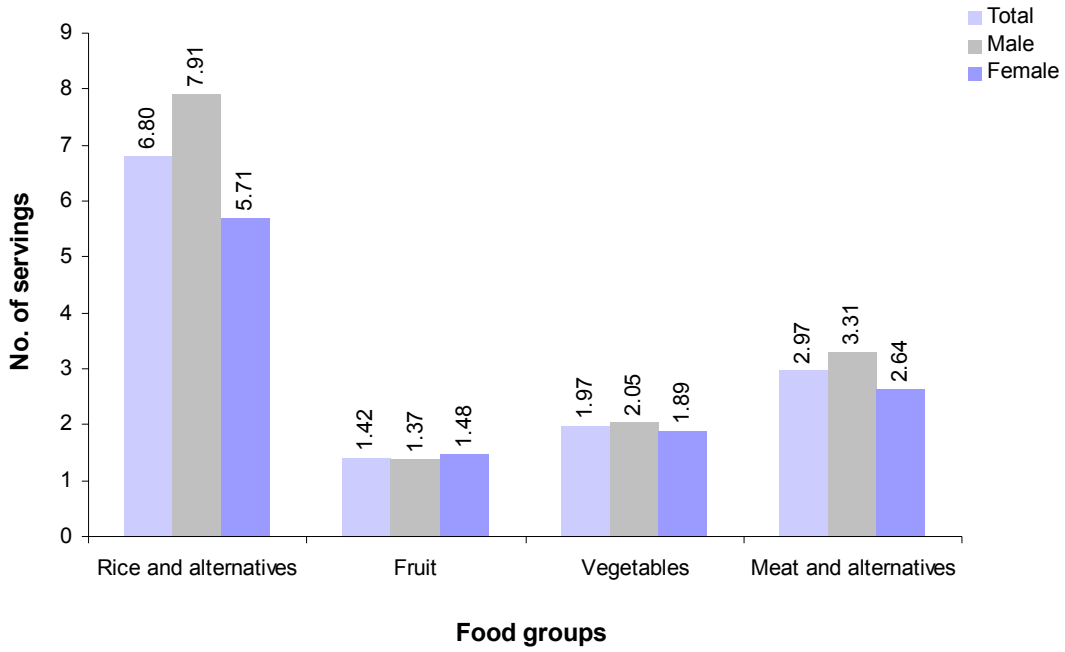
| Frequency of dieting | 1998 (%) | 2004 (%) | 2004 *vs* 1998 |
|---|---|---|---|
| Occasionally | 19.5 | 15.3 | ▽ |
| Frequently | 2.2 | 4.6 | ▲ |
| Continually | 4.1 | 7.6 | ▲ |
| Never diet | 74.1 | 72.5 | - |

# Food & Nutrient Intakes

## 3.1 Mean Intake of Basic Food Groups among Adult Singaporeans

The mean intake of the four basic food groups among adult Singaporeans were 6.80 servings of rice & alternatives, 1.42 servings of fruit, 1.97 servings of vegetables and 2.97 servings of meat & alternatives. Males consumed significantly more servings of rice & alternatives (7.91 *vs* 5.71 servings), vegetables (2.05 *vs* 1.89 servings) and meat & alternatives (3.31 *vs* 2.64 servings) than females. The intake of wholegrain products in this survey is determined by measuring the intake of wholemeal and softmeal bread as a surrogate food item.

**Figure 3.1.1: Mean intake of the four basic food groups (servings) among adult Singaporeans, by gender**



Generally, the Indians ate more wholegrain products, fruit and vegetables and less meat and alternatives compared to the Chinese and the Malays. Those aged 18-29 years ate less fruit and more meat and alternatives than the other age groups. Those aged 60-69 years ate more wholegrain products, fruit and less meat and alternatives than the other age groups.

**Table 3.1.1(a): Mean (SE) intake of the four basic food groups (servings) among adult Singaporeans, by gender and ethnic groups**

| | | Rice and alternatives | | Fruit | Vegetables | Meat and alternatives |
|---|---|---|---|---|---|---|
| | N | Total | Wholegrain products | | | |
| **Males** | | | | | | |
| Chinese | 419 | 7.92 (0.14) | 0.16 (0.02) | 1.33 (0.04) | 2.11 (0.05) | 3.33 (0.07) |
| Malay | 127 | 8.09 (0.36) | 0.18 (0.05) | 1.41 (0.13) | 1.70 (0.12) | 3.43 (0.18) |
| Indian | 141 | 7.58 (0.42) | 0.26 (0.11) | 1.67 (0.18) | 1.99 (0.14) | 2.94 (0.19) |
| **Females** | | | | | | |
| Chinese | 404 | 5.70 (0.10) | 0.22 (0.02) | 1.49 (0.05) | 1.88 (0.04) | 2.67 (0.05) |
| Malay | 147 | 5.77 (0.29) | 0.12 (0.03) | 1.38 (0.12) | 1.79 (0.13) | 2.58 (0.14) |
| Indian | 143 | 5.72 (0.31) | 0.19 (0.05) | 1.53 (0.14) | 2.11 (0.16) | 2.43 (0.16) |
| **Total** | | | | | | |
| Chinese | 823 | 6.79 (0.09) | 0.19 (0.01) | 1.41 (0.03) | 2.00 (0.03) | 2.99 (0.04) |
| Malay | 274 | 6.92 (0.25) | 0.15 (0.03) | 1.39 (0.09) | 1.74 (0.09) | 3.00 (0.12) |
| Indian | 284 | 6.66 (0.28) | 0.23 (0.06) | 1.60 (0.12) | 2.04 (0.10) | 2.69 (0.13) |

**Table 3.1.1(b): Mean (SE) intake of the four basic food groups (servings) among adult Singaporeans, by gender and age (years) groups**

| | | Rice and alternatives | | Fruit | Vegetables | Meat and alternatives |
|---|---|---|---|---|---|---|
| | N | Total | Wholegrain products | | | |
| **Males** | | | | | | |
| 18-29 | 170 | 8.37 (0.24) | 0.17 (0.03) | 1.20 (0.09) | 2.05 (0.09) | 3.73 (0.13) |
| 30-39 | 183 | 8.16 (0.28) | 0.13 (0.02) | 1.20 (0.07) | 2.10 (0.09) | 3.50 (0.12) |
| 40-49 | 189 | 7.92 (0.22) | 0.12 (0.03) | 1.45 (0.08) | 1.98 (0.09) | 3.07 (0.11) |
| 50-59 | 90 | 7.47 (0.28) | 0.26 (0.04) | 1.56 (0.09) | 2.25 (0.11) | 3.28 (0.14) |
| 60-69 | 55 | 6.88 (0.40) | 0.26 (0.10) | 1.63 (0.17) | 1.72 (0.12) | 2.44 (0.14) |
| **Females** | | | | | | |
| 18-29 | 184 | 6.11 (0.18) | 0.20 (0.04) | 1.24 (0.08) | 2.02 (0.08) | 2.94 (0.11) |
| 30-39 | 187 | 5.86 (0.17) | 0.19 (0.05) | 1.32 (0.08) | 2.00 (0.07) | 2.75 (0.09) |
| 40-49 | 188 | 5.72 (0.18) | 0.20 (0.04) | 1.60 (0.09) | 1.89 (0.07) | 2.62 (0.09) |
| 50-59 | 87 | 5.42 (0.21) | 0.24 (0.04) | 1.76 (0.10) | 1.73 (0.08) | 2.49 (0.10) |
| 60-69 | 48 | 4.83 (0.25) | 0.22 (0.06) | 1.67 (0.14) | 1.58 (0.11) | 1.91 (0.09) |
| **Total** | | | | | | |
| 18-29 | 354 | 7.23 (0.16) | 0.19 (0.03) | 1.22 (0.06) | 2.03 (0.06) | 3.33 (0.09) |
| 30-39 | 370 | 6.98 (0.18) | 0.16 (0.03) | 1.26 (0.06) | 2.05 (0.06) | 3.12 (0.08) |
| 40-49 | 377 | 6.83 (0.15) | 0.16 (0.02) | 1.52 (0.06) | 1.94 (0.06) | 2.85 (0.07) |
| 50-59 | 177 | 6.45 (0.19) | 0.25 (0.03) | 1.66 (0.07) | 1.99 (0.07) | 2.89 (0.09) |
| 60-69 | 103 | 5.82 (0.25) | 0.24 (0.06) | 1.65 (0.11) | 1.65 (0.08) | 2.17 (0.09) |

**Figure 3.1.2: Mean intake of the four basic food groups (weight in grams) among adult Singaporeans, by gender**

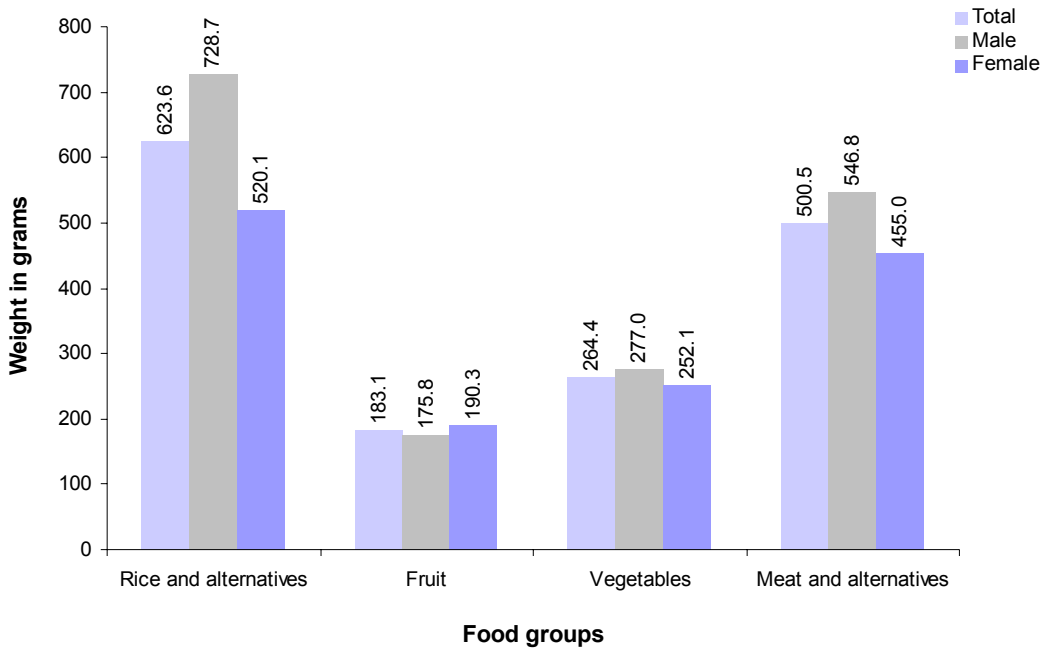



**Table 3.1.2(a): Mean (SE) intake of the four basic food groups (weight in grams) among adult Singaporeans, by gender and ethnic groups**

| | N | Rice and alternatives | | Fruit | Vegetables | Meat and alternatives |
|---|---|---|---|---|---|---|
| | | Total | Wholegrain products | | | |
| **Males** | | | | | | |
| Chinese | 419 | 737.0 (12.4) | 9.6 (1.0) | 171.1 (5.6) | 283.1 (7.0) | 518.0 (12.2) |
| Malay | 127 | 715.3 (31.2) | 11.1 (2.7) | 181.7 (16.8) | 234.2 (17.0) | 675.3 (39.1) |
| Indian | 141 | 670.1 (37.5) | 15.5 (6.4) | 212.4 (23.7) | 283.6 (21.6) | 625.6 (42.2) |
| **Females** | | | | | | |
| Chinese | 404 | 524.3 (9.2) | 13.2 (1.5) | 192.4 (6.2) | 247.7 (4.9) | 431.2 (10.0) |
| Malay | 147 | 506.1 (24.9) | 7.3 (1.9) | 174.2 (14.8) | 251.7 (18.1) | 526.3 (32.1) |
| Indian | 143 | 501.3 (28.8) | 11.7 (2.9) | 195.1 (17.4) | 296.4 (22.1) | 580.2 (37.8) |
| **Total** | | | | | | |
| Chinese | 823 | 629.5 (8.3) | 11.4 (0.9) | 181.8 (4.2) | 265.2 (4.3) | 474.1 (8.0) |
| Malay | 274 | 609.7 (21.4) | 9.2 (1.6) | 177.9 (11.2) | 243.0 (12.4) | 600.1 (25.8) |
| Indian | 284 | 587.1 (24.9) | 13.6 (3.6) | 203.9 (14.7) | 289.9 (15.4) | 603.2 (28.3) |

**Table 3.1.2(b): Mean (SE) intake of the four basic food groups (weight in grams) among adult Singaporeans, by gender and age (years) groups**

| | | Rice and alternatives | | Fruit | Vegetables | Meat and alternatives |
|---|---|---|---|---|---|---|
| | N | Total | Wholegrain products | | | |
| **Males** | | | | | | |
| 18-29 | 170 | 768.2 (21.6) | 10.1 (1.9) | 154.5 (11.2) | 282.2 (12.7) | 587.1 (24.3) |
| 30-39 | 183 | 751.9 (25.4) | 7.7 (1.4) | 153.8 (9.6) | 284.3 (13.2) | 586.7 (23.3) |
| 40-49 | 189 | 734.7 (20.0) | 7.4 (1.5) | 186.7 (10.7) | 267.0 (12.8) | 512.3 (23.4) |
| 50-59 | 90 | 686.5 (24.3) | 15.6 (2.6) | 200.8 (11.2) | 299.3 (13.9) | 561.8 (27.0) |
| 60-69 | 55 | 630.9 (37.0) | 15.5 (6.0) | 209.3 (21.3) | 229.1 (17.2) | 406.3 (28.6) |
| **Females** | | | | | | |
| 18-29 | 184 | 555.3 (17.1) | 12.1 (2.4) | 158.3 (9.6) | 273.1 (10.7) | 476.7 (20.2) |
| 30-39 | 187 | 534.8 (16.4) | 11.3 (3.0) | 170.0 (10.8) | 266.6 (9.3) | 477.7 (20.7) |
| 40-49 | 188 | 516.8 (16.7) | 11.8 (2.4) | 206.1 (11.9) | 252.0 (10.0) | 481.9 (19.6) |
| 50-59 | 87 | 497.8 (19.7) | 14.3 (2.1) | 225.5 (12.7) | 224.6 (9.9) | 427.6 (20.6) |
| 60-69 | 48 | 445.3 (23.6) | 13.2 (3.5) | 215.7 (18.7) | 212.4 (16.2) | 319.5 (20.3) |
| **Total** | | | | | | |
| 18-29 | 354 | 660.6 (15.0) | 11.1 (1.5) | 156.4 (7.4) | 277.6 (8.3) | 531.3 (16.0) |
| 30-39 | 370 | 640.8 (16.1) | 9.5 (1.7) | 162.1 (7.2) | 275.3 (8.0) | 530.9 (15.8) |
| 40-49 | 377 | 626.6 (14.3) | 9.6 (1.4) | 196.3 (8.0) | 259.6 (8.1) | 497.2 (15.3) |
| 50-59 | 177 | 592.5 (16.8) | 15.0 (1.7) | 213.1 (8.5) | 262.1 (8.6) | 495.0 (17.5) |
| 60-69 | 103 | 535.1 (23.1) | 14.3 (3.4) | 212.6 (14.0) | 220.5 (11.8) | 361.5 (17.7) |

## 3.2 Proportion of Adult Singaporeans Meeting the Dietary Guidelines

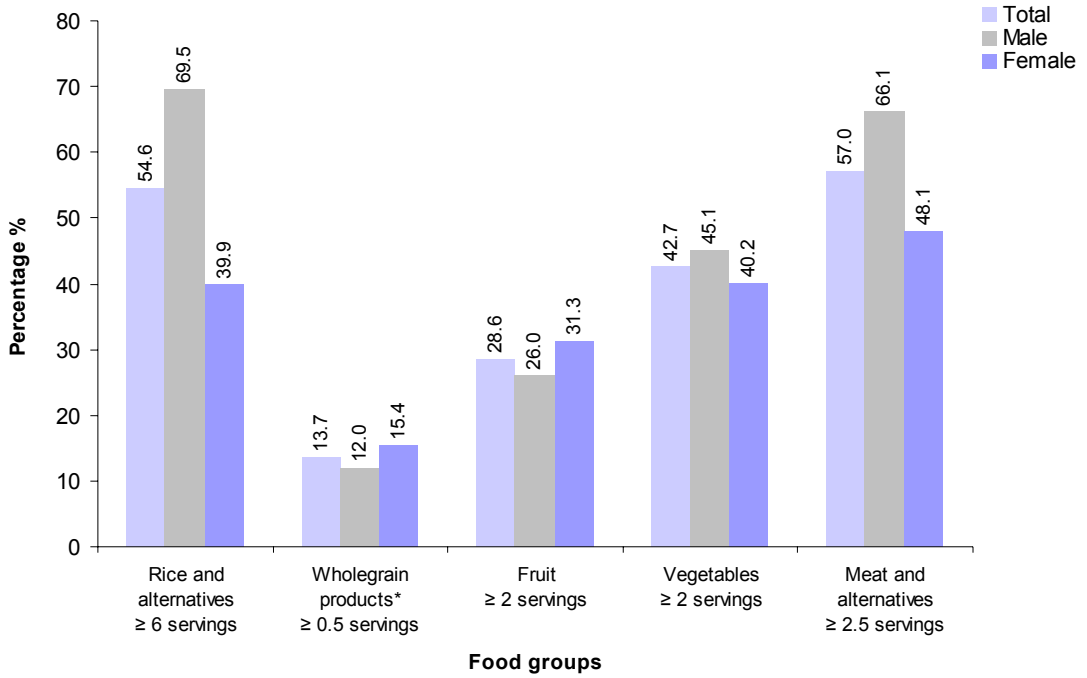
The Dietary Guidelines for Adult Singaporeans recommend the intake of 5-7 servings of rice and alternatives (of which at least one serving should be a wholegrain product), 2 servings of fruit, 2 servings of vegetables, 2-3 servings of meat and alternatives a day. The guidelines also recommend that individuals who choose to drink alcoholic beverages should do so in moderation [(2)].

More than half of adult Singaporeans consumed adequate amounts of rice and alternatives (54.6%) and meat and alternatives (57.0%). However, less than half of adult Singaporean met the guidelines for wholegrain products (13.7%), fruit (28.6%) and vegetables (42.7%).

Significantly more males met the guidelines for rice and alternatives (69.5% *vs* 39.9%) and meat and alternatives (66.1% *vs* 48.1%) compared to the females. Conversely, significantly more females met the guidelines for fruit (31.3% *vs* 26.0%) compared to the males.

Less than one third of adult Singaporeans (31.3%) consumed alcoholic beverages. The majority of these (95.5%) consumed within the recommendations of the guidelines.

**Figure 3.2: Proportion of adult Singaporeans (%) meeting the Dietary Guidelines, by gender**




* *The guidelines recommend the intake of 1 serving of wholegrain products daily. Due to the low proportion of adult Singaporeans consuming 1 serving of wholegrain products daily, 0.5 serving was used as the standard for evaluation in this report.*

The Indians had the highest proportion meeting the guidelines for wholegrain products (15.2%), fruit (32.1%) and vegetables (46.4%). The Malays were the least likely to meet the guidelines for wholegrain products (12.6%), fruit (28.2%) and vegetables (31.6%).

Among females, more Indians met the recommendations for wholegrain products (16.4%), fruit (33.9%) and vegetables (49.1%), while more Chinese met the recommendation for meat and alternatives.

Among males, fewer Chinese met the recommendations for wholegrain products (11.4%) and fruit (24.9%) compared to the other ethnic groups.

**Table 3.2(a): Proportion of adult Singaporeans (%) meeting the Dietary Guidelines, by gender and ethnic groups**

| | | Rice and alternatives | | Fruit | Vegetables | Meat and alternatives |
|---|---|---|---|---|---|---|
| | | Total | Wholegrain products | | | |
| | N | ≥ 6 servings | ≥ 0.5 servings* | ≥ 2 servings | ≥ 2 servings | ≥ 2.5 servings |
| **Males** | | | | | | |
| Chinese | 419 | 70.1 | 11.4 | 24.9 | 48.0 | 67.5 |
| Malay | 127 | 68.6 | 14.0 | 29.1 | 27.9 | 65.1 |
| Indian | 141 | 64.9 | 14.0 | 31.6 | 43.9 | 54.4 |
| **Females** | | | | | | |
| Chinese | 404 | 40.3 | 15.9 | 31.6 | 40.3 | 49.5 |
| Malay | 147 | 35.2 | 11.4 | 27.3 | 34.1 | 43.7 |
| Indian | 143 | 41.8 | 16.4 | 33.9 | 49.1 | 41.8 |
| **Total** | | | | | | |
| Chinese | 823 | 55.1 | 13.7 | 28.3 | 44.1 | 58.4 |
| Malay | 274 | 51.7 | 12.6 | 28.2 | 31.6 | 54.0 |
| Indian | 284 | 53.6 | 15.2 | 32.1 | 46.4 | 48.2 |

* *The guidelines recommend the intake of 1 serving of wholegrain products daily. Due to the low proportion of adult Singaporeans consuming 1 serving of wholegrain products daily, 0.5 serving was used as the standard for evaluation in this report.*

Singaporeans aged 60-69 years (36.5%) were least likely to meet the recommendations for rice and alternatives and meat and alternatives (29.9%). Those aged 30-39 years (10.9%) were least likely to meet the recommendations for wholegrain products compared to the other age groups. Young adults aged 18-29 years were least likely to meet the guidelines for wholegrain products (12.7%) and fruit (19.2%) intake.

**Table 3.2(b): Proportion of adult Singaporeans (%) meeting the Dietary Guidelines, by gender and age (years) groups**

| | | Rice and alternatives | | Fruit | Vegetables | Meat and alternatives |
|---|---|---|---|---|---|---|
| | | Total | Wholegrain products | | | |
| | N | ≥ 6 servings | ≥ 0.5 servings* | ≥ 2 servings | ≥ 2 servings | ≥ 2.5 servings |
| **Males** | | | | | | |
| 18-29 | 170 | 78.3 | 10.8 | 17.8 | 44.6 | 76.3 |
| 30-39 | 183 | 68.7 | 7.8 | 20.4 | 42.2 | 74.1 |
| 40-49 | 189 | 72.6 | 9.5 | 33.0 | 44.4 | 57.8 |
| 50-59 | 90 | 61.2 | 21.5 | 29.8 | 57.0 | 66.9 |
| 60-69 | 55 | 55.7 | 14.5 | 34.4 | 32.8 | 41.0 |
| **Females** | | | | | | |
| 18-29 | 184 | 48.1 | 14.4 | 20.6 | 46.3 | 56.9 |
| 30-39 | 187 | 44.8 | 13.8 | 24.1 | 49.4 | 51.7 |
| 40-49 | 188 | 38.1 | 14.1 | 36.9 | 37.5 | 49.4 |
| 50-59 | 87 | 35.8 | 20.0 | 45.8 | 32.5 | 45.0 |
| 60-69 | 48 | 18.5 | 16.9 | 34.8 | 23.1 | 19.7 |
| **Total** | | | | | | |
| 18-29 | 354 | 63.0 | 12.7 | 19.2 | 45.4 | 66.2 |
| 30-39 | 370 | 56.4 | 10.9 | 22.3 | 45.7 | 62.8 |
| 40-49 | 377 | 55.6 | 11.5 | 35.1 | 41.0 | 53.7 |
| 50-59 | 177 | 49.0 | 20.7 | 37.6 | 44.8 | 56.0 |
| 60-69 | 103 | 36.5 | 15.7 | 34.1 | 27.8 | 29.9 |

* *The guidelines recommend the intake of 1 serving of wholegrain products daily. Due to the low proportion of adult Singaporeans consuming 1 serving of wholegrain products daily, 0.5 serving was used as the standard for evaluation in this report.*

## 3.3 Mean Intake of Food Types among Adult Singaporeans

The intake of the fourteen main food types and various sub-food types are shown in Tables 3.3(a) to 3.3(h).

### Gender Differences

Overall, males consumed more of all the main food types, with the exception of fruit, compared to females. Males also consumed more alcohol compared to females. Intake of sub-food types showed further distinction in the intake patterns between males and females. Females ate more wholemeal bread or bread with fruits and nuts, noodles in soup, dark green leafy vegetables, dishes with poultry without skin and lean meat, reduced fat milk, yogurt and cheese compared to males. This showed that although females ate smaller amounts of the respective main food types overall than males, they tend to choose the healthier choices.

### Ethnic Differences

The Chinese ate more rice or porridge dishes, noodle dishes, poultry and meat dishes compared to the other ethnic groups. They also consumed the least amount of milk and dairy products. Although the Chinese consumed less vegetables compared to the Indians, they tend to consume more dark green leafy vegetables and dishes compared to the Indians.

The Indians consumed the most bread and cereals, vegetable dishes and milk and dairy products. They also consumed less eggs, poultry and meat dishes compared to the other ethnic groups. These findings were consistent with the preponderance of vegetarians among the Indians.

The Malays consumed more fish and seafood dishes, eggs and soy products than the other ethnic groups. They also consumed the least amount of vegetables and fruit.

### Age Differences

In general across age groups, the elderly (60-69 years) consumed the least amounts of all the main food types except for fruit.

The younger adults (18-29 years) consumed the most rice or porridge dishes, poultry and meat dishes, eggs, fast food and soft drinks and soy products than the other age groups. This group also consumed the least amount of fruit.

