

Malaysian Adult Nutrition Survey 2003

Dietary Intake of Adults Aged 18 to 59 Years



Ministry of Health Malaysia

Volume 5

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The completion and success of this survey was due to the hard work and dedication of the scouting team, survey team and the Technical Committee for the Malaysian Adult Nutrition Survey. The latter was responsible for the development of the survey design and the survey questionnaire, monitoring the quality of the survey data, analyzing the data and preparing this report. Throughout this period the survey team and the Technical Committee members showed a high level of professionalism and team spirit.

The Technical Committee comprised of members from several divisions in the Ministry of Health, the Health Departments of the states of Johor and Selangor, the Institute for Public Health, the Institute of Medical Research, the Institute for Health Systems Research, as well as academicians from the local universities. Their commitment and contribution is highly acknowledged. We would like to acknowledge support from the Directors of the State Health Department, Director of the Institute for Public Health, Director of the Institute of Medical Research, Director of the Institute for Health Systems Research, Heads of Departments of Nutrition and Dietetic, of the Universiti Kebangsaan Malaysia and Universiti Putra Malaysia and the Dean, School of Health Sciences, Universiti Sains Malaysia for their support and cooperation.

Special thanks are due to the staff at the Nutrition Laboratory, Institute for Medical Research for their help in the nutrient analysis of 41 food samples to supplement the data in the current Malaysian Food Composition Tables, which was used in the analysis of certain food items not in the database. This survey would not have been possible without the understanding, commitment and participation of our respondents. We offer our deepest gratitude to the nearly 7000 Malaysians who welcomed us into their homes and made this Adult Nutrition Survey a success.

The report of this survey has been written in nine volumes which are:

Volume 1: Methodology

Volume 2: General Findings

Volume 3: Nutritional Status of Adults Aged 18 to 59 Years

Volume 4: Meal Pattern of Adults Aged 18 to 59 Years

Volume 5: Dietary Intake of Adults Aged 18 to 59 Years

Volume 6: Physical Activity of Adults Aged 18 to 59 Years

Volume 7: Habitual Food Intake of Adults Aged 18 to 59 Years

Volume 8: Dietary Supplement Use among Adults Aged 18 to 59 Years

Volume 9: The Field Survey and Data Support Team

VOLUME 5

Dietary Intake of Adults Aged 18 to 59 Years

Malaysian Adult Nutrition Survey 2003

Authors

Mirnalini Kandiah

Department of Nutrition and Dietetics
Universiti Putra Malaysia

Zalilah Mohd Shariff

Department of nutrition and dietetics
Universiti Putra Malaysia

Safiah Mohd. Yusof

Family Health Development Division
Ministry of Health Malaysia

Tahir Aris

Institute for Health Systems Research (IHSR)
Ministry of Health Malaysia

Siti Haslinda Mohd. Din

Department of Statistics, Malaysia

Siti Rohana Din

State Department of Health, Kedah

Khairul Zarina Mohd Yusop

Family Health Development Division
Ministry of Health Malaysia

Mohd Hasyami Saihun

Family Health Development Division
Ministry of Health Malaysia

Normah Haron

Family Health Development Division
Ministry of Health Malaysia

Siti Fatimah Ahmad

Family Health Development Division
Ministry of Health Malaysia

Technical Committee Members

Ahmad Ali Zainuddin
Institute for Public Health
Ministry of Health Malaysia

Ahmad Mahir Razali
Universiti Kebangsaan Malaysia

Azmi Md. Yusof
State Department of Health, Johor

Fatimah Salim
Family Health Development Division
Ministry of Health Malaysia

Fatimah Sulong
State Department of Health, Negeri Sembilan

Jamal Khair Hashim
State Department of Health, Selangor

Khairul Zarina Mohd Yusop
Family Health Development Division
Ministry of Health Malaysia

Mirnalini Kandiah
Department of Nutrition and Dietetics
Universiti Putra Malaysia

Nor Azliana Mohamat Nor
Family Health Development Division
Ministry of Health Malaysia

Norlela Mohd. Hussin
State Department of Health, Selangor

Norimah A. Karim
Department of Nutrition and Dietetics
Universiti Kebangsaan Malaysia, Kuala Lumpur

Poh Bee Koon
Department of Nutrition and Dietetics
Universiti Kebangsaan Malaysia, Kuala Lumpur

Safiah Mohd. Yusof (Principal Investigator)
Family Health Development Division
Ministry of Health Malaysia

Siti Haslinda Mohd. Din
Department of Statistics, Malaysia

Technical Committee Members

Sabtuah Royali

Health Education Division
Ministry of Health Malaysia

Tahir Aris

Institute for Health Systems Research (IHSR)
Ministry of Health Malaysia

Wan Abdul Manan Wan Muda

Universiti Sains Malaysia

Zalilah Mohd Shariff

Department of Nutrition and Dietetics
Universiti Putra Malaysia

Research Officers

Aida Azna Abu Hassan
(from April 2002 until October 2003)
Family Health Development Division
Ministry of Health Malaysia

Asnah Laile Abdul Latif
(from July 2004 until January 2006)
Family Health Development Division
Ministry of Health Malaysia

Fasiah Wahad
(from November 2006)
Family Health Development Division
Ministry of Health Malaysia

Fatimah Zurina Mohamad
(from April 2002 until October 2003)
Family Health Development Division
Ministry of Health Malaysia

Mohd Hasyami Saihun
(from July 2004 until November 2007)
Family Health Development Division
Ministry of Health Malaysia

Norhasniza Yaacob
(from September 2007)
Family Health Development Division
Ministry of Health Malaysia

Normah Haron
(from February 2006 to April 2007)
Family Health Development Division
Ministry of Health Malaysia

Siti Fatimah Ahmad
(from October 2003 until November 2007)
Family Health Development Division
Ministry of Health Malaysia

Siti Norazlin Mohd Ngadikin
(from April 2002 until November 2007)
Family Health Development Division
Ministry of Health Malaysia

Research Assistants

Anim Zakiah Mokhter
(from March 2007)
Family Health Development Division
Ministry of Health Malaysia

Azlina Aliyah
(from August 2004 until April 2005)
Family Health Development Division
Ministry of Health Malaysia

Nik Fazlina Nik Mustafa
(from October 2003 until July 2004)
Family Health Development Division
Ministry of Health Malaysia

Nor Ismawan Othman
(from October 2003 until September 2004)
Family Health Development Division
Ministry of Health Malaysia

Siti Rohana Mohd Yunus
(from October 2003 until April 2005)
Family Health Development Division
Ministry of Health Malaysia

Zanarita Ariffin
(from January 2004 until September 2006)
Family Health Development Division
Ministry of Health Malaysia

FOREWORD BY DIRECTOR GENERAL OF HEALTH MALAYSIA

This report and the results of the Malaysian Adult Nutrition Survey 2003 mark the outcome of five years of planning, development, field work and analysis. This was brought about by a successful collaboration between the Ministry of Health and the local universities.

This report provides definitive information on the nutritional status of Malaysian adults. For the first time, a detailed food and nutrient intake information of the adult population in various parts of the country, whether urban or rural, and of the various ethnic groups. Findings from this survey of a representative sample of the population indicate the magnitude of the nutrition problems in this country, for example, the estimated number of adults who are overweight and obese, those who are sedentary, not consuming adequate energy or over consuming calories from fats.

This report is timely, as it coincides with our 9th Malaysia Plan mid-term review, and thus provides useful guidance in the development of policies regarding health, nutrition, food safety, agriculture and trade. This will place Malaysia at par with the developed countries, an important milestone in our quest for standard setting and evidence-based planning of programmes.

The information obtained from this survey is essential in keeping up with the changing eating habits due to globalisation and urbanisation. I, therefore, hope similar surveys will be continued on a regular basis, and that future surveys cover other age groups such as infants, children, adolescents and the elderly.

The Ministry of Health Malaysia would like to congratulate the Family Health Development Division, Ministry of Health Malaysia and everyone involved in making this study a success. Special thanks to the Technical Committee for the Malaysian Adult Nutrition Survey, all State Health Departments and universities for their commendable effort in coming up with this extremely important document for planning of Public Health programmes.

Thank you.



Tan Sri Dato' Seri Dr. Hj Mohd. Ismail Merican
Director General of Health Malaysia

FOREWORD BY DEPUTY DIRECTOR GENERAL OF HEALTH (PUBLIC HEALTH)

The increase in diet-related diseases during the last few decades in Malaysia has prompted the government to recognize the important role that nutrition plays in the promotion of good health. To achieve the goal of healthy population, Malaysians must have access to a nutritionally adequate diet, safe foods and a sustainable healthy living environment.

The publication of the Malaysian Adult Nutrition Survey (MANS) 2003 would generate much interest amongst all health and nutrition care stakeholders in the country. Data and information gathered by these surveys are extremely valuable to all decision makers at the national, state and districts level as well as those interested in the nutritional status of the Malaysian population.

Results of the MANS 2003 can be utilised as indicators to evaluate the achievements of the targets in the National Plan of Action for Nutrition (2006-2015). The outcome of this survey can also be used to measure the impact of current nutrition intervention programmes as well as to plan future activities to cater for the unique needs of the various target population. This report will serve as a useful reference for future research and helps in improving the availability of local data sources.

I would like to take this opportunity to congratulate and thank the Director of Family Health Development Division and the Principal Investigator MANS 2003, all those directly involved in the conduct of the survey, the Technical Committee Members and research field survey teams for their dedication and tenacious efforts in completing this survey and publishing this invaluable report.



Dato' Dr. Hj. Ramlee Hj. Rahmat
Deputy Director General of Health (Public Health)
Ministry of Health Malaysia

FOREWORD BY DIRECTOR OF FAMILY HEALTH DEVELOPMENT DIVISION

I am very happy with the successful completion of this report of the Malaysian Adult Nutrition Survey (MANS) 2003. I appreciate the concerted effort, persistence and endurance of the officers who have been involved in this survey. I am extra proud of the report which is the first National Adult Survey of its kind conducted in this country.

This survey provides the data for action and policies, as well as the direction for further research efforts towards improving the nutritional well-being of the population in line with the objectives of the National Nutrition Policy of Malaysia.

I believe this survey report is an important document to provide guidance in the implementation and evaluation of nutrition programmes and activities in the country under the Ninth and Tenth Malaysia Plans.

The results of this study have given us a more comprehensive and up-to-date picture of the nutritional status, dietary intake and physical activity of the adult population as well as their use of food supplements. The report will also be valuable in assisting with the decision making for research, services or training.

I would like to take this opportunity to thank the immediate past Director Family Health Development Division Dato' Dr Narimah Awin, whose support was instrumental in making this study a success. I must congratulate Datin Dr Safiah Mohd Yusof the Principal Investigator and the research team members whom with passion, dedication and hardwork, have successfully undertaken and completed this study. I would also like to thank all individuals and agencies who have directly or indirectly, contributed towards the completion of this study.



Dr. Hjh Safurah Hj. Jaafar
Director of Family Health Development Division
Ministry of Health Malaysia

FOREWORD BY PRINCIPAL INVESTIGATOR

A nutrition survey involves measuring multiple variables that are interrelated. Moreover, a person's food intake or physical activity can change from time to time. However, this type of information and others to assess the nutritional status of the Malaysian population is urgently needed to develop food and nutrition policies, intervention and educational programmes as well as to monitor the country's nutrition situation.

This is the first time that a cross-sectional nutrition survey has been conducted nationwide, covering Peninsular Malaysia, Sabah and Sarawak. The main objective of this survey is to determine the nutritional status, food consumption and physical activity pattern of Malaysian adults from 18 to 59 years old.

It is my sincere wish that the results of this study be maximally utilized by all stakeholders of nutrition and health services in the country, including programme managers of the Ministry of Health Malaysia, academicians, food manufacturers, private health institutions and individuals concerned. The results should be used for the betterment of the nation, directly or indirectly in nutrition planning, prioritisation, research or training.

I would like to take this opportunity to thank the Director General of Health Malaysia, Tan Sri Dato' Seri Dr. Hj Mohd Ismail Merican for giving valuable support in this survey.

A note of gratitude goes to the Deputy Director General of Health Malaysia (Public Health), Dato' Dr. Hj. Ramlee Hj. Rahmat as an advisor to Technical Committee for this survey for his patience, understanding and guidance to ensure the success of this survey.

I would like to acknowledge support from the Director of the Family Health Development Division, Directors of all the State Health Departments, Director of the Institute for Public Health, Director of the Institute of Medical Research, Director of the Institute for Health Systems Research, Heads of Nutrition Departments of Universiti Kebangsaan Malaysia and Universiti Putra Malaysia and the Dean, School of Health Sciences, Universiti Sains Malaysia for their support and cooperation. Their commitment and contribution is highly appreciated.

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This survey would not have been possible without the understanding, commitment and participation of our respondents. I offer my deepest gratitude to the nearly 7000 Malaysians who welcomed us into their homes and made this Adult Nutrition Survey a success.



Datin Dr. Safiah Mohd Yusof
Principal Investigator
Malaysian Adult Nutrition Survey 2003
Family Health Development Division
Ministry of Health Malaysia

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EXECUTIVE SUMMARY

In 2003, the Ministry of Health, Malaysia, conducted a nationwide Food Consumption Survey on a representative sample of 6886 adult subjects between the ages of 18 and 59 years. The survey was undertaken to determine the population's dietary practices and adequacy. Information on dietary intake was collected using the 24-hour diet recall (24 HDR), a widely used method to obtain quantitative dietary information of individuals in large epidemiological studies. Trained enumerators carried out face-to-face interviews with subjects who were requested to recall the food and beverages consumed the day before the interview. A specially developed food album comprising pictures of commonly consumed foods and household measures were utilized as dietary assessment aids to facilitate the identification of food items and quantification of consumed portions. Dietary data were analyzed using Nutritionist Pro, dietary analysis software consisting of various food databases including the Malaysian Food Composition Tables. Statistical analysis was carried out using the SPSS ver. 13.0. This report describes the intakes of energy and nutrients, energy contribution by macronutrients, dietary adequacy and eating patterns of Malaysians by various demographic and socioeconomic characteristics, and body mass index status.

Energy and Nutrient Intakes

Energy

The daily median energy intake of Malaysian adults was 1540 kcal or 70% of the recommended level (RNI). By strata, rural respondents had slightly higher median energy intake and RNI achievement (71%) than their urban counterparts (65%). Sabah, Sarawak and East Coast achieved higher than 70% of RNI for energy (1650 kcal to 1680 kcal) while Central zone had the lowest median intake (1484 kcal) and RNI achievement (65%). By ethnic groups, the median energy intake of Orang Asli satisfied only 37% (1014 kcal) of the recommended energy intake while Sabah Bumiputera had the highest intake of energy (1705 kcal) or percent RNI (72%). In general, the energy intake and percent RNI achievement declined gradually with age. In most of the demographic and socioeconomic groups, women had lower median energy intake and percent achievement of RNI than men. Malaysians with very little or no formal education had the lowest median intake of energy (1348 kcal or 60% RNI) while the other groups percent RNI ranged from 63% to 71%. By BMI status, the obese group had the least median intake of energy (1458 kcal) and the underweight and normal weight groups had the highest (1573 kcal).

Macronutrients

The median intakes of carbohydrate, protein and fat are approximately 221 g, 55 g and 46 g, respectively. While rural adults had higher median carbohydrate intake than their urban counterparts, protein and fat median intakes were similar between these groups. Carbohydrate intake was highest in the East Coast and Sabah (242 g) while fat intake was highest in Sarawak (49 g). The Southern and Northern zones had the lowest median intakes of carbohydrate (210 g) and fat (44 g), respectively. The Chinese had the lowest carbohydrate intake (197 g) but highest fat intake (49 g) among all the ethnic groups. The median intakes for carbohydrate and fat are highest in the youngest group (18 to 19 years) and lowest in the oldest group (50 to 59 years). Both rural and urban adults achieved 90% to 100% of the recommended level for protein. Men and women in Sabah and Sarawak consumed the highest amount of protein (60 g to 63 g) and had the highest RNI percent (more than 100%) while the Central zone had the lowest median protein intake (52 g) and RNI achievement (85%). A marked difference in protein intake and percent RNI was seen among ethnic groups being highest in Sabah Bumiputera (61 g or more than 100% RNI) and lowest in Orang Asli (18 g or less than 40% RNI). By age groups, the highest intake of protein was seen in the 30 to 39 years group (57 g) and the lowest in the 50 to 59 years group (52 g). However, there was little variation in percent RNI for protein by age group. By educational level, protein intake and percent RNI achievement were lowest in the group with no formal education (45 g or 80% RNI) but highest in the Matriculation/Form 6 group (58 g or 100% RNI). Similarly, the group with no formal education had the lowest median intakes of carbohydrate (203 g) and fat (33 g). Adults with higher secondary (230 g) and tertiary education (50 g) had the highest carbohydrate and fat intake, respectively. Although the intakes of carbohydrate, protein and fat did not vary much by BMI status, the median intakes were lowest for all three in the obese group.

Energy Contribution by Macronutrients

The median percentage of total energy contributed by macronutrients for the Malaysian population was 59% for carbohydrate, 14% protein and 27% fat. Contribution of energy by macronutrients was similar in both men and women. By strata, rural respondents (60%) did not differ very much in the proportion of energy from carbohydrates as compared to urban respondents (58%). Contributions of protein (15%) and fat (27%) to energy intake were also similar in both urban and rural areas. Energy contributions by carbohydrate (57% to 60%), protein (15%) and fat (25% to 28%) were almost similar for all the zones. By ethnic group, the highest proportion of energy from carbohydrate was seen in the Orang Asli (70%) while

the lowest in the Chinese community (55%). The percentage intake of energy from protein did not vary much by ethnic groups. Fat percent energy was in the range of 15% to 30% being the lowest in the Indian and highest in Chinese. The proportion of energy from carbohydrate (58% to 61%) and protein (14%) was similar across education groups. However, for energy from fat, the group with the least education had the lowest (22%) while the tertiary group had the highest (30%). By age group and BMI status, little variation was seen in the distribution of energy from macronutrients.

More men than women achieved the recommended percent energy from macronutrients. Higher percentages of women than men had less than 55% carbohydrate energy, more than 15% protein energy and more than 30% fat energy. Except for Sarawak, all zones had more than 50% of the population with recommended carbohydrate energy. The Southern and Central zones had the highest percentages of population with 10% to 15% protein energy (52%) and more than 30% fat energy (48% to 50%). The highest percentage of population with 55% to 70% carbohydrate energy and 20% to 30% fat energy was observed in the East Coast. Sarawak had the highest percentages of population consuming energy less than 55% from carbohydrate (43%) and more than 15% from protein (58%). While higher percentages of rural than urban population had the recommended energy from carbohydrate and protein, similar percentage (50%) of rural and urban populations achieved 10% to 15% protein energy. Among age groups all but the 18 to 19 years-olds had more than 50% of the population which met the recommended carbohydrate energy. About 50% of adults aged 18 to 39 years had 10 to 15% protein energy. The percentage of population achieving the recommended protein energy decreased for 40 to 60 years old adults. The percentage of population with more than 15% protein energy increased with age. In all age groups, 40% to 50% of the population consumed 20% to 30% fat energy with the highest percentage (40%) in the 18 to 19 years group which consumed more than 30% fat energy.

Intake of Micronutrients

Sodium

The median sodium intake of Malaysians was about 2300 mg. By gender, Malaysian men consumed about 500 mg higher than women (2072 mg). Sodium intake did not differ very much between rural (2283 mg) and urban (2321 mg) respondents. Sarawak and Sabah (2500 mg) consumed the highest amount of sodium while the Southern zone (2100 mg) had the least intake. By ethnic groups, Orang Asli had the lowest intake of sodium (752 mg) while the Chinese had the highest intake (2688 mg). By age group, sodium intake ranged from the highest (2376 mg) in the 30 to 39 years group to the lowest (2131 mg) in the 50 to

59 years group. The highest intake of sodium was observed in the college/university group (2529 mg) and lowest in the group with the least education (1778 mg). Sodium intake decreased with weight status being lowest in the obese (2118 mg) and highest in the normal weight group (2374 mg).

Calcium

Malaysians recorded a median intake of about 353 mg or 43% of the RNI for calcium. Gender comparison showed that women took less calcium (334 mg) than men (374 mg). Rural and urban adults had similar amount of calcium intakes (350 mg), however, the rural adults (48%) had slightly higher percent RNI achievement than the urban adults (42%). Median calcium intake and percent RNI were highest in Sarawak (389 mg) but lowest in the Northern zone (331 mg). Across ethnic groups, Orang Asli had the lowest intake of calcium (273 mg) and percent RNI achievement (34%) while Sarawak Bumiputera had the highest intake (394 mg) and percent RNI (48%). The lowest intake of calcium (mg and percent RNI) was recorded for the youngest age group (18 to 19 years) (332 mg or 35% RNI) while the highest intake was in 30 to 39 year group (367 mg or 43% RNI). The tertiary group had the highest amount of calcium intake (383 mg) and percent RNI (46%) while the group with little or no formal education had the lowest intake (309 mg) and percent RNI (36%) achievement. By BMI category, the obese consumed the least calcium amount (317 mg). For all demographic, socioeconomic groups, the achievement of recommended level for calcium did not exceed 50%.

Iron

The median intake of iron among Malaysians was about 8.7 mg with men having a higher intake (9.5 mg) than women (8.2 mg). While men achieved more than 60% of RNI for iron, women satisfied only 30% of the recommended level. Rural (8.5 mg) and urban (8.9 mg) adults were similar in the amount of iron intakes but percent RNI was higher in the rural (65%) than urban (46%) adults. The intake of iron did not vary much by zones with the range of intakes and percent RNI being 8.52 mg to 9.10 mg and 43% to 50%, respectively. While the Orang Asli had the least intake of iron (5 mg) and percent RNI achievement (34%), the other ethnic groups had higher range of intake (8.1 mg to 9.0 mg) and more than 40% of RNI for iron. The amount of iron intake did not differ much across age groups, however the percent achievement of RNI was lowest in the youngest age group (38%) and highest in the oldest age group (63%). By educational level, the group had the lowest median intake of iron (7 mg) while the tertiary group had the highest intake (9.7 mg).

Percent RNI for iron was lowest in the group with little or no formal education and Matriculation/Form 6 groups (40%) but highest in the tertiary group (52%). Iron intake varied little among the BMI groups. .

Vitamin C

The median intake of vitamin C was 39 mg or 55% of the recommended level. Vitamin C intake of rural and urban adults was almost similar (38 mg) and in the range of 51% to 54% of the RNI. Sarawak had markedly higher percent intake of Vitamin C (106%), while all other zones achieved about 40% to 60% of RNI only. The amount of vitamin C taken was lowest among the Indian group (27 mg) and highest in the Sarawak Bumiputera (75 mg). While the Sarawak Bumiputera achieved 100% of RNI, the intakes of other ethnic groups were below 80% of RNI. By age groups, Vitamin C intake increased by about 10 mg from 32 mg in the 18 to 19 years group to 42 mg in the 50 to 59 years group. The percent RNI for Vitamin C intake increased with age although achievement was less than 60%. Vitamin C intake (38mg to 42mg or 53% to 60% RNI) did not vary much by education level of adults. By BMI status, the highest and lowest vitamin C intakes were observed in the normal weight (41 mg) and obese (33 mg) categories, respectively.

Vitamin A

The intake of Vitamin A was around 380 µg or 68% of recommended intake for vitamin A. In terms of strata, the rural adults' intake (400 µg or 73% of RNI) of Vitamin A was higher than that of urban adults (364 µg or 65%). Sarawak had the highest intake of Vitamin A (498 µg or 90% RNI) and Central zone (348 µg or 62%) had the lowest intake. Ethnic group difference was marked and it ranged from the lowest in Orang Asli (184 µg or 37% RNI) to highest in Sarawak Bumiputera (508 µg or 92% RNI). Age group distribution showed intake of Vitamin A was lowest in the 18 to 19 years group (335 µg or 60% RNI) and highest in the 30 to 39 years group (389 µg or 70% RNI). Vitamin A intake increased with educational level being lowest in the group with little or no education (333 µg or 60% RNI) and highest in the college/university group (379 µg 70% of RNI). While the obese group had the lowest vitamin A intake (332 µg), the normal weight group had the highest intake (396 µg).

Thiamin

The median intake of thiamin for Malaysians was 0.65 mg. Rural and urban adults did not differ in the amount (0.63 mg to 0.67mg) and percent RNI (56% to 58%) of thiamin intakes. By zone, Sabah had the lowest intake (0.58 mg or 48% RNI) and the Southern zone (0.70 mg or 60% RNI) had the highest. The Orang Asli consumed the lowest amount of thiamin (0.49 mg) while the Chinese had the highest (0.73 mg). The Orang Asli and Chinese satisfied about 40% and 63% of the recommended level intake, respectively. There was very little variation in thiamin intake (0.60 mg to 0.68 mg and 53% to 58% RNI) by age group distribution. Thiamin intake increased with educational level being lowest in the group with little or no formal education (0.48 mg or 42% RNI) and highest in the tertiary educated group (0.71 mg or 61% RNI). Little difference was seen for thiamin intake among BMI categories.

Eating Patterns

Meals and Snacks

While more than 80% of Malaysians consumed morning meals, lunch and dinner, 54% of the population reported having afternoon tea. The median percentage of energy intake from morning meals, lunch and dinner was 29.9%, 30.5% and 32.4%, respectively. Afternoon tea contributed to 17% of the total daily energy intake among those who consumed afternoon tea.

The range of the median percentage of energy from morning meals was 25% to 32% with population in Sarawak (24%) and Southern (31%) zone had the lowest and highest percentages, respectively. Morning meals contributed about 29% and 30% of energy for urban and rural populations, respectively. While the Sarawak Bumiputera (26%) had the lowest energy percentage from morning meals, the Orang Asli (31%) had the highest percentage. The percentage of energy from morning meals in all age, education level and BMI groups ranged from 28% to 31%. While adults in 18 to 19 years-old, lower secondary and obese groups had highest energy percentage from morning meals, those in 50 to 59 years-old, College/University and underweight groups had the lowest energy percentage.

The contribution of energy from lunch ranged from 29% to 32% with the East Coast and Sarawak had the lowest and highest percentages, respectively. Urban and rural populations did not differ much in energy percentage (30%) from lunch. By ethnicity, the Indian had the lowest energy percentage (30%) and the Orang Asli had the highest energy percentage

(33%). Adults in all age groups had similar percentage of energy from lunch. The highest percentage of energy from lunch was observed in adults with no formal education (32%) and categorized as obese (33%). Adults with matriculation/form 6 education and normal BMI consumed the least percentage energy from lunch.

By zone, energy contribution from dinner ranged from 29% to 34% with the lowest and highest percentages were observed in the East Coast and Sarawak, respectively. Urban population (34%) had higher percentage energy from dinner than the rural population (31%). Energy percentage from dinner was lowest among the Orang Asli (28%) and highest among the Chinese (36%). The range of percentage energy from dinner was 30% to 35% in all age, educational level and BMI groups. The youngest age group as well as college/university educated and underweight adults had 34% to 35% of total daily energy contributed by dinner. The lowest energy percentage from dinner was observed in the oldest age group (50 to 59 years) (31%), adults with no formal education (31%) and overweight adults (32%).

Afternoon tea contributed the highest and lowest percentages of total daily energy intake among the East Coast (19%) and Sarawak (12%) populations, respectively. Energy percentage from afternoon tea was higher in the urban (17%) than rural (16%) populations. Sarawak Bumiputera (11%) had the least energy percentage from afternoon tea while the Orang Asli had the highest percentage (24%). There was a decreasing trend in energy percentage from afternoon tea from the youngest (18 to 19 years) (19%) to the oldest (50 to 59 years) (14%) age groups. In all BMI groups, the percentage energy contributed by afternoon tea was in the range of 16% to 18%. While adults with Matriculation/Form 6 (18%) education had the highest percentage energy from afternoon tea, those with no formal education (Others) achieved the least (14%).

Weekday and Weekend Intakes

Similar (difference less than 100 kcal) median energy intake for weekdays and weekend was observed in all zones except for the East Coast and Northern zone. In these zones, the median energy intake was higher during the weekend (1600 kcal to 1750 kcal) than weekdays (1500 kcal to 1650 kcal). While the urban population had similar energy intakes on weekdays (1504 kcal) and weekend (1542 kcal), the rural population consumed slightly more energy on weekend (1651 kcal) than weekdays (1562 kcal). The median energy intake on weekend was higher than that of the weekday for all ethnic groups except for the Sabah Bumiputera. Adults in 18 to 19 and 30 to 39 age groups and with no formal education (Others), Higher Secondary and Matriculation/Form 6 had higher weekend than weekday energy intakes while other age and education groups had similar weekday and weekend intakes. With the exception of adults with normal weight, all BMI groups tend to consume more during the weekend (1500 kcal to 1700 kcal) than weekdays (1400 kcal to 1600 kcal).

While the East Coast and Northern zone had higher carbohydrate intakes on weekend (231 g to 262 g) than on weekdays (210 g to 239 g), the other zones had similar weekdays and weekend carbohydrate intakes. There was not much difference (less than 15g) in the median carbohydrate intake during the weekdays and weekend by strata and age group. All ethnic groups with the exception of Sabah Bumiputera and Other Bumiputera had similar weekdays and weekend carbohydrate intakes. Higher carbohydrate intake on weekdays (255 g) than weekend (234 g) was observed among Sabah Bumiputera but lower carbohydrate intake on weekdays (225 g) than weekend (248 g) for Other Bumiputera. While the Matriculation/Form 6 educated and obese adults had higher weekend (226 g to 238 g) than weekdays (206 g to 218 g) carbohydrate intake, similar weekdays and weekend intakes were observed in other education and BMI groups. For median intake of protein, there was not much difference (less than 7g) between the weekdays and weekend intakes by zone, strata, ethnicity, age educational level and BMI status. Malaysians in all zones, strata, age and BMI groups had similar fat intakes (difference less than 5 g) on weekdays and weekend. However, of the ethnic and educational level groups, the Sabah Bumiputera and adults with no formal education (Others) consumed more fat on weekend (38 g to 51 g) than on weekdays (32 g to 45 g).

Dietary Intake of Adults Aged 18 to 59 Years

VOLUME 5

5.1 INTRODUCTION

The government's vision to develop Malaysia into an industrialized nation by the year 2020 has accelerated the phase of industrialization and urbanization in the country. The resulting stable economic growth and political climate have greatly contributed to improved socioeconomic status of its population leading to significant lifestyle and nutrition transition in dietary and physical activity patterns (Tee, 1999; Ismail, 2002). Increasing mechanization and shifts in dietary intakes towards higher consumption of energy, total fat, refined carbohydrate and animal products, sweetened beverages and lower fiber, fruits and vegetables, and concomitant sedentary lifestyle have affected morbidity and mortality patterns among Malaysians. These changes have contributed to the increasing rate of obesity and other nutrition-related non-communicable diseases among Malaysian adults (Ng et al., 1995; Ministry of Health, 1999; Khor et al., 1999; Lim et al., 2000). Control of obesity and diet-related diseases requires evidence based knowledge on the dietary intakes of Malaysians, which is critical to the government in its vision to achieve its goal of improving the health of the population.

Dietary surveys provide estimates of population food and nutrient intake which offer insight into population adherence to established nutrient and dietary guidelines and progress toward national nutrition policy goals. In countries such as the United States and Japan, cross-sectional nutrition surveys at the national level are conducted at regular interval to observe and monitor trends in dietary intakes of the population. The dietary method of choice has been the 24-hour diet recall method in these surveys. The 24-hour diet recall (24-HDR) is a quantitative estimate of all foods and beverages a subject consumes the previous day, covering a 24-hour duration from midnight to midnight. This interviewer-administered dietary method has been recognized as accurate and complete self-reported information for group intake for a given day (Subar, 2004). The 24-HDR has been used in periodic national surveys such as the NHANES surveys in the United States despite the fact that it necessitates highly trained interviewers, complex coding and analysis as well as a heavy respondent burden. An interactive 24-hour diet recall was the primary method designed to collect data on dietary intake of respondents in the Malaysian Adult Nutrition

Survey. For the first time, detailed information on energy and nutrient intakes of a representative sample of the Malaysian population are presented.

5.2 LITERATURE REVIEW

Food consumption at the population level is indirectly determined by using food balance sheets (FBS), which provide information on national per capita food *availability* over a specific period but do not give information on actual food *consumption* at the individual level. In the absence of nation wide food consumption surveys in Malaysia, FBS have been used to provide an estimate of per capita energy and macronutrient availability (Tee, 1999 and Khor, 2006). From a systematic analysis of FBS from 1960 to 2000, the authors noted that the per capita availability of calories has increased from 2407 kcals to 2919 kcals recording an increase of about 21% over a period of 36 years with concomitant increase in the proportion of caloric intakes from fat and protein. FBS data, while giving a proxy estimate of diet adequacy of the population, are limited in that they do not yield information on actual food consumption according to socio-economic, demographic, geographical and even seasonal differentials.

The results of the many sporadic dietary surveys among Malaysian adults in relation to intake of total calories and nutrients have been variable due to differences in sample size, ethnicity, geographical locations, rural and urban strata, socio-economic status, body weight status and methods of obtaining dietary information. A food consumption survey of households in poverty villages showed the range of average energy intake and percentage of energy from carbohydrates, fats and protein as 1648 kcal to 2106 kcal, 70% to 72%, 15% to 20% and 10% to 13%, respectively (Chong et al., 1984). Chee et al., (1997) reported a similar mean energy intake of 1871 kcal with 67% of total energy from carbohydrates, 20% from fats and 13% from protein among adults (18 to 60 years) in four regions in Malaysia.

Adequacy of micronutrient intakes among Malaysian adults may depend on many factors such as socioeconomic status, vulnerability to deficiencies (e.g. pregnant and lactating women, elderly), diet composition (e.g. plant versus animal foods) and geographical locations (e.g. Orang Asli residing in the interior of Malaysia). While the intakes of vitamins A and C have been frequently reported to be adequate, intakes of iron, calcium and B vitamins were generally below the recommended levels (Suriah et al., 1996; Chee et al.,

1997; Zalilah and Khor, 2005). The inadequate intakes could be due to lower consumption of milk and dairy products, meat and poultry, especially among the low-income communities (Chee et al., 1996; Lim et al., 2003; Khor and Zalilah, 2003).

Twenty-Four-Hour Diet Recall

The 24-hour diet recall is a dietary method that is used to quantitatively assess current nutrient intakes of individuals. It can be conducted in person or by telephone with similar results (Gibson, 2005). This method requires only short-term memory, and if the interview is done without prior notice, the diet is often not changed. The method is relatively brief about 30 minutes, and the subject burden is less in comparison with more detailed methods such as food records. It is appropriate for use with low-income and low-literacy populations because the subjects are not required to read nor write to complete the recall. The disadvantages of the 24-hour diet recall include the inability of a single day's intake to describe the usual diet (Gibson, 2005). The success of the recall depends on the memory, cooperation, and communication ability of the subject. Lastly, a trained interviewer is needed. Any 24-hour diet recall interview protocol needs to be standardized and pre-tested prior to use. Standardization is particularly important in large-scale national surveys and for comparisons across countries (Slimani, 2004). Pre-testing should be undertaken in an area near the study site, using respondents similar to those who will participate in the actual study. Sometimes, the pre-testing can be carried out on the field staff if they are comparable to the participants (Gibson and Ferguson, 1999).

The 24-hour diet recall has been the method of National Nutrition Survey of Japan (Yoshiike et al., 1996), the U.S National Health and Nutrition Examination Survey (NHANES) (Briefel, 1994), and the Continuing Survey of Food Intakes by Individuals (CSFI II/DHSK, 1997). The CSFI II has developed a computerized multiple-pass recall to specifically improve the recall of easily overlooked foods such as nonalcoholic and alcoholic beverages, sweets, snacks, and breads. A modification of the 24-hour diet recall termed an interactive 24-hour diet recall has been developed to collect information on rural populations in developing countries (Ferguson et al., 1995).

Under reporting of Energy

Under reporting of energy is recognized as a principal hurdle in the assessment of the true intakes of populations. This occurs when people report estimated food intakes that are lower than their true intake. A ratio of the reported energy intake to basal metabolic rate (EI: BMR) is often used as a guideline to identify under-reporters. Individuals who report energy intake that is not biologically plausible (EI: BMR less than 1.2) are identified as low or under-energy reporters. A number of factors are associated with low-energy reporting which include age, sex, and body mass index, as well as other demographic and psychological factors (Macdiarmid and Blundell, 1997). In a large U.S. survey, 1224 of 8334 adults were found to be low-energy reporters. Some studies suggested that low-energy reporters consistently report lower intakes of fat, as a percentage of total energy, and higher intakes of protein and carbohydrate (Becker & Welton, 2001). In comparing the low-energy reporters with the non-low-energy reporters, the following were among the foods less likely to be reported: cakes/pie, savory snacks, cheese, white potatoes, meat mixtures, regular soft drinks, fat-type spreads, and condiments (Johnson, 1998). A British study found that under-reporters reported consuming significantly less cakes, sugars, fat, and breakfast cereals. However, they found no discernible differences in reports of bread, potatoes, meat, or vegetable and fruit consumption between under-reporters and other subjects (Pryer et al, 1997). At this time there is no consensus in the literature as to whether or how much the macronutrients are differently reported. Others have reported that added sugar intake was significantly lower than measured, caused in part by the omission of high sugar containing snack foods from the dietary record (24).

5.3 OBJECTIVES

5.3.1 General Objective

The general objective of this dietary survey was to determine energy and nutrient intakes of Malaysians.

5.3.2 Specific Objectives

The specific objectives of this dietary survey were to describe the dietary intake pattern of Malaysians according to gender, zone, strata, ethnicity, age, education level and BMI categories for:

1. Daily intake of energy, macro and micronutrients
2. Percentage contribution of macronutrients to total energy intake
3. Percentage achievement of RNI for energy, macro and micronutrients
4. Distribution of respondents by energy consumption from macronutrients
5. Percentage of energy and macronutrient intakes by meal patterns
6. Percentage of energy and macronutrient intakes during weekdays and weekend

5.4 METHODOLOGY

Subjects

The data for this study were obtained from a statistically sampled population comprising 6886 individuals (3316 males and 3415 females) between the ages of 18 to 59 years in Peninsular Malaysia, Sabah and Sarawak.

Socio-demographic Variables

A questionnaire was developed to obtain data on socio-demographic variables, which included gender, ethnicity, age group, educational level, strata (rural/urban) and zone (Southern, Central, East Coast, Northern, Sabah and Sarawak).

Anthropometric Measurements

Body mass index (BMI, kg/m^2) was calculated from direct measurements of weight and height. Relative BMI categories viz: underweight (less than 18.5 kg/m^2), normal ($18.5\text{-}24.9 \text{ kg/m}^2$), overweight ($25\text{-}29 \text{ kg/m}^2$) and obese ($\geq 30 \text{ kg/m}^2$) were used according to WHO recommendations (WHO, 1997).

Assessment of Dietary Intake

An interactive 24-hour dietary recall method was adapted, pretested and utilized to obtain dietary intake information (Gibson and Ferguson, 1999). This method is rapid, easy to implement, less expensive and has lower respondent burden than other methods such as food weighing, food record and diet history. A one-day 24-hour dietary recall was obtained from all respondents.

The 24-hour dietary recall was interviewer-administered (Appendix). Interviewer recorded information on the meal type, time and venue of consumption, description and quantities of foods and beverages (including alcohol) consumed over a 24-hour period (midnight to midnight) of the day prior to the day of interview. Dietary assessment aids such as the album of food pictures (Ministry of Health, 2004) and household measures were used to facilitate identification of foods and quantification of portion sizes eaten. The album consisted of photographs of commonly consumed foods by Malaysians. Produced to represent the actual size of foods, these photographs were useful in helping subjects estimate amounts eaten as fractions or multiples of the illustrated reference portions.

Design

The 24-hour dietary recall form consisted of 6 pages (Appendix). The first page listed the ID of respondent, date of interview, name of respondent, day of recall and code for the recall day. All foods and beverages consumed on the recall day are recorded in the tables provided on pages 1-5 while alcohol consumption is recorded on page 6 of the form.

Interview Process

All interviews were conducted in Bahasa Malaysia (BM). However, in situations where the respondent was not able to understand BM, the interview was conducted in the respective vernacular medium. The recall was carried out through an interactive interview conducted in 4 stages:-

i) Stage 1: Recall of time and the type of food and beverages consumed.

During this stage, the interviewer requests the respondent to recall the time at which he/she ate beginning from at midnight one day before the interview. The information is recorded according to the times that the meals or foods were consumed (column a). The time is divided into four blocks:

Morning meals:	12.00 am – 10.59 am
Afternoon meal or lunch:	11.00 am – 2.59 pm
Afternoon tea:	3.00 pm – 5.59 pm
Evening meal or dinner:	6.00 pm – 11.59 pm

In addition, foods eaten at each time block are also recorded in the appropriate column (column b). At this stage further probing is avoided. However, if the respondent volunteers with the information on the amount eaten, then the information is recorded. An example of the interview at this stage is shown below:

1. Sir/Madam, did you eat or drink anything before going to bed last night?
2. Yesterday, after you woke up, at what time did you first eat and/or drink?
3. What did you eat and or drink?

ii) Stage 2 : Detailed description of food and beverages consumed

The interviewer goes through in detail the list of foods recalled at Stage 1 and probes further the description of these foods with respect to ingredients, cooking methods, whether the foods were purchased or cooked, brand names, recipes etc. This information is recorded in column c. To enhance the accuracy of the information provided by the

respondent, the interviewer uses a specially developed extensive food photo album and household measures such as glasses, plates, bowls, cups, spoons and ladles to help the respondent to identify and estimate portion sizes and weights of foods consumed. In addition, information on the cost of purchased food is also obtained. Wherever possible, the actual weight of the food is recorded if the food sample is available in the household. The amount of food eaten is then recorded into column d.

Recording of alcohol intake

Information on alcohol consumption is obtained only for non-Muslim respondents. The type and amount of alcohol consumed is recorded. Alcohol containing drinks include wine, whiskey, brandy, beer, toddy, local brews, Dom, rum and *tuak* (rice wine). An example of an interview on alcohol consumption is shown in the box below:

1. Sir/ Madam, did you take any alcohol containing drinks last night?
2. What were they?
3. How many glasses did you drink?
4. Apart from the ones, which you identified, did you take any other drink?

iii) Stage 3: Review of foods eaten and weights recalled.

At this stage, the interviewer reviews the detailed recorded intake with the respondent. This stage acts as a check for both respondent and interviewer. The interviewer reviews what was eaten in a chronological order and checks with the respondent to ensure all foods eaten are recorded. The portion sizes are once again clarified. The respondent is given time to recall again the foods and drinks that he may have omitted or failed to recall in Stage 2.

iv) Stage 4: Conversion of portion sizes to weight in grams.

This is the final stage in which the data on portion sizes of all foods and drinks consumed by respondents are converted to grams. The data in grams are recorded in column e.

Data analysis

Dietary intake analysis

For the 24-hour diet recalls, nearly 100% (99.4%) response rate was obtained (n=6886). Data cleaning and quality control checks were carried out before dietary intake analysis was performed. Forty-one (41) questionnaires with inadequate data were excluded in the analysis. A dietary analysis software, Nutritionist Pro (First Data Bank, USA), was used for energy and nutrient analysis. Food databases utilized in the analysis included USDA Food Database, Malaysian Food Composition Tables, Singapore Food Composition Guide, ASEAN Food Composition Tables and The Composition of Chinese Food.

For local complex mixed cooked dishes that are not available in any of the food databases, local recipe books were used to identify at least two recipes for each dish. These recipes were analyzed for energy and nutrient values and the average of these values were entered into Nutritionist Pro software to be used as a standard for dietary analysis of the food. For example, two recipes of fish curry (gravy) were obtained and the ingredients were analyzed for energy and nutrient values (per 100 gram). The average values of the two recipes were then used as the standard for analysis of fish curry. For processed and packaged foods that have energy and nutrient information on their labels, the information were entered into the software for dietary analysis of these foods. Nutrient estimates were based exclusively on consumption of foods vitamin and mineral supplements did not contribute to the nutrient intake levels presented here.

Assessment of dietary adequacy

Dietary adequacy was assessed by comparison of intake with those recommended by the Recommended Nutrient Intakes (RNIs) for Malaysians (NCFFN, 2005). For macronutrients, adequacy was achieved if the person's mean intake met, at a minimum, the following guidelines: 20% to 30% of energy from total fat, 55% to 70% carbohydrate and 10% to 15% protein. For micronutrients (vitamins A, C, thiamin, iron, sodium and calcium), adequacy was considered achieved if the individual's mean intake met or exceeded 100% of the RNI. Data were also screened for individuals exceeding tolerable upper intake levels for micronutrients (NCFFN, 2005).

Underreporting of Energy

Underreporting of energy is a major concern in dietary assessment (Goldberg & Black, 1998). The ratio between reported total energy intake (EI) and basal metabolic rate (BMR) was used to examine the prevalence of underreporting of energy. BMR was calculated using the equation of Ismail *et al* (1993). An EI/BMR ratio below 1.2 is usually regarded as energy intake too low for the maintenance of body weight (Goldberg *et al.*, 1995) was used to identify low energy reporters.

Statistical analysis

Data on energy and nutrient intakes were transferred to Statistical Package for Social Sciences (SPSS) version 13.0 with complex sample module for statistical analysis. A sampling weight was added in the analysis for extrapolation of the findings to the Malaysian population. Median energy, macronutrient and micronutrient intakes were calculated separately for total population, men, women, and by socio-demographic (zone, strata, ethnicity, age and educational level) and BMI characteristics. As the distribution of intake energy and most of the nutrients was skewed, the median was determined to characterize population intake levels, as it is the most appropriate statistic. Proportions of the population adhering to dietary recommendations on energy consumption from macronutrients as well as energy and macronutrient intakes by meal patterns and by weekdays and weekend were also determined.

5.5 FINDINGS

5.5.1 Median Energy and Nutrient Intakes by Socio-demographic Characteristic And BMI Status

i. Energy intakes by socio-demographic characteristic and BMI Status

The median energy and nutrient intakes of Malaysians by socio-demographic characteristics and BMI status are presented in Table 5.5.1. Malaysians had a median intake of energy of 1540 kcal. The median energy intake was higher in men (1722 kcal) than in women (1400 kcal).

Zones

Among zones, Sabah had highest (1679 kcal) median intake and Central the lowest (1484 kcal). Between genders, men had a higher median intake of energy than women across all zones. Men in Sarawak had the highest intake while men in the Central zone had the lowest. Among women, Sabah women had the highest intake (1543 kcal) as compared to women in other zones.

Strata

Overall, rural respondents had higher median intakes than urban residents. Both men and women in rural areas had higher median intakes for energy.

Age group

The median intake of energy showed a decreasing trend with the highest seen in the young adult group and lowest in the 50 to 59 age group. Median intakes were higher in men than in women in all age groups.

Ethnicity

Sabah Bumiputera had the highest intake of energy (1705 kcal) followed by the Sarawak Bumiputera while Orang Asli in Peninsular Malaysia had the lowest (1014 kcal). Both men and women in the Orang Asli group had the lowest energy intake in comparison to other ethnic groups.

Educational level

Malaysians who were in the "Others" category (no formal education, religious schools etc) irrespective of gender had the lowest median intake of energy (1348 kcal). This trend was also observed in both men and women in the Others group having the lowest intake being 1428 kcal and 1314 kcal, respectively.

BMI status

A decreasing trend in energy intake was observed with the highest being consumed by the under to normal weight categories and the lowest in the obese group. A similar trend was seen in women but not in men. Women's intake decreased from 1469 kcal in underweight category to 1364 kcal in the obese group.

Table 5.5.1: Median intake of energy (kcal) by socio-demographic characteristics and BMI status

Characteristic	Total (n=6886)		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	1,540	14,101,107	1,722	7,183,355	1,400	6,917,752
Zone						
Southern	1,488	2,963,301	1,696	1,526,897	1,359	1,436,404
Central	1,484	5,364,732	1,634	2,745,850	1,339	2,618,881
East Coast	1,654	1,611,177	1,833	827,926	1,476	783,250
Northern	1,504	1,881,879	1,666	913,769	1,382	968,110
Sabah	1,679	1,096,289	1,795	564,477	1,543	531,812
Sarawak	1,652	1,183,730	1,866	604,437	1,476	579,293
Strata						
Urban	1,512	8,402,510	1,671	4,273,233	1,379	4,129,277
Rural	1,575	5,698,597	1,755	2,910,122	1,423	2,788,475
Age Group (years)						
18-19	1,571	1,448,992	1,802	734,969	1,355	714,022
20-29	1,595	4,229,053	1,759	2,157,112	1,461	2,071,940
30-39	1,567	3,631,012	1,773	1,834,137	1,415	1,796,875
40-49	1,501	2,889,150	1,657	1,478,375	1,356	1,410,775
50-59	1,443	1,902,901	1,576	978,761	1,351	924,140
Ethnic Group						
Malay	1,579	7,668,443	1,757	3,955,483	1,416	3,712,960
Chinese	1,492	3,541,009	1,648	1,786,186	1,359	1,754,823
Indian	1,370	1,372,449	1,512	669,482	1,256	702,967
Orang Asli PM	1,014	69,202	1,369	38,171	987	31,032
Sabah Bumiputera	1,705	564,247	1,837	275,869	1,540	288,378
Sarawak Bumiputera	1,641	613,110	1,809	312,829	1,484	300,281
Other Bumiputera	1,557	272,647	1,663	145,336	1,492	127,311
Educational Level						
Primary School	1,439	2,684,514	1,617	1,208,750	1,346	1,475,764
Lower Secondary School	1,539	2,860,859	1,688	1,648,341	1,395	1,212,518
Higher Secondary School	1,616	4,888,189	1,776	2,506,948	1,476	2,381,241
Matriculation/Form 6	1,564	785,324	1,815	308,479	1,437	476,845
College/University	1,600	2,184,400	1,773	1,292,128	1,395	892,273
Others	1,348	678,021	1,428	214,636	1,314	463,385
BMI Status						
Underweight	1,572	1,361,827	1,694	666,169	1,469	695,657
Normal weight	1,573	6,946,068	1,751	3,743,877	1,413	3,202,191
Overweight	1,513	3,765,233	1,707	2,046,959	1,333	1,718,274
Obese	1,458	1,720,808	1,614	701,141	1,364	1,019,667

ii. Median intake of protein (g) by socio-demographic characteristics and BMI status

Malaysians' median intake of total protein was about 55 g and men consumed about 10g more than women (50 g) as shown in Table 5.5.2.