**Table 3.3 (a): Mean (SE) daily intake of the various food types (weight in grams) among adult Singaporeans, by gender and ethnic groups**

| | Mean daily intake (grams) | | | | | |
|---|---|---|---|---|---|---|
| | Males | Females | Chinese | Malay | Indian | Total |
| N | 687 | 694 | 823 | 274 | 284 | 1381 |
| **Food types** | | | | | | |
| **Bread and breakfast cereals** | 73.2 (2.7) | 59.7 (2.2) | 60.3 (1.7) | 86.4 (6.8) | 94.9 (6.6) | 66.4 (1.7) |
| White bread | 36.4 (1.6) | 28.6 (1.6) | 29.4 (1.1) | 49.3 (5.4) | 35.9 (3.9) | 32.5 (1.2) |
| Wholemeal bread/bread with fruits and nuts | 12.2 (1.1) | 14.3 (1.3) | 13.1 (0.9) | 12.7 (2.4) | 15.1 (3.7) | 13.2 (0.8) |
| Cereals and other types of bread (e.g. roti prata, thosai, chapati) | 24.7 (1.9) | 16.8 (1.0) | 17.7 (1.1) | 24.4 (3.2) | 43.9 (4.9) | 20.7 (1.1) |
| **Rice/Porridge and dishes** | 586.9 (10.1) | 404.7 (8.7) | 505.9 (8.1) | 463.5 (18.6) | 438.5 (22.4) | 495.1 (7.1) |
| Plain rice/porridge | 437.1 (8.5) | 287.6 (6.4) | 364.9 (6.5) | 348.1 (15.5) | 352.7 (19.2) | 361.8 (5.7) |
| Flavoured rice/porridge | 149.8 (5.5) | 117.1 (5.0) | 141 (4.3) | 115.4 (10.1) | 85.9 (10.3) | 133.3 (3.7) |
| **Noodles dishes** | 325.8 (9.8) | 295.7 (8.6) | 340.9 (7.4) | 213.5 (15.6) | 165.7 (17.2) | 310.6 (6.5) |
| Noodles in soup | 105.5 (4.7) | 112 (4.5) | 121 (3.8) | 69.1 (7.2) | 51.5 (7.9) | 108.8 (3.2) |
| Dry noodles | 84.6 (3.7) | 64 (3.1) | 84.4 (2.9) | 35.9 (4.6) | 34.3 (4.7) | 74.2 (2.4) |
| Fried noodles | 103.9 (4.7) | 88.5 (4.0) | 102.7 (3.6) | 77.9 (7.2) | 59.7 (7.6) | 96.1 (3.1) |
| Noodles in lemak gravy | 21.5 (1.5) | 20.4 (1.6) | 21.9 (1.3) | 20.3 (2.8) | 11.8 (3.1) | 20.9 (1.1) |
| Instant noodles | 6.9 (0.5) | 6.4 (0.4) | 6.7 (0.3) | 6.9 (1.2) | 5.5 (1.0) | 6.6 (0.3) |
| Pasta | 3.5 (0.4) | 4.4 (0.4) | 4.2 (0.3) | 3.4 (0.7) | 2.9 (0.7) | 4.0 (0.3) |
| **Vegetarian Chinese** | 24.2 (2.3) | 24.5 (1.8) | 27.5 (1.6) | 6.1 (3.8) | 22.2 (5.0) | 24.4 (1.4) |

**Table 3.3 (b): Mean (SE) daily intake of the various food types (weight in grams) among adult Singaporeans, by gender and ethnic groups**

| | Mean daily intake (grams) | | | | | |
|---|---|---|---|---|---|---|
| | Males | Females | Chinese | Malay | Indian | Total |
| N | 687 | 694 | 823 | 274 | 284 | 1381 |
| **Food types** | | | | | | |
| **Vegetables & beans/bean products and dishes** | 233.7 (5.7) | 222.5 (4.8) | 223.8 (3.9) | 219.2 (12.0) | 283.3 (17.2) | 228.0 (3.7) |
| Pale green leafy vegetables and dishes | 58.7 (2.1) | 54.7 (1.9) | 57.9 (1.5) | 50.2 (4.3) | 55 (5.4) | 56.7 (1.4) |
| Dark green leafy vegetables and dishes | 55.4 (1.8) | 57.8 (1.7) | 58.9 (1.4) | 51.1 (3.7) | 43.6 (3.7) | 56.6 (1.2) |
| Tomatoes, carrots, red/yellow peppers and dishes | 36.0 (1.7) | 34.5 (1.4) | 32.5 (1.1) | 33.7 (3.2) | 64.8 (5.5) | 35.3 (1.1) |
| Legumes/pulses and dishes | 17.8 (0.9) | 16.5 (1.1) | 14.7 (0.5) | 15.7 (1.5) | 43 (6.5) | 17.1 (0.7) |
| Mixed vegetables and dishes | 28.6 (1.4) | 25.9 (1.2) | 26.5 (1.0) | 26 (3.2) | 36 (4.6) | 27.2 (0.9) |
| Others (roots/stems) and dishes | 36.7 (1.9) | 32.6 (1.5) | 32.8 (1.3) | 42.4 (3.9) | 40.8 (4.7) | 34.6 (1.2) |
| Preserved vegetables | 0.5 (0.1) | 0.5 (0.1) | 0.6 (0.1) | 0.1 (0.1) | 0.1 (0.1) | 0.5 (0.1) |
| **Fruit** | 270.2 (8.4) | 309.8 (9.1) | 294.3 (7.0) | 261.5 (17.5) | 294.7 (21.0) | 290.2 (6.2) |
| Orange/red/yellow fruit and juices | 154.3 (6.4) | 172.3 (7.0) | 167.5 (5.5) | 143.5 (12.2) | 153.7 (14.6) | 163.4 (4.8) |
| Other fruit and juices | 114.9 (4.6) | 136.4 (5.0) | 125.9 (3.8) | 116 (9.9) | 139.1 (12.4) | 125.7 (3.4) |
| Canned fruits | 1.1 (0.2) | 1.1 (0.2) | 0.9 (0.1) | 2.1 (0.6) | 1.9 (0.6) | 1.1 (0.1) |
| **Poultry and dishes** | 36.8 (1.3) | 26.1 (1.0) | 31.7 (0.9) | 31.5 (2.5) | 28.6 (3.2) | 31.4 (0.8) |
| Poultry (without skin) and dishes | 14.2 (1.0) | 15.6 (0.9) | 14.3 (0.7) | 13.5 (1.8) | 22.4 (2.8) | 14.9 (0.7) |
| Poultry (with skin) and dishes | 22.6 (1.2) | 10.5 (0.7) | 17.3 (0.8) | 18 (2.3) | 6.2 (2.1) | 16.5 (0.7) |

**Table 3.3 (c): Mean (SE) daily intake of the various food types (weight in grams) among adult Singaporeans, by gender and ethnic groups**

| | Mean daily intake (grams) | | | | | |
|---|---|---|---|---|---|---|
| | Males | Females | Chinese | Malay | Indian | Total |
| **N** | 687 | 694 | 823 | 274 | 284 | 1381 |
| **Food types** | | | | | | |
| **Meat and dishes** | 48.0 (1.7) | 34.9 (1.4) | 46.6 (1.3) | 23.0 (1.9) | 19.6 (3.0) | 41.4 (1.1) |
| Meat (lean) and dishes | 15.7 (1.1) | 18.1 (1.0) | 18.8 (0.9) | 10.3 (1.1) | 9 (1.7) | 16.9 (0.7) |
| Meat (lean and fat) and dishes | 18.2 (1.1) | 7.7 (0.8) | 14.8 (0.8) | 6.7 (1.3) | 3.6 (1.5) | 12.9 (0.7) |
| Meat (preserved and cured) and dishes | 14.1 (0.8) | 9.1 (0.6) | 12.9 (0.6) | 6 (1.1) | 7 (1.8) | 11.6 (0.5) |
| **Fish/Seafood and dishes** | 58.4 (2.1) | 47.1 (1.5) | 50.4 (1.3) | 71.3 (5.6) | 46.1 (4.5) | 52.7 (1.3) |
| Fish and dishes | 47.1 (2.0) | 38.5 (1.3) | 40.3 (1.1) | 60.8 (5.4) | 38.5 (4.1) | 42.8 (1.2) |
| Other seafood and dishes | 11.2 (0.6) | 8.6 (0.5) | 10.1 (0.4) | 10.5 (1.2) | 7.6 (1.2) | 9.9 (0.4) |
| **Eggs** | 22.3 (0.8) | 15.9 (0.5) | 19.2 (0.5) | 20.9 (1.9) | 14.5 (1.6) | 19.1 (0.5) |
| **Milk and dairy products** | 257.0 (10.7) | 236.0 (10.4) | 211.0 (7.5) | 330.7 (21.2) | 461.0 (36.1) | 246.4 (7.5) |
| Milk used with beverages (e.g. in tea, coffee, malt drinks) | 182.2 (9.5) | 150.9 (9.2) | 143.2 (6.9) | 209.4 (17.6) | 325.9 (32.7) | 166.4 (6.6) |
| Full cream milk (as a drink) | 15.1 (2.1) | 13.8 (2.4) | 11.4 (1.6) | 24.7 (5.8) | 27.6 (7.3) | 14.4 (1.6) |
| Reduced fat milk (as a drink) | 51.2 (4.0) | 59.6 (3.8) | 48.9 (2.7) | 86.4 (10.7) | 71.6 (11.9) | 55.4 (2.7) |
| Yogurt/cheese | 8.5 (1.0) | 11.8 (1.1) | 7.5 (0.6) | 10.2 (1.7) | 35.9 (5.7) | 10.2 (0.7) |

**Table 3.3 (d): Mean (SE) daily intake of the various food types (weight in grams) among adult Singaporeans, by gender and ethnic groups**

| | Mean daily intake (grams) | | | | | |
|---|---|---|---|---|---|---|
| | Males | Females | Chinese | Malay | Indian | Total |
| **N** | 687 | 694 | 823 | 274 | 284 | 1381 |
| **Food types** | | | | | | |
| **Miscellaneous** | 500.3 (13.0) | 410.4 (10.4) | 472.7 (9.1) | 428.5 (27.3) | 323.4 (29.5) | 455.0 (8.4) |
| Bread spreads | 7.8 (0.4) | 6.2 (0.3) | 6.7 (0.3) | 8.6 (0.9) | 7 (0.9) | 7.0 (0.3) |
| Soup cream/broth/clear | 153.6 (7.2) | 147.4 (5.5) | 173.5 (5.1) | 72.1 (10.9) | 47.6 (7.6) | 150.5 (4.5) |
| Salad dressings | 1.0 (0.1) | 1.0 (0.1) | 0.9 (0.1) | 1.5 (0.2) | 1.4 (0.4) | 1.0 (0.1) |
| Desserts in soup | 32.1 (2.1) | 32.5 (2.2) | 34.7 (1.8) | 24.3 (3.2) | 21.4 (4.4) | 32.3 (1.5) |
| Local snacks – kueh kueh (steamed) | 20.3 (1.7) | 14.2 (1.0) | 15.9 (1.0) | 23.0 (4.0) | 21.8 (4.1) | 17.3 (1.0) |
| Other desserts/snacks (e.g. dim sum, goreng pisang, Indian rojak) | 22.0 (1.4) | 16.8 (1.0) | 21.3 (0.9) | 14.1 (3.4) | 8.6 (1.7) | 19.3 (0.8) |
| Biscuits, pastries and cakes | 23.0 (1.2) | 21.1 (1.0) | 20.3 (0.8) | 30.1 (2.5) | 26.3 (3.3) | 22.1 (0.8) |
| Fast food and soft drinks | 157.3 (7.8) | 100.8 (5.1) | 118.7 (4.6) | 189.6 (18.8) | 133.0 (20.4) | 128.8 (4.7) |
| Nuts | 3.7 (0.5) | 2.1 (0.2) | 2.9 (0.3) | 2.4 (0.5) | 4.4 (1.2) | 2.9 (0.3) |
| Titbits (e.g. fried salty snacks, ice-cream, chocolates) | 13.5 (0.9) | 13 (0.9) | 11.7 (0.6) | 21.1 (2.9) | 16.2 (2.6) | 13.3 (0.6) |
| Beverages with creamer or whitener | 56.2 (5.4) | 47.7 (4.5) | 56.0 (4.0) | 39 (9.6) | 32.1 (11.4) | 51.9 (3.5) |
| Beverages without milk or sugar | 9.7 (1.9) | 7.5 (1.5) | 10 (1.5) | 2.8 (1.4) | 3.7 (2.9) | 8.6 (1.2) |
| **Soy products** | 70.3 (3.0) | 60.9 (2.7) | 61.3 (2.0) | 88.6 (7.9) | 71.3 (8.4) | 65.6 (2.0) |
| Tofu/beancurd and dishes | 16.6 (0.9) | 12.7 (0.6) | 15.2 (0.6) | 12.1 (1.2) | 12.6 (2.0) | 14.6 (0.5) |
| Soy milk and beancurd | 53.8 (2.8) | 48.2 (2.6) | 46.1 (1.9) | 76.6 (7.7) | 58.7 (7.8) | 51.0 (1.9) |
| **Alcohol** | 74.0 (9.3) | 14.7 (2.6) | 49.9 (5.7) | 3.0 (1.7) | 51.1 (23.6) | 44.1 (4.8) |

**Table 3.3 (e): Mean (SE) daily intake of the various food types (weight in grams) among adult Singaporeans, by age (years) groups**

| | Mean daily intake (grams) | | | | | |
|---|---|---|---|---|---|---|
| | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 | Total |
| N | 354 | 370 | 377 | 177 | 103 | 1381 |
| **Food types** | | | | | | |
| **Breads and breakfast cereals** | 68.8 (3.1) | 65.7 (3.3) | 68.9 (3.9) | 65.8 (4.5) | 56.6 (4.5) | 66.4 (1.7) |
| White bread | 30.2 (1.8) | 32.3 (2.2) | 38.3 (3.1) | 28.5 (2.3) | 29.7 (3.0) | 32.5 (1.2) |
| Wholemeal bread/bread with fruits and nuts | 12.6 (1.6) | 11.6 (1.9) | 11.3 (1.6) | 18.6 (1.9) | 14.4 (3.4) | 13.2 (0.8) |
| Cereals and other types of breads (e.g. roti prata, thosai, chapati) | 26.0 (2.1) | 21.8 (1.6) | 19.3 (1.8) | 18.7 (4.1) | 12.5 (2.1) | 20.7 (1.1) |
| **Rice/Porridge and dishes** | 507.4 (14.7) | 489.3 (13.5) | 501.3 (15.1) | 484.3 (15.5) | 482.8 (24.4) | 495.1 (7.1) |
| Plain rice/porridge | 358.5 (11.4) | 355.6 (10.4) | 375 (12.3) | 349.7 (12.7) | 372.3 (21.8) | 361.8 (5.7) |
| Flavoured rice/porridge | 148.9 (7.7) | 133.6 (7.1) | 126.3 (7.7) | 134.6 (9.4) | 110.5 (12.0) | 133.3 (3.7) |
| **Noodles dishes** | 323.0 (12.6) | 342.7 (15.7) | 307.5 (12.0) | 300.3 (15.0) | 221.9 (16.7) | 310.6 (6.5) |
| Noodles in soup | 108.6 (6.6) | 112.8 (6.6) | 114.4 (6.8) | 102.9 (7.1) | 93.8 (10.8) | 108.8 (3.2) |
| Dry noodles | 74.0 (4.2) | 86.2 (6.2) | 69.9 (4.1) | 81.2 (6.3) | 41.5 (5.0) | 74.2 (2.4) |
| Fried noodles | 103.9 (6.1) | 108.4 (8.0) | 92.6 (5.5) | 86.5 (5.5) | 71.6 (8.1) | 96.1 (3.1) |
| Noodles in lemak gravy | 17.6 (2.0) | 24.0 (2.5) | 22.0 (1.9) | 24.8 (3.6) | 10.4 (1.9) | 20.9 (1.1) |
| Instant noodles | 11.4 (0.9) | 7.1 (0.6) | 5.1 (0.5) | 3.5 (0.5) | 3.6 (0.6) | 6.6 (0.3) |
| Pasta | 7.5 (0.8) | 4.2 (0.5) | 3.4 (0.5) | 1.3 (0.3) | 1.0 (0.3) | 4.0 (0.3) |
| **Vegetarian Chinese** | 25.8 (2.6) | 23.6 (2.8) | 24.8 (3.2) | 25.3 (3.1) | 19.8 (5.4) | 24.4 (1.4) |

**Table 3.3 (f): Mean (SE) daily intake of the various food types (weight in grams) among adult Singaporeans, by age (years) groups**

| | Mean daily intake (grams) | | | | | |
|---|---|---|---|---|---|---|
| | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 | Total |
| **N** | 354 | 370 | 377 | 177 | 103 | 1381 |
| **Food types** | | | | | | |
| **Vegetables & beans/bean products and dishes** | 222.1 (7.8) | 231.2 (7.3) | 233.4 (7.8) | 238 (8.8) | 200.5 (11.1) | 228.0 (3.7) |
| Pale green leafy vegetables and dishes | 54.4 (2.7) | 58.8 (2.8) | 57.0 (2.9) | 61.5 (3.8) | 46.4 (4.3) | 56.7 (1.4) |
| Dark green leafy vegetables and dishes | 54.6 (2.7) | 55.9 (2.5) | 57.5 (2.1) | 61.0 (3.1) | 53.1 (3.9) | 56.6 (1.2) |
| Tomatoes, carrots, red/yellow peppers and dishes | 32.8 (2.1) | 35.6 (2.1) | 37.9 (2.6) | 38.4 (2.6) | 26.7 (2.7) | 35.3 (1.1) |
| Legumes/pulses and dishes | 17.0 (2.1) | 18.2 (1.5) | 17.4 (1.2) | 15.1 (1.0) | 17.7 (1.7) | 17.1 (0.7) |
| Mixed vegetables and dishes | 24.3 (1.8) | 28.2 (1.9) | 27.5 (1.8) | 29.1 (2.3) | 27.5 (3.9) | 27.2 (0.9) |
| Others (roots/stems) and dishes | 38.3 (2.7) | 33.8 (2.2) | 35.8 (2.7) | 32.4 (2.5) | 28.7 (2.9) | 34.6 (1.2) |
| Preserved vegetables | 0.6 (0.1) | 0.6 (0.1) | 0.4 (0.1) | 0.4 (0.1) | 0.5 (0.1) | 0.5 (0.1) |
| **Fruit** | 251.5 (11.8) | 261.0 (11.7) | 315.0 (13.4) | 325.3 (13.4) | 328.8 (23.7) | 290.2 (6.2) |
| Orange/red/yellow fruit and juices | 143.8 (9.3) | 137.2 (8.9) | 179.9 (10.4) | 178.9 (8.8) | 206.8 (20.3) | 163.4 (4.8) |
| Other fruit and juices | 106.2 (6.7) | 122.8 (7.2) | 134.3 (6.9) | 145.2 (8.2) | 121.2 (9.9) | 125.7 (3.4) |
| Canned fruits | 1.5 (0.3) | 1.1 (0.3) | 0.9 (0.2) | 1.2 (0.3) | 0.8 (0.4) | 1.1 (0.1) |
| **Poultry and dishes** | 43.3 (2.0) | 34.9 (1.8) | 26.7 (1.4) | 25.4 (1.7) | 16.8 (1.5) | 31.4 (0.8) |
| Poultry (without skin) and dishes | 17.9 (1.7) | 15.5 (1.6) | 14.4 (1.2) | 13.8 (1.3) | 9.1 (1.2) | 14.9 (0.7) |
| Poultry (with skin) and dishes | 25.4 (1.9) | 19.5 (1.5) | 12.2 (1.2) | 11.5 (1.4) | 7.7 (1.2) | 16.5 (0.7) |

**Table 3.3 (g): Mean (SE) daily intake of the various food types (weight in grams) among adult Singaporeans, by age (years) groups**

| | Mean daily intake (grams) | | | | | |
|---|---|---|---|---|---|---|
| | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 | Total |
| **N** | 354 | 370 | 377 | 177 | 103 | 1381 |
| **Food types** | | | | | | |
| **Meat and dishes** | 51.3 (2.6) | 45.7 (2.2) | 37.9 (2.0) | 35.5 (2.4) | 26.1 (2.2) | 41.4 (1.1) |
| Meat (lean) and dishes | 18.1 (1.7) | 17.9 (1.5) | 17.7 (1.4) | 15.1 (1.6) | 12.6 (1.4) | 16.9 (0.7) |
| Meat (lean and fat) and dishes | 14.5 (1.4) | 13.8 (1.5) | 10.9 (1.2) | 13.7 (1.9) | 10.5 (1.9) | 12.9 (0.7) |
| Meat (preserved and cured) and dishes | 18.7 (1.4) | 14.0 (1.1) | 9.4 (0.8) | 6.7 (0.8) | 2.9 (0.5) | 11.6 (0.5) |
| **Fish/Seafood and dishes** | 48.9 (2.4) | 48.2 (2.1) | 54.4 (2.8) | 63.3 (3.8) | 49.2 (3.6) | 52.7 (1.3) |
| Fish and dishes | 37.4 (2.1) | 37.0 (1.7) | 45.5 (2.7) | 54.0 (3.7) | 42.5 (3.3) | 42.8 (1.2) |
| Other seafood and dishes | 11.4 (0.9) | 11.2 (0.9) | 8.8 (0.6) | 9.4 (0.9) | 6.7 (1.0) | 9.9 (0.4) |
| **Eggs** | 25.1 (1.3) | 20.4 (0.9) | 17.2 (0.8) | 14.8 (0.9) | 13.7 (1.4) | 19.1 (0.5) |
| **Milk and dairy products** | 218.7 (12.5) | 262 (16.3) | 269.4 (17.2) | 252.2 (16.0) | 198.3 (20.3) | 246.4 (7.5) |
| Milk used with beverages (e.g. In tea, coffee, malt drinks) | 124.1 (10.3) | 175.2 (14.1) | 197.9 (16.0) | 170.9 (13.9) | 151.1 (19.0) | 166.4 (6.6) |
| Full cream milk (as a drink) | 15.6 (3.0) | 18.3 (4.2) | 15.8 (3.0) | 9.0 (2.9) | 7.5 (2.6) | 14.4 (1.6) |
| Reduced fat milk (as a drink) | 66.5 (5.3) | 54.6 (5.9) | 48.4 (5.7) | 62.9 (6.6) | 35.8 (7.0) | 55.4 (2.7) |
| Yogurt/cheese | 12.5 (1.5) | 13.9 (1.9) | 7.2 (1.3) | 9.3 (1.5) | 4.0 (1.2) | 10.2 (0.7) |

**Table 3.3 (h): Mean (SE) daily intake of the various food types (weight in grams) among adult Singaporeans, by age (years) groups**

| | Mean daily intake (grams) | | | | | |
|---|---|---|---|---|---|---|
| | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 | Total |
| N | 354 | 370 | 377 | 177 | 103 | 1381 |
| **Food types** | | | | | | |
| **Miscellaneous** | 575.7 (20.4) | 498.0 (17.2) | 372.1 (12.7) | 411.5 (18.3) | 352.7 (23.4) | 455.0 (8.4) |
| Bread spreads | 6.4 (0.5) | 7.0 (0.6) | 7.4 (0.5) | 7.4 (0.5) | 6.0 (0.7) | 7.0 (0.3) |
| Soup cream/broth/clear | 142.6 (9.2) | 158.3 (10.1) | 136.3 (7.8) | 163.4 (11.2) | 164.5 (14.5) | 150.5 (4.5) |
| Salad dressings | 1.1 (0.1) | 1.1 (0.2) | 0.9 (0.1) | 1.1 (0.2) | 0.4 (0.1) | 1.0 (0.1) |
| Other desserts/snacks (e.g. dim sum, goreng pisang, Indian rojak) | 24.4 (2.5) | 20.1 (1.3) | 17.6 (1.4) | 15.9 (1.9) | 16.1 (2.6) | 19.3 (0.8) |
| Biscuits, pastries and cakes | 25.6 (1.7) | 24.3 (1.8) | 18.9 (1.3) | 20.9 (1.7) | 18.2 (2.4) | 22.1 (0.8) |
| Fast food and soft drinks | 250.1 (13.6) | 147.9 (8.8) | 81.0 (5.4) | 62.2 (6.5) | 35.4 (6.7) | 128.8 (4.7) |
| Nuts | 1.6 (0.2) | 2.6 (0.4) | 3.5 (0.4) | 4.3 (1.1) | 2.8 (0.8) | 2.9 (0.3) |
| Titbits (e.g. fried salty snacks, ice-cream, chocolates) | 23.6 (1.9) | 14.0 (1.1) | 10.1 (1.0) | 8.0 (0.9) | 4.3 (0.8) | 13.3 (0.6) |
| Beverages with creamer or whitener | 40.0 (6.0) | 59.6 (7.8) | 45.8 (6.0) | 69.8 (10.9) | 44.2 (8.9) | 51.9 (3.5) |
| Beverages without milk or sugar | 7.9 (2.1) | 5.8 (1.6) | 6.4 (2.0) | 9.7 (3.0) | 22.2 (8.1) | 8.6 (1.2) |
| **Soy products** | 72.9 (4.8) | 71.1 (4.3) | 62.1 (3.5) | 66.2 (4.5) | 40.9 (6.1) | 65.6 (2.0) |
| Tofu/beancurd and dishes | 14.2 (0.9) | 15.0 (1.2) | 15.8 (1.1) | 13.4 (1.0) | 13.9 (1.7) | 14.6 (0.5) |
| Soy milk and beancurd | 58.8 (4.5) | 56.2 3.9) | 46.3 (3.3) | 52.8 (4.4) | 27.0 (5.4) | 51.0 (1.9) |
| **Alcohol** | 39.5 (7.8) | 43.8 (9.5) | 47.2 (11.3) | 47.6 (12.9) | 41.1 (12.3) | 44.1 (4.8) |

## 3.4 Major Sources of Selected Nutrients

### 3.4.1 Sources of Total Fat and Saturated Fat

The major sources of total fat and saturated fat in the diet of adult Singaporeans in 2004 were similar to those in 1998. Most of the total fat intake of adult Singaporeans was contributed by stir-fried vegetables (13.6%); biscuits, pastries, cakes, nuts, tidbits, snacks and local snacks (12.2%); rice, noodle, meat dishes, desserts containing coconut milk (11.3%); fried noodles (7.6%); and flavoured rice (5.7%).

**Table 3.4.1(a): Major sources of total fat in the diet of adult Singaporeans, 1998 and 2004**

| Food items | 1998 (%) | 2004 (%) |
|---|---|---|
| Stir fried vegetables[@] | 12.4 | 13.6 |
| Biscuits, pastries, cakes, nuts, tidbits, snacks, local snacks[#] | 13.8 | 12.2 |
| Rice, noodles, meat dishes and desserts containing coconut milk/cream | 10.3 | 11.3 |
| Fried noodles | 6.7 | 7.6 |
| Flavoured rice e.g. chicken rice, nasi briyani, claypot rice etc | 6.5 | 5.7 |

[@] *Plain or with meat/seafood/oyster sauce or sambal*
[#] *e.g. Crackers, puff pastries, nuts, salty snacks, chocolates, etc*

Dishes prepared with coconut milk as a group (17.5%) has the highest contribution of saturated fat in the Singaporean diet. The other major sources were biscuits, pastries, cakes, nuts, tidbits, snacks and local snacks (11.9%); stir-fried vegetables (10.0%); fried noodles (9.7%); and coffee, tea and beverages containing milk, creamer, condensed/evaporated milk (7.4%).

**Table 3.4.1(b): Major sources of saturated fat in the diet of adult Singaporeans, 1998 and 2004**

| Food items | 1998 (%) | 2004 (%) |
|---|---|---|
| Rice, noodles, meat dishes and desserts containing coconut milk/cream | 13.9 | 17.5 |
| Biscuits, pastries, cakes, nuts, tidbits, snacks, local snacks[#] | 13.3 | 11.9 |
| Stir fried vegetables[@] | 8.7 | 10.0 |
| Fried noodles | 8.6 | 9.7 |
| Coffee, tea and malt beverages containing milk* | 9.7 | 7.4 |

[@] *Plain or with meat/seafood/oyster sauce or sambal*
[#] *Crackers, puff pastries, nuts, salty snacks, chocolates, etc*

* *Includes full-cream, low fat, skim milk and milk powder, condensed/ evaporated milk, creamer/ whitener*

## 3.4.2 Sources of Calcium

Milk and diary products (32.9%) were the most important sources of calcium in the diet of adult Singaporeans. Other important sources of calcium in the diet were pale and dark green leafy vegetables (11.3%); flavoured rice, plain rice, porridge and noodles (11.0%); breads and breakfast cereals (7.0%); and fish and seafood (6.0%).

**Table 3.4.2: Major sources of calcium in the diet of adult Singaporeans, 1998 and 2004**

| Food items | 1998 (%) | 2004 (%) |
|---|---|---|
| Milk and dairy products | 36.0 | 32.9 |
| Pale and dark green leafy vegetables | 10.1 | 11.3 |
| Noodles, flavoured or plain rice and porridge | 11.2 | 11.0 |
| Breads and breakfast cereals | 6.8 | 7.0 |
| Fish and seafood | 7.1 | 6.0 |

## 3.4.3 Sources of Vitamin A and C

Vegetables and fruit with red and orange flesh (33.0%) are the major sources of vitamin A. Brightly coloured fruit and vegetables, and dark green leafy vegetables contributed more than half (52.9%) of vitamin A in the diet of adult Singaporeans. Milk and dairy products contributed to 22.1% of the vitamin A while eggs contributed to 3.9% of the vitamin A.

**Table 3.4.3(a): Major sources of vitamin A in the diet of adult Singaporeans, 1998 and 2004**

| Food items | 1998 (%) | 2004 (%) |
|---|---|---|
| Tomatoes, carrots, red/yellow peppers | 21.0 | 24.6 |
| Milk and diary products | 25.8 | 22.1 |
| Dark green leafy vegetables | 18.9 | 19.9 |
| Orange/red/yellow fresh fruit, fruit juices | 9.8 | 8.4 |
| Eggs | 4.7 | 3.9 |

The most important source of vitamin C in the diet of adult Singaporeans was fruit and fruit juices (59.8%).

**Table 3.4.3(b): Major sources of vitamin C in the diet of adult Singaporeans, 1998 and 2004**

| Food items | 1998 (%) | 2004 (%) |
|---|---|---|
| Orange/red/yellow fresh fruit, fruit juices | 41.7 | 37.9 |
| Other fresh fruit, fruit juices | 24.8 | 21.9 |
| Dark green leafy vegetables | 12.9 | 15.0 |
| Pale green leafy vegetables | 8.4 | 10.5 |
| Tomatoes, carrots, red/yellow peppers | 4.2 | 5.0 |

## 3.4.4 Sources of Dietary Fibre

The major contributor of dietary fibre intake in the diet of adult Singaporeans was vegetables (19.0%). Other important sources of dietary fibre were fruit and juices (16.8%); plain rice (white or brown) (15.2%); bread (12.9%); and noodles (12.0%).

**Table 3.4.4: Major sources of dietary fibre in the diet of adult Singaporeans, 1998 and 2004**

| Food items | 1998 (%) | 2004 (%) |
|---|---|---|
| Vegetables* | 15.7 | 19.0 |
| Fruit# | 19.3 | 16.8 |
| Plain rice (white or brown) | 18.3 | 15.2 |
| Bread (including local bread and buns) | 12.6 | 12.9 |
| Noodles (soup, dry, fried or with gravy) | 10.9 | 12.0 |

* *Leafy, non-leafy vegetables, legumes, roots and stems*
\# *Fresh fruit, juices, canned and dried fruits*

## 3.5 Comparison of Mean Intake of Food Groups among Adult Singaporeans, NNS 1998 and NNS 2004

In comparison to the results from NNS 1998, there was a significant increase in the mean intake of the four basic food groups among adult Singaporeans. The mean intake of rice and alternatives increased from 6.30 in 1998 to 6.83 in 2004. Of this, the mean intake of wholegrain products was 0.11 servings in 1998 and 0.19 servings in 2004. The intake of fruit was 1.29 servings in 1998 and 1.41 servings in 2004. Vegetable intake was 1.31 and 1.97 servings in 1998 and 2004 respectively. In 2004, the intake of meat and alternatives was 2.99 servings, an increase from 2.63 servings in 1998.

**Figure 3.5.1: Comparison of mean intake of the four basic food groups (servings) among adult Singaporeans, NNS 1998 and NNS 2004**

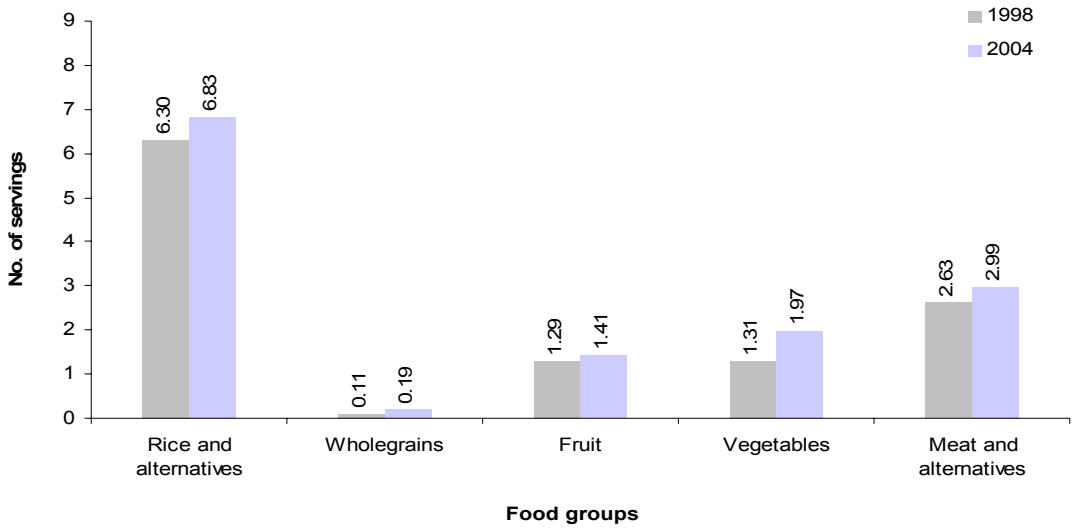
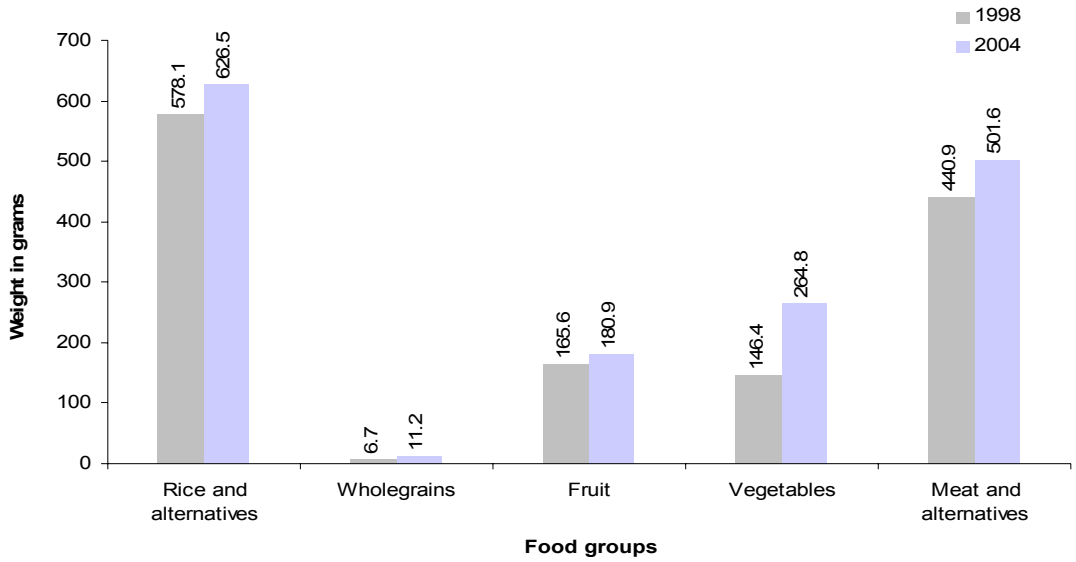



**Figure 3.5.2: Comparison of mean intake of the four basic food groups (weight in grams) among adult Singaporeans, NNS 1998 and NNS 2004**

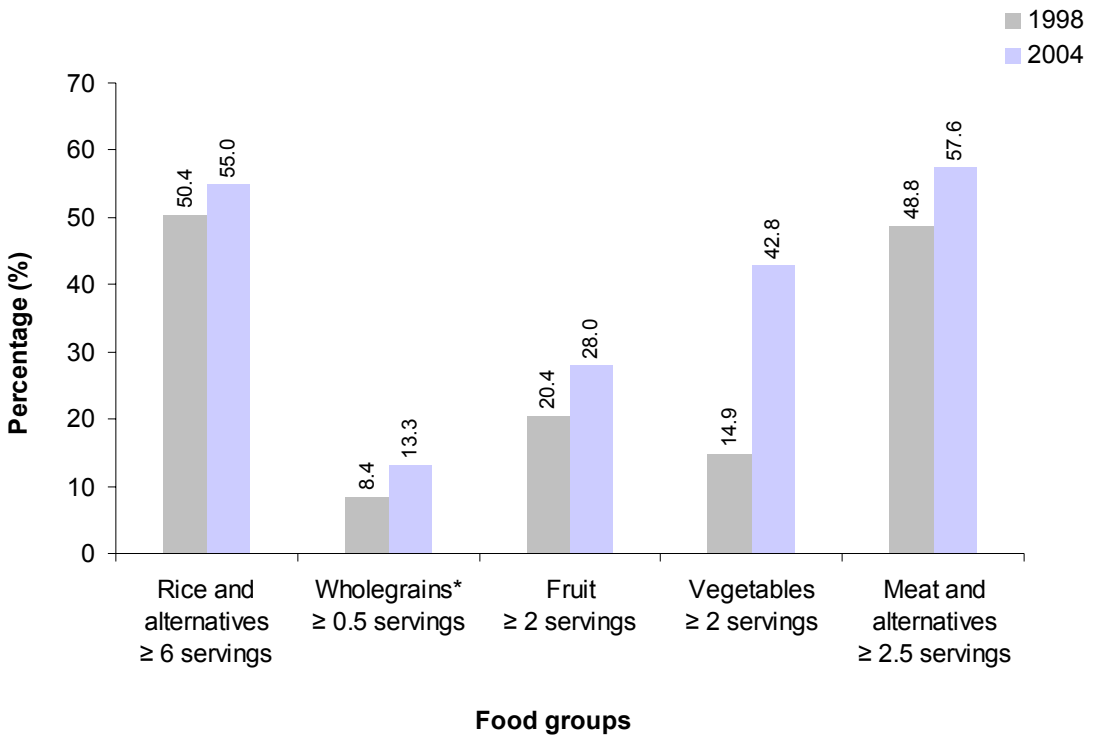



## 3.6 Comparison of the Proportion of Adult Singaporeans Meeting the Dietary Guidelines, NNS 1998 and NNS 2004

In comparison with 1998, the proportion of adult Singaporeans who met the Dietary Guidelines for the four basic food groups increased significantly. In 2004, 55.0% of adult Singaporeans consumed at least 6 servings of rice and alternatives compared to 50.4% in 1998. In addition, 13.3% of adult Singaporeans ate at least 0.5 servings of wholegrain products in 2004 compared to 8.4% in 1998.

More Singaporeans met the guidelines for the intake of fruit (28.0% *vs* 20.4%) and vegetables (42.8% *vs* 14.9%) in 2004 compared to 1998. Also, more Singaporeans met the guidelines for the intake of both fruit and vegetables in 2004 compared to 1998 (14.0% *vs* 5.0%). The proportion of Singaporeans who met the guidelines for meat and alternatives (57.6% *vs* 48.8%) also increased in 2004 compared to 1998.

**Figure 3.6.1: Comparison of proportion of adult Singaporeans (%) meeting the Dietary Guidelines, NNS 1998 and NNS 2004**




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

## 4.1 Energy Intake

The mean daily energy intake of adult Singaporeans was 2398 kcal.

The mean energy intake of males was 2688 kcal and that of females was 2112 kcal. The difference in energy intake between the genders was statistically significant. Daily energy intake was between 1384 kcal and 4523 kcal for 90% of the males and between 1131 kcal and 3513 kcal for 90% of females.

The Chinese (2367 kcal) had lower energy intake than the Malays (2522 kcal) and the Indians (2499 kcal).

In general, energy intake declined with age. Those aged 18-29 years (2701 kcal) had the highest energy intake and those aged 60-69 years (1871 kcal) had the lowest energy intake.

**Table 4.1.1: Mean (SE) and percentile distribution of daily energy intake (kcal) among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean (kcal) | SE | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 2645 | 42.4 | 1442 | 1594 | 2014 | 2481 | 3048 | 3810 | 4422 |
| Malay | 2905 | 124.6 | 1315 | 1521 | 2115 | 2705 | 3581 | 4484 | 5265 |
| Indian | 2769 | 136.7 | 1307 | 1593 | 1970 | 2666 | 3459 | 4132 | 4758 |
| **Females** | | | | | | | | | |
| Chinese | 2095 | 30.6 | 1134 | 1266 | 1588 | 2003 | 2520 | 3019 | 3298 |
| Malay | 2147 | 102.3 | 977 | 1158 | 1532 | 1950 | 2469 | 3376 | 4292 |
| Indian | 2220 | 101.6 | 1124 | 1392 | 1639 | 2175 | 2636 | 3285 | 3744 |
| **All Ethnic group** | | | | | | | | | |
| Chinese | 2367 | 27.4 | 1213 | 1382 | 1748 | 2236 | 2776 | 3470 | 3946 |
| Malay | 2522 | 85.3 | 1093 | 1347 | 1724 | 2266 | 3205 | 4142 | 4961 |
| Indian | 2499 | 89.1 | 1226 | 1443 | 1809 | 2372 | 2990 | 3896 | 4233 |
| **Males** | | | | | | | | | |
| 18-29 | 3029 | 88.5 | 1538 | 1872 | 2266 | 2771 | 3686 | 4686 | 5342 |
| 30-39 | 2852 | 91.4 | 1485 | 1676 | 2113 | 2666 | 3331 | 4051 | 4750 |
| 40-49 | 2511 | 61.2 | 1467 | 1572 | 2002 | 2417 | 2923 | 3557 | 3688 |
| 50-59 | 2580 | 77.7 | 1349 | 1611 | 1872 | 2463 | 3213 | 3920 | 4143 |
| 60-69 | 2106 | 85.9 | 1189 | 1330 | 1584 | 2005 | 2563 | 3191 | 3233 |
| **Females** | | | | | | | | | |
| 18-29 | 2381 | 65.5 | 1251 | 1497 | 1902 | 2272 | 2754 | 3260 | 3728 |
| 30-39 | 2182 | 57.3 | 1172 | 1357 | 1607 | 2107 | 2626 | 3099 | 3745 |
| 40-49 | 2102 | 56.6 | 1126 | 1182 | 1563 | 1991 | 2482 | 3242 | 3562 |
| 50-59 | 1916 | 55.8 | 981 | 1204 | 1572 | 1816 | 2272 | 2743 | 3074 |
| 60-69 | 1650 | 59.0 | 938 | 1012 | 1338 | 1549 | 1859 | 2255 | 2632 |
| **All Age group** | | | | | | | | | |
| 18-29 | 2701 | 57.7 | 1464 | 1567 | 2018 | 2492 | 3140 | 4164 | 4796 |
| 30-39 | 2509 | 56.3 | 1222 | 1442 | 1869 | 2405 | 2907 | 3575 | 4423 |
| 40-49 | 2308 | 43.0 | 1180 | 1355 | 1718 | 2207 | 2737 | 3412 | 3599 |
| 50-59 | 2249 | 52.4 | 1132 | 1344 | 1658 | 2121 | 2690 | 3320 | 3924 |
| 60-69 | 1871 | 55.2 | 986 | 1193 | 1433 | 1743 | 2254 | 2913 | 3191 |
| **Total** | | | | | | | | | |
| Males | 2688 | 38.8 | 1384 | 1587 | 2018 | 2517 | 3191 | 3954 | 4523 |
| Females | 2112 | 28.7 | 1131 | 1262 | 1578 | 2007 | 2523 | 3060 | 3513 |
| **ALL** | **2398** | **25.3** | **1211** | **1383** | **1751** | **2254** | **2827** | **3556** | **4080** |

*SE - standard error of mean*

## Recommended Daily Allowances for Energy

### Table 4.1.2: Formulae obtained from the WHO* to calculate the daily energy requirements for each gender and age (years) group

| Age group | Energy (kcal) |
|---|---|
| | |
| **Males** | |
| 18-29 | (15.3W** + 679) x 1.55 |
| 30-59 | (11.6W + 879) x 1.55 |
| 60-69 | (15.3W + 478) 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 4.1.3. According to NHS 2004, the mean weight of Singaporeans was 69.4 kilograms for males and 57.2 kilograms for females.

### Table 4.1.3: RDA for energy (kcal), by gender and age (years) groups

| Age group | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 |
|---|---|---|---|---|---|
| | | | | | |
| **Males** | 2692 | 2607 | 2607 | 2607 | 2243 |
| **Females** | 2014 | 2082 | 2082 | 2082 | 1881 |

## Mean RDA for Energy

Calculation for the mean RDA for energy for males:

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

A similar calculation was used for females.

Based on these calculations, the mean RDAs for energy for adult Singaporeans were 2599 kcal for males and 2050 kcal for females. The mean energy intake of adult Singaporean males and females met 103.5% and 103.1% of the respective mean RDAs for both genders.

## Comparison with RDA for Energy

Nearly half of adult Singaporeans (47.7%) met or exceeded the RDA appropriate for their gender and age.

More Indians (54.1%) and Malays (50.0%) met or exceeded their respective RDA for energy compared to the Chinese (46.7 %).

More adult aged 18-29 years (60.2%) and 30-39 years (52.6%) met or exceeded their RDA compared to those from the other age groups (range: 31.6% - 42.7%).

**Table 4.1.4: Distribution (%) of percentage of RDA met for energy intake among adult Singaporeans, by gender, ethnic and age (years) groups**

| | < 50% | < 70% | < 100% | ≥ 100% | ≥ 120% | ≥ 150% | ≥ 200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 1.6 | 15.7 | 54.2 | 45.8 | 24.1 | 9.0 | 1.7 |
| Malay | 3.7 | 15.9 | 45.8 | 54.2 | 38.8 | 16.4 | 4.9 |
| Indian | 4.2 | 17.8 | 49.2 | 50.8 | 32.6 | 14.3 | 2.9 |
| **Females** | | | | | | | |
| Chinese | 2.3 | 16.9 | 52.5 | 47.5 | 26.3 | 8.8 | 1.1 |
| Malay | 5.1 | 18.2 | 54.2 | 45.8 | 24.0 | 13.9 | 5.9 |
| Indian | 2.6 | 12.5 | 42.6 | 57.4 | 35.1 | 12.1 | 2.1 |
| **All Ethnic group** | | | | | | | |
| Chinese | 2.0 | 16.3 | 53.3 | 46.7 | 25.2 | 8.9 | 1.4 |
| Malay | 4.4 | 17.0 | 50.0 | 50.0 | 31.4 | 15.1 | 5.4 |
| Indian | 3.4 | 15.2 | 45.9 | 54.1 | 33.9 | 13.2 | 2.5 |
| **Males** | | | | | | | |
| 18-29 | 1.4 | 10.6 | 45.5 | 54.5 | 35.0 | 19.2 | 4.5 |
| 30-39 | 3.4 | 11.2 | 46.0 | 54.0 | 28.2 | 12.2 | 3.2 |
| 40-49 | 1.1 | 19.4 | 60.4 | 39.6 | 20.7 | 3.5 | 1.3 |
| 50-59 | 2.5 | 19.8 | 55.9 | 44.1 | 25.2 | 10.9 | 0.3 |
| 60-69 | 2.2 | 24.0 | 60.3 | 39.7 | 21.9 | 2.2 | 0.0 |
| **Females** | | | | | | | |
| 18-29 | 0.7 | 6.5 | 34.3 | 65.7 | 39.8 | 16.6 | 3.5 |
| 30-39 | 1.6 | 17.3 | 48.8 | 51.2 | 30.1 | 9.2 | 2.2 |
| 40-49 | 3.1 | 20.9 | 54.2 | 45.8 | 24.5 | 10.6 | 1.8 |
| 50-59 | 4.9 | 19.1 | 63.7 | 36.3 | 17.7 | 3.3 | 0.0 |
| 60-69 | 5.3 | 24.1 | 75.9 | 24.1 | 8.4 | 3.1 | 0.0 |
| **Age group** | | | | | | | |
| 18-29 | 1.1 | 8.5 | 39.8 | 60.2 | 37.4 | 17.9 | 4.0 |
| 30-39 | 2.5 | 14.4 | 47.4 | 52.6 | 29.2 | 10.7 | 2.7 |
| 40-49 | 2.1 | 20.1 | 57.3 | 42.7 | 22.6 | 7.0 | 1.5 |
| 50-59 | 3.7 | 19.5 | 59.8 | 40.2 | 21.5 | 7.1 | 0.2 |
| 60-69 | 3.8 | 24.1 | 68.4 | 31.6 | 14.9 | 2.6 | 0.0 |
| **Total** | | | | | | | |
| Males | 2.1 | 15.9 | 52.7 | 47.3 | 26.7 | 10.4 | 2.2 |
| Females | 2.7 | 16.7 | 51.9 | 48.1 | 26.7 | 9.7 | 1.8 |
| **ALL** | **2.4** | **16.3** | **52.3** | **47.7** | **26.7** | **10.0** | **2.0** |

## 4.2 Protein Intake

The mean daily protein intake of adult Singaporeans was 83.3g.

The mean protein intake of adult Singaporean males and females was 91.5g and 75.3g respectively. The difference in mean protein intake between the genders was statistically significant. Daily protein intake for 90% of the males was between 45.6g and 152.6g. In comparison, the daily protein intake for 90% of the females was between 38.7g and 124.0g.

Those in the youngest age group (18-29 years) had the highest intake of protein (93.1g) while those in the oldest age group (60-69 years) had the lowest intake of protein (63.9g).

**Table 4.2.1: Mean (SE) and percentile distribution of protein intake (weight in grams) among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean (g) | SE | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 91.6 | 1.5 | 48.3 | 54.1 | 68.6 | 87.0 | 106.9 | 131.3 | 151.0 |
| Malay | 93.3 | 4.2 | 42.4 | 52.0 | 65.4 | 86.6 | 113.6 | 150.0 | 180.3 |
| Indian | 87.3 | 4.7 | 38.9 | 44.9 | 58.9 | 84.4 | 109.0 | 134.8 | 166.1 |
| **Females** | | | | | | | | | |
| Chinese | 76.2 | 1.2 | 39.3 | 45.6 | 57.2 | 72.0 | 91.2 | 110.2 | 122.9 |
| Malay | 71.6 | 3.3 | 34.1 | 39.1 | 50.3 | 67.3 | 84.2 | 119.5 | 131.0 |
| Indian | 71.6 | 3.6 | 36.3 | 40.6 | 52.8 | 68.3 | 85.3 | 110.7 | 134.3 |
| **All Ethnic group** | | | | | | | | | |
| Chinese | 83.9 | 1.0 | 43.3 | 49.0 | 62.2 | 79.0 | 100.1 | 122.3 | 137.9 |
| Malay | 82.4 | 2.8 | 37.3 | 43.5 | 56.8 | 74.3 | 104.5 | 131.2 | 164.6 |
| Indian | 79.6 | 3.1 | 37.9 | 41.9 | 57.1 | 73.1 | 97.1 | 129.4 | 141.2 |
| **Males** | | | | | | | | | |
| 18-29 | 102.4 | 3.0 | 52.0 | 57.7 | 76.2 | 93.9 | 125.4 | 153.5 | 180.1 |
| 30-39 | 97.0 | 3.2 | 47.2 | 56.2 | 71.6 | 91.2 | 113.1 | 146.8 | 166.4 |
| 40-49 | 84.8 | 2.2 | 45.6 | 52.2 | 65.6 | 80.5 | 100.8 | 120.1 | 129.7 |
| 50-59 | 90.2 | 2.8 | 46.3 | 51.9 | 62.9 | 88.3 | 111.8 | 134.1 | 147.2 |
| 60-69 | 70.8 | 3.0 | 35.2 | 36.5 | 53.9 | 69.6 | 87.1 | 106.7 | 119.6 |
| **Females** | | | | | | | | | |
| 18-29 | 84.0 | 2.4 | 45.0 | 51.8 | 65.7 | 81.2 | 97.3 | 117.5 | 133.9 |
| 30-39 | 77.4 | 2.2 | 38.3 | 45.7 | 57.1 | 73.7 | 93.4 | 114.6 | 128.3 |
| 40-49 | 75.4 | 2.1 | 39.3 | 42.3 | 56.7 | 71.9 | 90.9 | 118.0 | 130.4 |
| 50-59 | 70.0 | 2.1 | 38.2 | 43.9 | 53.0 | 66.4 | 83.8 | 106.7 | 119.0 |
| 60-69 | 57.5 | 2.1 | 30.8 | 37.4 | 47.2 | 56.9 | 66.1 | 86.8 | 95.2 |
| **All Age group** | | | | | | | | | |
| 18-29 | 93.1 | 2.0 | 47.1 | 55.3 | 69.0 | 86.5 | 109.2 | 138.0 | 162.3 |
| 30-39 | 87.0 | 2.0 | 40.8 | 49.0 | 63.0 | 82.3 | 102.8 | 124.4 | 150.3 |
| 40-49 | 80.2 | 1.5 | 41.4 | 46.6 | 59.2 | 75.7 | 96.3 | 118.9 | 129.5 |
| 50-59 | 80.1 | 1.9 | 43.3 | 46.1 | 59.2 | 73.3 | 99.6 | 122.6 | 134.2 |
| 60-69 | 63.9 | 1.9 | 31.9 | 36.5 | 49.0 | 61.3 | 77.1 | 93.7 | 106.6 |
| **Total** | | | | | | | | | |
| Males | 91.5 | 1.4 | 45.6 | 52.4 | 67.8 | 86.6 | 107.9 | 133.4 | 152.6 |
| Females | 75.3 | 1.1 | 38.7 | 44.5 | 56.7 | 71.1 | 90.0 | 110.2 | 124.0 |
| **ALL** | **83.3** | **0.9** | **41.3** | **47.6** | **60.7** | **77.8** | **100.1** | **123.0** | **140.9** |

*SE - standard error of mean*

## Recommended Daily Allowances for Protein

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 safe level of protein intake for an adult Singaporean adult is 1.07g/kg body weight per day (Health Promotion Board, 2003)

Based on the average body weight of Singaporean males and females as reported earlier, the RDAs for protein for adult Singaporeans were 74.3g and 61.2g for males and females respectively.

## Mean RDA for Protein

The mean protein intake of males and females met 123.1% and 123.0% of their respective RDAs for protein.