Zone

Among zones, respondents in Sarawak had the highest intake of protein (62 g) followed by Sabah subjects while Central zone had the lowest intake (51 g), marking a difference of 10 g. Both men and women in Sabah were found to have the highest intake while their counterparts in the Central zone had the lowest.

Strata

A somewhat similar median intake of protein was observed in rural and urban respondents. Both men and women in the respective strata were almost similar in their protein intake.

Age group

The highest intake of protein was in the 30 to 39 years age group (57 g) and the lowest was observed in the 50 to 59 years group. Men in the former age group had the highest intake of protein, but in the women it was highest in the 20 to 29 age group.

Ethnicity

A marked variation was observed for protein intake among ethnic groups. Protein intake was highest in Sarawak Bumiputera and lowest in Orang Asli (60.8 g vs. 17.8 g), and recorded a substantial difference of about 45 g.

Educational level

An increasing trend was seen in protein intake from being lowest (45.4 g) in the Others category (no formal education, religious school etc) to highest in the secondary tertiary levels (57g).

BMI status

Among BMI categories, a negative trend was observed for protein intake in that it was lowest in the obese group (50 g) and highest in the underweight category (57 g). A similar trend was noted in both women and in men.

Table 5.5.2: Median intake of protein (g) by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	55.31	14,101,107	60.11	7,183,355	50.50	6,917,752
Zone						
Southern	52.59	2,963,301	57.48	1,526,897	48.09	1,436,404
Central	51.56	5,364,732	57.01	2,745,850	46.46	2,618,881
East Coast	57.15	1,611,177	63.18	827,926	52.83	783,250
Northern	56.18	1,881,879	60.03	913,769	52.56	968,110
Sabah	60.84	1,096,289	64.91	564,477	56.82	531,812
Sarawak	62.64	1,183,730	69.61	604,437	56.35	579,293
Strata						
Urban	54.61	8,402,510	59.05	4,273,233	49.62	4,129,277
Rural	56.21	5,698,597	61.75	2,910,122	51.45	2,788,475
Age Group (years)						
18-19	56.42	1,448,992	61.79	734,969	48.70	714,022
20-29	56.26	4,229,053	60.15	2,157,112	52.02	2,071,940
30-39	56.92	3,631,012	62.83	1,834,137	51.57	1,796,875
40-49	54.04	2,889,150	58.68	1,478,375	48.73	1,410,775
50-59	52.44	1,902,901	56.51	978,761	48.86	924,140
Ethnic Group						
Malay	55.09	7,668,443	59.27	3,955,483	50.65	3,712,960
Chinese	57.33	3,541,009	62.07	1,786,186	52.27	1,754,823
Indian	44.56	1,372,449	49.04	669,482	40.90	702,967
Orang Asli PM	17.78	69,202	45.47	38,171	17.35	31,032
Sabah Bumiputera	60.81	564,247	69.15	275,869	53.23	288,378
Sarawak Bumiputera	63.06	613,110	66.72	312,829	60.86	300,281
Other Bumiputera	57.85	272,647	63.99	145,336	55.06	127,311
Educational Level						
Primary School	52.59	2,684,514	57.59	1,208,750	49.29	1,475,764
Lower Secondary School	55.07	2,860,859	59.21	1,648,341	50.43	1,212,518
Higher Secondary School	57.35	4,888,189	61.31	2,506,948	52.65	2,381,241
Matriculation/Form 6	57.55	785,324	62.21	308,479	55.35	476,845
College/University	57.49	2,184,400	62.91	1,292,128	50.65	892,273
Others	45.44	678,021	47.62	214,636	44.38	463,385
BMI Status						
Underweight	57.04	1,361,827	58.93	666,169	53.42	695,657
Normal weight	56.39	6,946,068	60.74	3,743,877	51.15	3,202,191
Overweight	54.46	3,765,233	59.21	2,046,959	47.85	1,718,274
Obese	50.13	1,720,808	58.79	701,141	46.92	1,019,667

iii. Median intake of carbohydrate (g) by socio-demographic characteristics and BMI status

Median carbohydrate intake of Malaysians is reported in Table 5.5.3. The median intake of carbohydrate by Malaysians is about 221 g, being higher in men than in women.

Zone

Zone-wise, a similarity in carbohydrate intake was observed between East Coast and Sabah (242 g) and these zones also had the highest intakes. The lowest intake was in the Southern zone. A similar picture was seen in men and women being highest in East Coast and Sabah.

Strata

The median intake of carbohydrate in rural respondents was higher by 17 g than their urban counterparts. Similarly, men and women in rural areas had higher intakes than their urban counterparts.

Age group

Across age groups, carbohydrate intake was lowest in the 50 to 59 years age group. This situation was also seen in men but not in women. In women, carbohydrate intake was similar in the youngest and oldest age groups studied (185 g). Again women's intake was lower than men in all age groups.

Ethnicity

Among all the ethnic groups Chinese had the lowest intake of carbohydrate (197.2 g) and Sabah Bumiputera the highest (253.5 g). This trend was also observed in men where Sabah Bumiputera men had the highest intake and Chinese men the lowest. Intake of carbohydrate by women was lower than men in all ethnic groups particularly in the Orang Asli group (162 g). These women had the lowest intake across ethnic and gender groups.

Educational level

The Others group had the lowest intake of carbohydrate across educational status. A similar situation was seen in men in all groups but not in women. In the latter, intake was about the same in all groups.

BMI status

The Obese category had the lowest intake across BMI status while the intake was somewhat similar in other groups. Men in the normal weight category had higher median intake than those in other categories and obese the lowest. In women a slightly different picture emerged in that underweight women had higher intake of carbohydrate (208.7 g) and overweight the lowest (194.2 g).

Table 5.5.3: Median intake of carbohydrate (g) by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	220.76	14,101,107	245.85	7,183,355	198.48	6,917,752
Zone						
Southern	209.62	2,963,301	238.92	1,526,897	190.35	1,436,404
Central	212.39	5,364,732	235.96	2,745,850	188.47	2,618,881
East Coast	242.46	1,611,177	270.48	827,926	218.03	783,250
Northern	214.77	1,881,879	242.35	913,769	194.22	968,110
Sabah	242.57	1,096,289	270.04	564,477	221.94	531,812
Sarawak	229.41	1,183,730	253.34	604,437	205.26	579,293
Strata						
Urban	213.38	8,402,510	239.22	4,273,233	191.00	4,129,277
Rural	230.63	5,698,597	254.16	2,910,122	209.19	2,788,475
Age Group (years)						
18-19	220.21	1,448,992	251.64	734,969	184.93	714,022
20-29	228.37	4,229,053	250.44	2,157,112	204.48	2,071,940
30-39	227.81	3,631,012	256.04	1,834,137	204.38	1,796,875
40-49	213.94	2,889,150	237.80	1,478,375	191.88	1,410,775
50-59	207.77	1,902,901	228.51	978,761	184.92	924,140
Ethnic Group						
Malay	231.67	7,668,443	256.05	3,955,483	207.39	3,712,960
Chinese	197.22	3,541,009	221.93	1,786,186	177.48	1,754,823
Indian	206.54	1,372,449	223.49	669,482	188.24	702,967
Orang Asli PM	215.09	69,202	254.81	38,171	162.19	31,032
Sabah Bumiputera	253.49	564,247	286.57	275,869	227.23	288,378
Sarawak Bumiputera	231.38	613,110	248.84	312,829	221.49	300,281
Other Bumiputera	234.29	272,647	257.09	145,336	215.88	127,311
Educational Level						
Primary School	210.59	2,684,514	239.43	1,208,750	194.46	1,475,764
Lower Secondary School	220.31	2,860,859	242.85	1,648,341	195.84	1,212,518
Higher Secondary School	229.82	4,888,189	251.88	2,506,948	207.47	2,381,241
Matriculation/Form 6	223.11	785,324	252.66	308,479	196.70	476,845
College/University	221.48	2,184,400	245.26	1,292,128	190.63	892,273
Others	202.84	678,021	216.68	214,636	199.24	463,385
BMI Status						
Underweight	221.28	1,361,827	244.73	666,169	208.68	695,657
Normal weight	224.93	6,946,068	250.86	3,743,877	199.03	3,202,191
Overweight	217.01	3,765,233	241.51	2,046,959	192.50	1,718,274
Obese	209.36	1,720,808	235.51	701,141	194.23	1,019,667

iv. Median intake of fat (g) by socio-demographic characteristics and BMI status

Median intake of fat among Malaysians was about 46 g and was highest in men (50 g) (Table 5.5.4).

Zone

Fat intakes of adults in East Malaysia were (47g to 49 g) higher than that of other zones. This trend was repeated in men and women across all zones. However, women's intake of fat was lower in comparison to men across all zones

Strata

Fat intake was almost similar in rural (45 g) and urban (47 g) subjects.

Age group

A clearly decreasing trend was observed for fat intake being highest in the youngest age (49.2 g) group and lowest in the oldest age group (41.0 g), showing a difference of about 8 g. A similar trend was seen in both men and women where the intake decreased from 56 g in the youngest group to 46 g in oldest group (men) and from 42 g to 38 g (women).

Ethnicity

Chinese had the highest intake of fat (48.9 g) across ethnic groups while Orang Asli had the lowest (14.0 g), recording a difference of 34 g. Orang Asli men and women consumed the lowest amount of fat while Chinese counterparts had the highest intake.

Educational level

Median fat intake increased with educational level, being lowest in those with no formal education (others) (33 g) and highest in the matriculation and college/university-educated (50 g) groups.

BMI status

The obese group had the lowest median intake of fat with the underweight recording the highest intake. Obese men and women too had the lowest median intake with women having lower median intake of fat across all BMI categories.

Table 5.5.4: Median intake of fat (g) by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	45.53	14,101,107	50.27	7,183,355	41.28	6,917,752
Zone						
Southern	45.23	2,963,301	52.59	1,526,897	39.26	1,436,404
Central	44.78	5,364,732	48.95	2,745,850	40.59	2,618,881
East Coast	46.08	1,611,177	50.28	827,926	41.77	783,250
Northern	44.35	1,881,879	46.80	913,769	41.35	968,110
Sabah	47.18	1,096,289	49.21	564,477	45.04	531,812
Sarawak	49.37	1,183,730	54.55	604,437	44.76	579,293
Strata						
Urban	46.57	8,402,510	50.71	4,273,233	42.31	4,129,277
Rural	44.62	5,698,597	49.51	2,910,122	40.10	2,788,475
Age Group (years)						
18-19	49.22	1,448,992	56.52	734,969	42.22	714,022
20-29	48.09	4,229,053	52.07	2,157,112	44.73	2,071,940
30-39	45.49	3,631,012	50.75	1,834,137	41.57	1,796,875
40-49	43.26	2,889,150	47.76	1,478,375	38.74	1,410,775
50-59	41.02	1,902,901	46.17	978,761	38.45	924,140
Ethnic Group						
Malay	45.40	7,668,443	50.10	3,955,483	40.78	3,712,960
Chinese	48.88	3,541,009	54.01	1,786,186	44.33	1,754,823
Indian	39.88	1,372,449	43.99	669,482	35.71	702,967
Orang Asli PM	13.96	69,202	15.74	38,171	13.96	31,032
Sabah Bumiputera	46.34	564,247	51.84	275,869	43.43	288,378
Sarawak Bumiputera	45.06	613,110	47.76	312,829	42.51	300,281
Other Bumiputera	42.91	272,647	43.05	145,336	42.24	127,311
Educational Level						
Primary School	40.44	2,684,514	44.44	1,208,750	38.21	1,475,764
Lower Secondary School	45.18	2,860,859	49.32	1,648,341	40.47	1,212,518
Higher Secondary School	48.18	4,888,189	52.13	2,506,948	44.35	2,381,241
Matriculation/Form 6	50.09	785,324	56.23	308,479	45.76	476,845
College/University	50.46	2,184,400	55.61	1,292,128	45.31	892,273
Others	33.36	678,021	33.33	214,636	33.48	463,385
BMI Status						
Underweight	46.04	1,361,827	49.12	666,169	44.58	695,657
Normal weight	47.00	6,946,068	50.37	3,743,877	43.03	3,202,191
Overweight	44.66	3,765,233	50.92	2,046,959	38.46	1,718,274
Obese	40.59	1,720,808	48.36	701,141	38.06	1,019,667

v. Median intake of sodium (mg) by socio-demographic characteristics and BMI status

The median sodium intake of Malaysians was found to be 2,293 mg. Malaysian men had a median intake, which was higher than the overall median by about 290 mg and by about 500 mg more than in women (Table 5.5.5).

Zone

Sabah and Sarawak had somewhat similar median intakes for sodium, which were higher than the median intakes in other zones. Sarawak men had the highest intakes among all zones. Women were almost similar in their intake of sodium in all zones with highest observed in Sabah.

Strata

Median intakes for sodium were slightly higher in urban compared to rural respondents. Sodium intake was similar in both men and women across strata

Age group

Across age groups, the intake of sodium was almost similar. Taking men separately, the oldest and the youngest groups recorded the lowest intake for sodium but this was not the case with women who had somewhat similar median intakes in all age groups.

Ethnicity

Orang Asli were found to have the lowest median intake for sodium while the highest was seen in the Chinese (752 mg vs. 2668 mg), the difference being about 1,916 mg. In men, median intakes ranged from lowest in Orang Asli (1139 mg) to highest in Sabah Bumiputera (3018 mg) recording a difference of 1,869 mg. Orang Asli women also had the lowest intake for sodium while Sabah Bumiputera and Chinese women had the highest (almost similar).

Educational level

Median intakes for sodium decreased from 2,529 mg in the college/university group to 1,778 mg in Others group. Similarly a decreasing trend was seen in men and women across educational level.

BMI status

Sodium intake decreased with weight status being lowest in the obese (2118 mg) and highest in the normal weight group (2374 mg). However a gender similarity was not observed.

Table 5.5.5: Median intake of sodium (mg) by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	2,293	14,101,107	2,584	7,183,355	2,072	6,917,752
Zone						
Southern	2,172	2,963,301	2,454	1,526,897	1,971	1,436,404
Central	2,191	5,364,732	2,469	2,745,850	1,965	2,618,881
East Coast	2,472	1,611,177	2,705	827,926	2,242	783,250
Northern	2,229	1,881,879	2,467	913,769	1,968	968,110
Sabah	2,533	1,096,289	2,743	564,477	2,364	531,812
Sarawak	2,585	1,183,730	3,039	604,437	2,232	579,293
Strata						
Urban	2,321	8,402,510	2,585	4,273,233	2,095	4,129,277
Rural	2,283	5,698,597	2,578	2,910,122	2,053	2,788,475
Age Group (years)						
18-19	2,266	1,448,992	2,708	734,969	2,036	714,022
20-29	2,363	4,229,053	2,616	2,157,112	2,165	2,071,940
30-39	2,376	3,631,012	2,702	1,834,137	2,140	1,796,875
40-49	2,249	2,889,150	2,545	1,478,375	1,973	1,410,775
50-59	2,131	1,902,901	2,322	978,761	1,850	924,140
Ethnic Group						
Malay	2,251	7,668,443	2,494	3,955,483	2,030	3,712,960
Chinese	2,668	3,541,009	2,936	1,786,186	2,342	1,754,823
Indian	1,725	1,372,449	1,940	669,482	1,492	702,967
Orang Asli PM	752	69,202	1,139	38,171	752	31,032
Sabah Bumiputera	2,594	564,247	3,018	275,869	2,365	288,378
Sarawak Bumiputera	2,395	613,110	2,852	312,829	2,115	300,281
Other Bumiputera	2,268	272,647	2,355	145,336	2,144	127,311
Educational Level						
Primary School	2,143	2,684,514	2,328	1,208,750	1,945	1,475,764
Lower Secondary School	2,338	2,860,859	2,586	1,648,341	2,023	1,212,518
Higher Secondary School	2,371	4,888,189	2,667	2,506,948	2,178	2,381,241
Matriculation/Form 6	2,349	785,324	2,668	308,479	2,088	476,845
College/University	2,529	2,184,400	2,732	1,292,128	2,246	892,273
Others	1,778	678,021	1,863	214,636	1,763	463,385
BMI Status						
Underweight	2,320	1,361,827	2,411	666,169	2,271	695,657
Normal weight	2,374	6,946,068	2,600	3,743,877	2,176	3,202,191
Overweight	2,257	3,765,233	2,649	2,046,959	1,921	1,718,274
Obese	2,118	1,720,808	2,467	701,141	1,916	1,019,667

vi. Median intake of calcium (mg) by socio-demographic characteristics and BMI status

Malaysians recorded a median intake of 353 mg for calcium. Gender comparison showed that men had a higher intake than women (Table 5.5.6)

Zone

Calcium intake ranged narrowly from 389 mg in Sarawak to 330 mg in the Northern zone. Men's intake was higher than women across all zones.

Strata

Both rural and urban residents were similar in their median intake of calcium and this was reflected in men and women.

Age group

The lowest median intake was recorded for the young adult group (332 mg) although no particular trend in consumption was noticed. Between gender, women had generally lower intakes of calcium in comparison to men in all age groups, being lowest again in the youngest group.

Ethnicity

Across ethnic groups, Orang Asli had the lowest intake of calcium (274 mg) while it was highest in Sarawak Bumiputera (390 mg). Orang Asli men and women too had the lowest median intake.

Educational level

Calcium intake declined with level of education. It was highest in the college/university category (380 mg) while the lowest was in the others (no formal education) category (308 mg). A similar trend prevailed in both men and women.

BMI status

Median intake of calcium was lowest in the obese group (317 mg). A similar situation was seen in obese men and women across BMI categories.

Table 5.5.6: Median intake of calcium (mg) by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	352.98	14,101,107	374.19	7,183,355	333.54	6,917,752
Zone						
Southern	363.71	2,963,301	383.40	1,526,897	338.26	1,436,404
Central	343.76	5,364,732	369.69	2,745,850	324.02	2,618,881
East Coast	367.48	1,611,177	408.08	827,926	335.37	783,250
Northern	330.92	1,881,879	346.06	913,769	318.49	968,110
Sabah	339.04	1,096,289	341.93	564,477	338.05	531,812
Sarawak	389.05	1,183,730	413.49	604,437	368.67	579,293
Strata						
Urban	351.02	8,402,510	373.34	4,273,233	334.38	4,129,277
Rural	354.88	5,698,597	376.55	2,910,122	332.68	2,788,475
Age Group (years)						
18-19	331.68	1,448,992	367.89	734,969	293.85	714,022
20-29	353.44	4,229,053	367.03	2,157,112	338.05	2,071,940
30-39	366.93	3,631,012	392.83	1,834,137	341.86	1,796,875
40-49	346.63	2,889,150	361.45	1,478,375	329.49	1,410,775
50-59	353.26	1,902,901	375.50	978,761	325.51	924,140
Ethnic Group						
Malay	349.06	7,668,443	373.08	3,955,483	329.22	3,712,960
Chinese	361.97	3,541,009	390.53	1,786,186	334.72	1,754,823
Indian	342.36	1,372,449	359.74	669,482	322.85	702,967
Orang Asli PM	273.72	69,202	311.35	38,171	263.31	31,032
Sabah Bumiputera	339.04	564,247	343.83	275,869	337.07	288,378
Sarawak Bumiputera	394.17	613,110	382.88	312,829	405.77	300,281
Other Bumiputera	338.50	272,647	353.02	145,336	335.13	127,311
Educational Level						
Primary School	333.90	2,684,514	356.11	1,208,750	311.50	1,475,764
Lower Secondary School	349.42	2,860,859	359.89	1,648,341	336.37	1,212,518
Higher Secondary School	367.76	4,888,189	378.91	2,506,948	353.43	2,381,241
Matriculation/Form 6	351.96	785,324	412.38	308,479	332.25	476,845
College/University	383.08	2,184,400	418.21	1,292,128	336.06	892,273
Others	308.79	678,021	308.79	214,636	308.90	463,385
BMI Status						
Underweight	357.67	1,361,827	355.15	666,169	358.30	695,657
Normal weight	362.32	6,946,068	385.62	3,743,877	338.15	3,202,191
Overweight	344.16	3,765,233	373.38	2,046,959	316.92	1,718,274
Obese	317.15	1,720,808	348.76	701,141	301.59	1,019,667

vii. Median intake of iron (mg) by socio-demographic characteristics and BMI status

Median Intakes of iron by socio-demographic characteristics and BMI status are shown Table 5.5.7. The median intake of iron among Malaysians was 8.72 mg and men had an intake higher by 1.2 mg (9.4 mg) than women (8.2 mg).

Zone

Iron intake was lowest in the Southern zone (8.5 mg) and highest in Sarawak (9.1 mg). In men, the highest intake of iron was seen in Sarawak (10.1 mg) and lowest in Sabah (8.83 mg). In women the median intake of iron in the Southern and Central zones were about 1mg lower than that of the other zones.

Strata

Median iron intakes were higher in the urban sector (8.9 mg) with men and women showing a similar pattern.

Age group

Median iron intake was almost similar in all age groups. This pattern was also observed in men and women of all age groups.

Ethnicity

Orang Asli group had the lowest median intake of iron (5.0 mg) followed by the Indian group in comparison to the other zones. Among men, Indian men had the lowest intake (7.94 mg). In women, the Orang Asli group had the lowest (4.45 mg) intake being almost half that of women in other ethnic groups.

Educational level

The Others category, which include those with no formal education, had the lowest median intake (7.01 mg) for iron while the highest was in the college/university group (9.65 mg). The difference observed was about 3 mg. In men too, a clear increasing trend in iron intake was observed with educational status. In women, however intake was almost similar at all educational levels.

BMI status

There was very little variation in iron intake across BMI categories. However, in men there appears to be a difference of about 1.1 mg between the underweight and overweight categories suggesting an increasing trend with BMI status. Women in general had lower iron intake than men in each of the BMI categories, but a reverse in trend was observed where overweight and obese groups had lower intakes.

Table 5.5.7: Median intake of iron (mg) by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	8.72	14,101,107	9.43	7,183,355	8.19	6,917,752
Zone						
Southern	8.52	2,963,301	9.33	1,526,897	7.89	1,436,404
Central	8.54	5,364,732	9.32	2,745,850	7.89	2,618,881
East Coast	8.90	1,611,177	9.87	827,926	8.40	783,250
Northern	8.84	1,881,879	9.49	913,769	8.49	968,110
Sabah	8.74	1,096,289	8.83	564,477	8.43	531,812
Sarawak	9.10	1,183,730	10.11	604,437	8.39	579,293
Strata						
Urban	8.85	8,402,510	9.55	4,273,233	8.29	4,129,277
Rural	8.53	5,698,597	9.24	2,910,122	8.11	2,788,475
Age Group (years)						
18-19	8.26	1,448,992	8.68	734,969	7.77	714,022
20-29	8.87	4,229,053	9.71	2,157,112	8.40	2,071,940
30-39	8.95	3,631,012	9.90	1,834,137	8.29	1,796,875
40-49	8.46	2,889,150	9.11	1,478,375	7.92	1,410,775
50-59	8.44	1,902,901	8.78	978,761	7.97	924,140
Ethnic Group						
Malay	8.83	7,668,443	9.65	3,955,483	8.25	3,712,960
Chinese	8.97	3,541,009	9.83	1,786,186	8.34	1,754,823
Indian	7.79	1,372,449	7.94	669,482	7.59	702,967
Orang Asli PM	5.04	69,202	8.58	38,171	4.47	31,032
Sabah Bumiputera	8.66	564,247	8.83	275,869	8.38	288,378
Sarawak Bumiputera	8.98	613,110	9.11	312,829	8.48	300,281
Other Bumiputera	8.16	272,647	8.29	145,336	7.97	127,311
Educational Level						
Primary School	7.97	2,684,514	8.47	1,208,750	7.73	1,475,764
Lower Secondary School	8.55	2,860,859	9.23	1,648,341	8.04	1,212,518
Higher Secondary School	9.27	4,888,189	9.87	2,506,948	8.67	2,381,241
Matriculation/Form 6	8.84	785,324	9.97	308,479	8.48	476,845
College/University	9.65	2,184,400	10.34	1,292,128	8.77	892,273
Others	7.01	678,021	6.58	214,636	7.08	463,385
BMI Status						
Underweight	8.74	1,361,827	8.68	666,169	8.75	695,657
Normal weight	8.76	6,946,068	9.33	3,743,877	8.29	3,202,191
Overweight	8.67	3,765,233	9.80	2,046,959	7.65	1,718,274
Obese	8.43	1,720,808	9.38	701,141	7.89	1,019,667

viii. Median intake of vitamin C (mg) by socio-demographic characteristics and BMI status

Intake of vitamin C by the Malaysian population is presented in Table 5.5.8 according to socio-demographic characteristics and BMI Status. The median intake of vitamin C was 38.7 mg and women had slightly higher intake (40.7 mg) than men by about 3 mg.