### Comparison with RDA for Protein

Almost two thirds (65.4%) of adult Singaporeans met or exceeded their RDA for protein.

Among the ethnic groups, significantly more Chinese (67.2%) met or exceeded their RDA for protein compared to the Malays (57.8%) and the Indians (60.0%)

Those aged 60-69 years (40.1%) had the lowest proportion who met or exceeded their RDA for protein compared to the other age groups (60% and above).

**Table 4.2.2: Distribution (%) of percentage of RDA met for protein among adult Singaporeans, by gender, ethnic and age (years) groups**

| | < 50% | < 70% | < 100% | ≥ 100% | ≥ 120% | ≥ 150% | ≥ 200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 1.3 | 8.2 | 33.6 | 66.4 | 46.6 | 22.5 | 5.3 |
| Malay | 2.4 | 10.0 | 37.9 | 62.1 | 48.4 | 26.8 | 9.9 |
| Indian | 2.9 | 16.6 | 42.1 | 57.9 | 44.6 | 22.8 | 5.7 |
| **Females** | | | | | | | |
| Chinese | 0.6 | 7.4 | 32.0 | 68.0 | 49.0 | 24.6 | 5.1 |
| Malay | 3.1 | 13.8 | 46.3 | 53.7 | 39.8 | 18.0 | 8.6 |
| Indian | 3.2 | 14.1 | 37.8 | 62.2 | 38.9 | 17.3 | 4.7 |
| **All Ethnic group** | | | | | | | |
| Chinese | 1.0 | 7.8 | 32.8 | 67.2 | 47.8 | 23.6 | 5.2 |
| Malay | 2.8 | 11.9 | 42.2 | 57.8 | 44.1 | 22.3 | 9.2 |
| Indian | 3.0 | 15.4 | 40.0 | 60.0 | 41.8 | 20.1 | 5.2 |
| **Males** | | | | | | | |
| 18-29 | 0.0 | 4.8 | 23.3 | 76.7 | 57.7 | 35.1 | 11.1 |
| 30-39 | 1.6 | 8.0 | 29.4 | 70.6 | 52.2 | 25.9 | 8.0 |
| 40-49 | 0.7 | 9.7 | 41.2 | 58.8 | 39.0 | 14.7 | 2.7 |
| 50-59 | 0.3 | 9.7 | 37.1 | 62.9 | 48.3 | 24.8 | 4.1 |
| 60-69 | 10.7 | 20.3 | 55.9 | 44.1 | 22.6 | 5.9 | 0.0 |
| **Females** | | | | | | | |
| 18-29 | 0.0 | 4.5 | 20.0 | 80.0 | 62.1 | 29.0 | 8.2 |
| 30-39 | 0.2 | 7.4 | 32.8 | 67.2 | 50.5 | 27.2 | 6.8 |
| 40-49 | 2.2 | 10.3 | 37.3 | 62.7 | 49.0 | 24.1 | 5.4 |
| 50-59 | 1.6 | 8.3 | 35.0 | 65.0 | 36.5 | 17.4 | 3.3 |
| 60-69 | 2.2 | 19.6 | 63.6 | 36.4 | 14.6 | 6.2 | 0.0 |
| **All Age group** | | | | | | | |
| 18-29 | 0.0 | 4.7 | 21.6 | 78.4 | 59.9 | 32.0 | 9.7 |
| 30-39 | 0.9 | 7.7 | 31.2 | 68.8 | 51.3 | 26.6 | 7.4 |
| 40-49 | 1.4 | 10.0 | 39.3 | 60.7 | 44.0 | 19.4 | 4.1 |
| 50-59 | 1.0 | 9.0 | 36.1 | 63.9 | 42.4 | 21.1 | 3.7 |
| 60-69 | 6.3 | 19.9 | 59.9 | 40.1 | 18.5 | 6.0 | 0.0 |
| **Total** | | | | | | | |
| Males | 1.6 | 9.1 | 34.8 | 65.2 | 46.7 | 23.1 | 5.9 |
| Females | 1.1 | 8.8 | 34.3 | 65.7 | 47.0 | 23.2 | 5.5 |
| **ALL** | **1.3** | **8.9** | **34.6** | **65.4** | **46.8** | **23.1** | **5.7** |

## 4.3 Total Fat Intake

The mean total fat intake of adult Singaporeans was 77.9g per day.

Males had significantly a higher intake of total fat compared to females (86.8g *vs* 69.2g). The total fat intake of 90% of the males was between 39.3g and 162.0g. The total fat intake for 90% of the females was between 31.0g and 127.1g.

Malays (85.2g) had significantly higher total fat intake than the Indians (83.3g) and the Chinese (76.2g).

In general, mean total fat intake decreased with age. Those aged 60-69 years had the lowest intake of total fat (53.5g) compared to the other age groups.

**Table 4.3.1: Mean (SE) and percentile distribution of fat intake (weight in grams) among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean (g) | SE | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 84.4 | 1.7 | 39.5 | 43.0 | 58.1 | 76.7 | 102.1 | 133.8 | 158.0 |
| Malay | 99.0 | 5.1 | 39.4 | 42.3 | 69.2 | 90.1 | 124.1 | 157.4 | 199.8 |
| Indian | 90.8 | 5.5 | 36.3 | 43.3 | 60.1 | 87.1 | 112.0 | 162.4 | 182.9 |
| **Females** | | | | | | | | | |
| Chinese | 68.2 | 1.3 | 31.0 | 34.5 | 46.8 | 63.2 | 86.1 | 106.2 | 121.1 |
| Malay | 71.6 | 4.2 | 28.5 | 34.9 | 43.3 | 63.3 | 84.8 | 129.6 | 165.5 |
| Indian | 75.5 | 4.4 | 31.9 | 37.0 | 52.3 | 71.6 | 96.9 | 119.4 | 143.1 |
| **All Ethnic group** | | | | | | | | | |
| Chinese | 76.2 | 1.1 | 32.6 | 38.5 | 51.1 | 70.5 | 92.9 | 119.5 | 140.9 |
| Malay | 85.2 | 3.4 | 33.0 | 38.4 | 52.8 | 73.9 | 110.4 | 149.0 | 180.9 |
| Indian | 83.3 | 3.6 | 32.8 | 39.1 | 55.3 | 76.5 | 104.7 | 138.5 | 165.6 |
| **Males** | | | | | | | | | |
| 18-29 | 103.1 | 3.6 | 43.6 | 51.9 | 70.6 | 94.5 | 129.6 | 168.2 | 190.9 |
| 30-39 | 96.2 | 3.6 | 41.6 | 51.1 | 69.5 | 85.5 | 114.2 | 149.5 | 169.6 |
| 40-49 | 76.7 | 2.5 | 37.2 | 41.3 | 52.9 | 73.2 | 93.7 | 113.2 | 137.4 |
| 50-59 | 81.1 | 3.0 | 39.8 | 42.3 | 58.1 | 76.0 | 98.2 | 133.7 | 154.8 |
| 60-69 | 59.5 | 3.3 | 24.6 | 31.1 | 42.6 | 54.1 | 73.1 | 103.9 | 105.7 |
| **Females** | | | | | | | | | |
| 18-29 | 82.6 | 2.7 | 37.4 | 45.7 | 60.7 | 79.1 | 97.1 | 121.8 | 154.8 |
| 30-39 | 73.1 | 2.4 | 32.5 | 38.2 | 51.6 | 67.6 | 89.6 | 116.9 | 139.2 |
| 40-49 | 67.9 | 2.2 | 31.2 | 35.0 | 46.5 | 63.6 | 83.7 | 105.3 | 121.0 |
| 50-59 | 59.2 | 2.4 | 26.1 | 31.1 | 39.3 | 51.9 | 74.0 | 102.4 | 120.5 |
| 60-69 | 47.9 | 2.4 | 21.9 | 30.1 | 32.9 | 44.0 | 55.8 | 68.5 | 89.4 |
| **All Age group** | | | | | | | | | |
| 18-29 | 92.8 | 2.3 | 40.5 | 49.7 | 63.6 | 85.2 | 111.4 | 151.8 | 174.2 |
| 30-39 | 84.4 | 2.2 | 35.9 | 41.7 | 57.0 | 76.6 | 103.0 | 129.9 | 155.6 |
| 40-49 | 72.4 | 1.7 | 32.9 | 38.1 | 49.2 | 68.1 | 89.5 | 111.8 | 129.4 |
| 50-59 | 70.2 | 2.1 | 31.1 | 34.9 | 47.0 | 63.8 | 84.2 | 119.6 | 133.7 |
| 60-69 | 53.5 | 2.1 | 24.2 | 31.0 | 36.7 | 49.3 | 66.9 | 84.2 | 104.3 |
| **Total** | | | | | | | | | |
| Males | 86.8 | 1.6 | 39.3 | 43.0 | 59.4 | 78.5 | 105.1 | 139.2 | 162.0 |
| Females | 69.2 | 1.2 | 31.0 | 34.6 | 47.0 | 63.6 | 86.5 | 109.5 | 127.1 |
| **ALL** | **77.9** | **1.0** | **32.7** | **38.5** | **51.4** | **71.4** | **95.0** | **123.8** | **150.6** |

*SE - standard error of mean*

## Dietary Guidelines for Total Fat Intake

The Dietary Guidelines for Adult Singaporeans recommended the restriction of total fat intake to 25% to 30% of total energy. The recommended level used for evaluation in this section is 30% (upper limit of the recommended range) of the RDA for energy of each age group (refer to Table 4.1.3) divided by the factor 9. This factor is based on the estimation that one gram of fat provides around 9 kcal of energy. The recommended total fat intake for the adult Singaporeans is as follows:

**Table 4.3.2: Recommended daily intake for total fat (g), by gender and age (years) groups**

| Age group | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 |
|---|---|---|---|---|---|
| | | | | | |
| **Males** | 89.7 | 86.9 | 86.9 | 86.9 | 74.8 |
| **Females** | 67.1 | 69.4 | 69.4 | 69.4 | 62.7 |

## Mean Recommended Daily Intake for Total Fat

Calculation of the mean recommended intake for total fat for males:

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

A similar calculation was used for females.

Based on these calculations, the mean recommended intakes for total fat were 86.6g and 68.3g for males and females respectively. The mean total fat intake of males and females met 100.0% and 101.3% of their mean recommendations respectively.

## Comparison with Mean Recommended Intake for Total Fat

Two in five adult Singaporeans (42.0%) met or exceeded their recommended intake for total fat. Almost one-third (27.3%) of the population had total fat intake which met or exceeded 120% of the recommendation.

More Indians (51.6%) had total fat intake meeting or exceeding the recommendation compared to the Chinese (40.7%) and the Malays (44.2%). One-third of the Indian (33.6%) had total fat intake meeting or exceeding 120% of the recommended fat intake.

The proportion of those meeting or exceeding their recommended intake of fat decreased with age and was lowest for those aged 60-69 years (20.3%). The proportion of those consuming at least 1.2 times more than their recommended intake for fat was highest among those aged 18-29 years (42.5%).

**Table 4.3.3: Distribution (%) of percentage of recommended intake met for total fat among adult Singaporeans, by gender, ethnic and age (years) groups**

| | < 50% | < 70% | < 100% | ≥ 100% | ≥ 120% | ≥ 150% | ≥ 200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 10.0 | 27.4 | 62.5 | 37.5 | 22.8 | 10.8 | 2.3 |
| Malay | 10.4 | 18.9 | 49.0 | 51.0 | 39.2 | 21.3 | 7.2 |
| Indian | 9.4 | 25.9 | 51.2 | 48.8 | 32.6 | 14.3 | 5.0 |
| **Females** | | | | | | | |
| Chinese | 9.0 | 26.3 | 56.2 | 43.8 | 28.6 | 11.7 | 2.4 |
| Malay | 7.9 | 28.7 | 62.6 | 37.4 | 26.6 | 16.0 | 8.5 |
| Indian | 6.3 | 19.5 | 45.5 | 54.5 | 34.7 | 17.6 | 4.7 |
| **All Ethnic group** | | | | | | | |
| Chinese | 9.5 | 26.8 | 59.3 | 40.7 | 25.8 | 11.2 | 2.4 |
| Malay | 9.1 | 23.9 | 55.8 | 44.2 | 32.9 | 18.7 | 7.9 |
| Indian | 7.9 | 22.8 | 48.4 | 51.6 | 33.6 | 15.9 | 4.9 |
| **Males** | | | | | | | |
| 18-29 | 5.7 | 17.8 | 46.6 | 53.4 | 37.9 | 23.7 | 6.4 |
| 30-39 | 5.5 | 15.4 | 51.7 | 48.3 | 34.0 | 13.8 | 4.4 |
| 40-49 | 13.9 | 33.6 | 67.7 | 32.3 | 15.7 | 6.3 | 1.3 |
| 50-59 | 13.1 | 30.4 | 67.5 | 32.5 | 20.6 | 10.6 | 1.3 |
| 60-69 | 15.5 | 47.0 | 77.4 | 22.6 | 11.5 | 1.5 | 0.7 |
| **Females** | | | | | | | |
| 18-29 | 1.4 | 10.5 | 35.3 | 64.7 | 47.0 | 20.9 | 6.5 |
| 30-39 | 6.9 | 20.7 | 53.1 | 46.9 | 31.6 | 15.0 | 4.7 |
| 40-49 | 9.0 | 28.4 | 58.8 | 41.2 | 25.4 | 10.1 | 2.9 |
| 50-59 | 17.9 | 38.9 | 70.5 | 29.5 | 17.2 | 8.2 | 0.0 |
| 60-69 | 12.6 | 49.0 | 81.8 | 18.2 | 7.9 | 1.7 | 0.0 |
| **All Age group** | | | | | | | |
| 18-29 | 3.5 | 14.1 | 40.9 | 59.1 | 42.5 | 22.3 | 6.4 |
| 30-39 | 6.2 | 18.1 | 52.4 | 47.6 | 32.7 | 14.4 | 4.5 |
| 40-49 | 11.5 | 31.0 | 63.3 | 36.7 | 20.5 | 8.2 | 2.1 |
| 50-59 | 15.5 | 34.7 | 69.0 | 31.0 | 18.9 | 9.4 | 0.7 |
| 60-69 | 14.0 | 48.1 | 79.7 | 20.3 | 9.6 | 1.6 | 0.4 |
| **Total** | | | | | | | |
| Males | 10.0 | 26.2 | 59.8 | 40.2 | 25.7 | 12.4 | 3.2 |
| Females | 8.6 | 26.1 | 56.2 | 43.8 | 28.9 | 12.7 | 3.4 |
| **ALL** | **9.3** | **26.1** | **58.0** | **42.0** | **27.3** | **12.6** | **3.3** |

## 4.4 Carbohydrate Intake

The mean daily carbohydrate intake for adult Singaporeans was 336.7g.

Males had significantly higher intake of carbohydrate compared to females (378.5g *vs* 295.6g). Daily fat intake of 90% of adult Singaporeans was between 197.1 g and 644.7 g for males and between 158.9 g and 473.7 g for females.

The Malays (356.4g) had significantly higher carbohydrate intake than the Indians (352.9g) and the Chinese (331.9g).

In general, the intake of carbohydrate decreased with age. Those aged 60-69 years (279.6g) had the lowest intake of total fat compared to the other age groups.

**Table 4.4.1: Mean (SE) and percentile distribution of carbohydrate intake (weight in grams) among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean (g) | SE | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 372.1 | 5.8 | 201.6 | 231.4 | 280.7 | 349.5 | 434.0 | 536.8 | 621.1 |
| Malay | 409.9 | 16.8 | 184.7 | 220.3 | 302.7 | 386.1 | 503.1 | 654.6 | 682.0 |
| Indian | 392.0 | 19.5 | 180.7 | 227.1 | 282.4 | 366.6 | 485.6 | 593.7 | 699.0 |
| **Females** | | | | | | | | | |
| Chinese | 292.6 | 4.2 | 159.5 | 175.1 | 225.8 | 283.2 | 353.0 | 408.1 | 456.0 |
| Malay | 303.9 | 14.1 | 139.9 | 163.5 | 226.0 | 282.2 | 349.7 | 469.3 | 552.4 |
| Indian | 312.6 | 14.3 | 166.6 | 198.2 | 228.0 | 311.7 | 373.6 | 469.6 | 518.3 |
| **All Ethnic group** | | | | | | | | | |
| Chinese | 331.9 | 3.8 | 168.5 | 195.9 | 249.6 | 315.6 | 389.4 | 484.6 | 561.1 |
| Malay | 356.4 | 11.6 | 156.3 | 180.5 | 247.1 | 322.6 | 434.0 | 574.6 | 668.8 |
| Indian | 352.9 | 12.7 | 176.6 | 208.1 | 254.9 | 336.4 | 419.1 | 538.0 | 635.9 |
| **Males** | | | | | | | | | |
| 18-29 | 418.3 | 12.0 | 207.2 | 249.7 | 319.3 | 377.4 | 512.6 | 647.1 | 700.4 |
| 30-39 | 392.3 | 12.3 | 186.7 | 243.1 | 294.6 | 360.2 | 452.5 | 567.0 | 649.6 |
| 40-49 | 362.2 | 8.7 | 220.0 | 232.5 | 273.2 | 349.1 | 430.8 | 510.3 | 573.9 |
| 50-59 | 363.9 | 11.6 | 181.5 | 209.8 | 279.4 | 359.5 | 420.1 | 520.7 | 564.0 |
| 60-69 | 315.8 | 13.6 | 171.5 | 181.3 | 234.2 | 293.5 | 366.7 | 475.6 | 492.8 |
| **Females** | | | | | | | | | |
| 18-29 | 322.4 | 8.8 | 177.3 | 202.7 | 255.1 | 306.4 | 373.7 | 458.7 | 512.4 |
| 30-39 | 302.5 | 7.7 | 170.5 | 177.8 | 227.5 | 298.1 | 361.5 | 402.9 | 491.9 |
| 40-49 | 296.7 | 8.3 | 153.6 | 164.8 | 224.3 | 274.2 | 363.4 | 435.6 | 547.9 |
| 50-59 | 275.5 | 7.7 | 142.8 | 163.3 | 223.4 | 271.1 | 332.8 | 386.6 | 402.6 |
| 60-69 | 245.6 | 9.4 | 134.0 | 157.5 | 200.1 | 234.6 | 284.7 | 343.2 | 432.4 |
| **All Age group** | | | | | | | | | |
| 18-29 | 369.9 | 7.9 | 189.3 | 216.4 | 282.7 | 341.0 | 430.0 | 575.0 | 667.1 |
| 30-39 | 346.3 | 7.6 | 174.4 | 198.8 | 255.5 | 331.5 | 400.5 | 501.7 | 587.9 |
| 40-49 | 329.7 | 6.3 | 163.7 | 195.0 | 247.9 | 312.1 | 391.4 | 484.2 | 551.1 |
| 50-59 | 319.9 | 7.5 | 159.5 | 181.8 | 246.3 | 298.4 | 388.2 | 476.1 | 523.7 |
| 60-69 | 279.6 | 8.7 | 152.7 | 170.5 | 211.6 | 259.3 | 335.6 | 438.6 | 473.2 |
| **Total** | | | | | | | | | |
| Males | 378.5 | 5.3 | 197.1 | 231.1 | 281.9 | 351.8 | 444.2 | 559.0 | 644.7 |
| Females | 295.6 | 3.9 | 158.9 | 174.5 | 226.1 | 283.3 | 354.4 | 416.6 | 473.7 |
| **ALL** | **336.7** | **3.5** | **167.6** | **195.5** | **249.2** | **318.6** | **396.0** | **497.0** | **573.4** |

*SE - standard error of mean*

## Recommended Dietary Guidelines for Carbohydrate Intake

The Dietary Guidelines for Adult Singaporeans recommended that 55%-65% of dietary energy should be contributed by carbohydrate intake. The recommended level of intake used in this section is 60% (mid-point of the recommended range) of the mean RDA for energy for each gender and age group (refer to Table 4.1.3) divided by the factor 4. This factor is based on the estimation that one gram of carbohydrate provides around 4 kcal of energy.

**Table 4.4.2: Recommended intake for carbohydrate (g), by gender and age (years) groups**

| Age group | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 |
|---|---|---|---|---|---|
| | | | | | |
| **Males** | 403.8 | 391.1 | 391.1 | 391.1 | 336.5 |
| **Females** | 302.1 | 312.3 | 312.3 | 312.3 | 282.2 |

## Mean Recommended Daily Intake for Carbohydrate

Calculation of the mean recommended intake for carbohydrate for males:

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

A similar calculation was used for females.

Based on these calculations, the mean recommended intake of carbohydrate were 389.8g and 307.5g for males and females respectively. The mean carbohydrate intake of males and females met 97.2% and 96.2% of their mean recommendations for carbohydrate intake respectively.

## Comparison with Mean Recommended Intake for Carbohydrate

Two in five adult Singaporeans (40.1%) met or exceeded their recommended intake for carbohydrate.

No significant difference was found among the various gender or ethnic groups.

The proportion of those that met or exceeded their recommended intake for carbohydrate decreased with age. Those aged 60-69 years (33.1%) had the lowest proportion that met or exceeded their recommended intake of carbohydrates.

**Table 4.4.3: Distribution (%) of percentage of recommended intake met for carbohydrate among adult Singaporeans, by gender, ethnic and age (years) groups**

| | < 50% | < 70% | < 100% | ≥ 100% | ≥ 120% | ≥ 150% | ≥ 200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 3.4 | 21.3 | 63.2 | 36.8 | 20.2 | 5.5 | 1.4 |
| Malay | 7.0 | 17.4 | 50.2 | 49.8 | 29.2 | 13.0 | 2.4 |
| Indian | 5.7 | 22.7 | 55.4 | 44.6 | 27.7 | 8.5 | 1.5 |
| **Females** | | | | | | | |
| Chinese | 4.0 | 20.3 | 59.6 | 40.4 | 18.2 | 5.5 | 0.9 |
| Malay | 7.0 | 21.5 | 60.1 | 39.9 | 20.5 | 9.2 | 2.6 |
| Indian | 3.3 | 16.6 | 50.5 | 49.5 | 25.8 | 8.8 | 1.4 |
| **All Ethnic group** | | | | | | | |
| Chinese | 3.7 | 20.8 | 61.4 | 38.6 | 19.2 | 5.5 | 1.2 |
| Malay | 7.0 | 19.5 | 55.2 | 44.8 | 24.8 | 11.1 | 2.5 |
| Indian | 4.5 | 19.7 | 53.0 | 47.0 | 26.8 | 8.7 | 1.4 |
| **Males** | | | | | | | |
| 18-29 | 3.9 | 14.4 | 56.7 | 43.3 | 31.6 | 13.7 | 1.0 |
| 30-39 | 5.5 | 18.4 | 57.7 | 42.3 | 21.8 | 7.5 | 3.2 |
| 40-49 | 2.0 | 25.7 | 67.3 | 32.7 | 17.4 | 3.5 | 1.1 |
| 50-59 | 6.2 | 22.7 | 60.0 | 40.0 | 18.0 | 2.9 | 1.5 |
| 60-69 | 2.2 | 27.4 | 63.4 | 36.6 | 19.2 | 3.3 | 0.0 |
| **Females** | | | | | | | |
| 18-29 | 1.1 | 12.6 | 46.3 | 53.7 | 26.5 | 10.5 | 1.8 |
| 30-39 | 2.8 | 21.9 | 56.2 | 43.8 | 18.2 | 5.3 | 1.5 |
| 40-49 | 5.3 | 22.7 | 61.4 | 38.6 | 21.1 | 6.3 | 1.4 |
| 50-59 | 7.1 | 21.2 | 70.0 | 30.0 | 12.3 | 1.6 | 0.0 |
| 60-69 | 8.4 | 24.6 | 70.3 | 29.7 | 10.9 | 6.2 | 0.0 |
| **All Age group** | | | | | | | |
| 18-29 | 2.4 | 13.5 | 51.4 | 48.6 | 29.0 | 12.1 | 1.4 |
| 30-39 | 4.1 | 20.2 | 56.9 | 43.1 | 19.9 | 6.4 | 2.3 |
| 40-49 | 3.6 | 24.2 | 64.3 | 35.7 | 19.2 | 4.9 | 1.2 |
| 50-59 | 6.6 | 22.0 | 65.0 | 35.0 | 15.1 | 2.3 | 0.8 |
| 60-69 | 5.4 | 26.0 | 66.9 | 33.1 | 14.9 | 4.8 | 0.0 |
| **Total** | | | | | | | |
| Males | 4.0 | 20.9 | 60.9 | 39.1 | 22.0 | 6.7 | 1.6 |
| Females | 4.3 | 20.1 | 58.9 | 41.1 | 19.1 | 6.2 | 1.1 |
| **ALL** | **4.2** | **20.5** | **59.9** | **40.1** | **20.5** | **6.4** | **1.3** |

## 4.5 Cholesterol Intake

The mean daily cholesterol intake for adult Singaporeans was 285mg.

Males had significantly higher cholesterol intake compared to females (324mg *vs* 246mg). The cholesterol intake for 90% of the males was between 109mg and 609mg and that for 90% of the females was between 76mg and 492mg.

There was no significant difference among the various ethnic groups.

Generally, the intake of cholesterol declined with age. Those aged 60-69 years (193 mg) had the lowest intake of cholesterol compared to other age groups.