Zone

Median intake of vitamin C was highest in Sarawak (74 mg) being about 30 mg higher than the other zones. A similar situation was noted for both men and women in Sarawak with median intakes also about 30 mg higher than their counterparts in other zones.

Strata

Median intakes of rural and urban strata were almost similar, a situation which was also seen in men and women in both strata.

Age group

An increasing trend was seen in iron intake where it increased by about 10 mg from 32 mg in the youngest group to 42 mg in the oldest group. This trend with increasing age was also reflected in men and women.

Ethnic group

Ethnic differences were observed for vitamin C intake. Intake ranged from lowest (26.9 mg) in the Indian group to highest in the Sarawak Bumiputera group (74.6 mg) which was a difference of about 48 mg. Orang Asli men had the highest intake of iron (72.12 mg) and again it was lowest in the Indian group (25.16 mg). In women differences between ethnic groups were also observed. Iron intake was lowest in the Indian group (27.92 mg) while it was highest in the Sarawak Bumiputera (82.96 mg).

Educational level

No particular trend in iron intake was seen according to educational status. However, intake by women was seen to be higher than men's particularly for the groups with lower secondary, higher secondary, matriculation group and the Others group.

BMI status

Normal weight respondents' intake of vitamin C was highest among all BMI categories (40.92 mg). Underweight men and obese women had the lowest intake of iron across BMI categories.

Table 5.5.8: Median intake of vitamin C (mg) by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	38.70	14,098,745	37.08	7,180,994	40.65	6,917,752
Zone						
Southern	40.78	2,963,301	37.05	1,526,897	42.18	1,436,404
Central	34.26	5,362,370	32.43	2,743,489	35.29	2,618,881
East Coast	32.25	1,611,177	32.99	827,926	31.78	783,250
Northern	36.88	1,881,879	35.48	913,769	39.34	968,110
Sabah	44.01	1,096,289	43.10	564,477	44.92	531,812
Sarawak	74.24	1,183,730	73.78	604,437	75.73	579,293
Strata						
Urban	38.95	8,400,148	37.37	4,270,872	40.89	4,129,277
Rural	38.42	5,698,597	37.05	2,910,122	40.07	2,788,475
Age Group (years)						
18-19	32.29	1,448,992	34.26	734,969	29.12	714,022
20-29	36.99	4,229,053	36.00	2,157,112	37.65	2,071,940
30-39	40.89	3,631,012	36.30	1,834,137	43.13	1,796,875
40-49	40.33	2,886,788	37.33	1,476,013	42.82	1,410,775
50-59	42.04	1,902,901	42.88	978,761	40.52	924,140
Ethnic Group						
Malay	32.72	7,668,443	31.34	3,955,483	33.95	3,712,960
Chinese	56.98	3,538,647	56.56	1,783,824	57.83	1,754,823
Indian	26.88	1,372,449	25.16	669,482	27.92	702,967
Orang Asli PM	53.92	69,202	72.12	38,171	49.30	31,032
Sabah Bumiputera	47.94	564,247	43.79	275,869	52.88	288,378
Sarawak Bumiputera	74.57	613,110	68.52	312,829	82.96	300,281
Other Bumiputera	40.25	272,647	35.48	145,336	40.89	127,311
Educational Level						
Primary School	38.95	2,682,153	40.65	1,206,388	37.66	1,475,764
Lower Secondary School	37.91	2,860,859	35.52	1,648,341	42.50	1,212,518
Higher Secondary School	38.10	4,888,189	36.22	2,506,948	40.35	2,381,241
Matriculation/Form 6	39.22	785,324	35.25	308,479	41.98	476,845
College/University	39.30	2,184,400	39.41	1,292,128	38.71	892,273
Others	42.01	678,021	38.25	214,636	44.69	463,385
BMI Status						
Underweight	33.83	1,361,827	29.68	666,169	37.43	695,657
Normal weight	40.92	6,946,068	38.41	3,743,877	42.81	3,202,191
Overweight	39.38	3,765,233	38.03	2,046,959	39.72	1,718,274
Obese	33.48	1,718,446	34.45	698,779	32.65	1,019,667

ix. Median intake of vitamin A (μg) by socio-demographic characteristics and BMI status

Median intake of vitamin A by Socio-demographic characteristics and BMI status are presented in Table 5.5.9. Malaysians median intake of vitamin A was 379 μg . By gender, vitamin A intake was higher in men (419 μg) than in women (345 μg)

Zone

Sarawak had the highest median intake of vitamin A among the zones (498 μg). Men and women in Sarawak too had the highest median intake.

Strata

Overall, rural respondents had higher vitamin A intake than urban residents (399 μg vs. 364 μg) and this observation was repeated in both rural men and women.

Ethnic group

Across ethnic groups, the Orang Asli consumed the lowest intake vitamin A (184 μg) while it was highest in the Sarawak Bumiputera (508 μg). In men ethnic variation was not obvious but in women. Orang Asli group had markedly lower intake in comparison to other ethnic groups.

Age group

Vitamin A intake appears to increase with age from 335 μg in the 18 to 19 years group to 389 μg in the 30 to 39 years group after which there is a reduction in intake with increasing age. This observation was also evident in women but not in men. In the latter, the oldest and youngest group had the highest intake.

Educational level

Overall, lowest intake was in the respondents in the Others group which was also observed in men. In women no such trend was seen, although intake was lowest at the primary school level.

BMI status

Median intakes were almost similar across all BMI categories although the obese had slightly lower intake. In men and women too median intake was lowest in the obese group.

Table 5.5.9: Median intake of vitamin A (μg) by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	379.38	14,098,745	418.87	7,180,994	345.45	6,917,752
Zone						
Southern	358.35	2,963,301	412.06	1,526,897	317.71	1,436,404
Central	347.57	5,362,370	385.02	2,743,489	320.52	2,618,881
East Coast	378.35	1,611,177	433.98	827,926	337.64	783,250
Northern	415.31	1,881,879	445.40	913,769	373.94	968,110
Sabah	398.67	1,096,289	398.67	564,477	397.17	531,812
Sarawak	498.13	1,183,730	545.48	604,437	464.99	579,293
Strata						
Urban	363.56	8,400,148	399.19	4,270,872	332.23	4,129,277
Rural	399.67	5,698,597	438.09	2,910,122	355.57	2,788,475
Age Group (years)						
18-19	335.41	1,448,992	386.08	734,969	290.98	714,022
20-29	382.86	4,229,053	422.92	2,157,112	350.12	2,071,940
30-39	389.00	3,631,012	434.43	1,834,137	358.23	1,796,875
40-49	372.17	2,886,788	390.89	1,476,013	347.83	1,410,775
50-59	379.07	1,902,901	431.08	978,761	315.53	924,140
Ethnic Group						
Malay	372.43	7,668,443	421.56	3,955,483	331.50	3,712,960
Chinese	395.78	3,538,647	437.71	1,783,824	358.19	1,754,823
Indian	313.49	1,372,449	347.38	669,482	285.27	702,967
Orang Asli PM	183.74	69,202	407.58	38,171	55.66	31,032
Sabah Bumiputera	429.01	564,247	434.87	275,869	418.35	288,378
Sarawak Bumiputera	508.30	613,110	508.20	312,829	508.65	300,281
Other Bumiputera	337.61	272,647	345.85	145,336	337.61	127,311
Educational Level						
Primary School	366.77	2,682,153	412.76	1,206,388	329.07	1,475,764
Lower Secondary School	392.81	2,860,859	433.88	1,648,341	352.65	1,212,518
Higher Secondary School	385.01	4,888,189	421.39	2,506,948	351.47	2,381,241
Matriculation/Form 6	380.55	785,324	438.09	308,479	362.95	476,845
College/University	379.77	2,184,400	417.30	1,292,128	331.17	892,273
Others	333.05	678,021	313.82	214,636	340.68	463,385
BMI Status						
Underweight	367.05	1,361,827	377.96	666,169	348.18	695,657
Normal weight	396.03	6,946,068	433.32	3,743,877	358.16	3,202,191
Overweight	379.32	3,765,233	432.51	2,046,959	328.87	1,718,274
Obese	332.12	1,718,446	376.74	698,779	303.99	1,019,667

x. Median intake of thiamin (mg) by socio-demographic characteristics and BMI status

Table 5.5.10 reports the median intake thiamin by Malaysians by socio-demographic characteristics and BMI status. Malaysians' median intake of thiamin was 0.65 mg and men and women were similar in their intake.

Zone

By zone, the lowest intake was seen in Sabah 0.50 mg and highest in the Southern zone 0.7 mg. Men and women in Sabah and Northern zones had lower intakes than those in other zones.

Strata

Urban residents across strata and gender had higher intakes than rural residents.

Age group

Thiamin intake was quite similar across age groups, ranging narrowly between 0.60 mg in the youngest group to 0.68 mg in the 30 to 39 years group. Men's intake however, was seen to be higher than women in all age groups.

Ethnic group

Orang Asli had the lowest intake among the zones 0.49 mg, a pattern which was reflected in men and women in this group.

Educational level

A progressive increase thiamin intake was noted with increasing educational level. An intake of 0.71 mg and 0.48 mg was recorded for the college educated group and the group with the least education respectively. This positive trend was also seen in men and women.

BMI status

An inverse trend in thiamin intake was seen with BMI status. This pattern was repeated in women but not in men.

Table 5.5.10: Median intake of thiamin (mg) by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	0.65	14,098,745	0.69	7,180,994	0.61	6,917,752
Zone						
Southern	0.70	2,963,301	0.75	1,526,897	0.66	1,436,404
Central	0.66	5,362,370	0.71	2,743,489	0.61	2,618,881
East Coast	0.65	1,611,177	0.70	827,926	0.61	783,250
Northern	0.61	1,881,879	0.65	913,769	0.58	968,110
Sabah	0.58	1,096,289	0.58	564,477	0.57	531,812
Sarawak	0.67	1,183,730	0.73	604,437	0.62	579,293
Strata						
Urban	0.67	8,400,148	0.71	4,270,872	0.63	4,129,277
Rural	0.63	5,698,597	0.68	2,910,122	0.58	2,788,475
Age Group (years)						
18-19	0.60	1,448,992	0.71	734,969	0.56	714,022
20-29	0.64	4,229,053	0.69	2,157,112	0.60	2,071,940
30-39	0.68	3,631,012	0.73	1,834,137	0.63	1,796,875
40-49	0.66	2,886,788	0.68	1,476,013	0.63	1,410,775
50-59	0.64	1,902,901	0.68	978,761	0.58	924,140
Ethnic Group						
Malay	0.63	7,668,443	0.69	3,955,483	0.58	3,712,960
Chinese	0.73	3,538,647	0.79	1,783,824	0.68	1,754,823
Indian	0.71	1,372,449	0.74	669,482	0.67	702,967
Orang Asli PM	0.49	69,202	0.52	38,171	0.40	31,032
Sabah Bumiputera	0.58	564,247	0.61	275,869	0.56	288,378
Sarawak Bumiputera	0.63	613,110	0.65	312,829	0.61	300,281
Other Bumiputera	0.55	272,647	0.51	145,336	0.61	127,311
Educational Level						
Primary School	0.60	2,682,153	0.62	1,206,388	0.58	1,475,764
Lower Secondary School	0.64	2,860,859	0.68	1,648,341	0.63	1,212,518
Higher Secondary School	0.69	4,888,189	0.74	2,506,948	0.64	2,381,241
Matriculation/Form 6	0.69	785,324	0.79	308,479	0.63	476,845
College/University	0.71	2,184,400	0.78	1,292,128	0.64	892,273
Others	0.48	678,021	0.50	214,636	0.48	463,385
BMI Status						
Underweight	0.64	1,361,827	0.64	666,169	0.66	695,657
Normal weight	0.66	6,946,068	0.70	3,743,877	0.62	3,202,191
Overweight	0.65	3,765,233	0.71	2,046,959	0.59	1,718,274
Obese	0.60	1,718,446	0.66	698,779	0.57	1,019,667

5.5.2 Median energy and nutrient intakes as percentage of RNI by socio-demographic characteristics and BMI status

i. Energy intake as percentage of RNI

Figures 5.5.1 to Figures 5.5.6 illustrate the median energy intake as percentage of RNI for Malaysians by socio-demographic characteristics and BMI status.

Zone

East Coast, Sabah and Sarawak had the highest percentage achievement of RNI (72%) in comparison to other zones. Percentage of RNI adequacy ranged from highest at 72% to lowest at about 65%. Men's energy percentage of RNI intake was higher than women in all zones.

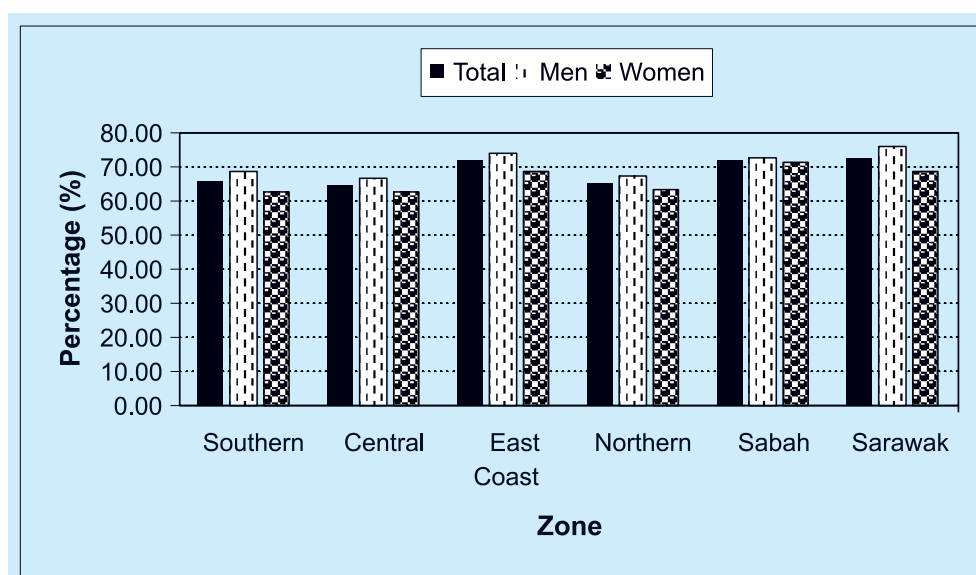


Figure 5.5.1: Median energy intake as percentage of RNI by zone

Strata

The median energy intake as percentage of RNI by rural and urban residence showed that rural respondents had a slightly higher percentage achievement than their urban counterparts (Figure 5.5.2). Rural men achieved about 6% higher intake than their urban counterparts (71% vs. 65%) while rural-urban differences in women was little.

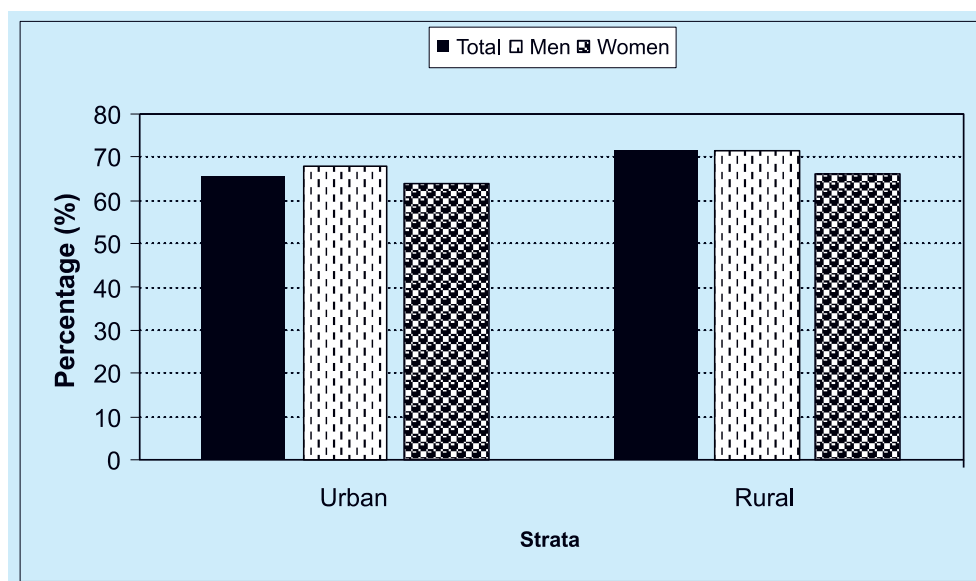


Figure 5.5.2: Median energy intake as percentage of RNI by strata

Ethnicity

Overall Sabah Bumiputera and Sarawak Bumiputera in East Malaysia recorded higher percentage intakes of energy (around 73%) in comparison to other ethnic groups. As for ethnic groups in West Malaysia, there appears to be a downward trend in % RNI achievement for energy. The highest was recorded for Malays (70%), intermediary in the Chinese (65%) and Indian group (60%) and lowest in Orang Asli (37%). Intake of Other Bumiputera group was somewhat similar to that of Malays. Intake by men and women in the Orang Asli group was the lowest compared to their counterparts from the other ethnic groups being 55% and 45% respectively.

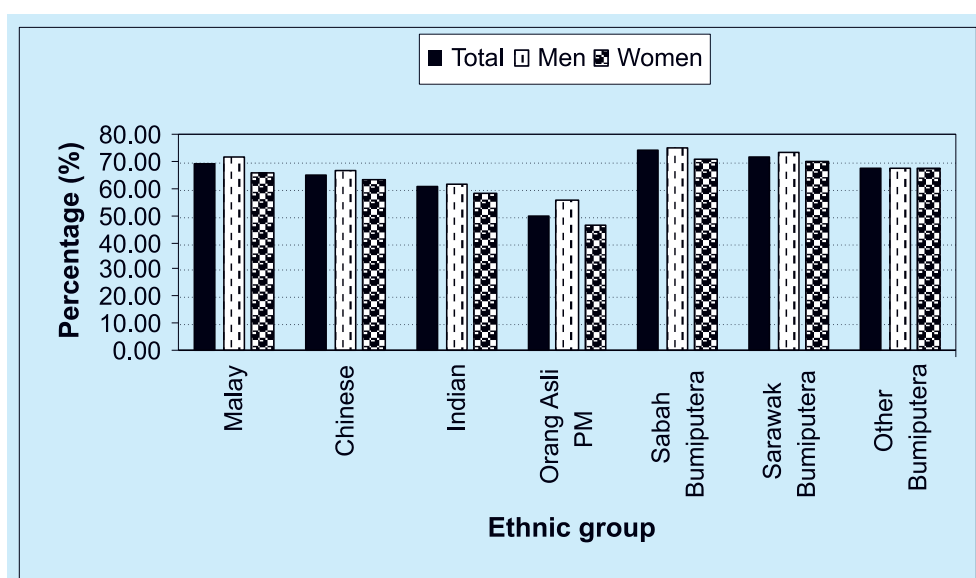


Figure 5.5.3: Median energy intake as percentage of RNI by ethnic group

Age group

In general, the energy intake as percent RNI declined gradually with age being highest in the 20 to 29 years group (71%) and lowest in the 50 to 59 years group (63%) recording a reduction by about 8%. A similar trend was seen in men and women.

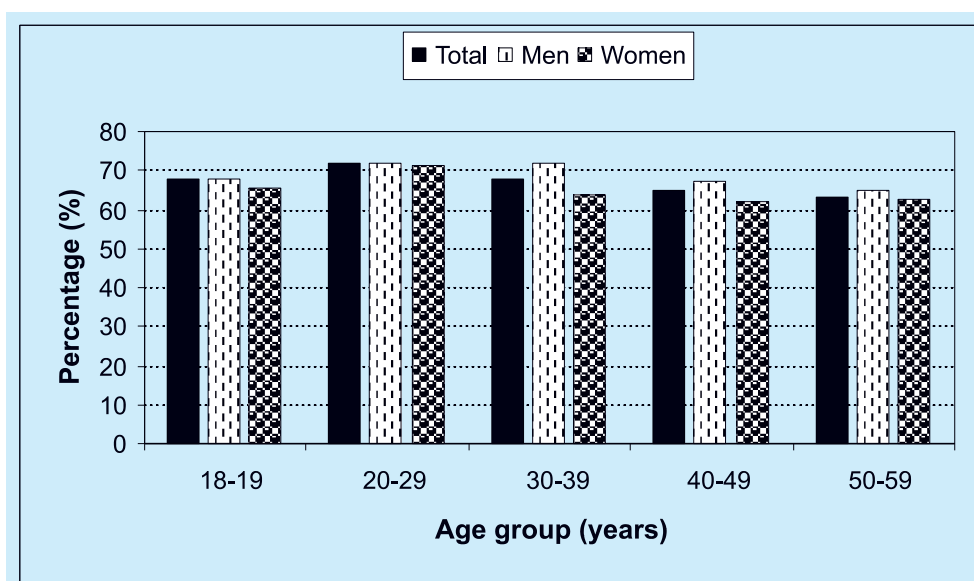


Figure 5.5.4: Median energy intake as percentage of RNI by age group

Educational level

Percentage of RNI for energy intake was lowest in the Others group (60%) followed by respondents with primary school education (64%) and highest in the group with highest educational level. Similarly, an upward trend in % energy intake was observed in men and women with increasing educational status.

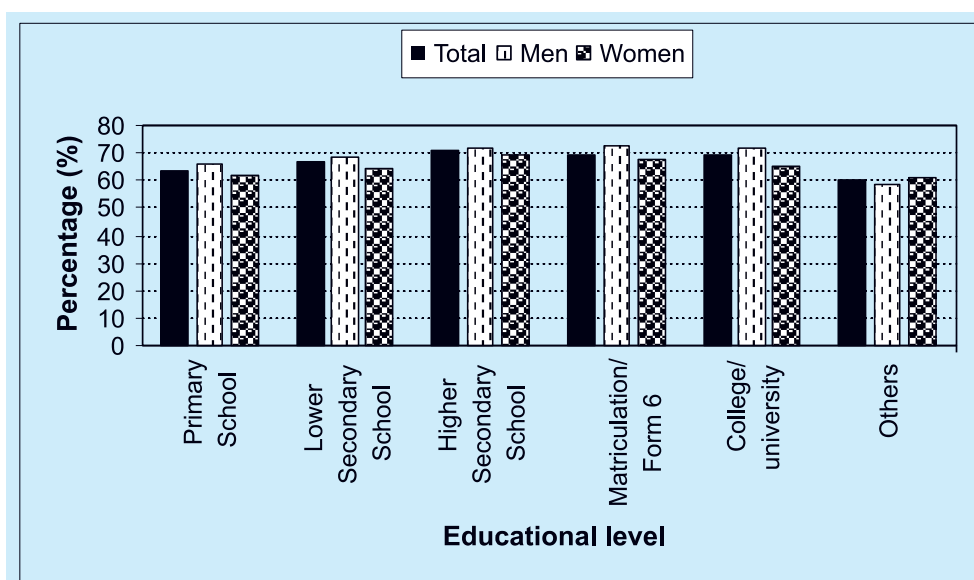


Figure 5.5.5: Median energy intake as percentage of RNI by educational level

BMI status

The obese group had the lowest % RNI for energy intake among BMI categories (64%). Again this observation was repeated in obese men and women.

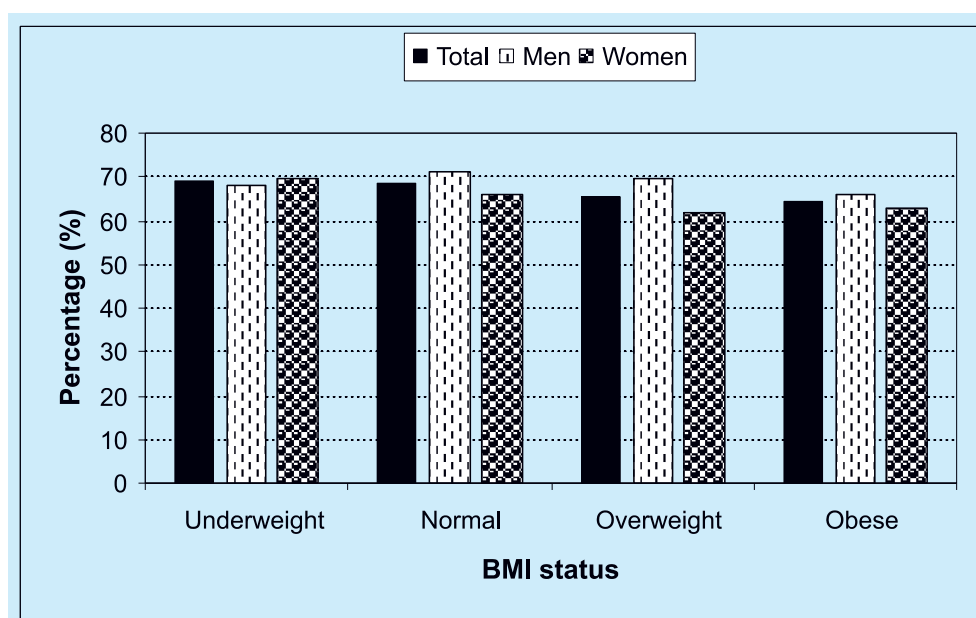


Figure 5.5.6: Median energy intake as percentage of RNI by BMI status

ii. Protein intake as percentage of RNI

Figures 5.5.7 to Figures 5.5.12 illustrate the median protein intake as percentage of RNI for Malaysians by socio-demographic characteristics and BMI status

Zone

Sabah and Sarawak exceeded RNI for protein intake by about 3% to 6%. In other zones % RNI ranged from 88% in Central zone to 98% in the Northern zone. Men in Sarawak, Sabah and East Coast exceeded RNI for protein intake by about 2% to 12%. In women % intake of protein was lowest in the Southern zone (87%) and increased to about 103% in Sarawak.

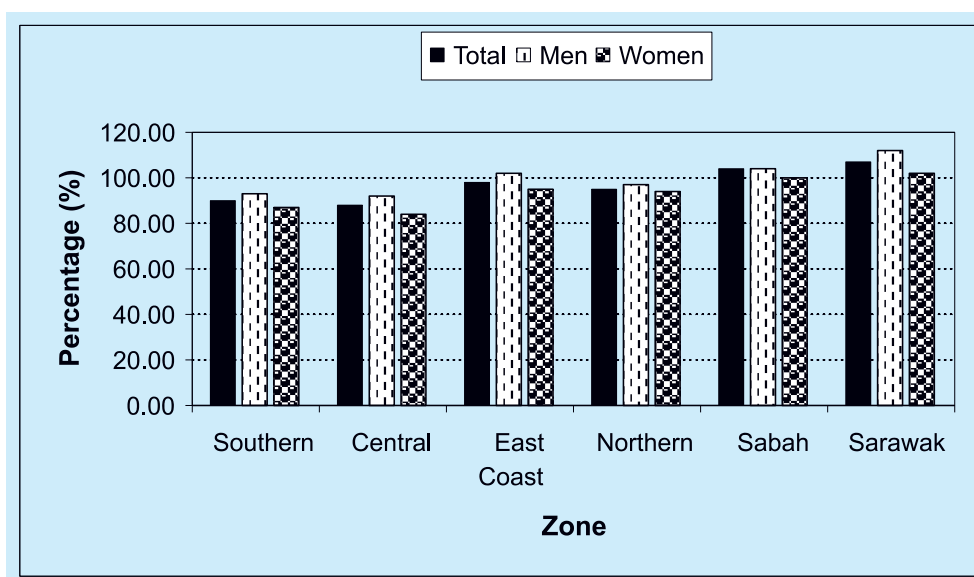


Figure 5.5.7: Median protein intake as percentage of RNI by zone

Strata

Overall, the rural sector, including rural men, achieved 100% adequacy for protein intake while the urban sector fell short by about 12 %. Urban men and women in both sectors did not meet the recommended intake for protein.

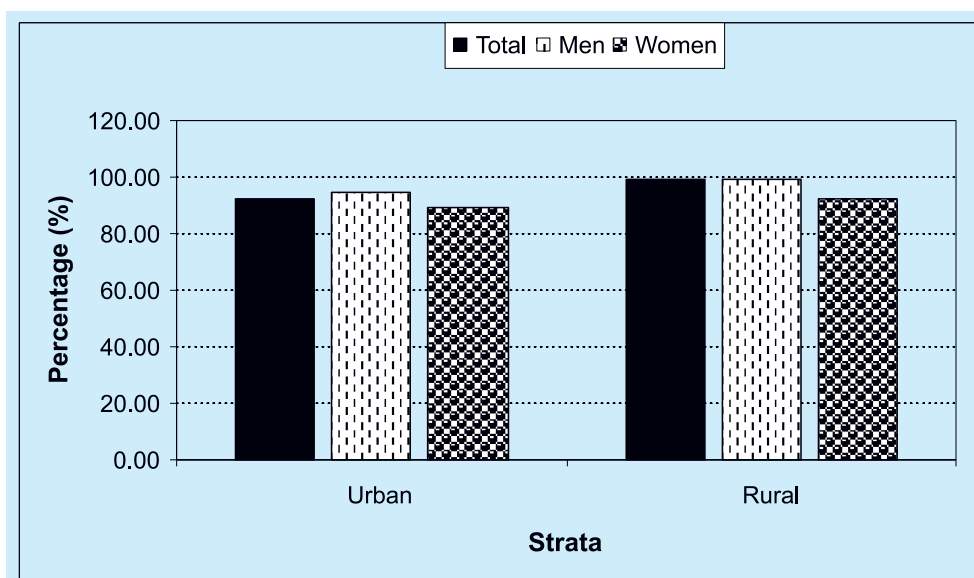


Figure 5.5.8: Median protein intake as percentage of RNI by strata

Ethnicity

The highest % RNI for protein intake was in Sabah Bumiputera followed by Sarawak Bumiputera and Other Bumiputera. Comparatively % RNI achievement was lowest in the Orang Asli PM, which was only about one-third of the % RNI intake of Sabah Bumiputera and Sarawak Bumiputera. The Indian group was the next group with the lowest % RNI intake (75%). Men in all zones exceeded RNI for protein intake ranging from 120% to 148%. Women in Sabah and Sarawak achieved 100% of RNI while women in the Central zone achieved the lowest, which was about 84%.

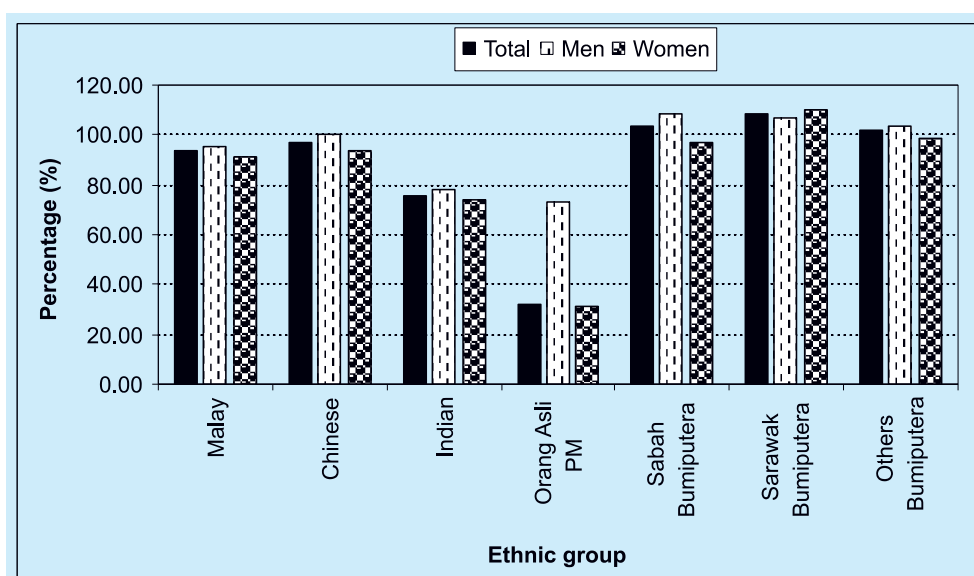


Figure 5.5.9: Median protein intake as percentage of RNI by ethnic group

Age group

A decline in % achievement of RNI for protein intake was seen with advancing age. The 18 to 19 years group recorded the highest intake (94%) while it was lowest in the 50 to 59 years group (88%). In men and women the lowest % achievement of RNI was also in the oldest age group.

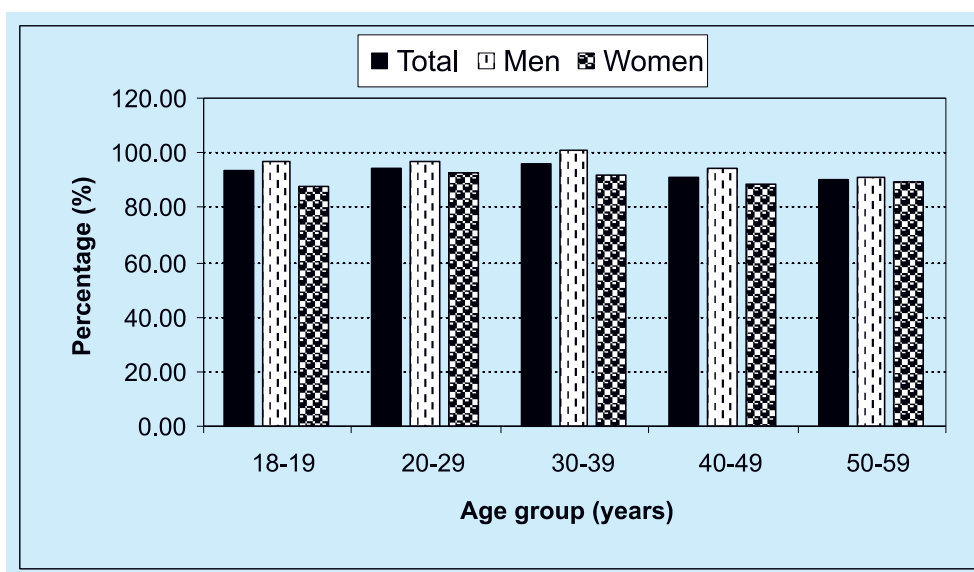


Figure 5.5.10: Median protein intake as percentage of RNI by age group

Educational level

A clear trend in higher % intake of RNI for protein with increasing educational status was observed. Respondents in the group with the least education had the lowest intake (78%) while the group with tertiary education achieved 100% adequacy for protein intake. Similarly, men and women in the others category had the lowest percentage intake of RNI for protein.

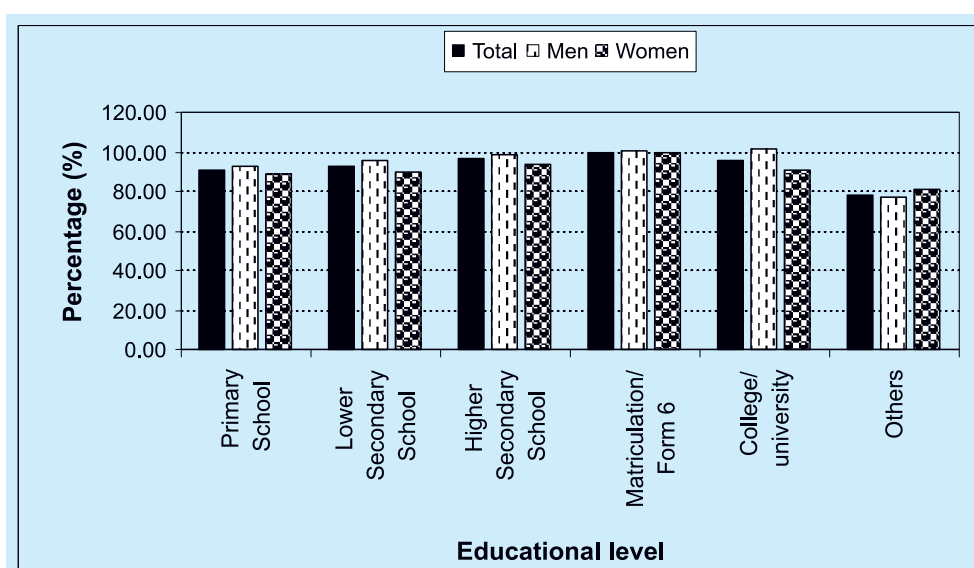


Figure 5.5.11: Median protein intake as percentage of RNI by educational level

BMI status

Overweight and obese had lower % RNI for protein compared to other BMI categories. In men little variation was seen in % RNI among BMI categories. In the women, however, a decreasing trend was noted from highest in the underweight group (97%) to lowest in the obese group (85%).

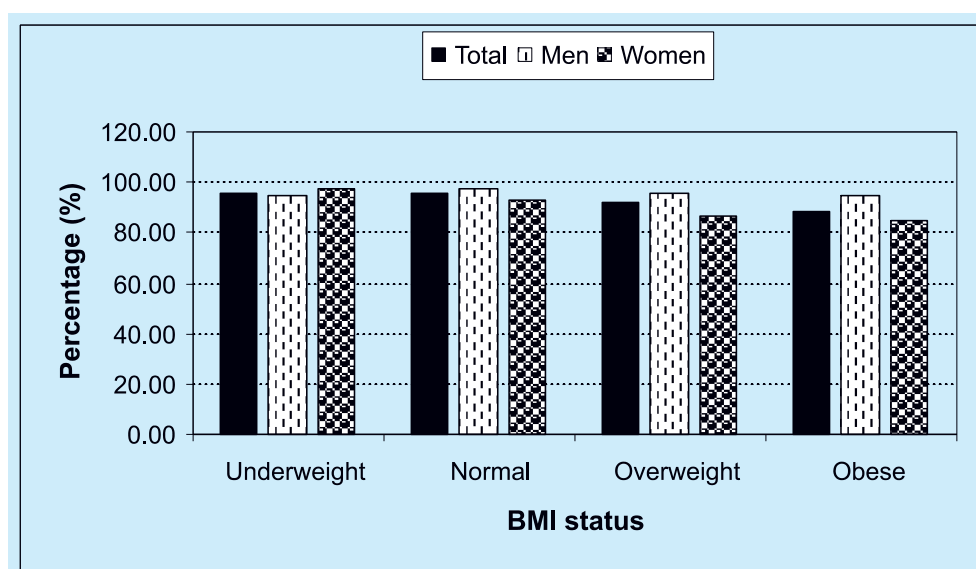


Figure 5.5.12: Median protein intake as percentage of RNI by BMI status

iii. Vitamin C intake as percentage of RNI

Figures 5.5.13 to Figures 5.5.18 illustrate the median vitamin C intake as percentage of RNI for Malaysians by socio-demographic characteristics and BMI status.

Zone

Sarawak, clearly, was the only zone that showed 100% adequacy of RNI for vitamin C intake. All other zones fell 60% and below with the lowest recorded by the East and Central zones (45%). Sarawak's men and women also took the highest % of RNI in comparison to their counterparts in all other zones.

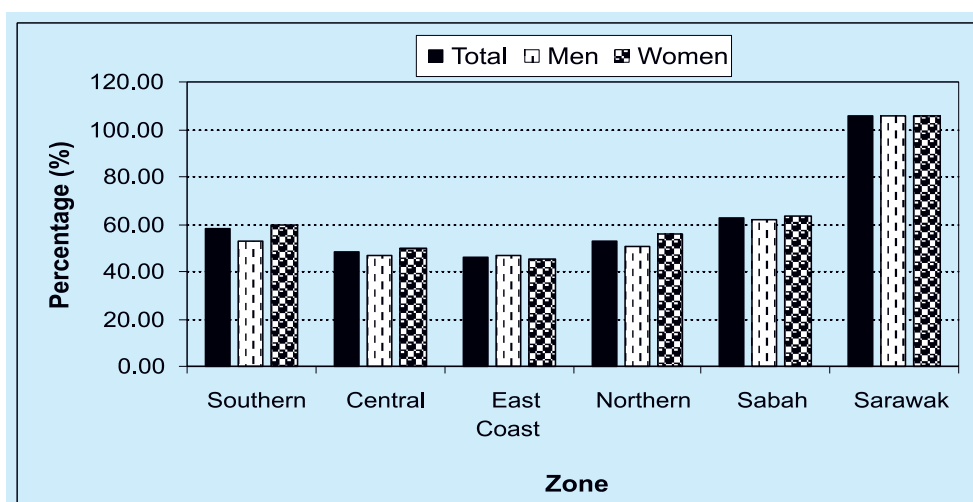


Figure 5.5.13: Median vitamin C intake as percentage of RNI by zone

Strata

Percentage of RNI for vitamin C intake was about 3% higher in the urban sectors (55%) compared to the rural stratum (52%) (Figure 5.5.14). Men and women in both strata were almost similar in their percent achievement of RNI.

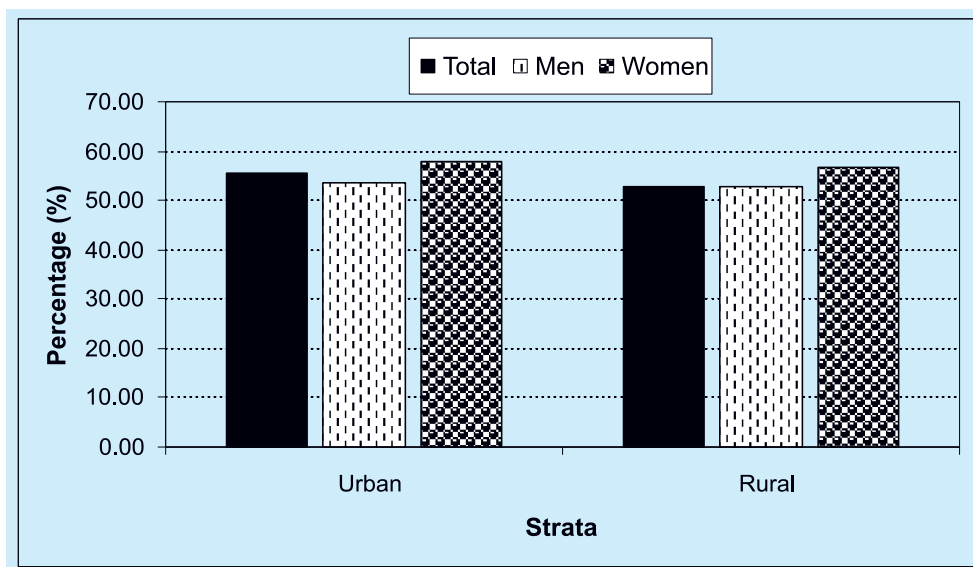


Figure 5.5.14: Median vitamin C intake as percentage of RNI by strata

Ethnicity

The only ethnic group with intake exceeding RNI for vitamin C was Sarawak Bumiputera (106%) while all other groups fell below 80% (Figure 5.5.15). The Indian group had the lowest % achievement of RNI for vitamin C intake (38%) followed by the Malay group (46%) and Other Bumiputera (58%) while Chinese and Orang Asli PM were similar (81%). Among men, Indian men had the lowest % intake of RNI (36%) followed by Malay men (45%) and Other Bumiputera men (51%). Sarawak Bumiputera womens' % achievement of RNI for vitamin C intake was the highest among women in all ethnic groups (116%). The lowest % intake was seen in Indian women followed by Malay and Other Bumiputera women.

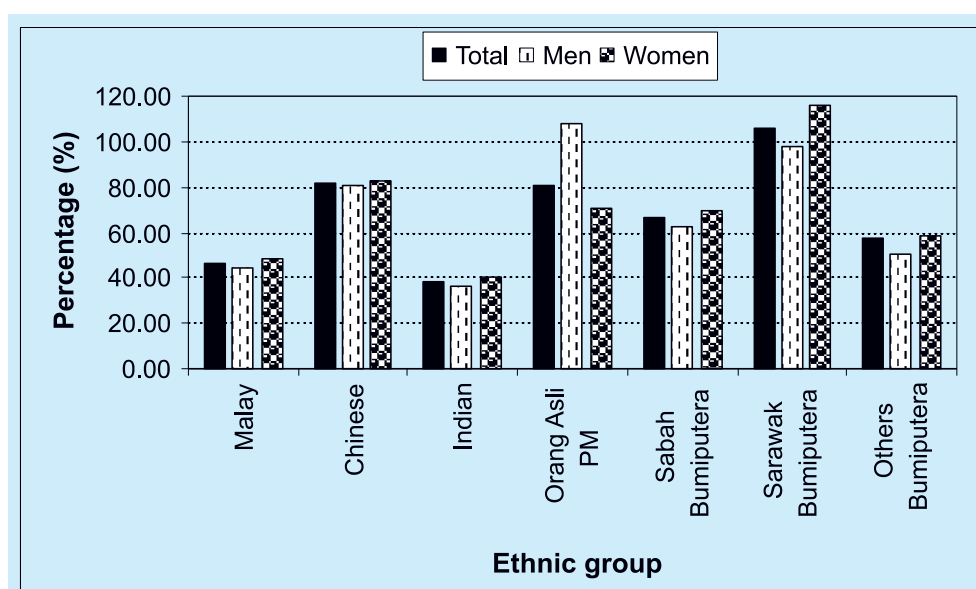


Figure 5.5.15: Median vitamin C intake as percentage of RNI by ethnic group

Age group

An increasing trend in % intake of RNI for vitamin C was observed, being lowest in the 18 to 19 years group (47%) and highest in the oldest age group (60%). A similar increasing trend was seen in men across all age groups. In women too % intake of RNI was lowest in the youngest age groups and increased with age.

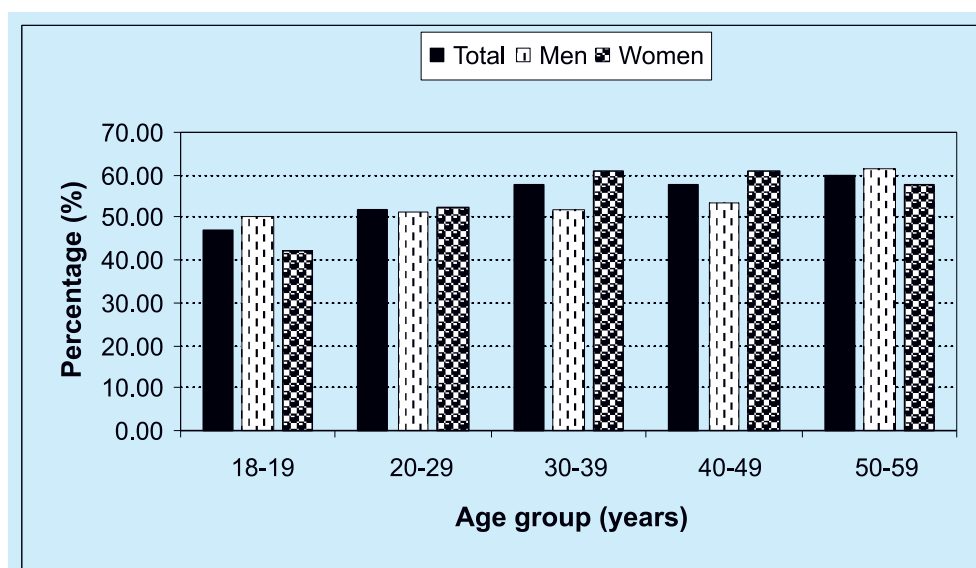


Figure 5.5.16: Median vitamin C intake as percentage of RNI by age group

Educational level

Across educational levels % intake of RNI for vitamin C was low (50% to 65%) and the difference among levels was not much. Among men % achievement was also low (53%) but quite similar across educational levels. Women's % achievement of RNI for vitamin C was slightly better than that of men about 57%. Within this group the lowest % intake was in the primary school group (53%) and highest in the Others group (64%).