**Table 4.5.1: Mean (SE) and percentile distribution of cholesterol intake (weight in milligrams) among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean (mg) | SE | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 322 | 7.5 | 114 | 146 | 211 | 294 | 406 | 518 | 597 |
| Malay | 376 | 23.5 | 130 | 161 | 243 | 343 | 464 | 632 | 773 |
| Indian | 264 | 21.8 | 39 | 85 | 146 | 223 | 357 | 492 | 667 |
| **Females** | | | | | | | | | |
| Chinese | 251 | 5.7 | 80 | 105 | 158 | 232 | 324 | 430 | 491 |
| Malay | 250 | 16.1 | 73 | 98 | 155 | 207 | 314 | 471 | 579 |
| Indian | 186 | 15.5 | 45 | 59 | 104 | 167 | 246 | 351 | 429 |
| **All Ethnic group** | | | | | | | | | |
| Chinese | 286 | 4.8 | 91 | 119 | 180 | 262 | 367 | 474 | 540 |
| Malay | 312 | 14.9 | 94 | 120 | 178 | 271 | 399 | 544 | 698 |
| Indian | 226 | 13.9 | 44 | 68 | 124 | 190 | 298 | 440 | 519 |
| **Males** | | | | | | | | | |
| 18-29 | 394 | 16.2 | 143 | 186 | 251 | 366 | 506 | 641 | 739 |
| 30-39 | 359 | 17.0 | 122 | 159 | 228 | 337 | 433 | 525 | 732 |
| 40-49 | 287 | 9.8 | 108 | 131 | 187 | 274 | 348 | 458 | 512 |
| 50-59 | 289 | 11.8 | 127 | 146 | 187 | 262 | 375 | 497 | 552 |
| 60-69 | 231 | 16.5 | 52 | 92 | 142 | 217 | 289 | 420 | 510 |
| **Females** | | | | | | | | | |
| 18-29 | 292 | 11.5 | 107 | 144 | 203 | 265 | 347 | 478 | 550 |
| 30-39 | 260 | 11.1 | 78 | 107 | 156 | 244 | 325 | 433 | 512 |
| 40-49 | 239 | 9.4 | 74 | 97 | 144 | 215 | 317 | 414 | 486 |
| 50-59 | 221 | 11.0 | 66 | 84 | 132 | 196 | 281 | 449 | 488 |
| 60-69 | 158 | 9.2 | 54 | 73 | 113 | 141 | 190 | 266 | 342 |
| **All Age group** | | | | | | | | | |
| 18-29 | 342 | 10.3 | 117 | 164 | 220 | 304 | 419 | 581 | 683 |
| 30-39 | 308 | 10.4 | 85 | 121 | 185 | 278 | 387 | 490 | 613 |
| 40-49 | 263 | 6.9 | 85 | 111 | 166 | 247 | 334 | 443 | 488 |
| 50-59 | 255 | 8.4 | 83 | 102 | 168 | 228 | 311 | 456 | 497 |
| 60-69 | 193 | 9.8 | 57 | 91 | 119 | 164 | 246 | 345 | 420 |
| **Total** | | | | | | | | | |
| Males | 324 | 6.9 | 109 | 143 | 206 | 297 | 412 | 526 | 609 |
| Females | 246 | 5.1 | 76 | 99 | 148 | 225 | 314 | 423 | 492 |
| **ALL** | **285** | **4.4** | **85** | **114** | **173** | **257** | **366** | **482** | **549** |

*SE - standard error of mean*

## Recommended Dietary Guidelines for Cholesterol

The dietary guidelines recommended that cholesterol intake should not exceed 100mg per 1000 kcal of RDA for energy (refer to Table 4.1.3 for RDA for energy).

**Table 4.5.2: Recommended intake for cholesterol (mg), by gender and age (years) groups**

| Age group | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 |
|---|---|---|---|---|---|
| | | | | | |
| **Males** | 269 | 261 | 261 | 261 | 224 |
| **Females** | 201 | 208 | 208 | 208 | 188 |

## Mean Recommended Daily Intake for Cholesterol

Calculation of the mean recommended intake for cholesterol for males:

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

A similar calculation was used for females.

Based on these calculations, the mean recommended intake of cholesterol for males was 72.2g and that for females was 56.9g. The mean cholesterol intake of males and females met 124.4% and 120.0% of their respective mean recommended intake.

## Comparison with Mean Recommended Intake for Cholesterol

More than half of adult Singaporeans (58.1%) met or exceeded their recommended intake of cholesterol. About two in five adult Singaporeans (43.5%) had cholesterol intake meeting or exceeding 120% of the recommendation.

A large proportion of both males and females had high cholesterol intake meeting or exceeding 120% of the recommended cholesterol intake (44.6% and 42.5% respectively).

Compared to the Indians (40.1%), more Chinese and Malays met or exceeded the recommended cholesterol intake (59.8% and 59.2% respectively).

More than half of the younger adult Singaporeans aged 18-29 years (59.1%) and aged 30-39 years (51.6%) met or exceeded 120% of the recommended cholesterol intake.

**Table 4.5.3: Distribution (%) of percentage of recommended intake met for cholesterol among adult Singaporeans, by gender, ethnic and age (years) groups**

| | < 50% | < 70% | < 100% | ≥ 100% | ≥ 120% | ≥ 150% | ≥ 200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 6.3 | 16.9 | 39.3 | 60.7 | 44.0 | 27.7 | 9.6 |
| Malay | 4.7 | 13.3 | 33.0 | 67.0 | 56.8 | 37.3 | 16.4 |
| Indian | 18.5 | 39.3 | 56.9 | 43.1 | 32.4 | 19.3 | 6.5 |
| **Females** | | | | | | | |
| Chinese | 9.3 | 20.5 | 41.1 | 58.9 | 44.6 | 28.1 | 11.2 |
| Malay | 9.9 | 21.3 | 48.4 | 51.6 | 39.9 | 26.3 | 12.5 |
| Indian | 24.5 | 42.8 | 62.9 | 37.1 | 24.6 | 11.2 | 4.8 |
| **All Ethnic group** | | | | | | | |
| Chinese | 7.9 | 18.7 | 40.2 | 59.8 | 44.3 | 27.9 | 10.4 |
| Malay | 7.3 | 17.3 | 40.8 | 59.2 | 48.3 | 31.7 | 14.4 |
| Indian | 21.5 | 41.0 | 59.9 | 40.1 | 28.6 | 15.3 | 5.7 |
| **Males** | | | | | | | |
| 18-29 | 4.1 | 10.0 | 31.8 | 68.2 | 58.5 | 40.2 | 21.4 |
| 30-39 | 5.3 | 14.1 | 31.4 | 68.6 | 56.6 | 33.0 | 9.9 |
| 40-49 | 9.3 | 22.3 | 43.4 | 56.6 | 35.8 | 19.9 | 3.3 |
| 50-59 | 4.8 | 19.5 | 49.2 | 50.8 | 29.9 | 21.5 | 8.4 |
| 60-69 | 18.1 | 36.6 | 56.6 | 43.4 | 31.5 | 22.3 | 5.9 |
| **Females** | | | | | | | |
| 18-29 | 4.1 | 9.3 | 24.9 | 75.1 | 59.7 | 39.2 | 16.0 |
| 30-39 | 8.8 | 21.3 | 39.3 | 60.7 | 46.7 | 27.0 | 11.8 |
| 40-49 | 12.1 | 25.9 | 48.5 | 51.5 | 37.9 | 25.6 | 9.5 |
| 50-59 | 18.7 | 26.5 | 52.4 | 47.6 | 33.9 | 19.8 | 10.4 |
| 60-69 | 12.8 | 40.3 | 73.3 | 26.7 | 17.1 | 9.2 | 0.0 |
| **All Age group** | | | | | | | |
| 18-29 | 4.1 | 9.7 | 28.3 | 71.7 | 59.1 | 39.7 | 18.6 |
| 30-39 | 7.1 | 17.8 | 35.4 | 64.6 | 51.6 | 30.0 | 10.8 |
| 40-49 | 10.7 | 24.1 | 45.9 | 54.1 | 36.8 | 22.7 | 6.4 |
| 50-59 | 11.7 | 23.0 | 50.8 | 49.2 | 31.9 | 20.6 | 9.4 |
| 60-69 | 15.4 | 38.5 | 65.2 | 34.8 | 24.1 | 15.5 | 2.9 |
| **Total** | | | | | | | |
| Males | 7.1 | 18.3 | 40.0 | 60.0 | 44.6 | 28.2 | 10.2 |
| Females | 10.6 | 22.4 | 43.8 | 56.2 | 42.5 | 26.5 | 10.8 |
| **All** | **8.9** | **20.3** | **41.9** | **58.1** | **43.5** | **27.4** | **10.5** |

## 4.6 Dietary Fibre Intake

The mean daily dietary intake for adult Singaporeans was 24.9g.

Females had significantly lower dietary fibre intake compared to the males (23.1g *vs* 26.7g). Dietary fibre intake of 90% of the males was between 12.8g and 46.5g. The dietary fibre intake for 90% of females was between 12.2g and 37.8g.

Among the different ethnic groups, Chinese (24.2g) had significantly lower intake of dietary fibre compared to the Malays (25.9g) and the Indians (30.5g).

Those aged 60-69 years (21.1g) had the lowest intake of dietary fibre compared to the other age groups.

**Table 4.6.1: Mean (SE) and percentile distribution of dietary fibre intake (weight in grams) among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean (g) | SE | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 25.8 | 0.4 | 12.6 | 14.9 | 18.7 | 24.6 | 31.1 | 38.2 | 43.7 |
| Malay | 28.5 | 1.2 | 13.3 | 15.1 | 20.0 | 28.0 | 34.6 | 42.0 | 52.1 |
| Indian | 33.4 | 1.9 | 15.2 | 16.8 | 22.4 | 32.4 | 42.2 | 54.1 | 62.5 |
| **Females** | | | | | | | | | |
| Chinese | 22.6 | 0.3 | 12.3 | 13.7 | 17.3 | 21.7 | 27.0 | 31.9 | 35.3 |
| Malay | 23.3 | 1.0 | 10.4 | 13.1 | 16.9 | 21.6 | 27.9 | 37.1 | 44.1 |
| Indian | 27.5 | 1.4 | 13.5 | 15.9 | 20.3 | 27.2 | 32.6 | 40.4 | 46.5 |
| **All Ethnic group** | | | | | | | | | |
| Chinese | 24.2 | 0.3 | 12.4 | 14.0 | 17.9 | 22.9 | 28.7 | 35.4 | 39.8 |
| Malay | 25.9 | 0.8 | 11.9 | 13.8 | 18.2 | 24.2 | 31.9 | 39.1 | 45.9 |
| Indian | 30.5 | 1.2 | 14.6 | 16.6 | 20.8 | 29.2 | 37.1 | 47.2 | 54.9 |
| **Males** | | | | | | | | | |
| 18-29 | 27.8 | 0.8 | 14.0 | 16.6 | 19.4 | 26.6 | 34.4 | 43.5 | 46.4 |
| 30-39 | 28.0 | 0.9 | 12.5 | 15.2 | 19.7 | 25.7 | 33.9 | 42.1 | 49.7 |
| 40-49 | 25.8 | 0.7 | 13.2 | 15.3 | 19.2 | 24.6 | 31.3 | 36.6 | 44.2 |
| 50-59 | 27.3 | 1.0 | 12.0 | 14.0 | 18.4 | 26.9 | 33.3 | 40.7 | 49.2 |
| 60-69 | 22.2 | 1.0 | 12.4 | 12.9 | 15.7 | 21.3 | 28.4 | 33.8 | 37.4 |
| **Females** | | | | | | | | | |
| 18-29 | 23.9 | 0.7 | 13.0 | 14.7 | 17.8 | 22.7 | 27.8 | 34.4 | 39.1 |
| 30-39 | 23.2 | 0.6 | 11.9 | 13.5 | 17.6 | 22.6 | 27.6 | 32.9 | 37.9 |
| 40-49 | 23.6 | 0.6 | 12.3 | 13.6 | 16.8 | 22.0 | 29.2 | 35.0 | 41.2 |
| 50-59 | 22.8 | 0.6 | 13.3 | 14.1 | 18.0 | 22.0 | 26.2 | 32.4 | 35.0 |
| 60-69 | 20.1 | 1.0 | 8.5 | 12.0 | 15.9 | 18.6 | 24.4 | 27.6 | 35.1 |
| **All Age group** | | | | | | | | | |
| 18-29 | 25.9 | 0.6 | 13.2 | 15.9 | 18.7 | 24.1 | 30.9 | 38.6 | 44.1 |
| 30-39 | 25.6 | 0.6 | 12.5 | 14.4 | 18.8 | 23.8 | 30.6 | 38.3 | 45.6 |
| 40-49 | 24.7 | 0.5 | 12.4 | 14.1 | 18.1 | 23.3 | 30.0 | 36.2 | 41.0 |
| 50-59 | 25.0 | 0.6 | 12.9 | 14.1 | 18.3 | 24.8 | 29.4 | 38.0 | 40.7 |
| 60-69 | 21.1 | 0.7 | 10.2 | 12.4 | 15.9 | 19.7 | 25.2 | 31.4 | 34.9 |
| **Total** | | | | | | | | | |
| Males | 26.7 | 0.4 | 12.8 | 15.2 | 18.9 | 25.4 | 32.4 | 39.8 | 46.5 |
| Females | 23.1 | 0.3 | 12.2 | 13.8 | 17.4 | 22.0 | 27.4 | 32.9 | 37.8 |
| **ALL** | **24.9** | **0.3** | **12.4** | **14.1** | **18.2** | **23.4** | **29.7** | **37.1** | **42.3** |

*SE - standard error of mean*

## Recommended Dietary Guidelines for Dietary Fibre

The Dietary Guidelines for Adult Singaporeans recommended a daily intake of 10g of dietary fibre per 1000 kcal of energy requirement for adults (refer to Table 4.1.3 for RDA for energy).

**Table 4.6.2: Recommended intake for dietary fibre (g), by gender and age (years) groups**

| Age group | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 |
|---|---|---|---|---|---|
| | | | | | |
| **Males** | 26.9 | 26.1 | 26.1 | 26.1 | 22.4 |
| **Females** | 20.1 | 20.8 | 20.8 | 20.8 | 18.8 |

## Mean Recommended Daily Intake for Dietary Fibre

Calculation of the mean recommended intake for dietary fibre for males:

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

A similar calculation was used for females.

Based on these calculations, the mean recommended intake of dietary fibre for males was 26.0g and that for females was 20.5g. The mean dietary fibre intake of males and females met 103.0% and 112.9% of their mean recommendations respectively.

## Comparison with Mean Recommended Intake for Dietary Fibre

Insufficient dietary intake is defined as consuming less than 70% of the recommended dietary fibre intake. More than four in five adult Singaporeans (84.0%) met or exceeded 70% of their recommended intake for dietary fibre.

Males were more likely to have insufficient dietary fibre intake compared to females (20.5% *vs* 11.5% respectively).

More Chinese (16.8%) had insufficient intake of dietary fibre compared to the Malays (15.1%) and the Indians (9.1%).

More adult Singaporeans aged 60-69 years (20.8%) had insufficient dietary fibre intake compared to the other age groups.

**Table 4.6.3: Distribution (%) of percentage of recommended intake met for dietary fibre among adult Singaporeans, by gender, ethnic and age (years) groups**

| | < 50% | < 70% | < 100% | ≥ 100% | ≥ 120% | ≥ 150% | ≥ 200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 5.0 | 21.9 | 55.7 | 44.3 | 25.8 | 9.1 | 1.7 |
| Malay | 4.0 | 16.7 | 45.8 | 54.2 | 35.0 | 13.7 | 4.1 |
| Indian | 2.1 | 13.5 | 32.8 | 67.2 | 52.3 | 33.4 | 10.7 |
| **Females** | | | | | | | |
| Chinese | 2.0 | 11.9 | 43.0 | 57.0 | 37.7 | 11.8 | 1.7 |
| Malay | 3.4 | 13.5 | 45.4 | 54.6 | 37.7 | 16.3 | 4.7 |
| Indian | 1.9 | 4.6 | 25.7 | 74.3 | 57.4 | 33.7 | 8.0 |
| **All Ethnic group** | | | | | | | |
| Chinese | 3.5 | 16.8 | 49.2 | 50.8 | 31.8 | 10.5 | 1.7 |
| Malay | 3.7 | 15.1 | 45.6 | 54.4 | 36.3 | 15.0 | 4.4 |
| Indian | 2.0 | 9.1 | 29.3 | 70.7 | 54.8 | 33.6 | 9.3 |
| **Males** | | | | | | | |
| 18-29 | 4.6 | 22.5 | 49.9 | 50.1 | 31.1 | 12.2 | 1.9 |
| 30-39 | 5.0 | 17.6 | 50.5 | 49.5 | 31.8 | 13.2 | 4.2 |
| 40-49 | 4.0 | 19.1 | 58.1 | 41.9 | 25.2 | 7.0 | 2.6 |
| 50-59 | 6.5 | 22.3 | 46.6 | 53.4 | 28.4 | 16.0 | 2.9 |
| 60-69 | 2.2 | 24.5 | 60.0 | 40.0 | 30.0 | 11.8 | 0.7 |
| **Females** | | | | | | | |
| 18-29 | 0.4 | 7.4 | 34.0 | 66.0 | 43.6 | 16.6 | 3.0 |
| 30-39 | 3.0 | 11.8 | 41.3 | 58.7 | 38.5 | 12.8 | 2.8 |
| 40-49 | 1.6 | 13.5 | 45.5 | 54.5 | 39.9 | 17.3 | 3.6 |
| 50-59 | 1.6 | 10.4 | 41.3 | 58.7 | 37.7 | 11.1 | 0.0 |
| 60-69 | 6.7 | 17.4 | 54.1 | 45.9 | 32.2 | 8.4 | 3.1 |
| **All Age group** | | | | | | | |
| 18-29 | 2.4 | 14.8 | 41.9 | 58.1 | 37.4 | 14.4 | 2.5 |
| 30-39 | 4.0 | 14.6 | 45.8 | 54.2 | 35.2 | 13.0 | 3.4 |
| 40-49 | 2.9 | 16.3 | 51.8 | 48.2 | 32.5 | 12.1 | 3.1 |
| 50-59 | 4.1 | 16.4 | 44.0 | 56.0 | 33.1 | 13.6 | 1.5 |
| 60-69 | 4.5 | 20.8 | 57.0 | 43.0 | 31.1 | 10.0 | 1.9 |
| **Total** | | | | | | | |
| Males | 4.7 | 20.5 | 52.5 | 47.5 | 29.1 | 11.7 | 2.7 |
| Females | 2.2 | 11.5 | 41.9 | 58.1 | 39.3 | 14.1 | 2.6 |
| **ALL** | **3.4** | **16.0** | **47.2** | **52.8** | **34.3** | **12.9** | **2.6** |

## 4.7 Iron Intake

The mean daily iron intake of adult Singaporeans was 16.4 mg.

There was no significant difference in iron intake by gender or ethnic groups.

The iron intake among adult Singaporeans declined significantly with age. Those aged 60-69 years (12.9 mg) had the lowest iron intake compared to the other age groups.

**Table 4.7.1: Mean (SE) and percentile distribution of daily iron intake (weight in milligrams) among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean (mg) | SE | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 17.7 | 0.3 | 8.7 | 10.2 | 12.9 | 16.5 | 21.1 | 25.7 | 29.0 |
| Malay | 18.0 | 0.8 | 7.1 | 10.0 | 12.6 | 16.9 | 22.5 | 30.8 | 33.7 |
| Indian | 17.6 | 1.0 | 7.4 | 8.8 | 12.3 | 16.2 | 21.7 | 28.7 | 32.4 |
| **Females** | | | | | | | | | |
| Chinese | 15.1 | 0.2 | 7.8 | 8.7 | 11.0 | 14.3 | 18.3 | 21.6 | 25.3 |
| Malay | 14.8 | 0.7 | 6.6 | 7.6 | 10.4 | 14.0 | 17.6 | 24.5 | 27.1 |
| Indian | 14.8 | 0.8 | 7.2 | 8.2 | 10.3 | 14.2 | 18.2 | 22.3 | 26.9 |
| **All Ethnic group** | | | | | | | | | |
| Chinese | 16.4 | 0.2 | 8.3 | 9.5 | 12.0 | 15.4 | 19.7 | 24.2 | 27.8 |
| Malay | 16.4 | 0.6 | 6.9 | 8.0 | 11.0 | 15.1 | 20.5 | 25.9 | 31.9 |
| Indian | 16.2 | 0.7 | 7.3 | 8.5 | 11.3 | 14.9 | 19.6 | 26.7 | 31.2 |
| **Males** | | | | | | | | | |
| 18-29 | 19.5 | 0.6 | 9.0 | 10.5 | 13.8 | 17.8 | 24.4 | 31.7 | 34.9 |
| 30-39 | 18.6 | 0.7 | 9.0 | 11.1 | 13.2 | 16.8 | 22.4 | 27.8 | 29.4 |
| 40-49 | 16.5 | 0.4 | 8.5 | 9.9 | 12.0 | 15.8 | 20.1 | 24.2 | 27.7 |
| 50-59 | 18.2 | 0.9 | 8.7 | 9.5 | 13.0 | 16.8 | 21.3 | 25.7 | 27.8 |
| 60-69 | 14.0 | 0.6 | 6.2 | 7.5 | 10.6 | 12.9 | 17.8 | 21.5 | 23.5 |
| **Females** | | | | | | | | | |
| 18-29 | 16.5 | 0.5 | 8.5 | 10.0 | 12.8 | 15.7 | 18.8 | 23.2 | 27.1 |
| 30-39 | 15.3 | 0.4 | 7.5 | 8.5 | 11.3 | 15.1 | 18.6 | 21.3 | 25.3 |
| 40-49 | 15.6 | 0.5 | 7.6 | 9.0 | 11.0 | 14.3 | 19.1 | 23.5 | 27.9 |
| 50-59 | 13.8 | 0.4 | 7.6 | 8.6 | 9.8 | 13.7 | 16.6 | 20.3 | 23.5 |
| 60-69 | 11.9 | 0.5 | 7.6 | 7.8 | 8.6 | 11.7 | 13.4 | 17.9 | 20.7 |
| **All Age group** | | | | | | | | | |
| 18-29 | 18.0 | 0.4 | 8.9 | 10.2 | 13.3 | 16.7 | 20.9 | 27.3 | 32.5 |
| 30-39 | 16.9 | 0.4 | 7.8 | 9.5 | 12.4 | 15.9 | 20.0 | 25.0 | 29.1 |
| 40-49 | 16.0 | 0.3 | 7.9 | 9.5 | 11.5 | 15.2 | 19.4 | 24.1 | 27.7 |
| 50-59 | 16.0 | 0.5 | 8.3 | 8.7 | 10.8 | 15.0 | 19.5 | 23.7 | 26.2 |
| 60-69 | 12.9 | 0.4 | 7.1 | 7.8 | 9.8 | 12.2 | 15.5 | 20.1 | 21.7 |
| **Total** | | | | | | | | | |
| Males | 17.8 | 0.3 | 8.7 | 10.1 | 12.9 | 16.5 | 21.2 | 26.3 | 30.0 |
| Females | 15.1 | 0.2 | 7.7 | 8.6 | 11.0 | 14.3 | 18.2 | 21.8 | 25.8 |
| **ALL** | **16.4** | **0.2** | **7.9** | **9.1** | **11.8** | **15.3** | **19.7** | **24.5** | **28.1** |

*SE - standard error of mean*

## Recommended Dietary Allowances for Iron

The requirements of iron were obtained from the Report of the Joint FAO/WHO Expert Group, FAO, Rome, 1970.

### Table 4.7.2: RDA for iron (mg), by gender and age (years) groups

| Age group | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 |
|---|---|---|---|---|---|
| | | | | | |
| **Males** | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| **Females** | 19.0 | 19.0 | 19.0 | 19.0 | 6.0 |

## Mean RDA for Iron

Calculation for the mean RDA for iron for males:

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

Similar calculation is used for females.

Based on these calculations, the mean RDA for iron for males is 6.0 mg and that for females is 19.0 mg. The mean iron intake of males and females met 296.0% and 92.1% of their respective mean RDAs for iron intake.

### Comparison with RDA for Iron

Insufficient iron intake is defined as consuming less than 70% of the RDA for iron. Significantly more females (36.5%) were considered to have insufficient iron intake compared to males (0.2%).

There were no significant differences in the proportion of Singaporeans who had insufficient iron intake by ethnic or age groups.

**Table 4.7.3: Distribution (%) of percentage of RDA met for iron among adult Singaporeans, by gender, ethnic and age (years) groups**

| | < 50% | < 70% | < 100% | ≥ 100% | ≥ 120% | ≥ 150% | ≥ 200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 0.2 | 0.2 | 0.7 | 99.3 | 97.9 | 93.8 | 81.2 |
| Malay | 0.5 | 0.5 | 1.9 | 98.1 | 95.0 | 92.3 | 76.2 |
| Indian | 0.0 | 0.0 | 1.4 | 98.6 | 95.5 | 88.5 | 76.5 |
| **Females** | | | | | | | |
| Chinese | 10.1 | 35.5 | 69.6 | 30.4 | 17.1 | 9.7 | 5.0 |
| Malay | 16.9 | 41.4 | 75.2 | 24.8 | 17.4 | 7.6 | 3.9 |
| Indian | 13.6 | 38.5 | 72.3 | 27.7 | 14.8 | 7.2 | 3.9 |
| **All Ethnic group** | | | | | | | |
| Chinese | 5.2 | 18.0 | 35.5 | 64.5 | 57.1 | 51.3 | 42.7 |
| Malay | 8.8 | 21.2 | 38.9 | 61.1 | 55.8 | 49.5 | 39.7 |
| Indian | 6.7 | 18.9 | 36.3 | 63.7 | 55.8 | 48.5 | 40.8 |
| **Males** | | | | | | | |
| 18-29 | 0.0 | 0.0 | 0.7 | 99.3 | 97.9 | 95.0 | 84.4 |
| 30-39 | 0.0 | 0.0 | 0.4 | 99.6 | 98.4 | 95.4 | 87.6 |
| 40-49 | 0.7 | 0.7 | 1.6 | 98.4 | 96.6 | 92.0 | 75.6 |
| 50-59 | 0.0 | 0.0 | 0.3 | 99.7 | 99.3 | 92.8 | 81.4 |
| 60-69 | 0.7 | 0.7 | 1.5 | 98.5 | 91.2 | 86.4 | 60.8 |
| **Females** | | | | | | | |
| 18-29 | 8.1 | 29.6 | 75.6 | 24.4 | 11.0 | 2.7 | 1.3 |
| 30-39 | 13.2 | 38.2 | 77.1 | 22.9 | 7.7 | 3.7 | 0.3 |
| 40-49 | 11.2 | 45.3 | 74.8 | 25.2 | 9.7 | 4.1 | 1.4 |
| 50-59 | 18.7 | 49.1 | 85.4 | 14.6 | 4.9 | 0.0 | 0.0 |
| 60-69 | 0.0 | 1.7 | 1.7 | 98.3 | 97.8 | 71.1 | 43.1 |
| **All Age group** | | | | | | | |
| 18-29 | 4.1 | 15.0 | 38.5 | 61.5 | 54.0 | 48.4 | 42.4 |
| 30-39 | 6.8 | 19.5 | 39.7 | 60.3 | 52.0 | 48.5 | 42.9 |
| 40-49 | 5.9 | 22.8 | 37.9 | 62.1 | 53.5 | 48.5 | 38.8 |
| 50-59 | 9.3 | 24.4 | 42.7 | 57.3 | 52.3 | 46.6 | 40.8 |
| 60-69 | 0.4 | 1.2 | 1.6 | 98.4 | 94.6 | 78.5 | 51.7 |
| **Total** | | | | | | | |
| Males | 0.2 | 0.2 | 0.9 | 99.1 | 97.3 | 93.2 | 80.2 |
| Females | 11.2 | 36.5 | 70.5 | 29.5 | 17.0 | 9.3 | 4.8 |
| **ALL** | **5.8** | **18.5** | **36.0** | **64.0** | **56.8** | **50.9** | **42.2** |

## 4.8 Calcium Intake

The mean daily calcium intake of adult Singaporean was 627 mg.

The calcium intake for males (657 mg) was significantly higher than that for females (598 mg). Daily calcium intake for 90% of the males was between 262 mg and 1233 mg. Calcium intake for 90% of females was between 260 mg and 1046 mg.

The Chinese (601mg) had significantly lower intake of calcium than the Malays (728mg).

Those aged 60-69 years (481 mg) had the lowest calcium intake compared to the other age groups.