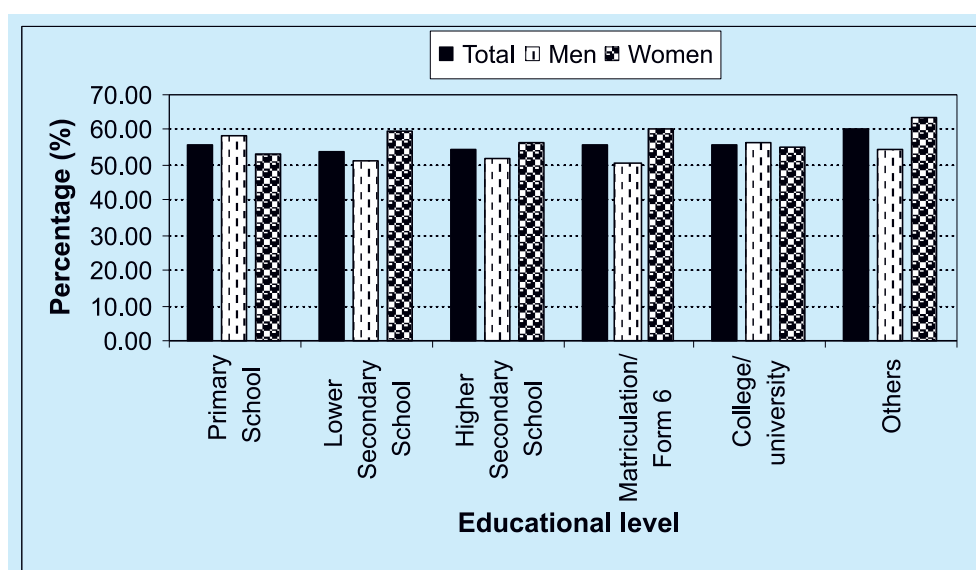


Figure 5.5.17: Median vitamin C intake as percentage of RNI by educational level

BMI status

The % achievement of RNI for vitamin C in all BMI groups was less than 60%. The underweight and obese group achieved less than 50% while the normal and overweight group achieved between 55% to 58%. In men, underweight men had the lowest intake of vitamin C (43%). In women, lowest % intake of RNI was seen in the obese category (57%) with the normal category having the highest % achievement (61%).

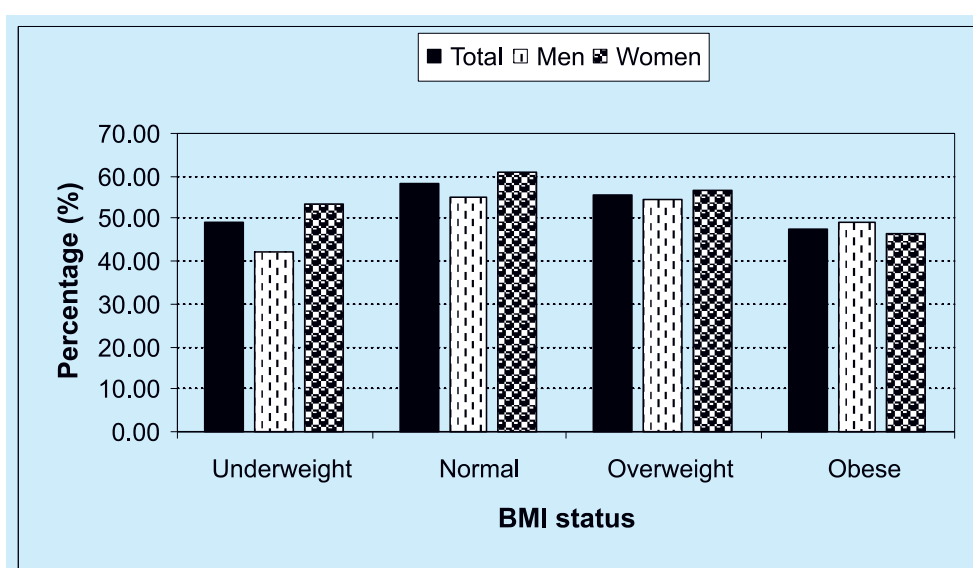


Figure 5.5.18: Median vitamin C intake as percentage of RNI by BMI status

iv. Calcium intake as percentage of RNI

Figures 5.5.19 to Figures 5.5.24 illustrate the median calcium intake as percentage of RNI for Malaysians by socio-demographic characteristics and BMI status

Zone

Overall, median calcium intake as percentage of RNI among Malaysians was less than 50% (Figure 5.5.19). Between gender, men's intake was higher than women (50% vs. 43%). Among the zones, Sarawak had the highest % intake of RNI (52%) while Northern zone had the lowest (40%). Among the other zones, % achievement of RNI ranged from 41% to 45%. In men % intake of RNI ranged from highest in Sarawak (51%) to lowest (41%) in Sabah. RNI % achievement in women in all zones was less than 50% with the lowest seen in Northern zone.

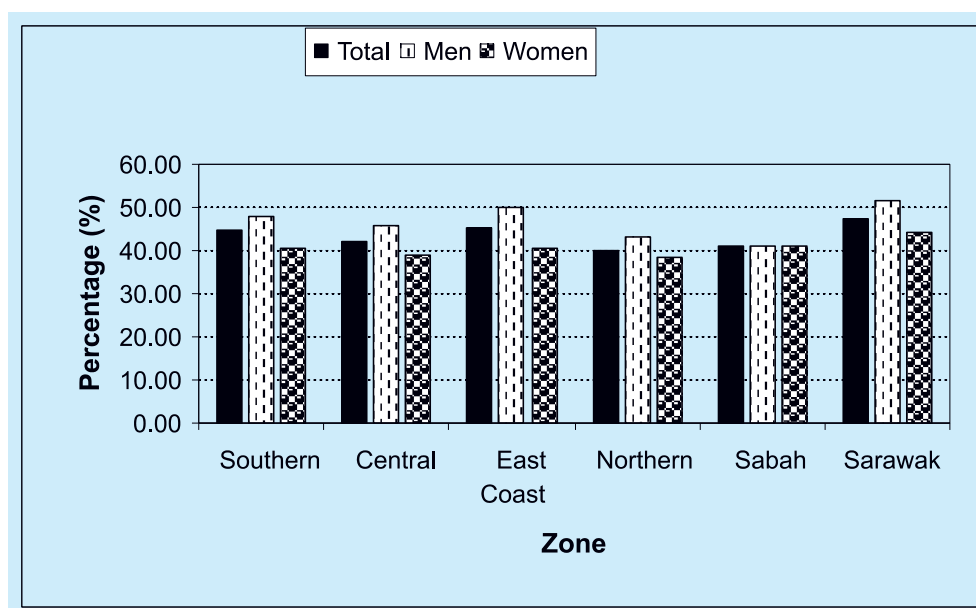


Figure 5.5.19: Median calcium intake as percentage of RNI by zone

Strata

By strata, rural residents had higher median intake of calcium as % of RNI compared to urban respondents. Urban and rural men had similar % intake of RNI for calcium (46%). Women's intakes were lower than men in both sectors.

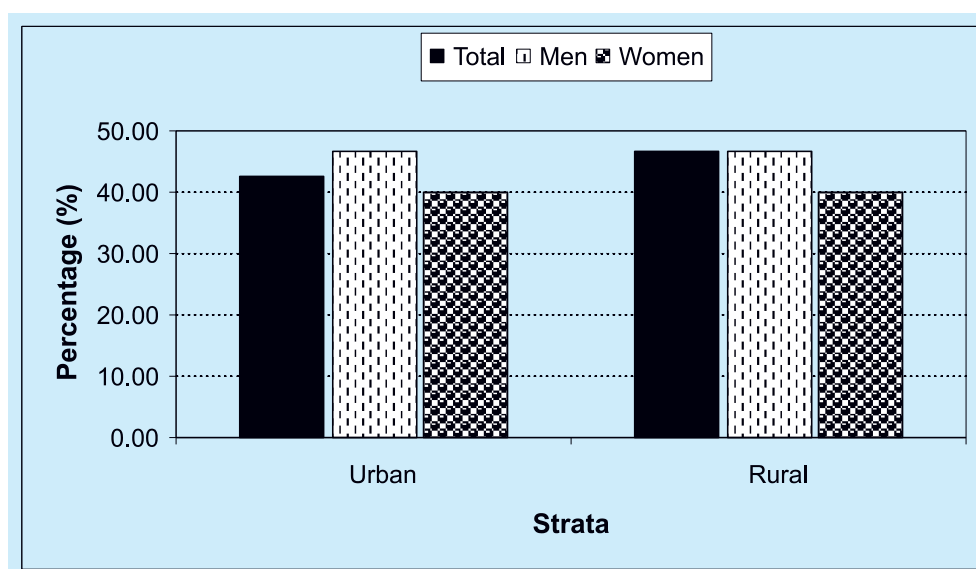


Figure 5.5.20: Median calcium intake as percentage of RNI by strata

Ethnicity

As seen in Figure 5.5.21, calcium intake was less than 50% of RNI in all-ethnic groups with Orang Asli being the lowest achiever (35%) and Sarawak, the highest (48%). Among men, Chinese men had the highest % intake while the Orang Asli men had the lowest. With the exception of Sabah Bumiputera and Sarawak, women in all ethnic groups achieved lower intakes of calcium in comparison to men with the lowest seen in Orang Asli women (33%).

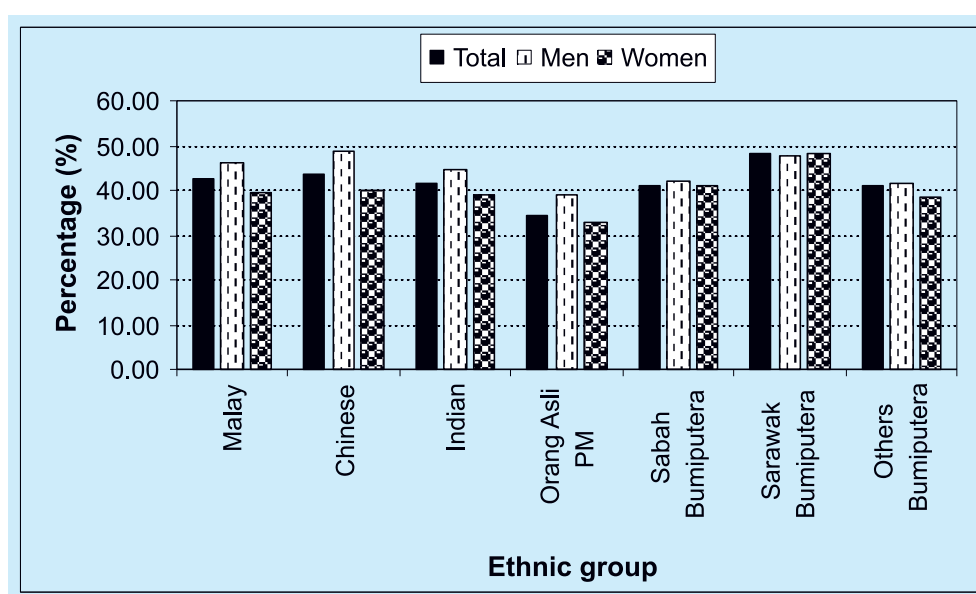


Figure 5.5.21: Median calcium intake as percentage of RNI by ethnic group

Age group

Age group analysis showed that the youngest age group had the lowest % achievement of RNI for calcium meeting only about 36%. In men, the 30 to 39 years group obtained the highest % intake of RNI while the 18 to 19 years group had the lowest. Women in youngest and oldest age groups had the lowest intake of calcium being about 34%.

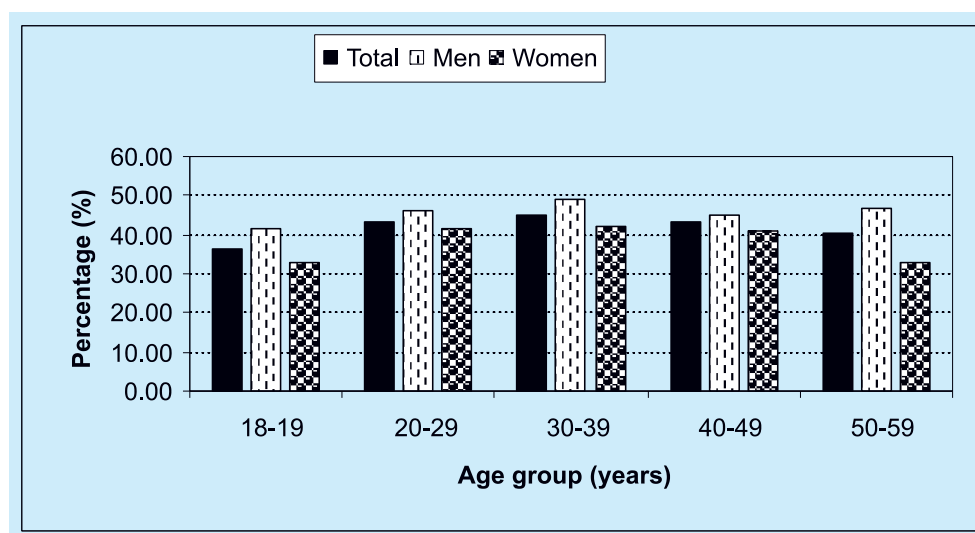


Figure 5.5.22: Median calcium intake as percentage of RNI by age group

Educational level

An increasing trend with educational level was observed for intake of calcium as % of RNI ranging from lowest (34%) in the Others group (no formal education) to highest (47%) in the college/university group. Men and women in the Others group recorded the lowest RNI achievement for calcium intake.

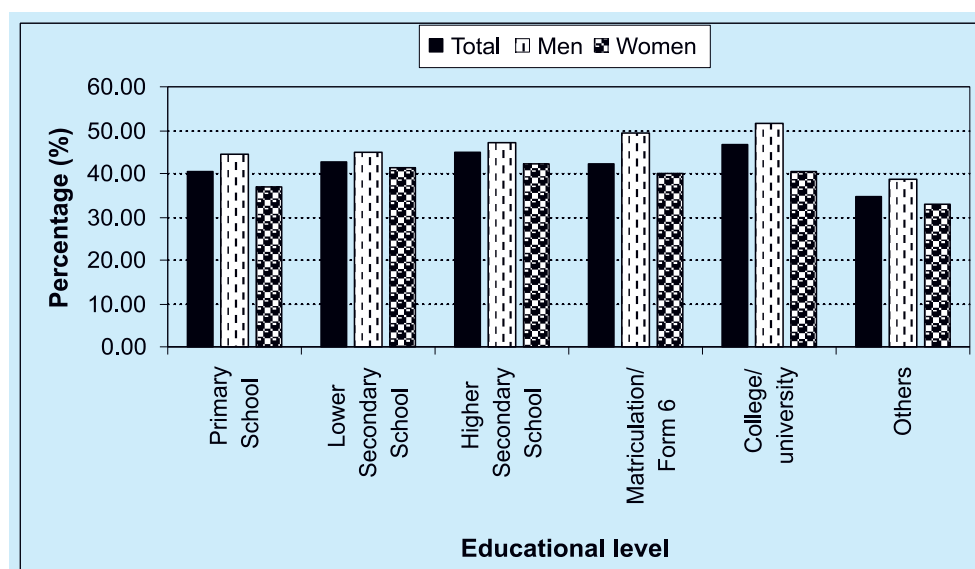


Figure 5.5.23: Median calcium intake as percentage of RNI by educational level

BMI status

Median calcium intake as percentage of RNI was lowest in the obese group (38%) and highest in the normal group. Men in the normal group had the highest % intake of RNI compared to men in other groups. A decreasing trend in % intake of RNI for calcium was seen in women with obese women having the lowest (36%).

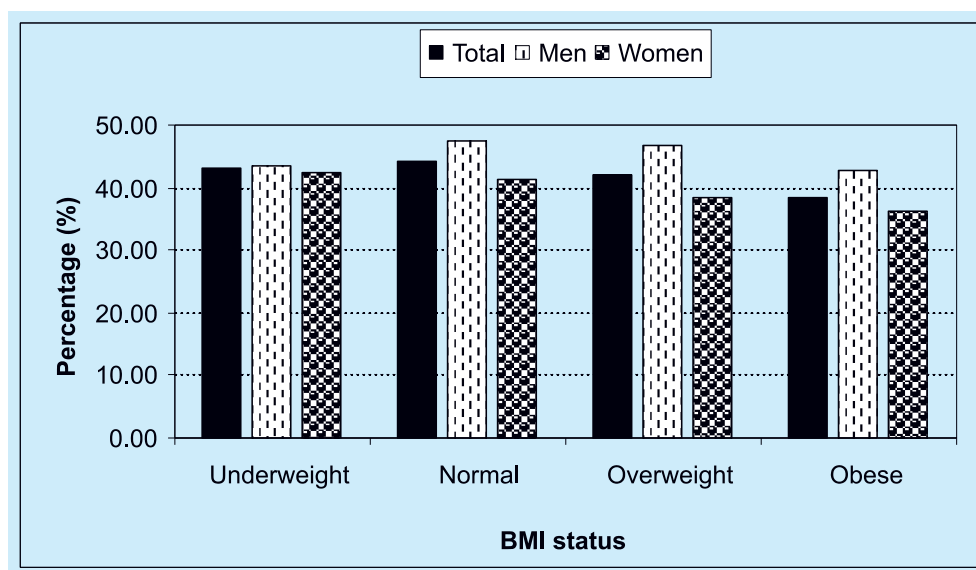


Figure 5.5.24: Median calcium intake as percentage of RNI by BMI status

v. Iron intake as percentage of RNI

Figures 5.5.25 to Figures 5.5.30 illustrate the median iron intake as percentage of RNI for Malaysians by socio-demographic characteristics and BMI status.

Zone

As shown in Figure 5.5.25, % intake of RNI for iron ranged from about 43% in Southern zone to 71% in Sarawak. Men's % achievement was generally higher than women with Sarawak men showing the highest % achievement (72%), followed by East Coast men (70%) and lowest in Central and Sabah. Women's % intake of RNI fell to about 30% in all zones.

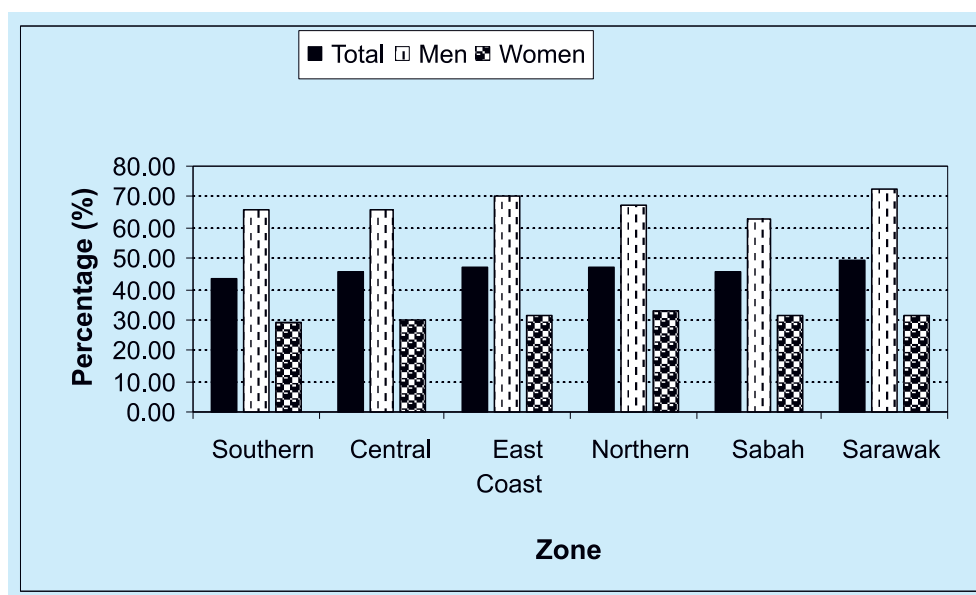


Figure 5.5.25: Median iron intake as percentage of RNI by zone

Strata

By strata, rural respondents had higher % of RNI intake for iron was about 5% to 7% higher compared to urban residents. Urban and rural men had almost similar % intake of iron, which were higher than women's intake in both areas. Women in both strata were similar in their iron intake, which was only 30% of RNI.

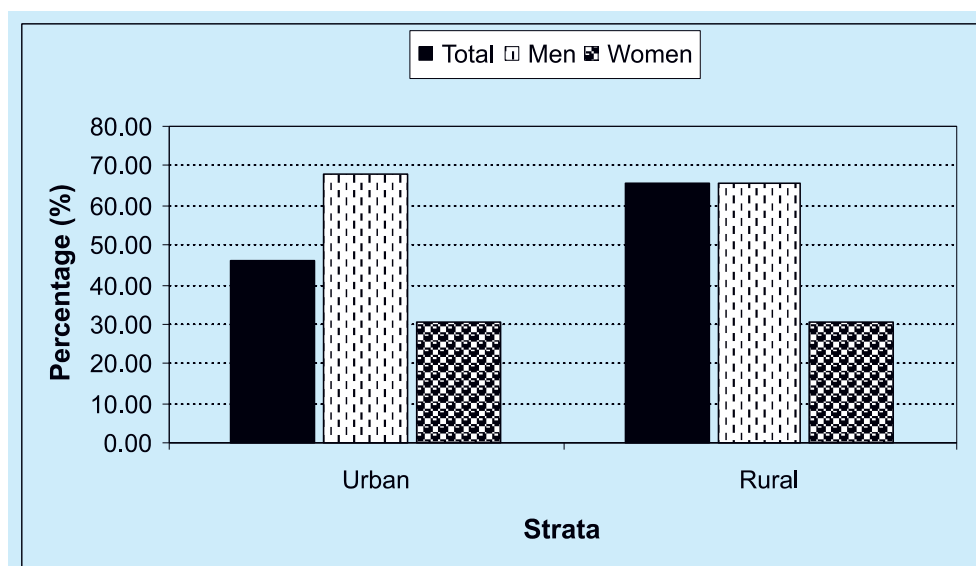


Figure 5.5.26: Median iron intake as percentage of RNI by strata

Ethnicity

The intake of iron was less than 50% of RNI in all-ethnic groups. Yet, among these groups the intake of Orang Asli was far less than other groups being only one-fifth of RNI followed by Other Bumiputera (37%). Men's intake of iron as % of RNI was lowest (57%) in the Indian group and highest in the Chinese (69%). Generally, women across all ethnic groups had lower median intake of iron as % of RNI and Orang Asli PM women had the lowest (15%).

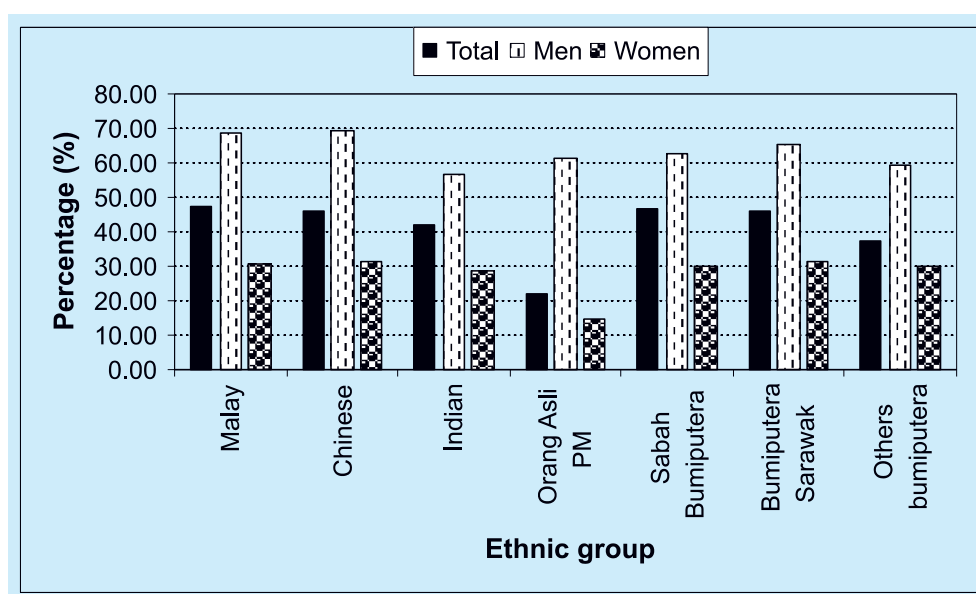


Figure 5.5.27: Median iron intake as percentage of RNI by ethnic group

Age group

By age groups, iron intake as % of RNI was lowest in youngest age group (38%) and highest in the oldest age group (64%) recording an increase of about 26%. Men generally recorded much higher intakes than women in all age groups. In women, % intake of RNI was almost similar in all age groups with the exception of the 50 to 59 years group in which iron intake exceeded by about 40%.