**Table 4.8.1: Mean (SE) and percentile distribution of daily calcium intake (weight in milligrams) among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean (mg) | SE | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 626 | 12.0 | 258 | 329 | 436 | 590 | 773 | 936 | 1,113 |
| Malay | 791 | 39.9 | 321 | 368 | 517 | 756 | 1,065 | 1,238 | 1,440 |
| Indian | 744 | 43.8 | 279 | 354 | 493 | 726 | 941 | 1,213 | 1,426 |
| **Females** | | | | | | | | | |
| Chinese | 575 | 10.7 | 257 | 307 | 402 | 534 | 697 | 902 | 1,006 |
| Malay | 665 | 32.8 | 269 | 311 | 448 | 639 | 833 | 1,072 | 1,169 |
| Indian | 718 | 42.4 | 324 | 373 | 488 | 672 | 885 | 1,107 | 1,375 |
| **All Ethnic group** | | | | | | | | | |
| Chinese | 601 | 8.1 | 258 | 317 | 418 | 553 | 744 | 929 | 1,043 |
| Malay | 728 | 26.1 | 286 | 343 | 458 | 676 | 949 | 1,135 | 1,358 |
| Indian | 731 | 30.4 | 304 | 364 | 488 | 703 | 894 | 1,137 | 1,362 |
| **Males** | | | | | | | | | |
| 18-29 | 708 | 25.7 | 286 | 359 | 466 | 666 | 884 | 1,105 | 1,344 |
| 30-39 | 691 | 24.0 | 290 | 374 | 465 | 666 | 834 | 1,020 | 1,290 |
| 40-49 | 618 | 21.7 | 230 | 327 | 429 | 583 | 744 | 950 | 1,204 |
| 50-59 | 680 | 26.7 | 246 | 336 | 485 | 657 | 887 | 1,008 | 1,288 |
| 60-69 | 504 | 27.9 | 202 | 259 | 351 | 489 | 596 | 787 | 1,049 |
| **Females** | | | | | | | | | |
| 18-29 | 652 | 23.6 | 260 | 355 | 450 | 612 | 784 | 1,001 | 1,144 |
| 30-39 | 617 | 22.7 | 258 | 307 | 407 | 556 | 788 | 971 | 1,117 |
| 40-49 | 610 | 18.8 | 274 | 322 | 409 | 565 | 769 | 960 | 1,062 |
| 50-59 | 556 | 20.0 | 256 | 299 | 397 | 536 | 666 | 894 | 975 |
| 60-69 | 459 | 18.4 | 242 | 255 | 357 | 460 | 544 | 652 | 701 |
| **All Age group** | | | | | | | | | |
| 18-29 | 680 | 17.4 | 277 | 358 | 461 | 628 | 840 | 1,058 | 1,263 |
| 30-39 | 653 | 16.6 | 285 | 335 | 431 | 609 | 807 | 984 | 1,156 |
| 40-49 | 614 | 14.3 | 274 | 325 | 419 | 578 | 753 | 957 | 1,120 |
| 50-59 | 618 | 17.1 | 252 | 300 | 435 | 582 | 795 | 953 | 1,097 |
| 60-69 | 481 | 16.6 | 208 | 258 | 357 | 476 | 553 | 711 | 799 |
| **Total** | | | | | | | | | |
| Males | 657 | 11.6 | 262 | 336 | 443 | 606 | 815 | 1,019 | 1,233 |
| Females | 598 | 10.1 | 260 | 314 | 411 | 548 | 739 | 949 | 1,046 |
| **ALL** | **627** | **7.7** | **264** | **323** | **427** | **579** | **781** | **971** | **1,119** |

*SE - standard error of mean*

## Recommended Daily Allowances for Calcium

The RDA for calcium for Adult Singaporeans aged 18 years and those aged above 51 years is 1000mg. The RDA for those who are aged 19-50 years is 800mg.

## Mean RDA for Calcium

Calculation for the mean RDA for calcium for males:

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

Similar calculation is used for females.

Based on these calculations, the mean RDA for calcium for males is 841 mg and that for females is 842 mg. The mean calcium intake of males and females met 78.1% and 71.0% of their respective mean RDAs.

## Comparison with RDA for Calcium

Insufficient calcium intake is defined as consuming less than 70% of the RDA for calcium. Half of adult Singaporeans (51.3%) had insufficient calcium intake.

Significantly more females (56.3%) had insufficient calcium intake compared to males (46.2%).

Among ethnic groups, more Chinese (54.8%) had insufficient calcium intake compared to the Malays (38.7%) and the Indians (36.2%).

Those aged 60-69 years (79.5%) were most likely to have insufficient calcium intake.

**Table 4.8.2: Distribution (%) of percentage of RDA met for calcium among adult Singaporeans, by gender, ethnic and age (years) groups**

| | < 50% | < 70% | < 100% | ≥ 100% | ≥ 120% | ≥ 150% | ≥ 200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 21.7 | 49.6 | 82.0 | 18.0 | 6.9 | 3.8 | 0.6 |
| Malay | 16.7 | 31.2 | 60.3 | 39.7 | 26.8 | 8.8 | 2.4 |
| Indian | 16.5 | 35.7 | 66.9 | 33.1 | 15.5 | 8.4 | 0.7 |
| **Females** | | | | | | | |
| Chinese | 29.4 | 59.9 | 85.4 | 14.6 | 4.9 | 0.9 | 0.4 |
| Malay | 19.1 | 46.1 | 75.7 | 24.3 | 9.6 | 3.3 | 0.7 |
| Indian | 13.6 | 36.8 | 70.8 | 29.2 | 12.5 | 6.2 | 2.1 |
| **All Ethnic group** | | | | | | | |
| Chinese | 25.6 | 54.8 | 83.7 | 16.3 | 5.9 | 2.3 | 0.5 |
| Malay | 17.9 | 38.7 | 68.1 | 31.9 | 18.1 | 6.0 | 1.5 |
| Indian | 15.1 | 36.2 | 68.8 | 31.2 | 14.0 | 7.3 | 1.4 |
| **Males** | | | | | | | |
| 18-29 | 19.1 | 39.7 | 70.4 | 29.6 | 14.9 | 6.9 | 1.2 |
| 30-39 | 14.7 | 41.2 | 76.8 | 23.2 | 10.7 | 4.8 | 1.8 |
| 40-49 | 23.9 | 52.1 | 83.6 | 16.4 | 8.6 | 3.9 | 0.4 |
| 50-59 | 19.5 | 37.8 | 72.9 | 27.1 | 8.5 | 5.6 | 0.3 |
| 60-69 | 33.3 | 75.2 | 94.5 | 5.5 | 4.1 | 0.7 | 0.0 |
| **Females** | | | | | | | |
| 18-29 | 18.9 | 46.7 | 80.2 | 19.8 | 9.4 | 3.2 | 1.3 |
| 30-39 | 29.3 | 52.8 | 80.1 | 19.9 | 6.8 | 2.9 | 1.2 |
| 40-49 | 26.7 | 53.0 | 81.0 | 19.0 | 6.2 | 0.6 | 0.0 |
| 50-59 | 25.9 | 64.1 | 85.9 | 14.1 | 4.0 | 0.0 | 0.0 |
| 60-69 | 42.0 | 83.5 | 98.3 | 1.7 | 0.0 | 0.0 | 0.0 |
| **All Age group** | | | | | | | |
| 18-29 | 19.0 | 43.3 | 75.3 | 24.7 | 12.1 | 5.1 | 1.2 |
| 30-39 | 22.2 | 47.1 | 78.5 | 21.5 | 8.7 | 3.8 | 1.5 |
| 40-49 | 25.3 | 52.6 | 82.3 | 17.7 | 7.4 | 2.2 | 0.2 |
| 50-59 | 22.7 | 50.9 | 79.3 | 20.7 | 6.3 | 2.8 | 0.2 |
| 60-69 | 37.8 | 79.5 | 96.4 | 3.6 | 2.0 | 0.4 | 0.0 |
| **Total** | | | | | | | |
| Males | 20.7 | 46.2 | 78.0 | 22.0 | 10.1 | 4.8 | 0.9 |
| Females | 26.9 | 56.3 | 83.1 | 16.9 | 6.1 | 1.6 | 0.6 |
| **ALL** | 23.8 | 51.3 | 80.5 | 19.5 | 8.1 | 3.2 | 0.7 |

## 4.9 Vitamin A Intake

The mean vitamin A intake for adult Singaporeans was 1077mcg.

There was no significant difference in the intake of vitamin A by gender.

The Chinese (1046mcg) had significantly lower intake of vitamin A compared to the Malays (1153mcg) and the Indians (1265mcg).

Those aged 50-59 years (1183mcg) had the highest intake of vitamin A compared to the other age groups.

**Table 4.9.1: Mean (SE) and percentile distribution of daily vitamin A intake (weight in micrograms) among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean (mcg) | SE | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 1052 | 28.4 | 328 | 409 | 608 | 908 | 1330 | 1881 | 2233 |
| Malay | 1147 | 66.0 | 407 | 469 | 665 | 995 | 1497 | 2161 | 2406 |
| Indian | 1159 | 79.9 | 421 | 525 | 760 | 998 | 1504 | 1976 | 2350 |
| **Females** | | | | | | | | | |
| Chinese | 1039 | 25.6 | 401 | 473 | 657 | 885 | 1288 | 1732 | 2190 |
| Malay | 1158 | 70.8 | 350 | 405 | 680 | 1018 | 1586 | 2186 | 2416 |
| Indian | 1376 | 126.9 | 515 | 596 | 846 | 1148 | 1731 | 2318 | 3055 |
| **All Ethnic group** | | | | | | | | | |
| Chinese | 1046 | 19.1 | 346 | 437 | 647 | 895 | 1315 | 1792 | 2227 |
| Malay | 1153 | 48.3 | 360 | 461 | 671 | 997 | 1557 | 2157 | 2410 |
| Indian | 1265 | 74.8 | 453 | 551 | 782 | 1095 | 1602 | 2051 | 2534 |
| **Males** | | | | | | | | | |
| 18-29 | 1103 | 52.6 | 334 | 403 | 635 | 968 | 1405 | 2071 | 2481 |
| 30-39 | 1032 | 38.4 | 405 | 450 | 662 | 923 | 1334 | 1804 | 2018 |
| 40-49 | 1035 | 48.5 | 334 | 412 | 597 | 875 | 1298 | 2046 | 2233 |
| 50-59 | 1243 | 75.3 | 292 | 453 | 686 | 1085 | 1549 | 2205 | 2547 |
| 60-69 | 884 | 69.3 | 269 | 352 | 483 | 711 | 1207 | 1589 | 2227 |
| **Females** | | | | | | | | | |
| 18-29 | 1026 | 42.2 | 428 | 478 | 675 | 890 | 1330 | 1692 | 2340 |
| 30-39 | 1082 | 58.3 | 355 | 464 | 643 | 915 | 1325 | 1794 | 2039 |
| 40-49 | 1144 | 50.4 | 409 | 511 | 691 | 937 | 1493 | 2017 | 2532 |
| 50-59 | 1122 | 58.2 | 298 | 463 | 693 | 932 | 1467 | 2178 | 2605 |
| 60-69 | 967 | 60.7 | 415 | 469 | 660 | 848 | 1112 | 1832 | 2243 |
| **All Age group** | | | | | | | | | |
| 18-29 | 1064 | 33.7 | 366 | 456 | 659 | 910 | 1355 | 1817 | 2386 |
| 30-39 | 1058 | 35.2 | 366 | 463 | 648 | 918 | 1331 | 1799 | 2034 |
| 40-49 | 1089 | 35.0 | 356 | 438 | 650 | 908 | 1344 | 2021 | 2385 |
| 50-59 | 1183 | 47.7 | 300 | 463 | 693 | 1007 | 1538 | 2195 | 2513 |
| 60-69 | 927 | 45.9 | 304 | 413 | 611 | 745 | 1171 | 1666 | 2226 |
| **Total** | | | | | | | | | |
| Males | 1073 | 24.9 | 338 | 416 | 634 | 930 | 1355 | 1936 | 2249 |
| Females | 1081 | 24.6 | 399 | 479 | 665 | 906 | 1363 | 1877 | 2287 |
| **ALL** | **1077** | **17.5** | **356** | **449** | **653** | **911** | **1360** | **1905** | **2264** |

*SE - standard error of mean*

## Recommended Daily Allowances for Vitamin A

The requirements for vitamin A intake have been taken from the Report of the Joint FAO/WHO Expert Group, FAO, Rome, 1965. The RDA for vitamin A is 750mcg for adults aged 18-69 years. The mean intake of vitamin A of males and females met 143.1% and 144.1% of the RDA for vitamin A respectively. Insufficient vitamin A intake is defined as consuming less than 70% of the RDA for vitamin A.

## Comparison with RDA for Vitamin A

Only 14.7% of adult Singaporeans had insufficient vitamin A intake.

Significantly more males (17.0%) had insufficient vitamin A intake compared to females (12.4%).

There was no significant difference by ethnic and age groups.

**Table 4.9.2: Distribution (%) of percentage of RDA met for vitamin A among adult Singaporeans, by gender, ethnic and age (years) groups**

| | < 50% | < 70% | < 100% | ≥ 100% | ≥ 120% | ≥ 150% | ≥ 200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 8.5 | 18.5 | 37.3 | 62.7 | 50.3 | 35.3 | 18.5 |
| Malay | 3.4 | 12.3 | 31.8 | 68.2 | 58.3 | 39.7 | 24.5 |
| Indian | 1.5 | 10.0 | 23.6 | 76.4 | 58.7 | 42.5 | 24.2 |
| **Females** | | | | | | | |
| Chinese | 4.3 | 12.3 | 35.6 | 64.4 | 48.0 | 30.2 | 16.4 |
| Malay | 8.1 | 17.8 | 33.5 | 66.5 | 55.2 | 42.3 | 28.9 |
| Indian | 1.7 | 5.0 | 18.5 | 81.5 | 72.8 | 50.8 | 34.0 |
| **All Ethnic group** | | | | | | | |
| Chinese | 6.4 | 15.4 | 36.4 | 63.6 | 49.2 | 32.8 | 17.4 |
| Malay | 5.8 | 15.1 | 32.7 | 67.3 | 56.8 | 41.0 | 26.7 |
| Indian | 1.6 | 7.5 | 21.1 | 78.9 | 65.6 | 46.6 | 29.0 |
| **Males** | | | | | | | |
| 18-29 | 7.1 | 15.5 | 34.1 | 65.9 | 54.9 | 38.5 | 20.1 |
| 30-39 | 4.6 | 12.9 | 32.8 | 67.2 | 52.9 | 33.3 | 19.8 |
| 40-49 | 7.9 | 20.2 | 36.4 | 63.6 | 47.7 | 32.7 | 16.2 |
| 50-59 | 7.7 | 13.0 | 27.9 | 72.1 | 60.9 | 47.8 | 28.6 |
| 60-69 | 12.6 | 31.1 | 58.2 | 41.8 | 37.8 | 28.5 | 11.5 |
| **Females** | | | | | | | |
| 18-29 | 3.2 | 12.8 | 30.9 | 69.1 | 48.5 | 28.7 | 14.2 |
| 30-39 | 7.0 | 14.8 | 37.0 | 63.0 | 53.0 | 36.2 | 17.4 |
| 40-49 | 2.9 | 10.9 | 32.3 | 67.7 | 53.1 | 37.6 | 23.9 |
| 50-59 | 7.1 | 10.8 | 30.2 | 69.8 | 54.0 | 35.4 | 23.6 |
| 60-69 | 1.7 | 12.1 | 44.8 | 55.2 | 39.3 | 22.2 | 17.4 |
| **All Age group** | | | | | | | |
| 18-29 | 5.2 | 14.1 | 32.5 | 67.5 | 51.7 | 33.6 | 17.1 |
| 30-39 | 5.8 | 13.8 | 35.0 | 65.0 | 53.0 | 34.8 | 18.6 |
| 40-49 | 5.4 | 15.5 | 34.3 | 65.7 | 50.4 | 35.1 | 20.0 |
| 50-59 | 7.4 | 11.9 | 29.0 | 71.0 | 57.5 | 41.6 | 26.1 |
| 60-69 | 7.0 | 21.3 | 51.3 | 48.7 | 38.5 | 25.2 | 14.5 |
| **Total** | | | | | | | |
| Males | 7.3 | 17.0 | 35.4 | 64.6 | 52.0 | 36.5 | 19.7 |
| Females | 4.6 | 12.4 | 34.0 | 66.0 | 50.9 | 33.4 | 19.4 |
| **ALL** | **5.9** | **14.7** | **34.7** | **65.3** | **51.5** | **34.9** | **19.6** |

## 4.10 Vitamin C Intake

The mean daily vitamin C intake of adult Singaporeans was 170mg.

Males had significantly lower intake of vitamin C compared to females (163mg *vs* 176mg). Daily vitamin C intake of 90% of the males was between 35mg and 354mg. Vitamin C intake for 90% of females was between 41mg and 372mg.

The Malays (154mg) had significantly lower intake of vitamin C compared to the Chinese (172mg) and the Indians (178mg).

Those aged 18-29 years (158mg) had the lowest mean intake of vitamin C than the other age groups.

**Table 4.10.1: Mean (SE) and percentile distribution of daily vitamin C (weight in milligrams) intake among adult Singaporeans, by gender ethnic and age (years) groups**

| | Mean (mg) | SE | Percentile | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| **Males** | | | | | | | | | |
| Chinese | 164 | 4.2 | 36 | 56 | 91 | 145 | 216 | 296 | 356 |
| Malay | 153 | 12.4 | 19 | 48 | 75 | 135 | 199 | 290 | 338 |
| Indian | 176 | 14.1 | 39 | 54 | 101 | 156 | 243 | 308 | 414 |
| **Females** | | | | | | | | | |
| Chinese | 180 | 4.4 | 44 | 65 | 110 | 158 | 234 | 312 | 377 |
| Malay | 155 | 9.7 | 31 | 45 | 82 | 145 | 206 | 286 | 325 |
| Indian | 179 | 11.9 | 45 | 74 | 113 | 171 | 240 | 315 | 356 |
| **All Ethnic group** | | | | | | | | | |
| Chinese | 172 | 3.0 | 39 | 60 | 102 | 152 | 227 | 304 | 363 |
| Malay | 154 | 7.8 | 29 | 47 | 79 | 139 | 203 | 287 | 330 |
| Indian | 178 | 9.2 | 40 | 65 | 107 | 164 | 238 | 308 | 375 |
| **Males** | | | | | | | | | |
| 18-29 | 156 | 8.4 | 40 | 54 | 82 | 135 | 206 | 268 | 356 |
| 30-39 | 152 | 6.7 | 47 | 59 | 89 | 138 | 196 | 281 | 317 |
| 40-49 | 170 | 8.0 | 27 | 36 | 92 | 153 | 233 | 312 | 366 |
| 50-59 | 178 | 8.0 | 36 | 58 | 110 | 173 | 225 | 302 | 345 |
| 60-69 | 168 | 15.2 | 35 | 49 | 81 | 134 | 208 | 373 | 433 |
| **Females** | | | | | | | | | |
| 18-29 | 160 | 6.6 | 41 | 68 | 99 | 151 | 210 | 256 | 307 |
| 30-39 | 170 | 7.8 | 41 | 55 | 107 | 153 | 213 | 311 | 376 |
| 40-49 | 188 | 8.3 | 58 | 74 | 112 | 159 | 247 | 328 | 398 |
| 50-59 | 188 | 8.9 | 32 | 56 | 119 | 195 | 252 | 301 | 386 |
| 60-69 | 182 | 13.4 | 33 | 58 | 118 | 145 | 226 | 360 | 418 |
| **All Age group** | | | | | | | | | |
| 18-29 | 158 | 5.3 | 41 | 59 | 90 | 145 | 207 | 260 | 319 |
| 30-39 | 161 | 5.2 | 43 | 56 | 91 | 142 | 203 | 289 | 335 |
| 40-49 | 179 | 5.8 | 34 | 61 | 104 | 157 | 238 | 317 | 372 |
| 50-59 | 183 | 6.0 | 35 | 57 | 117 | 180 | 240 | 300 | 346 |
| 60-69 | 175 | 10.1 | 35 | 50 | 109 | 135 | 218 | 369 | 404 |
| **Total** | | | | | | | | | |
| Males | 163 | 3.8 | 35 | 54 | 90 | 145 | 213 | 292 | 354 |
| Females | 176 | 3.8 | 41 | 63 | 109 | 157 | 232 | 307 | 372 |
| **ALL** | **170** | **2.7** | **38** | **58** | **101** | **151** | **224** | **299** | **358** |

*SE - standard error of mean*

## Recommended Daily Allowances for Vitamin C

The RDA for vitamin C for adults is 30mg. This is obtained from the Report of the Joint FAO/WHO Expert Group, FAO, Rome, 1965. The mean intake of vitamin C of adult Singaporeans met 545.0% and 588.3% of the RDA for males and females respectively.

## Comparison with RDA for Vitamin C

Insufficient vitamin C is defined as consuming less than 70% of the RDA for vitamin C. Few Singaporeans (0.8%) had insufficient intake of vitamin C.

**Table 4.10.2: Distribution (%) of percentage of RDA met for vitamin C among adult Singaporeans, by gender, ethnic and age (years) groups**

| | < 50% | < 70% | < 100% | ≥ 100% | ≥ 120% | ≥ 150% | ≥ 200% |
|---|---|---|---|---|---|---|---|
| **Males** | | | | | | | |
| Chinese | 0.7 | 1.4 | 2.8 | 97.2 | 95.1 | 92.9 | 88.3 |
| Malay | 3.5 | 5.0 | 5.7 | 94.3 | 92.1 | 92.1 | 83.8 |
| Indian | 0.0 | 0.0 | 1.5 | 98.5 | 96.4 | 93.0 | 87.9 |
| **Females** | | | | | | | |
| Chinese | 0.4 | 0.8 | 2.2 | 97.8 | 97.0 | 94.9 | 91.6 |
| Malay | 1.4 | 2.2 | 4.2 | 95.8 | 93.8 | 89.7 | 86.4 |
| Indian | 0.7 | 0.7 | 0.7 | 99.3 | 97.4 | 95.0 | 94.4 |
| **All Ethnic group** | | | | | | | |
| Chinese | 0.5 | 1.1 | 2.5 | 97.5 | 96.1 | 93.9 | 90.0 |
| Malay | 2.4 | 3.6 | 4.9 | 95.1 | 92.9 | 90.9 | 85.1 |
| Indian | 0.3 | 0.3 | 1.1 | 98.9 | 96.9 | 94.0 | 91.1 |
| **Males** | | | | | | | |
| 18-29 | 0.7 | 1.4 | 1.4 | 98.6 | 96.0 | 94.3 | 87.6 |
| 30-39 | 0.0 | 0.0 | 0.0 | 100.0 | 98.4 | 95.4 | 89.5 |
| 40-49 | 2.1 | 4.2 | 6.9 | 93.1 | 90.4 | 87.6 | 86.0 |
| 50-59 | 0.0 | 0.0 | 3.1 | 96.9 | 95.1 | 95.1 | 88.8 |
| 60-69 | 3.3 | 3.3 | 4.1 | 95.9 | 95.2 | 92.6 | 85.9 |
| **Females** | | | | | | | |
| 18-29 | 0.0 | 0.7 | 2.9 | 97.1 | 96.8 | 94.0 | 91.5 |
| 30-39 | 0.5 | 1.3 | 2.3 | 97.7 | 97.2 | 93.6 | 88.3 |
| 40-49 | 0.4 | 0.4 | 0.4 | 99.6 | 97.6 | 96.0 | 94.9 |
| 50-59 | 1.6 | 1.6 | 3.3 | 96.7 | 95.1 | 92.9 | 89.6 |
| 60-69 | 0.0 | 1.2 | 4.2 | 95.8 | 95.2 | 94.1 | 90.5 |
| **All Age group** | | | | | | | |
| 18-29 | 0.4 | 1.1 | 2.1 | 97.9 | 96.4 | 94.2 | 89.6 |
| 30-39 | 0.3 | 0.6 | 1.2 | 98.8 | 97.8 | 94.5 | 88.9 |
| 40-49 | 1.3 | 2.3 | 3.6 | 96.4 | 94.0 | 91.8 | 90.4 |
| 50-59 | 0.8 | 0.8 | 3.2 | 96.8 | 95.1 | 94.0 | 89.2 |
| 60-69 | 1.6 | 2.2 | 4.2 | 95.8 | 95.2 | 93.4 | 88.3 |
| **Total** | | | | | | | |
| Males | 1.0 | 1.7 | 3.0 | 97.0 | 94.9 | 92.8 | 87.7 |
| Females | 0.5 | 1.0 | 2.3 | 97.7 | 96.6 | 94.2 | 91.2 |
| **ALL** | **0.8** | **1.3** | **2.7** | **97.3** | **95.8** | **93.5** | **89.4** |

## 4.11 Ratio of Fatty Acids Relative to Saturated Fatty Acid Intake

The recommended polyunsaturated fat (PUFA), monounsaturated fat (MUFA) and saturated fat (SFA) ratio for all adults is 1.00: 1.00: 1.00 (P: M: S ratio).

The P: M: S ratio for adult Singaporeans was 0.54: 0.89: 1.00. This indicated that SFA was the predominant type of fatty acid in the Singaporean diet. This observation was true for all subgroups of the population.

**Table 4.11.1: Ratio of fatty acids relative to saturated fatty acid intake among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean Fat Intake (g) | PUFA/ SFA | MUFA/ SFA | SFA/ SFA |
|---|---|---|---|---|
| **Males** | | | | |
| Chinese | 84.4 | 0.49 | 0.91 | 1.00 |
| Malay | 99.0 | 0.40 | 0.75 | 1.00 |
| Indian | 90.8 | 0.56 | 0.73 | 1.00 |
| **Females** | | | | |
| Chinese | 68.2 | 0.61 | 0.95 | 1.00 |
| Malay | 71.6 | 0.46 | 0.77 | 1.00 |
| Indian | 75.5 | 0.60 | 0.75 | 1.00 |
| **All Ethnic group** | | | | |
| Chinese | 76.2 | 0.55 | 0.93 | 1.00 |
| Malay | 85.2 | 0.43 | 0.76 | 1.00 |
| Indian | 83.3 | 0.58 | 0.74 | 1.00 |
| **Males** | | | | |
| 18-29 | 103.1 | 0.42 | 0.90 | 1.00 |
| 30-39 | 96.2 | 0.47 | 0.86 | 1.00 |
| 40-49 | 76.7 | 0.50 | 0.85 | 1.00 |
| 50-59 | 81.1 | 0.53 | 0.92 | 1.00 |
| 60-69 | 59.5 | 0.52 | 0.85 | 1.00 |
| **Females** | | | | |
| 18-29 | 82.6 | 0.52 | 0.91 | 1.00 |
| 30-39 | 73.1 | 0.56 | 0.90 | 1.00 |
| 40-49 | 67.9 | 0.58 | 0.88 | 1.00 |
| 50-59 | 59.2 | 0.67 | 0.96 | 1.00 |
| 60-69 | 47.9 | 0.74 | 0.96 | 1.00 |
| **All Age group** | | | | |
| 18-29 | 92.8 | 0.47 | 0.90 | 1.00 |
| 30-39 | 84.4 | 0.52 | 0.88 | 1.00 |
| 40-49 | 72.4 | 0.53 | 0.87 | 1.00 |
| 50-59 | 70.2 | 0.60 | 0.94 | 1.00 |
| 60-69 | 53.5 | 0.63 | 0.91 | 1.00 |
| **Total** | | | | |
| Males | 86.8 | 0.48 | 0.88 | 1.00 |
| Females | 69.2 | 0.59 | 0.91 | 1.00 |
| **ALL** | **77.9** | **0.54** | **0.89** | **1.00** |

The mean daily intakes of PUFA, MUFA and SFA of adult Singaporeans were 14.8g, 26.5g and 30.8g respectively. The mean percentages of energy intake contributed by PUFA, MUFA and SFA were 5.6%, 9.8% and 11.2%.