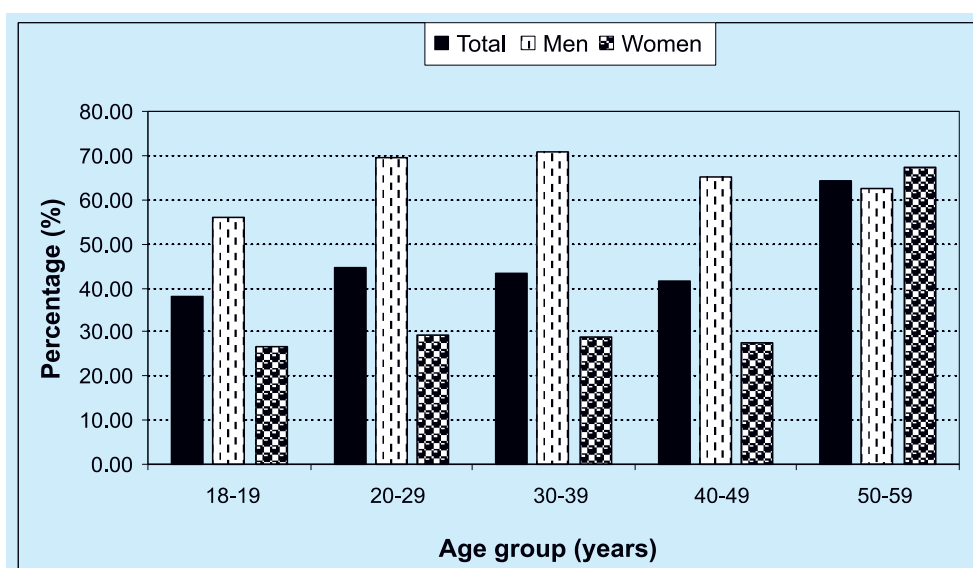


Figure 5.5.28: Median iron intake as percentage of RNI by age group

Educational level

The college/university group had the highest % achievement of RNI for iron (52%) while the Others group had the lowest (39%). In men, those with college/university education had the highest intake (74%) and men in Others group had the lowest (47%). Women across all educational levels had iron intakes achieving less than 35%, but the variation among the groups was little.

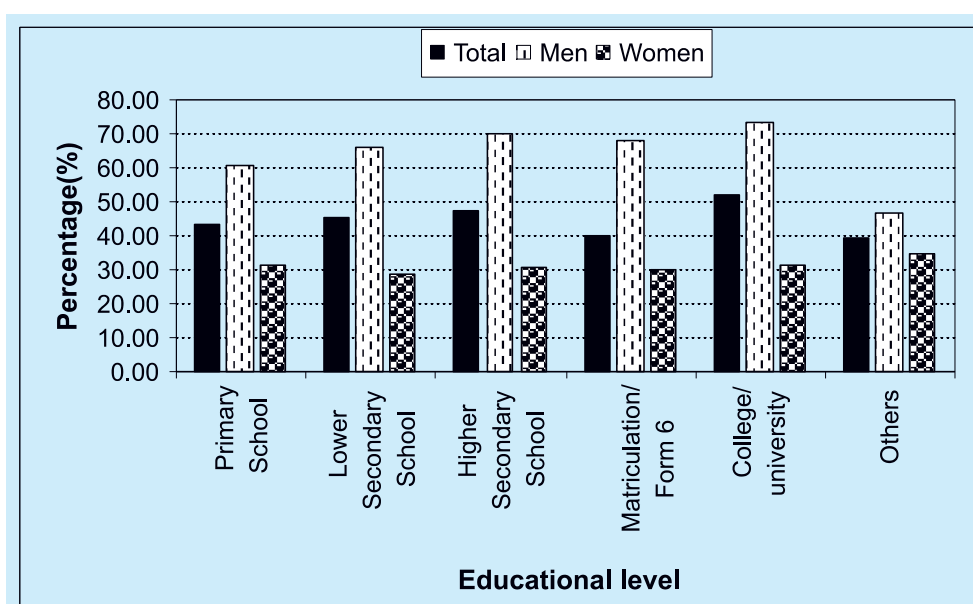


Figure 5.5.29: Median iron intake as percentage of RNI by educational level

BMI status

Percentage of RNI for iron across BMI categories was less than 50%. Among the groups, the obese group had the lowest intake (40%) and overweight group had the highest (50%). In men lowest % achievement was seen in the underweight group and highest in the overweight group. Women were similar in RNI % intake across the BMI groups.

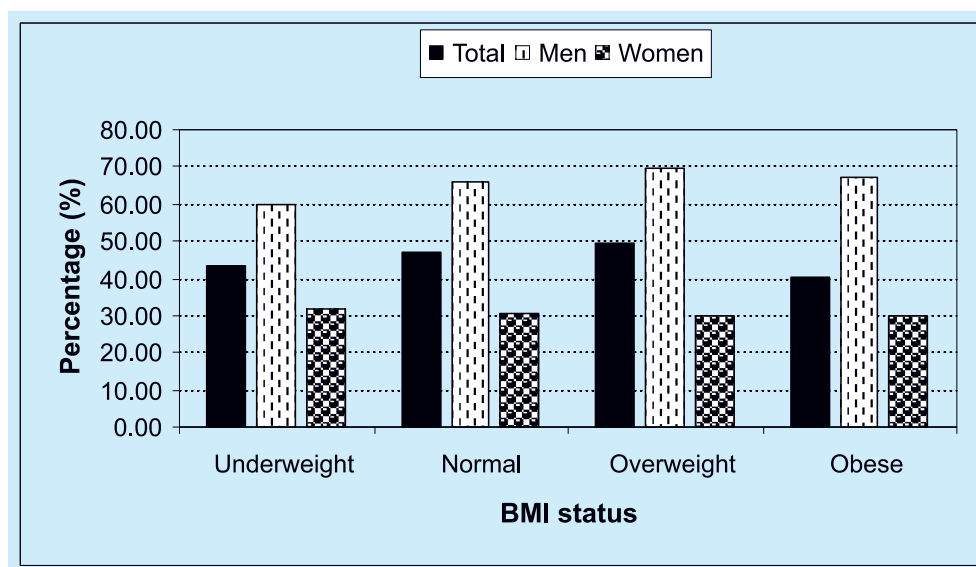


Figure 5.5.30: Median iron intake as percentage of RNI by BMI status

vi. Vitamin A intake as percentage of RNI

Figures 5.5.31 to Figures 5.5.36 illustrate the median vitamin A intake as percentage of RNI for Malaysians by socio-demographic characteristics and BMI status

Zone

Sarawak had the highest % intake of RNI for vitamin A (90%), which was about 20% higher than the rest of the zones (Figure 5.5.31). Intake of the other zones ranged from 72% in Northern zone to 62% in Central zone. Sarawak men had the highest percentage of RNI for vitamin A (91%), while it was lowest in Central zone men (64%). Women's % intake of RNI was generally lower than men across the zones with the exception of Sarawak where it was similar to that of their male counterparts.

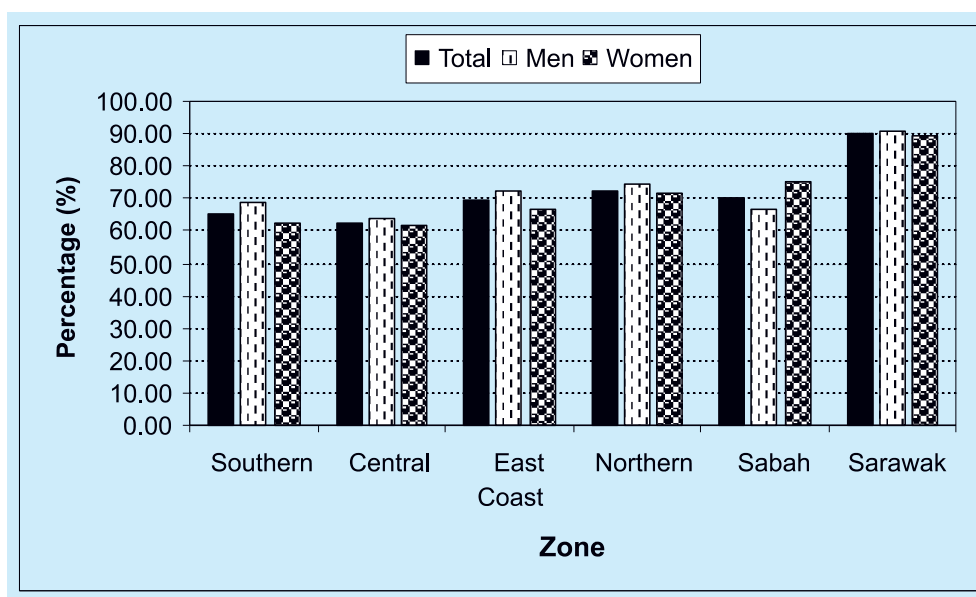


Figure 5.5.31: Median vitamin A intake as percentage of RNI by zone

Strata

By strata, the differences in % intake of RNI for vitamin A between the rural and urban sectors were clearly evident being about 8% higher in the rural sector. Similarly, rural men and women had higher intakes than the urban residents.

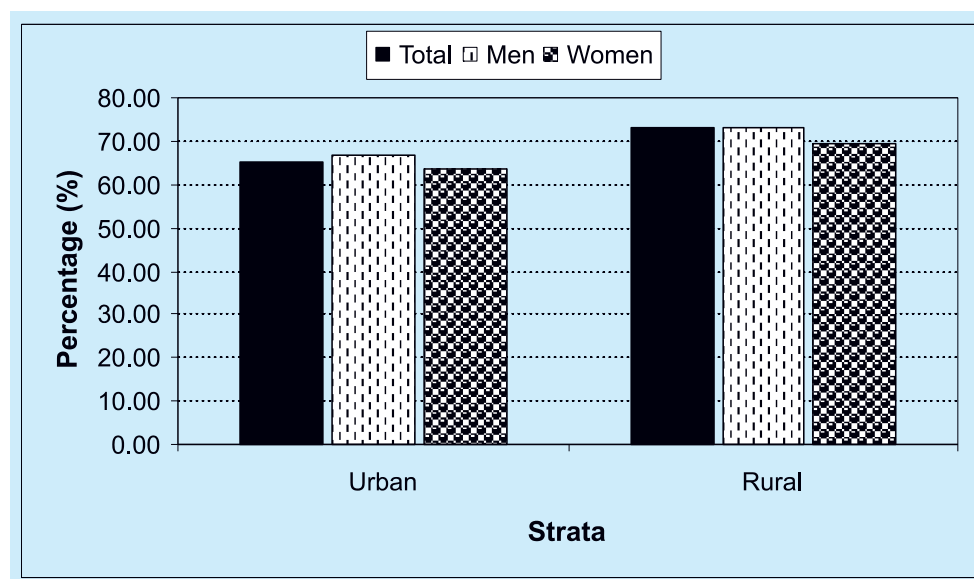


Figure 5.5.32: Median vitamin A intake as percentage of RNI by strata

Ethnicity

By ethnic group, Sarawak Bumiputera was found to have the highest adequacy of RNI for vitamin A (90%) while Orang Asli had the lowest intake (38%). Men in Sarawak had the highest intake (84%), followed by Sabah men (69%), while the lowest was seen in Indian and Other Bumiputera groups (58%). Among women, Sarawak women had almost 100% adequacy of RNI while women in all other groups achieved less than 80% with Orang Asli women showing extremely poor intake (15%).

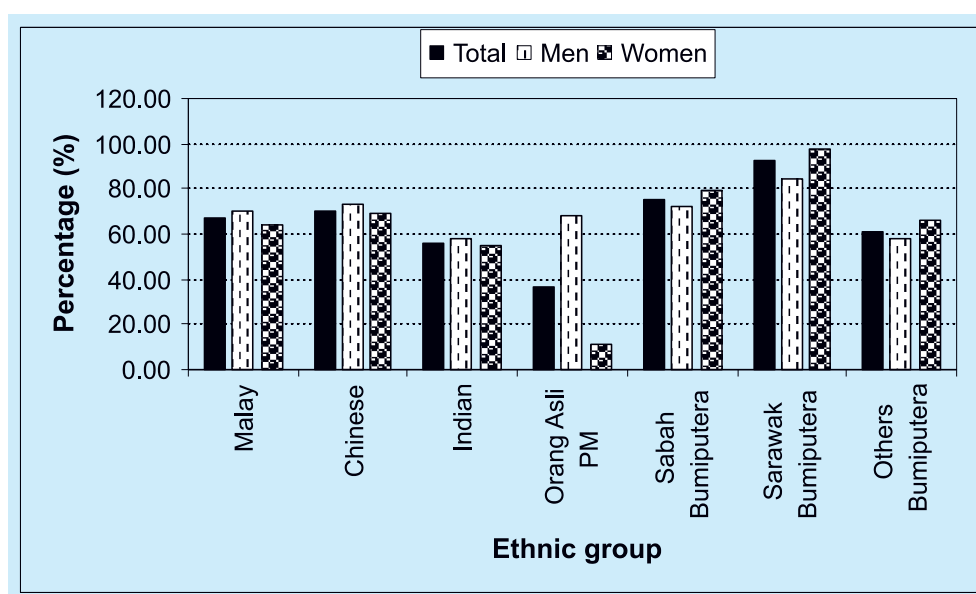


Figure 5.5.33: Median vitamin A intake as percentage of RNI by ethnic group

Age group

All age groups achieved less than 75% of RNI for vitamin A. The youngest age group's intake was only 60% of RNI while that of the oldest group met about 68%. Men generally were found to have better intakes in comparison to women. Females in the 18 to 19 age groups had the lowest % of RNI for vitamin A intake (50%).

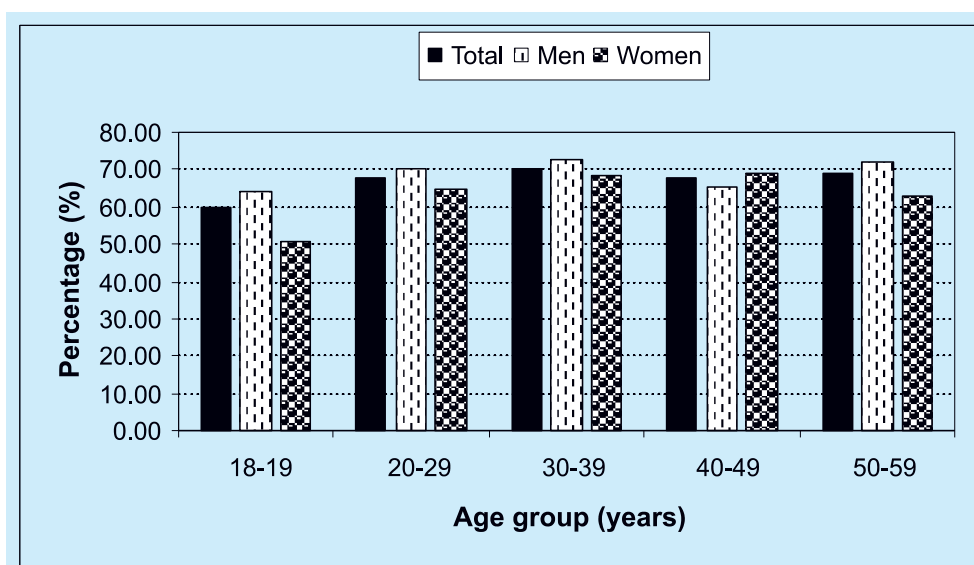


Figure 5.5.34: Median vitamin A intake as percentage of RNI by age group

Educational level

Vitamin A intake increased with increasing educational status from about 61% in the Others group to 72% in the college educated group. A similarity in intake across the groups was seen in men being around 70% with the exception of the Others group in which intake was only about 55% of RNI. Women's intake was generally similar to that of men in all age groups, while women with college or university level of education has the lowest % of RNI among all the women.

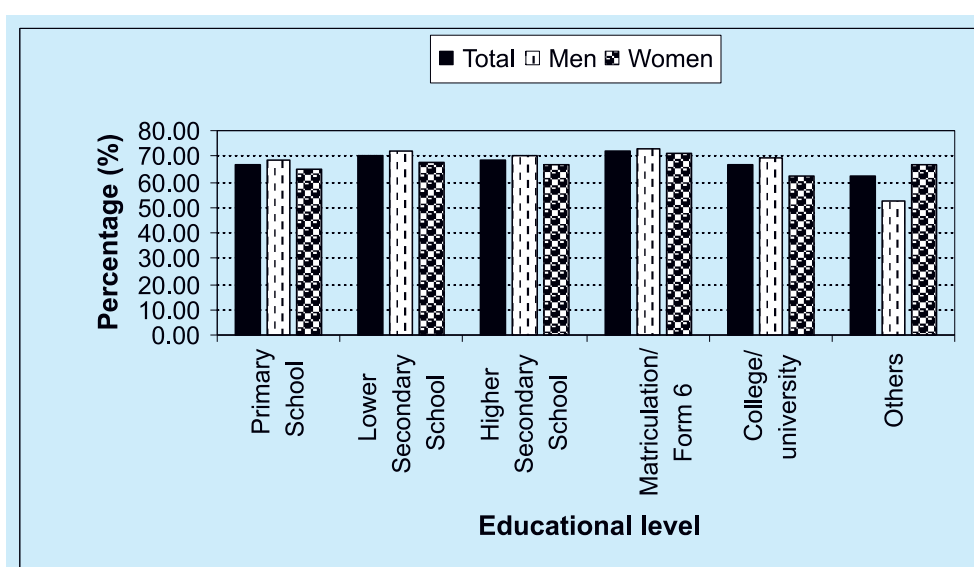


Figure 5.5.35: Median vitamin A intake as percentage of RNI by educational level

BMI status

By BMI categories, the obese group was found to have the lowest % of RNI for vitamin A intake (60%) followed by the underweight group. Similarly, obese men and women had lower intakes compared to their counterparts in other groups.

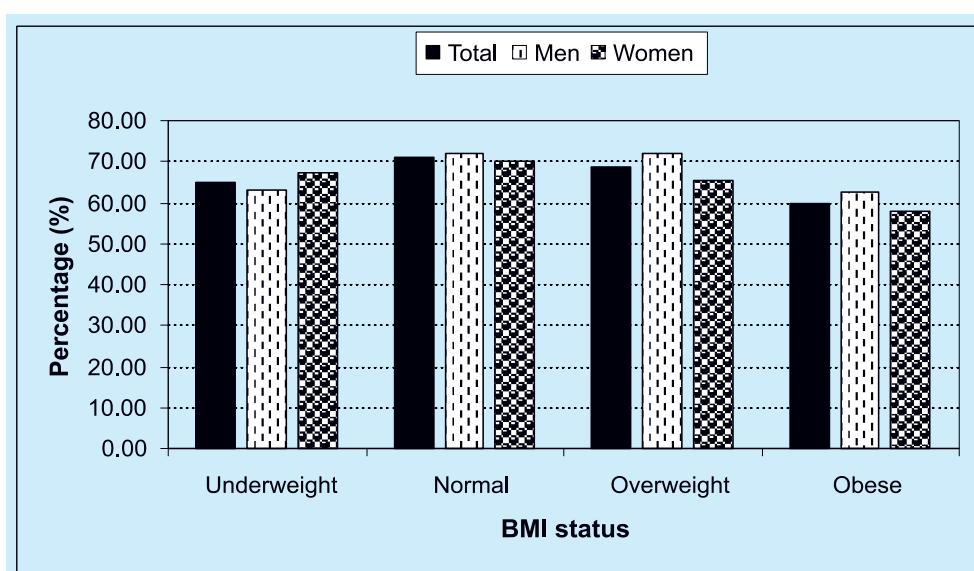


Figure 5.5.36: Median vitamin A intake as percentage of RNI by BMI status

vii. Thiamin intake as percentage of RNI

Figures 5.5.37 to Figures 5.5.42 illustrate the median thiamin intake as percentage of RNI for Malaysians by socio-demographic characteristics and BMI status. Malaysians in general were found to consume only about 56% of RNI for thiamin with the intake being about 58% in men and 55% in women.

Zone

Sabah was found to have the lowest adequacy for thiamin intake (49.5%), while the Southern zone had the highest (61%). Men in the Southern zone and in Sarawak have the highest % of RNI (above 60%) while Sabah men had the lowest intake (48%). Intake of women declined from about 59% in the Southern zone to 51% in Sabah.

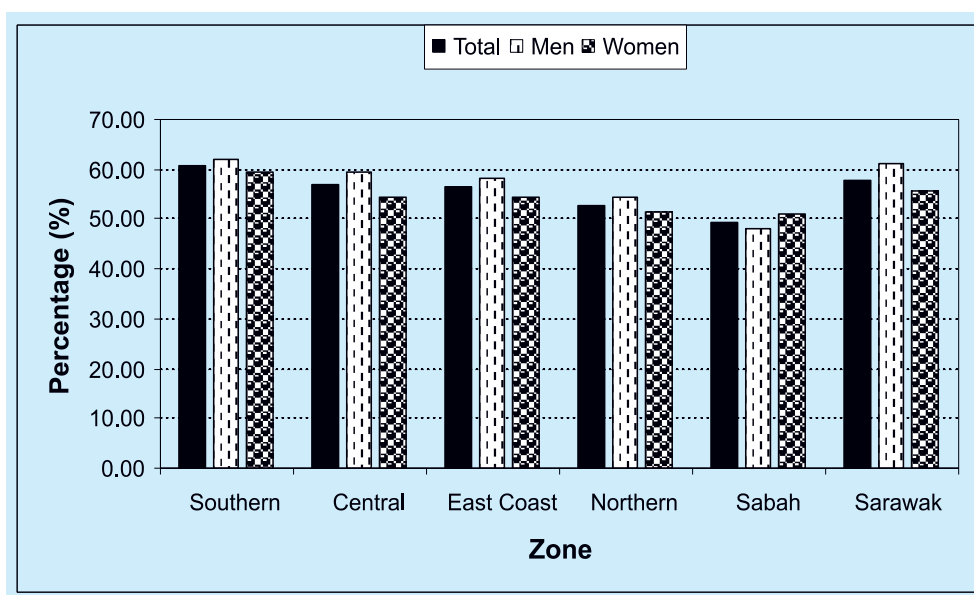


Figure 5.5.37: Median thiamin intake as percentage of RNI by zone

Strata

By strata, % intake of RNI for thiamin was slightly higher in the urban as compared to the rural population. The distribution was similar among men and women, as those who are residing in the urban areas have higher % of RNI compared to those in the rural areas.

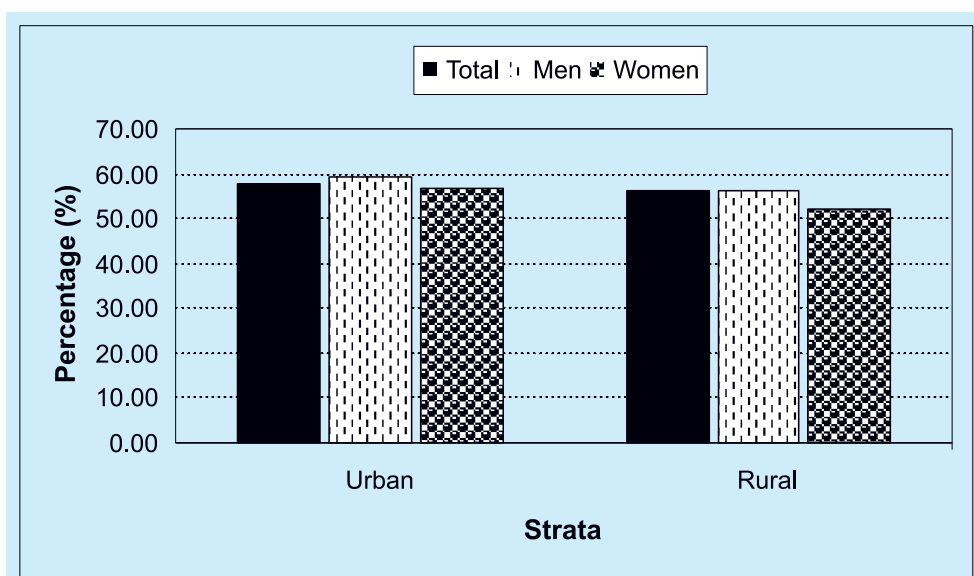


Figure 5.5.38: Median thiamin intake as percentage of RNI by strata

Ethnicity

By ethnic group, the Chinese community had the highest % of RNI for thiamin intake (63%), followed by the Indian group (61%) while the Orang Asli group, the lowest (41%). Men and women in the Orang Asli community were also the lowest achievers for thiamin intake being 43% and 36% respectively.