There was no significant difference in the energy contribution by the various fatty acids by gender.

The Malays had the highest percent of energy (12.6%) contributed by saturated fat, followed by the Indians (12.1%) and the Chinese (10.9%).

The youngest age group (18-29 years) had the highest energy contribution from SFA (12.1%) compared to the other age groups.

**Table 4.11.2: Mean (SE) fatty acid intake and mean (SE) percent contribution to total energy intake among adult Singaporeans, by gender, ethnic and age (years) groups**

| | Mean Intake (g) (SE) | | | Energy Contribution (%) (SE) | | |
|---|---|---|---|---|---|---|
| | PUFA | MUFA | SFA | PUFA | MUFA | SFA |
| **Males** | | | | | | |
| Chinese | 15.2 (0.3) | 29.6 (0.6) | 33.3 (0.7) | 5.1 (0.1) | 9.9 (0.1) | 11.1 (0.1) |
| Malay | 16.2 (0.9) | 31.9 (1.8) | 42.7 (2.3) | 5.0 (0.2) | 9.6 (0.2) | 12.9 (0.3) |
| Indian | 18.7 (1.4) | 26.9 (2.0) | 37.3 (2.4) | 6.2 (0.4) | 8.5 (0.3) | 12.0 (0.4) |
| **Females** | | | | | | |
| Chinese | 13.9 (0.3) | 23.6 (0.5) | 26.0 (0.6) | 6.0 (0.1) | 10.0 (0.1) | 10.8 (0.1) |
| Malay | 12.6 (0.7) | 23.1 (1.5) | 30.1 (1.9) | 5.3 (0.2) | 9.4 (0.3) | 12.2 (0.3) |
| Indian | 16.5 (1.3) | 22.0 (1.4) | 30.7 (2.0) | 6.7 (0.4) | 8.8 (0.4) | 12.2 (0.5) |
| **All Ethnic group** | | | | | | |
| Chinese | 14.5 (0.2) | 26.6 (0.4) | 29.6 (0.5) | 5.6 (0.1) | 9.96 (0.1) | 10.9 (0.1) |
| Malay | 14.4 (0.6) | 27.4 (1.2) | 36.3 (1.5) | 5.1 (0.1) | 9.46 (0.2) | 12.6 (0.2) |
| Indian | 17.6 (1.0) | 24.5 (1.2) | 34.1 (1.6) | 6.4 (0.3) | 8.62 (0.3) | 12.1 (0.3) |
| **Males** | | | | | | |
| 18-29 | 16.8 (0.6) | 36.5 (1.3) | 41.8 (1.6) | 4.97 (0.12) | 10.7 (0.2) | 12.1 (0.2) |
| 30-39 | 17.2 (0.7) | 32.8 (1.2) | 39.2 (1.7) | 5.49 (0.14) | 10.2 (0.2) | 12.1 (0.2) |
| 40-49 | 14.3 (0.6) | 25.5 (0.9) | 30.8 (1.1) | 5.04 (0.13) | 9.0 (0.2) | 10.8 (0.2) |
| 50-59 | 15.7 (0.7) | 28.0 (1.2) | 31.4 (1.2) | 5.41 (0.16) | 9.7 (0.2) | 11.0 (0.2) |
| 60-69 | 11.7 (0.8) | 19.4 (1.1) | 23.5 (1.4) | 4.97 (0.27) | 8.3 (0.3) | 9.9 (0.4) |
| **Females** | | | | | | |
| 18-29 | 15.4 (0.5) | 28.5 (0.9) | 32.7 (1.2) | 5.9 (0.2) | 10.7 (0.2) | 12.0 (0.2) |
| 30-39 | 14.4 (0.5) | 24.8 (0.8) | 28.7 (1.1) | 6.0 (0.2) | 10.1 (0.2) | 11.5 (0.2) |
| 40-49 | 13.8 (0.5) | 22.5 (0.8) | 26.9 (1.0) | 6.0 (0.2) | 9.6 (0.2) | 11.3 (0.2) |
| 50-59 | 12.9 (0.6) | 20.1 (0.9) | 22.1 (1.1) | 6.1 (0.2) | 9.2 (0.3) | 9.9 (0.3) |
| 60-69 | 11.2 (0.7) | 15.9 (0.9) | 17.0 (1.0) | 6.1 (0.3) | 8.6 (0.3) | 9.2 (0.4) |
| **All Age group** | | | | | | |
| 18-29 | 16.1 (0.4) | 32.4 (0.8) | 37.2 (1.0) | 5.5 (0.1) | 10.7 (0.1) | 12.1 (0.1) |
| 30-39 | 15.8 (0.4) | 28.7 (0.8) | 33.8 (1.0) | 5.7 (0.1) | 10.2 (0.1) | 11.8 (0.1) |
| 40-49 | 14.1 (0.4) | 24.0 (0.6) | 28.8 (0.8) | 5.5 (0.1) | 9.3 (0.1) | 11.1 (0.2) |
| 50-59 | 14.3 (0.5) | 24.1 (0.8) | 26.8 (0.9) | 5.8 (0.1) | 9.5 (0.2) | 10.4 (0.2) |
| 60-69 | 11.5 (0.5) | 17.6 (0.7) | 20.2 (0.9) | 5.5 (0.2) | 8.4 (0.2) | 9.6 (0.3) |
| **Total** | | | | | | |
| Males | 15.6 (0.3) | 29.7 (0.6) | 34.8 (0.7) | 5.19 (0.07) | 9.8 (0.1) | 11.4 (0.1) |
| Females | 13.9 (0.3) | 23.4 (0.4) | 26.9 (0.5) | 6.0 (0.1) | 9.8 (0.1) | 11.1 (0.1) |
| **ALL** | **14.8 (0.2)** | **26.5 (0.4)** | **30.8 (0.5)** | **5.6 (0.1)** | **9.8 (0.1)** | **11.2 (0.1)** |

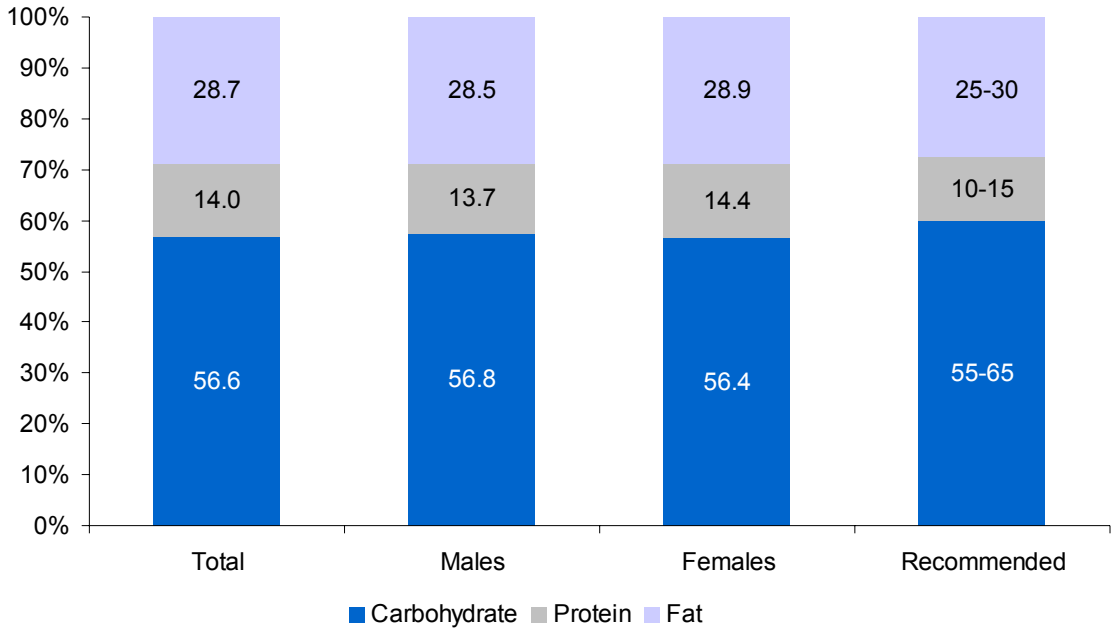
*SE - standard error of mean*

## 4.12 Percent Contribution of Macronutrients to Total Energy Intake

The recommended contribution of macronutrients to total energy intake is 55-65% from carbohydrate, 25-30% from fat and 10-15% from protein.

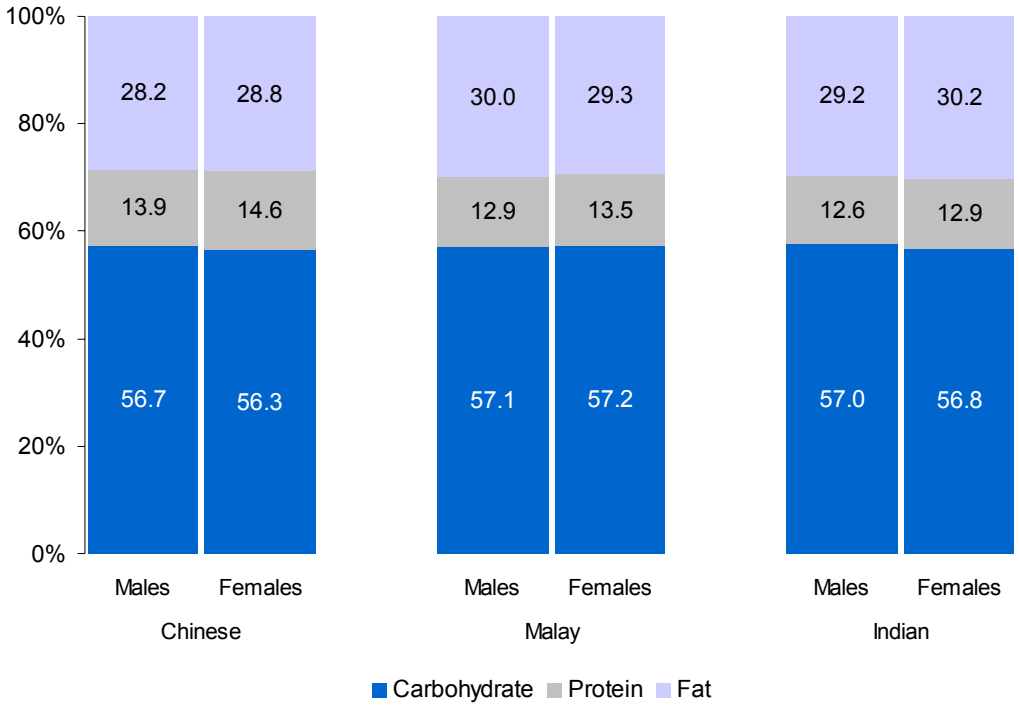
In general, the contribution of carbohydrate, protein and protein to total energy intake of adult Singaporeans were in line with the recommend ranges. The energy contribution of macronutrients to total energy intake was similar by gender.

**Figure 4.12.1: Energy contribution (%) of macronutrients to total energy intake among adult Singaporeans, by gender**



Among females, the percent contribution of carbohydrate to total energy intake was highest among the Malays (57.2%) and lowest among the Chinese (56.3%). However, Chinese females had the highest percent contribution of protein to energy intake (14.6%). The percent contribution of fat to total energy intake was highest among Indian females (30.2%).

**Figure 4.12.2: Energy contribution (%) of macronutrients to total energy intake among adult Singaporeans, by gender and ethnic groups**



## 4.13 Comparison of Mean (CI) Energy and Nutrient Intake, NNS 1998 and NNS 2004

Compared with 1998, the mean energy intake increased in 2004 for all sub-groups. The greatest increase was noted among males (377 kcal) and the Malays (368 kcal).

**Table 4.13.1: Comparison of mean (CI) energy intake (kcal) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (kcal) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 2335 | 2325 (2280, 2369) | 2688 | 2702 (2625, 2779) | 377 |
| Females | 1838 | 1832 (1798, 1867) | 2112 | 2123 (2067, 2180) | 291 |
| **Ethnic group** | | | | | |
| Chinese | 2060 | 2050 (2018, 2082) | 2367 | 2384 (2330, 2438) | 334 |
| Malay | 2173 | 2163 (2063, 2263) | 2523 | 2533 (2363, 2704) | 370 |
| Indian | 2237 | 2223 (2117, 2329) | 2499 | 2500 (2318, 2683) | 277 |
| **Overall** | **2087** | **2078 (2048, 2107)** | **2398** | **2412 (2362, 2462)** | **334** |

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

Protein intake increased significantly for all sub-groups in 2004 compared with 1998. The greatest increase was noted for males (15.9g) and the Malays (15.3g).

**Table 4.13.2: Comparison of mean (CI) protein intake (g) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (g) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 76.5 | 76.0 (74.5, 77.6) | 91.5 | 91.9 (89.2, 94.6) | 15.9 |
| Females | 63.1 | 62.8 (61.5, 64.0) | 75.3 | 75.7 (73.6, 77.8) | 12.9 |
| **Ethnic group** | | | | | |
| Chinese | 70.3 | 69.9 (68.8, 71.0) | 83.8 | 84.4 (82.4, 86.3) | 14.5 |
| Malay | 67.5 | 67.3 (64.0, 70.5) | 82.4 | 82.6 (77.0, 88.2) | 15.3 |
| Indian | 67.8 | 67.3 (63.9, 70.7) | 79.6 | 79.7 (73.4, 85.9) | 12.4 |
| **Overall** | **69.8** | **69.4 (68.3, 70.4)** | **83.3** | **83.8 (82.0, 85.5)** | **14.4** |

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

The intake of fat also increased significantly for all sub-groups in 2004 compared with 1998. Males (17.0g) and the Malays (16.8g) had the greatest increase over the years.

**Table 4.13.3: Comparison of mean (CI) fat intake (g) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (g) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 71.0 | 70.4 (68.5, 72.2) | 86.8 | 87.5 (84.3, 90.6) | 17.1 |
| Females | 56.1 | 55.8 (54.4, 57.3) | 69.2 | 69.8 (67.5, 72.2) | 14.0 |
| **Ethnic group** | | | | | |
| Chinese | 62.1 | 61.6 (60.3, 62.8) | 76.2 | 77.0 (74.9, 79.2) | 15.4 |
| Malay | 69.1 | 68.9 (64.6, 73.1) | 85.2 | 85.7 (78.8, 92.5) | 16.8 |
| Indian | 69.8 | 69.3 (64.9, 73.7) | 83.3 | 83.3 (75.9, 90.7) | 14.0 |
| **Overall** | **63.6** | **63.1 (61.9, 64.3)** | **77.9** | **78.6 (76.6, 80.6)** | **15.5** |

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

Comparing the figures from 2004 with that from 1998, there was a significant increase in saturated fat intake for all sub-groups with the exception of the Indians. Males (6.7g) and the Malays (7.0g) had the greatest increase over the years.

**Table 4.13.4: Comparison of mean (CI) saturated fat intake (g) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (g) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 28.7 | 28.4 (27.6, 29.2) | 34.8 | 35.1 (33.7, 36.5) | 6.7 |
| Females | 21.9 | 21.7 (21.1, 22.4) | 26.9 | 27.2 (26.1, 28.3) | 5.5 |
| **Ethnic group** | | | | | |
| Chinese | 24.2 | 24.0 (23.4, 24.5) | 29.6 | 30.0 (29.1, 31.0) | 6.0 |
| Malay | 29.6 | 29.5 (27.6, 31.4) | 36.3 | 36.5 (33.4, 39.5) | 7.0 |
| Indian | 29.2 | 29.0 (26.9, 31.1) | 34.1 | 34.1 (30.8, 37.3) | 5.1 |
| **Overall** | **25.3** | **25.1 (24.5, 25.6)** | **30.8** | **31.1 (30.2, 32.0)** | **6.0** |

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

The intake of monounsaturated fat showed a significant increased in 2004 compared with 1998 for all subgroups. Males (6.0g) and the Chinese had the highest increase (5.6g) in monounsaturated fat intake.

**Table 4.13.5: Comparison of mean (CI) monounsaturated fat intake (g) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (g) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 24.3 | 24.0 (23.4, 24.7) | 29.7 | 30.0 (28.9, 31.1) | 6.0 |
| Females | 18.9 | 18.7 (18.3, 19.2) | 23.4 | 23.7 (22.8, 24.5) | 5.0 |
| **Ethnic group** | | | | | |
| Chinese | 21.5 | 21.3 (20.8, 21.8) | 26.6 | 26.9 (26.1, 27.7) | 5.6 |
| Malay | 22.7 | 22.6 (21.1, 24.1) | 27.4 | 27.7 (25.3, 30.1) | 5.1 |
| Indian | 20.5 | 20.4 (18.9, 21.8) | 24.5 | 24.5 (21.9, 27.0) | 4.1 |
| **Overall** | **21.6** | **21.4 (21.0, 21.8)** | **26.5** | **26.8 (26.1, 27.5)** | **5.4** |

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

Compared with 1998, there was also a significant increase in polyunsaturated fat in 2004 for all the subgroups. Males (3.2%) and the Indians (3.7%) had the highest increase in polyunsaturated fat intake.

**Table 4.13.6: Comparison of mean (CI) polyunsaturated fat intake (g) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (g) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 12.6 | 12.5 (12.1, 12.9) | 15.6 | 15.7 (15.0, 16.3) | 3.2 |
| Females | 11.2 | 11.2 (10.9, 11.6) | 13.9 | 14.0 (13.5, 14.5) | 2.7 |
| **Ethnic group** | | | | | |
| Chinese | 11.8 | 11.7 (11.5, 12.0) | 14.5 | 14.6 (14.2, 15.0) | 2.9 |
| Malay | 11.5 | 11.5 (10.7, 12.3) | 14.4 | 14.5 (13.2, 15.7) | 3.0 |
| Indian | 14.0 | 13.9 (12.9, 15.0) | 17.6 | 17.6 (15.6, 19.6) | 3.7 |
| **Overall** | **11.9** | **11.9 (11.6, 12.1)** | **14.8** | **14.8 (14.4, 15.2)** | **2.9** |

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

The carbohydrate intake increased significantly for all the sub-groups except for the Indian sub-group in 2004 than in 1998. The greatest increase was noted for males (33.0g) and the Malays (38.8g).

**Table 4.13.7: Comparison of mean (CI) carbohydrate intake (g) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (g) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 347.6 | 346.9 (340.7, 353.2) | 378.5 | 379.9 (369.4, 390.4) | 33.0 |
| Females | 270.2 | 269.8 (265.0, 274.5) | 295.6 | 296.7 (288.9, 304.4) | 26.9 |
| **Ethnic group** | | | | | |
| Chinese | 304.9 | 304.2 (299.7, 308.8) | 331.9 | 333.6 (326.2, 341.0) | 29.4 |
| Malay | 320.3 | 318.7 (305.1, 332.3) | 356.4 | 357.8 (334.5, 381.1) | 38.8 |
| Indian | 334.4 | 332.5 (317.0, 347.9) | 352.9 | 353.3 (327.3, 379.3) | 21.0 |
| **Overall** | **309.0** | **308.2 (304.0, 312.4)** | **336.7** | **338.2 (331.3, 345.0)** | **30.0** |

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

Similarly, the intake of cholesterol also increased significantly for all the sub-groups with the exception of the Indians in 2004 compared with 1998. The greatest increase was noted for males (39.7 mg) and the Chinese (37.5 mg).

**Table 4.13.8: Comparison of mean (CI) cholesterol intake (mg) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (mg) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 291 | 287.6 (278.7, 296.4) | 324 | 327.3 (313.6, 341.0) | 39.7 |
| Females | 220 | 217.6 (211.3, 223.8) | 246 | 248.6 (238.4, 258.8) | 31.0 |
| **Ethnic group** | | | | | |
| Chinese | 255 | 252.1 (246.2, 258.0) | 286 | 289.6 (280.1, 299.1) | 37.5 |
| Malay | 275 | 273.3 (252.7, 293.9) | 312 | 314.4 (284.9, 344.0) | 41.1 |
| Indian | 224 | 222.2 (203.3, 241.1) | 226 | 225.8 (197.2, 254.4) | 3.6 |
| **Overall** | **255** | **252.5 (246.9, 258.0)** | **285** | **287.8 (279.1, 296.6)** | **35.3** |

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

There was a significant increased of the dietary fibre intake for all the sub-groups in 2004 compared with 1998. The increase was similar across the different sub-groups.

**Table 4.13.9: Comparison of mean (CI) dietary fibre intake (g) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (g) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 22.0 | 21.9 (21.5, 22.4) | 26.7 | 26.7 (25.9, 27.5) | 4.8 |
| Females | 18.6 | 18.6 (18.2, 19.0) | 23.1 | 23.1 (22.5, 23.7) | 4.5 |
| **Ethnic group** | | | | | |
| Chinese | 19.7 | 19.6 (19.3, 19.9) | 24.2 | 24.2 (23.7, 24.7) | 4.6 |
| Malay | 21.1 | 21.1 (20.2, 22.0) | 25.9 | 25.9 (24.2, 27.5) | 4.8 |
| Indian | 25.7 | 25.6 (24.0, 27.1) | 30.5 | 30.5 (28.1, 32.9) | 4.9 |
| **Overall** | **20.3** | **20.2 (19.9, 20.6)** | **24.9** | **24.9 (24.4, 25.4)** | **4.7** |

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

The intake of iron increased significantly for all the sub-groups in 2004 compared with 1998. The increase was similar across the various sub-groups.

**Table 4.13.10: Comparison of mean (CI) iron intake (mg) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (mg) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 15.2 | 15.1 (14.8, 15.4) | 17.8 | 17.8 (17.2, 18.4) | 2.7 |
| Females | 12.7 | 12.6 (12.3, 12.9) | 15.1 | 15.1 (14.7, 15.6) | 2.5 |
| **Ethnic group** | | | | | |
| Chinese | 14.0 | 13.9 (13.7, 14.1) | 16.4 | 16.5 (16.1, 16.9) | 2.6 |
| Malay | 13.7 | 13.6 (12.9, 14.3) | 16.4 | 16.4 (15.3, 17.5) | 2.8 |
| Indian | 13.8 | 13.7 (13.0, 14.4) | 16.2 | 16.2 (14.8, 17.6) | 2.5 |
| **Overall** | **13.9** | **13.8 (13.6, 14.0)** | **16.4** | **16.5 (16.1, 16.9)** | **2.7** |

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

For all the sub-groups there was a significant increase in the in take of calcium in 2004 compared with 1998. The Malays showed the highest increase (153.0mg) in calcium intake than the other ethnic groups.

**Table 4.13.11: Comparison of mean (CI) calcium intake (mg) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (mg) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 529 | 527.8 (513.5, 542.1) | 657 | 657.4 (634.8, 680.1) | 129.5 |
| Females | 472 | 470.6 (458.3, 483.0) | 598 | 599.6 (579.5, 619.7) | 129.0 |
| **Ethnic group** | | | | | |
| Chinese | 479 | 477.9 (468.1, 487.7) | 601 | 603.3 (587.4, 619.2) | 125.4 |
| Malay | 575 | 572.9 (540.6, 605.1) | 728 | 726.1 (674.2, 778.0) | 153.2 |
| Indian | 605 | 599.7 (558.3, 641.0) | 731 | 730.6 (668.6, 792.7) | 130.9 |
| **Overall** | **501** | **499.1 (489.6, 508.6)** | **627** | **628.4 (613.2, 643.6)** | **129.3** |

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

The females (222mcg) and the Indians (292mcg) showed the greatest increase in vitamin A intake in 2004 when compared with 1998.

**Table 4.13.12: Comparison of mean (CI) vitamin A intake (mcg) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (mcg) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 853 | 856 (826, 885) | 1073 | 1068 (1020, 1116) | 212 |
| Females | 850 | 854 (820, 888) | 1081 | 1076 (1027, 1124) | 222 |
| **Ethnic group** | | | | | |
| Chinese | 827 | 831 (806, 855) | 1046 | 1043 (1006, 1080) | 212 |
| Malay | 940 | 940 (869, 1011) | 1153 | 1140 (1045, 1234) | 200 |
| Indian | 969 | 970 (883, 1058) | 1265 | 1262 (1108, 1416) | 292 |
| **Overall** | **852** | **855 (832, 878)** | **1077** | **1072 (1038, 1106)** | **217** |

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

Similarly, the females (34.6mg) and Indians (29.5mg) showed the greatest increase in vitamin C intake in 2004 when compared with 1998.

**Table 4.13.13: Comparison of mean (CI) vitamin C intake (mg) among adult Singaporeans, by gender and ethnic groups**

| | 1998 | | 2004 | | Mean difference (mg) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 142 | 142.5 (137.1, 147.9) | 164 | 162.6 (155.1, 170.1) | 20.1 |
| Females | 141 | 141.0 (135.7, 146.3) | 177 | 175.6 (168.1, 183.1) | 34.6 |
| **Ethnic group** | | | | | |
| Chinese | 143 | 143.1 (138.8, 147.3) | 172 | 170.9 (165.0, 176.8) | 27.8 |
| Malay | 130 | 129.2 (120.0, 138.4) | 154 | 152.4 (136.9, 167.9) | 23.2 |
| Indian | 147 | 148.5 (133.3, 163.7) | 178 | 178.0 (159.0, 197.0) | 29.5 |
| **Overall** | **142** | **141.7 (138.0, 145.5)** | **170** | **169.1 (163.8, 174.4)** | **27.4** |

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

## 4.14 Comparison of the Proportion of Adult Singaporeans Meeting the Recommended Energy and Nutrient Intakes, NNS 1998 and NNS 2004

Both for males and females, there was a significant increase in the proportion of adult Singaporeans who exceeded their RDA for energy.

**Table 4.14.1: Comparison of proportion of adult Singaporeans consuming ≥100% of RDA for energy, by gender**

| | 1998 (%) | | 2004 (%) | | Difference (age-std proportion) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 32.1 | 31.8 (29.2, 34.5) | 47.3 | 47.6 (43.9, 51.3) | 15.8 |
| Females | 32.2 | 31.7 (29.1, 34.4) | 48.1 | 48.8 (45.1, 52.6) | 17.1 |
| **Overall** | **32.1** | **31.8 (29.9, 33.7)** | **47.7** | **48.2 (45.6, 50.9)** | **16.4** |

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

In 2004, significantly more adult Singaporeans exceeded their RDA for protein for both genders than in 1998.

**Table 4.14.2: Comparison of proportion of adult Singaporeans consuming ≥100% of RDA for protein, by gender**

| | 1998 (%) | | 2004 (%) | | Difference (age-std proportion) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 48.2 | 47.9 (45.1, 50.8) | 65.2 | 65.7 (62.1, 69.2) | 17.8 |
| Females | 49.4 | 48.6 (45.8, 51.5) | 65.7 | 66.2 (62.6, 69.7) | 17.6 |
| **Overall** | **48.8** | **48.3 (46.3, 50.3)** | **65.4** | **65.9 (63.4, 68.4)** | **17.6** |

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

Compared with 1998, the proportion of adult Singaporeans who exceeded their recommended fat intake increased significantly in 2004.

**Table 4.14.3: Comparison of proportion of adult Singaporeans consuming excess fat (fat contributing ≥30% of recommended energy requirements), by gender**

| | 1998 (%) | | 2004 (%) | | Difference (age-std proportion) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 24.7 | 24.2 (21.7, 26.6) | 40.2 | 40.8 (37.1, 44.4) | 16.6 |
| Females | 26.0 | 25.5 (23.0, 28.0) | 43.8 | 44.7 (41.0, 48.4) | 19.2 |
| **Overall** | **25.3** | **24.8 (23.1, 26.6)** | **42.0** | **42.7 (40.1, 45.4)** | **17.9** |

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

There was a significant increase in the proportion of adult Singaporeans exceeding the recommended intake of carbohydrate for both genders in 2004 compared with 1998.

**Table 4.14.4: Comparison of proportion of adult Singaporeans consuming excess carbohydrate (carbohydrate contributing ≥ 60% of recommended energy requirement), by gender**

| | 1998 (%) | | 2004 (%) | | Difference (age-std proportion) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 32.4 | 32.1 (29.4, 34.7) | 39.1 | 39.1 (35.5, 42.8) | 7.0 |
| Females | 29.2 | 29.1 (26.6, 31.8) | 41.1 | 41.6 (37.9, 45.3) | 12.5 |
| **Overall** | **30.8** | **30.6 (28.8, 32.5)** | **40.1** | **40.4 (37.8, 43.0)** | **9.8** |

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

Comparing 2004 with 1998, there was a significant increase in the proportion of male and female adult Singaporeans consuming excess cholesterol.

**Table 4.14.5: Comparison of proportion of adult Singaporeans consuming excess cholesterol (≥100mg per 1000kcal of recommended energy requirement), by gender**

| | 1998 (%) | | 2004 (%) | | Difference (age-std proportion) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 49.8 | 48.9 (46.1, 51.7) | 60.0 | 60.8 (57.1, 64.4) | 11.9 |
| Females | 48.9 | 48.3 (45.5, 51.2) | 56.2 | 57.3 (53.5, 60.9) | 9.0 |
| **Overall** | **49.4** | **48.6 (46.6, 50.6)** | **58.1** | **59.0 (56.4, 61.6)** | **10.4** |

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

In comparison with 1998, there was a significant decrease in the proportion of Singaporeans who had insufficient dietary fibre intake for both genders in 2004.

**Table 4.14.6: Comparison of proportion of adult Singaporeans consuming insufficient dietary fibre (< 70% of recommended intake), by gender**

| | 1998 (%) | | 2004 (%) | | Difference (age-std proportion) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 35.1 | 35.1 (32.4, 37.9) | 20.5 | 20.6 (17.6, 23.6) | -14.5 |
| Females | 28.9 | 29.2 (26.6, 31.8) | 11.5 | 11.5 (9.1, 13.9) | -17.7 |
| **Overall** | **32.0** | **32.2 (30.3, 34.0)** | **16.0** | **16.0 (14.1, 18.0)** | **-16.2** |

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

Significantly fewer females had insufficient iron intake in 2004 compared with 1998.

**Table 4.14.7: Comparison of proportion of adult Singaporeans consuming insufficient iron (< 70% RDA), by gender**

| | 1998 (%) | | 2004 (%) | | Difference (age-std proportion) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 0.0 | 0.0 (0, 0) | 0.2 | 0.3 (-0.1, 0.6) | 0.3 |
| Females | 53.2 | 53.5 (50.7, 56.3) | 36.5 | 36.1 (32.6, 39.7) | -17.4 |
| **Overall** | **26.5** | **26.8 (25.1, 28.6)** | **18.5** | **18.2 (16.2, 20.3)** | **-8.6** |

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

In 2004, significantly fewer Singaporeans consumed insufficient calcium than in 1998.

**Table 4.14.8: Comparison of proportion of adult Singaporeans consuming insufficient calcium (< 70% RDA), by gender**

| | 1998 (%) | | 2004 (%) | | Difference (age-std proportion) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 67.9 | 68.2 (65.5, 70.8) | 46.2 | 46.2 | -22.0 |
| Females | 76.1 | 76.2 (73.8, 78.6) | 56.3 | 55.9 (52.2, 59.6) | -20.3 |
| **Overall** | **72.0** | **72.2 (70.4, 74.0)** | **51.3** | **51.0 (48.4, 53.7)** | **-21.1** |

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

Similarly, fewer adult Singaporeans consumed insufficient vitamin A in 2004 compared with 1998.

**Table 4.14.9: Comparison of proportion of adult Singaporeans consuming insufficient vitamin A (< 70% RDA), by gender**

| | 1998 (%) | | 2004 (%) | | Difference (age-std proportion) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 24.3 | 24.1 (21.7, 26.6) | 17.0 | 17.0 (14.2, 19.9) | -7.1 |
| Females | 30.0 | 29.9 (27.3, 32.5) | 12.4 | 12.6 (10.1, 15.1) | -17.3 |
| **Overall** | **27.1** | **27.0 (25.2, 28.8)** | **14.7** | **14.8 (12.9, 16.7)** | **-12.2** |

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

Significantly fewer females consumed insufficient vitamin C in 2004 compared with 1998.

**Table 4.14.10: Comparison of proportion of adult Singaporeans consuming insufficient vitamin C (< 70% RDA), by gender**

| | 1998 (%) | | 2004 (%) | | Difference (age-std proportion) ['04- '98] |
|---|---|---|---|---|---|
| | Crude | Age-std (95% CI) | Crude | Age-std (95% CI) | |
| **Gender** | | | | | |
| Males | 3.3 | 3.2 (2.2, 4.2) | 1.7 | 1.7 (0.7, 2.7) | -1.5 |
| Females | 2.5 | 2.4 (1.6, 3.3) | 1.0 | 1.0 (0.2, 1.7) | -1.4 |
| **Overall** | **2.9** | **2.8 (2.2, 3.5)** | **1.3** | **1.3 (0.7, 1.9)** | **-1.5** |

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

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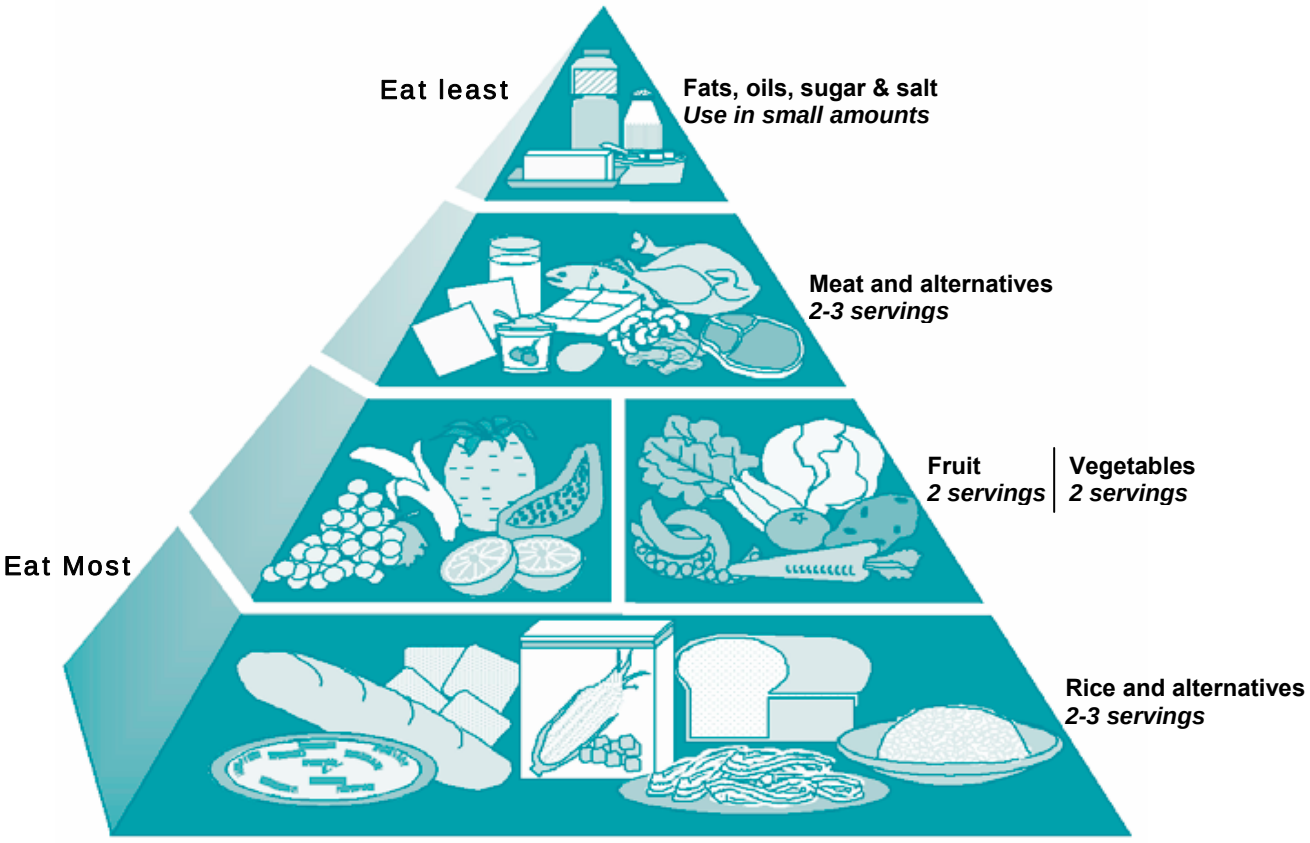
# Healthy Diet Pyramid

## Enjoy a variety of food using the Healthy Diet Pyramid as a guide

Different types of food contain different nutrients and other healthful substances. No single food can supply all the nutrients in the amounts that an individual needs each day. To get all the nutrients and other substances needed for optimal health, every adult is encouraged to use Healthy Diet Pyramid to guide food choices.

Food eaten daily should come most from the base and least from the tip of Healthy Diet Pyramid.

Food is to be selected every day from each of the four basic food groups: rice and alternatives, fruit, vegetables and meat and alternatives. While food items within the same food group are similar in content for key nutrients, they do differ in their content of other nutrients and beneficial substances. Therefore, it is best to select a variety of food from within each food group as well. Food items included in the Pyramid tip should be used sparingly for flavouring.



To get the right portion from each food group, individuals are encouraged to follow the number of servings recommended for each food group. Inactive individuals should aim for the lower number of servings.

- **Rice and alternatives** should be the main component of a healthy diet. They are good sources of carbohydrate (starches), dietary fibre and vitamins B and E. Individuals are encouraged to eat 5-7 servings a day, of which at least one should be a wholegrain product such as wholemeal bread and brown rice.

- **Fruits** are valuable sources of beta-carotene, vitamin C, dietary fibre and other phytochemicals (beneficial plant substances). Two servings a day are recommended. Of this, at least one serving should be a brightly-coloured fruit such as orange, papaya or watermelon.

- **Vegetables** are valuable sources of beta-carotene, vitamin C, dietary fibre and other phytochemicals. Dark green leafy vegetables are also good sources of iron, folate and calcium. Two servings a day are recommended. One of these servings should be dark green leafy or brightly-coloured vegetable such as broccoli, carrot or tomato.

- **Meat and alternatives** are excellent sources of protein. Adults are encouraged to eat 2-3 servings a day. Of these, select at least one from a plant source such as beancurd, peas, beans or lentils. Choose lower fat alternatives more often such as lean meat, poultry without skin and low fat or non-fat dairy products.

- Fats, oils, sugar and salt are to be used sparingly to flavour food.

- Six to eight glasses of fluid (1.5 – 2.0 litres) should be included in the diet every day.

**Note for vegetarians**

The Healthy Diet Pyramid can be used to plan vegetarian diet that meets all the nutrient needs of healthy adults. Pulses such as beans, peas, lentils are good sources of protein and listed in the meat and alternatives food group. To have a balanced diet, vegetarians must include one plant-based protein-rich food at every meal.

## *What counts as one serving?*

### *Rice and alternatives*

- ½ bowl★ of rice (100g)
- 2 slices of bread (60g)
- ½ bowl of noodles, beehoon or spaghetti (100g)
- 1 thosai (60g)
- 2 chapati (60g)
- 1 hamburger bun or hotdog bun (60g)
- 4 cream crackers or plain biscuits (40g)

### *Fruit*

- 1 small apple/orange/mango (130g)
- 1 wedge papaya/pineapple/watermelon (130g)
- 4 small seeds durian or jackfruit (80g)
- 10 grapes/longans (50g flesh only)
- 6 lychees/dukus (70g flesh only)
- ¼ cup dried fruit (40g)
- ½ cup canned fruit, drained (100g)
- 1 cup pure fruit juice (250ml)

### *Vegetables*

- 150g raw leafy vegetables
- 100g raw non-leafy vegetables
- ¾ mug▲ cooked leafy vegetables (100g)
- ¾ mug cooked non-leafy vegetables (100g)

### *Meat and alternatives*

- 1 palm-size piece meat, fish or poultry (90g)
- 5 medium prawns (90g)
- 3 eggs (150g)*
- 2 glasses✦ milk (500ml)
- 2 slices cheese (40g)
- 2 small blocks soft beancurd (170g)
- ¾ cup cooked pulses (peas, beans, lentils) (120g)

***Note***

- • *All weights listed are for edible portions only*
- ★ *1 bowl = 1 rice bowl*
- ▲ *1 mug = 250 ml*
- * *While 3 eggs are equivalent in protein content to the other items listed under the meat and alternatives food group, egg yolks are high in cholesterol and therefore, should be limited to no more than 4 egg yolks per week.*
- ✦ *1 glass = 250ml*

## Understanding Serving Sizes

Serving specified by the Healthy Diet Pyramid represent easy-to-remember household units that individuals can use to estimate the amount of food that they eat.

The serving sizes specified by Healthy Diet Pyramid are sometimes different from those listed on the food labels of packaged food. For example, the Healthy Diet Pyramid states that one serving of milk is equivalent to two glasses. Cartons of milk available in the supermarket may list one glass as one serving. To plan or evaluate a diet that includes packaged food, consumers need to translate the serving size on the food label into the Healthy Diet Pyramid servings.

# NATIONAL NUTRITION SURVEY 2004

## Dietary Practices Questionnaire (DPQ)

**For Official Use Only**

Respondent ID: _____ Age: _____Race: C /M / I Gender: M/ F

Interviewer ID: _____ Interviewed: _____

Coder ID: _____ Coded: _____

Reviewer ID: _____ Reviewed: _____

Research & Evaluation Department
Health Promotion Board

**Singapore**

Please circle ONE most appropriate answer (except for Q28)

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 _____ )

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? ☐
   _____ per week

5. How often do you eat at western fast food restaurants ☐
   (e.g. KFC, McDonald's, Burger King, A & W, etc.)?
   _____ per week

6. When eating out, how often do you "ask for" more vegetables? ☐
   _____ per week

7. When eating out, how often do you "ask for" less salt/sauces/gravy? ☐
   _____ per week

8. When eating out, how often do you "ask for" less oil? ☐
   _____ per week

9. When eating out, how often do you "ask for" less sugar/syrup?
   _____ per week

10. When eating out, how often do you include some fresh fruit in your diet?
    _____ per week

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

12. 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

13. 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

14. What types of milk/milk substitutes 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 Sweetener/Creamer
    6 Others (please specify _____ )
    9 Do not add milk/milk substitutes at all

15. What type of sweetening agent do you **USUALLY** add to tea, coffee or other beverages?
    1 Sugar
    2 Artificial sweeteners e.g. NutraSweet/Equal/Saccharin based syrups
    3 Others (please specify _____ )
    9 Do not add any sweetening agent at all

16. How many eggs (including salted or century egg) do you **USUALLY** per week? ☐

17. How many servings of fruit do you **USUALLY** eat per day? ☐
(Use showcard & explain what constitutes 1 serving)
_____ servings

18. How many servings of vegetables do you **USUALLY** eat per day? ☐
(Use showcard & explain what constitutes 1 serving)
_____ servings

19. How often do you drink sweetened drinks? (e.g. soft drinks, fruit drinks, packet drinks, cordials, yoghurt-based drinks and cultured milk drinks, etc.) ☐
_____ per week

20. How often do you eat sweet desserts and snacks? (e.g. cakes, kuehs, jellies, candies, chocolates, cookies, ice-cream, etc.) ☐
_____ per week

21. How often do you eat deep fried foods? ☐
_____ per week

22. 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

23. 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

24. 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 (Go to Q26)

25. When cooking at home, how often do you or your family cook with "less oil"? ☐
    1. Always
    2. Most of the time
    3. Half the time
    4. Sometimes
    5. Never
    9. Do not cook at home at all

26. **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

27. How many glasses of plain water do you **USUALLY** drink per day? ☐
    _____ glasses (G2)

28. Which of the following best describes your diet? ☐
    (you can choose more than one option)
    1 I eat less fatty foods
    2 I avoid red meat only
    3 Fat modified diet to lower blood lipids or cholesterol levels
    4 Vegetarian diet
    5 A weight loss diet
    6 I try to eat more fruit and vegetables
    7 I eat less meat
    8 I eat less sugar
    9 No special diet, I eat almost everything

29. 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

30. Do you **USUALLY** take health supplements? ☐
    1 Yes (Go to Q31)
    2 No

31. Please state what supplements you take and how often per week? ☐
    1 _____ _____ per week
    2 _____ _____ per week
    3 _____ _____ per week
    4 _____ _____ per week
    5 _____ _____ per week

**~END~**

# NATIONAL NUTRITION SURVEY 2004

## Food Frequency Questionnaire (FFQ)

**For Official Use Only**

Respondent ID: _____ Age: _____Race: C /M / I Gender: M/ F

Interviewer ID: _____ Interviewed: _____

Coder ID: _____ Coded: _____

Reviewer ID: _____ Reviewed: _____

Research & Evaluation Department
Health Promotion Board

**Singapore**

# Food Frequency Questionnaire

## Part A

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?

_____
_____
_____

*Please delete whichever is not applicable

## PART B

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

0. Blended vegetable oil (cooking oil)
1. Polyunsaturated oil (corn, soya, sunflower, safflower, gingely oil, grapeseed oil, flaxseed oil)
2. Monounsaturated oil (olive, peanut, canola, rice bran, sesame, mustard)
3. Saturated fat (lard, ghee, tallow, cooking margarine, butter, shortening, coconut oil, palm kernel oil)
4. Do not pan fry, deep fry or stew.

B. What type of oil/fat do you/your family use for cooking (stir frying)? Choose from list.

0. Blended vegetable oil (cooking oil)
1. Polyunsaturated oil (corn, soya, sunflower, safflower, gingely oil, grapeseed oil, flaxseed oil)
2. Monounsaturated oil (olive, peanut, canola, rice bran, sesame, mustard)
3. Saturated fat (lard, ghee, tallow, cooking margarine, butter, shortening, coconut oil, palm kernel oil)
4. Do not stir fry

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

0. Blended vegetable oil (cooking oil)
1. Polyunsaturated oil (corn, soya, sunflower, safflower, gingely oil, grapeseed oil, flaxseed oil)
2. Monounsaturated oil (olive, peanut, canola, rice bran, sesame, mustard)
3. Saturated fat (lard, ghee, tallow, cooking margarine, butter, shortening, coconut oil, palm kernel oil)
4. Do not bake or roast

D. What type of milk do you use with your coffee? Choose from the list.

0. Creamer/powdered
1. Sweetened condensed milk
2. Evaporated milk
3. Full cream milk/powder
4. Low fat milk/powder
5. Skimmed milk/powder
6. No added milk
7. Whitener/powder
8. Do not drink coffee

E. What type of milk do you use with your tea? Choose for the list.

0. Creamer/powdered
1. Sweetened condensed milk
2. Evaporated milk
3. Full cream milk/powder
4. Low fat milk/powder
5. Skimmed milk/powder
6. No added milk
7. Whitener/powder
8. Do not drink tea

F. What type of milk do you use with malt beverages? Choose from the list.

0. Creamer/ powdered
1. Sweetened condensed milk
2. Evaporated milk
3. Full cream milk/powder
4. Low fat milk/powder
5. Skimmed milk/powder
6. No added milk
7. Whitener/powder
8. Do not drink malt beverages

**Breads**

| **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/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 porridge | 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. Glutinuous rice | 1 portion | | | | |
| | | | | | |
| 24. Flavoured porridge (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 | 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 | | | | |
| 348. Laksa without gravy | 1 portion | | | | |
| 905. Boiled noodles/spaghetti/ pasta (plain) | 1 portion | | | | |
| 906. Boiled noodles with tomato sauce | 1 portion | | | | |
| 907. Boiled noodles with cream white sauce | 1 portion | | | | |

**Soups**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you eat the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| 600. Cream Soup | 1 B2 | | | | |
| 601. Clear Soup/broth | 1 B2 | | | | |

**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** |
| Legumes/pulses, e.g. beans, peas | | | | | | |
| 83. Stir fried, plain | | ½ cup | | | | |
| 87. Stir fried in oyster sauce | | ½ cup | | | | |
| 91. Stir fried in sambal belacan | | ½ cup | | | | |
| 95. Dried legumes (e.g. dhall, dried beans) in gravy | | ½ cup | | | | |
| 354. Legumes and Pulses Raw/steamed/boiled | | ½ cup | | | | |
| Mixed vegetables | | | | | | |
| 99. Stir fried, plain | | ½ cup | | | | |
| 103. Stir fried, with meat/ seafood | | ½ cup | | | | |
| 107. Stir fried in oyster sauce | | ½ cup | | | | |
| 700. Vegetables battered deep-fried (e.g. tempura) | | 1 serving | | | | |
| 111. Curry/lemak | | ½ cup | | | | |
| 115. Raw/steamed/ in Soup/Chinese rojak | | 1 cup or 1 serving | | | | |
| Tofu/beancurd | | | | | | |
| 116. Fried | | ½ square | | | | |
| 120. Steamed/in soups | | ½ square | | | | |
| Others (roots/stems) | | | | | | |
| 349. Stir fried potatoes | | 1 cup | | | | |
| 121. Curry lemak | | 1 cup | | | | |
| 125. Soups with meat stock | | 1 cup | | | | |
| 126. Stews | | 1 cup | | | | |
| | | | | | | |
| 704. Canned/Preserved vegetables (Chye Sim, Olives, etc) | | 1 D1 | | | | |

**Salad dressings**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you have 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) | | | | |

**Fruit**

| 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 fruit and fruit juices | 1 serving* | | | | |
| 134. Other fresh fruit and fruit juices | 1 serving* | | | | |
| 135. Bananas | 1 medium* | | | | |
| 136. Durians | 5 seeds | | | | |
| 137. Canned fruits | ½ cup (M1) | | | | |
| 800. Mixed fruits (dried) | 1 serving* | | | | |

**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/rending | | 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/rending | | 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 | | One | | | | |
| 231. Ham | | 1 slice | | | | |
| 232. Bacon | | 1 slice | | | | |
| 233. Canned (luncheon, corned) | | Size of 4 square of chocolate | | | | |
| 234. Liver and other innards | | Size of 4 square of chocolate | | | | |

**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 soup/steamed | | 1 egg | | | | |
| 292. Fried/scrambled | | 1 egg | | | | |
| Egg Whites, Only | | | | | | |
| 751. Boiled/poached/in soup/steamed | | 1 serve | | | | |
| 752. Fried/scrambled | | 1 serve | | | | |

**Desserts/Local Snacks**

| 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) | 1B1 | | | | |
| 297. Without coconut milk (e.g. cheng tng, green bean soup, tau suan) | 1B1 | | | | |
| 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. burfi, halwa) | 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, baked curry puffs etc) | 1 piece | | | | |
| 307. Plain butter cake/fruit cake | 1 piece | | | | |
| 308. Sponge cakes | 1 piece | | | | |
| 309. Cream cakes | 1 piece | | | | |

**Fast Food**

| 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 (Packet drinks, yoghurt, excl. diet/cal drinks) | 1 can or 1 pack | | | | |
| 1100. Mashed Potato with gravy | 1 regular | | | | |

**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 | ½ M1 or 1 small pkt | | | | |
| 316. Fried | ½ M1 or 1 small pkt | | | | |

**Tibits/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 or equivalent | | | | |
| 318. Ice cream | 1 scoop | | | | |
| 319. Chocolate | 4 squares | | | | |

**Milk Beverages**

| **Food Item** | | **Number of times eaten** | | | |
|---|---|---|---|---|---|
| **How often do you have the following:** | **Portion** | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| 1300. Coffee* | 1 M1 –D / 2 tsp | | | | |
| 1310. Tea* | 1 M1 –D / 2 tsp | | | | |
| 1320. Malt beverages (hot chocolate, Horlicks®, Milo®, Ovaltine®) | 1 M1 –D / 2 tsp | | | | |

| **Food Item** | **Portion** | **Number of times eaten** | | | |
|---|---|---|---|---|---|
| **How often do you have the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| 353. Sugar | 1 tsp (D2) | | | | |

* Assume no sugar added

**Milk & Dairy Products**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you have 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/ 4dsp | | | | |
| 347. Low fat cheese | 1 slice | | | | |

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

**Soya Products**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you have the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| | | | | | |
| 1200. Soya milk drink (fresh/packet/can) | 1 G2* | | | | |
| 1201. Soya beancurd (Tau huay) | 1 B1 | | | | |

**Vegetarian (Chinese)**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you have the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| | | | | | |
| 400. Fried vegetarian kway teow/ beehoon/mee/rice | 1 portion | | | | |
| 401. Gluten (Char siew/duck) | 1 piece | | | | |
| 402. Fried beancurd sheet (chicken/fish) | 1 piece | | | | |

**Alcoholic drinks**

| Food Item | Portion | Number of times eaten | | | |
|---|---|---|---|---|---|
| **How often do you have the following:** | | **Per day** | **Per week** | **Per month** | **Rarely/ Never** |
| | | | | | |
| 500. Alcohol (Beer/stout/wine/hard liquor) | 1 serving | | | | |

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