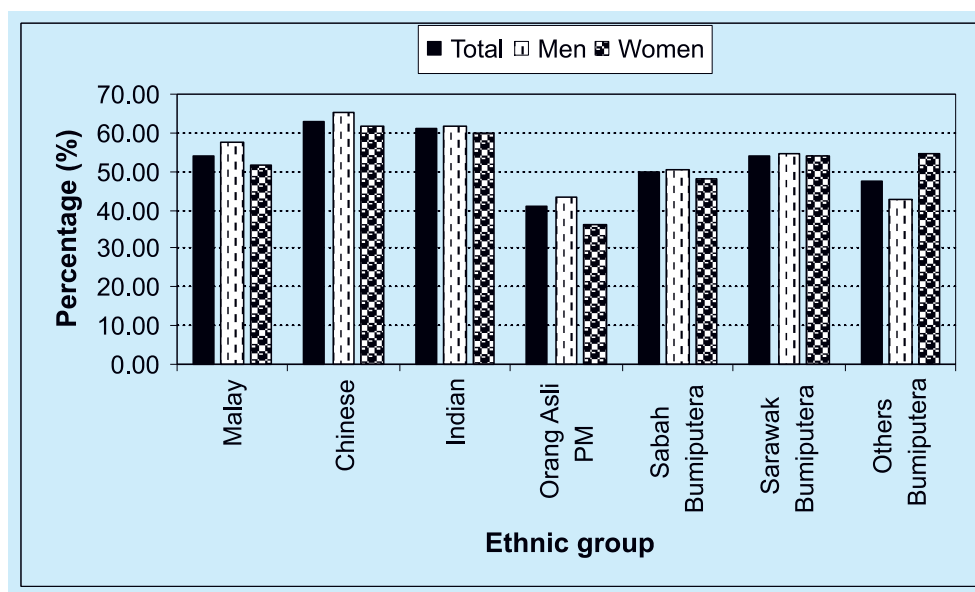


Figure 5.5.39: Median thiamin intake as percentage of RNI by ethnic group

Age group

Intake of thiamin increased from 53% in the youngest (53%) to 58% in the 30 to 39 years group after which it declined by 3% in the oldest age group (55%). Men in the 30 to 39 age group had the highest intake (61%) while their counterparts in the 50 to 59 years group had the lowest (57%). In women, adequacy of thiamin intake was lowest in the youngest group (50.5%).

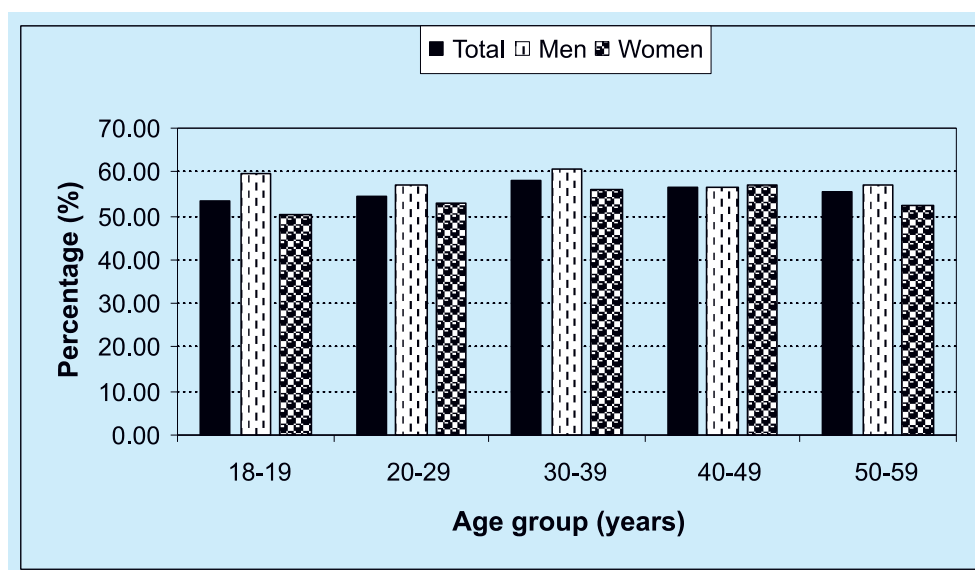


Figure 5.5.40: Median thiamin intake as percentage of RNI by age group

Educational level

By educational level, the highest % of RNI for thiamin intake was observed in college and university category (61%) and the lowest in the Others category (42.5%). A similar trend was observed in both sexes.

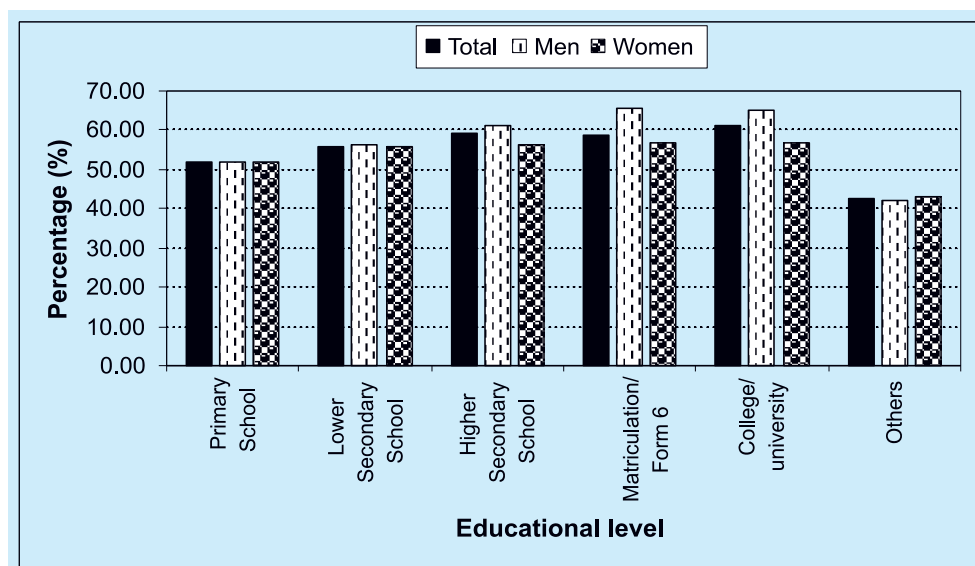


Figure 5.5.41: Median thiamin intake as percentage of RNI by educational level

BMI status

By BMI status, those in the normal BMI category have the highest % of RNI for thiamin intake. Conversely, those who are obese had the lowest intake (53%). In men, intake increased from 53% in the underweight group to 59.5% in the overweight group after which it fell to 55% in the obese group. Conversely, women in the underweight group had the highest intake (59%) while obese females took just about 50% of RNI for this nutrient.

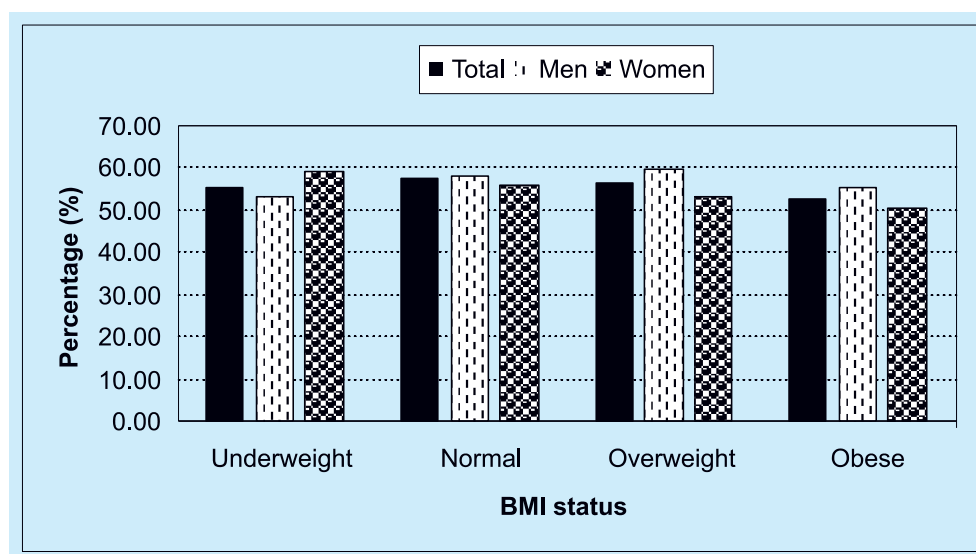


Figure 5.5.42: Median thiamin intake as percentage of RNI by BMI status

5.5.3 Median percentage of energy from macronutrient by socio-demographic characteristics and BMI status

i. Percentage of energy from macronutrients for total population

Almost 59% of the energy intake of the population comes from carbohydrate, while the remaining 26.8% and 14.3% comes from fat and protein respectively (Figure 5.5.43).

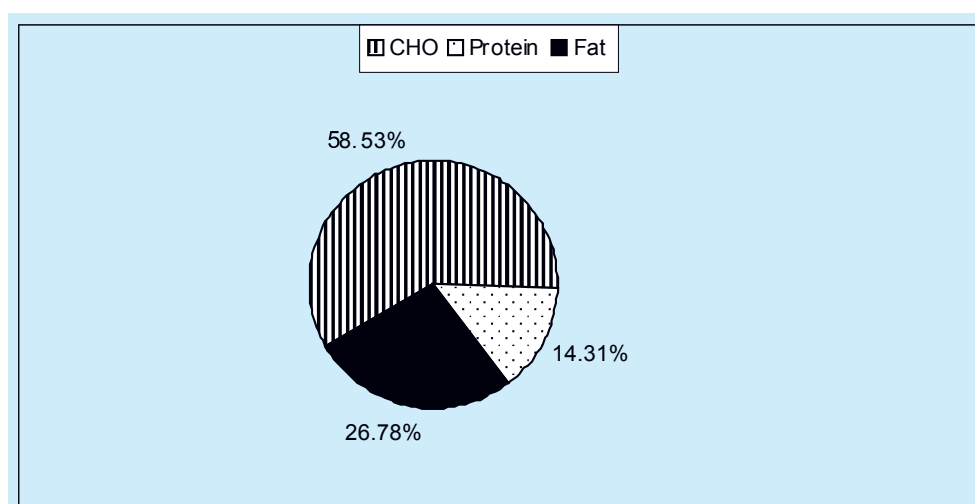


Figure 5.5.43: Median percentage of energy from macronutrients for total population

ii. Percentage of energy from macronutrients In men and women

Men's consumption of energy from carbohydrates was about 59% while it was about 27% from fat and 14% from protein (Figure 5.5.44). Contribution of macronutrients in the diets of women were almost similar to that of men (Figure 5.5.45).

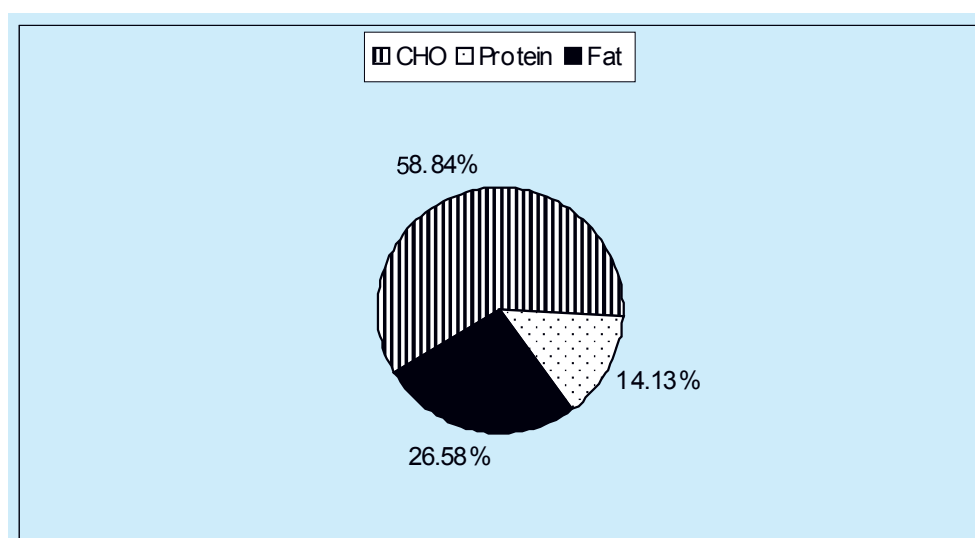


Figure 5.5.44: Median percentage of energy from macronutrients in men

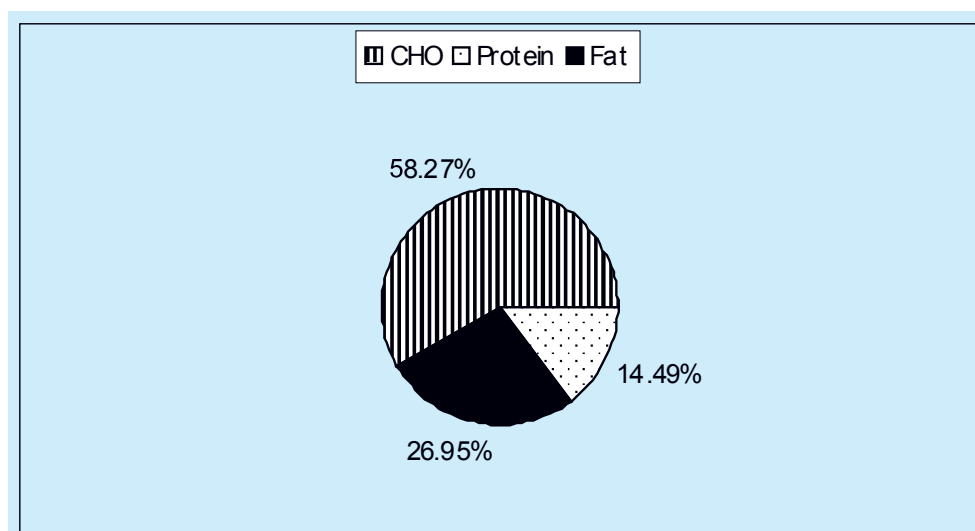


Figure 5.5.45: Median percentage of energy from macronutrients for women

iii. Percentage of energy from macronutrients for total population by zone

The trend in energy consumption from carbohydrates across the zones was almost similar (60%) except for Sarawak where it was around 56%. Fat % energy ranged from 25% in East Coast to about 28% in the Southern zone. As for protein energy contribution, little variation was seen across zones.

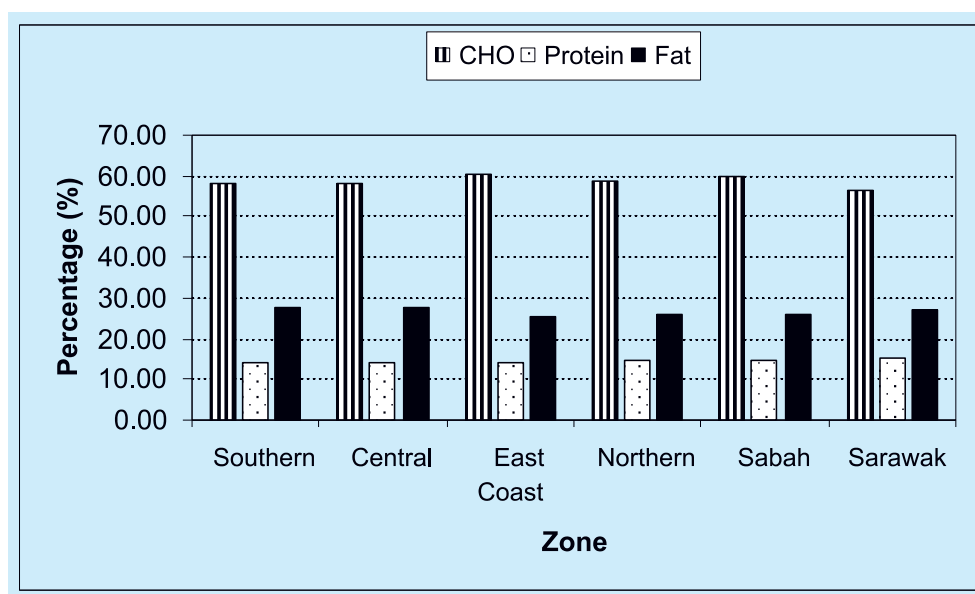


Figure 5.5.46: Median percentage of energy from macronutrients for total population by zone

iv. Percentage of energy from macronutrients In men and women by zone

As shown in Figure 5.5.47, men in the all the zones had similar % energy intake from carbohydrates (60%) with the exception of Sarawak where it was lower (56%). No marked variation in energy intake from protein was seen among men in all zones. Some differences in fat contribution to total energy intake was observed with highest being in Southern men (29%) compared to lowest in East Coast and Sabah men (25%). In women, carbohydrate contribution to energy intake was highest in the East Coast (60%) and lowest in Sarawak (56%). Protein contribution to energy in women's' diets was quite similar across zones and ranged between 15% to 17%. Women in Sarawak, Southern and Central zones had the highest intakes of energy from fat while lowest was observed in East Coast (Figure 5.5.48).

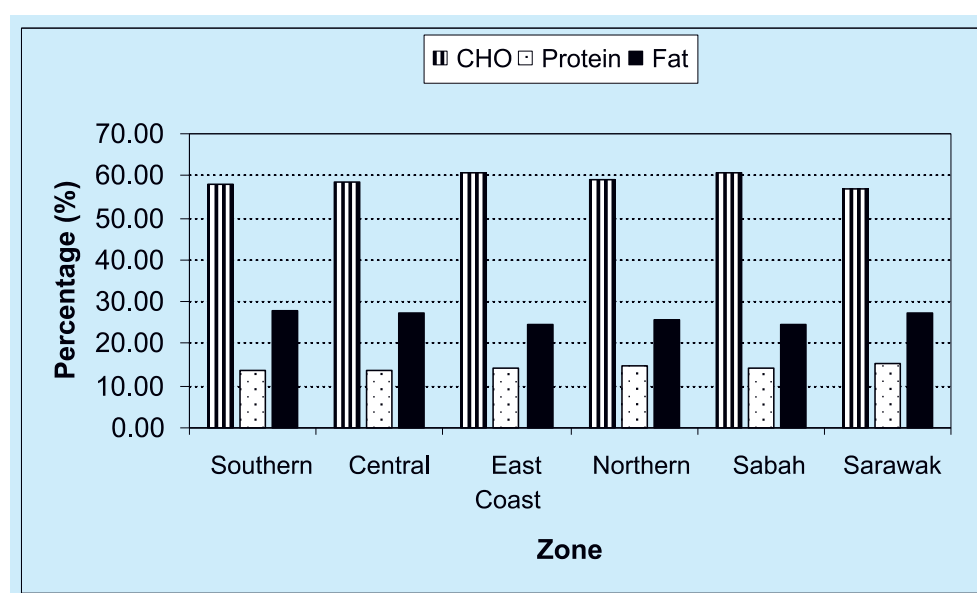


Figure 5.5.47: Median percentage of energy from macronutrients for men by zone

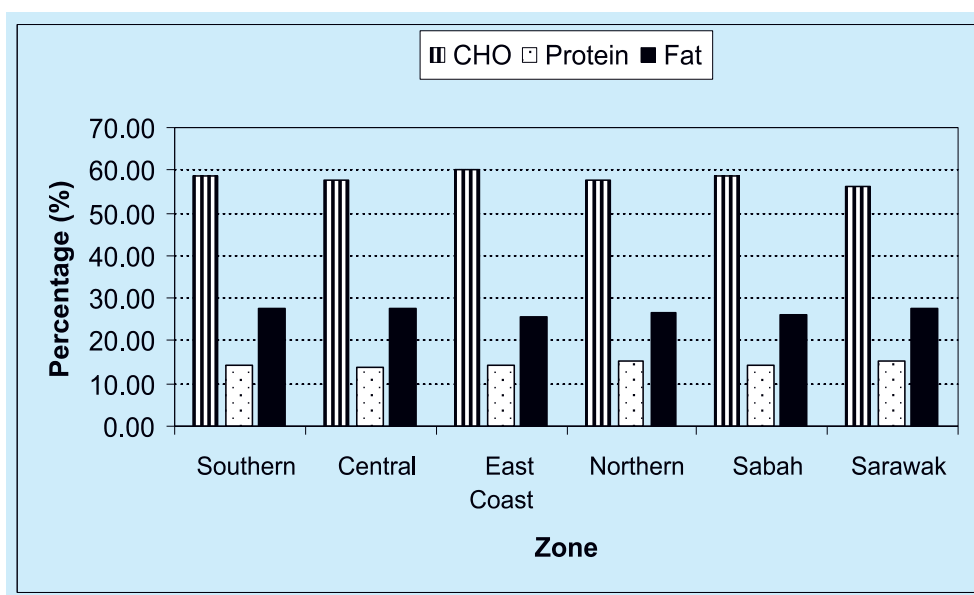


Figure 5.5.48: Median percentage of energy from macronutrients for women by zone

v. Median percentage of energy from macronutrients for total population by strata

By strata, subjects in rural areas consumed a slightly greater proportion of energy from carbohydrate as compared to urban respondents (60% vs. 57%). Fat contribution to energy intake was lower by 2% in rural subjects while that of protein was similar in both areas (14%).

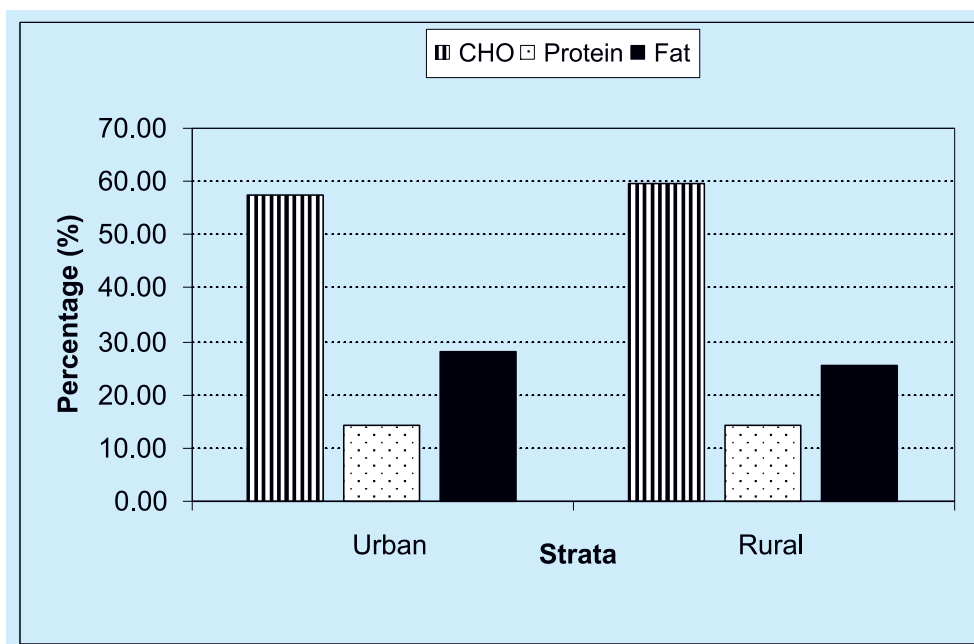


Figure 5.5.49: Median percentage of energy from macronutrients for total population by strata

vi. Median percentage of energy from macronutrients in men and women by strata

Rural men tend to consume slightly more energy from carbohydrate as compared to their urban counterparts while energy from fat was found to be a little lower in men residing in the rural areas (27% vs. 25%) (Figure 5.5.50). Carbohydrate contribution to energy intake by women was higher by about 3% in the rural sector (59%) compared to that of the urban sector. Percentage energy intake from protein in women remained at about 14% in both areas. The consumption of fat % energy in rural women was found to be more by about 3% compared to urban women (25%). (Figure 5.5.51).

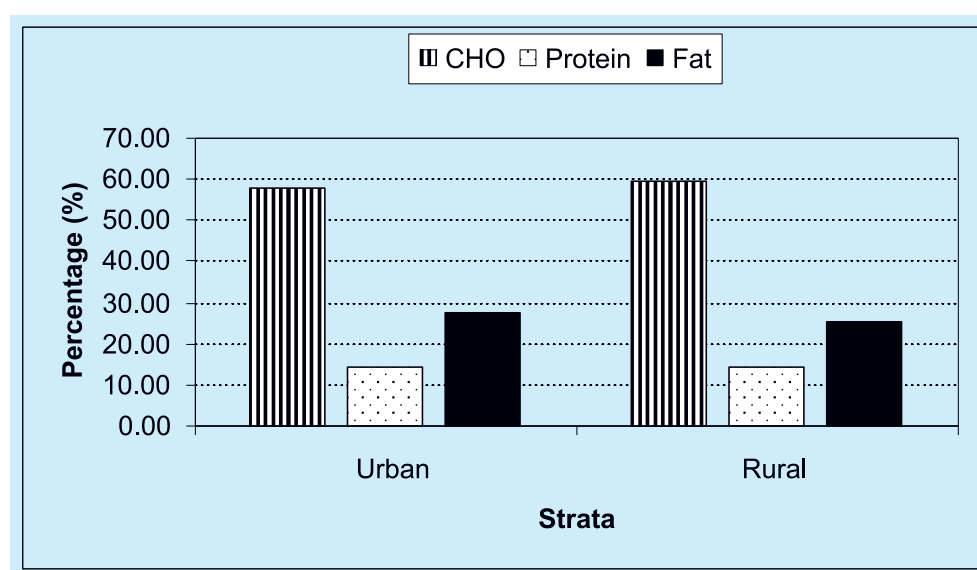


Figure 5.5.50: Median percentage of energy from macronutrients for men by strata

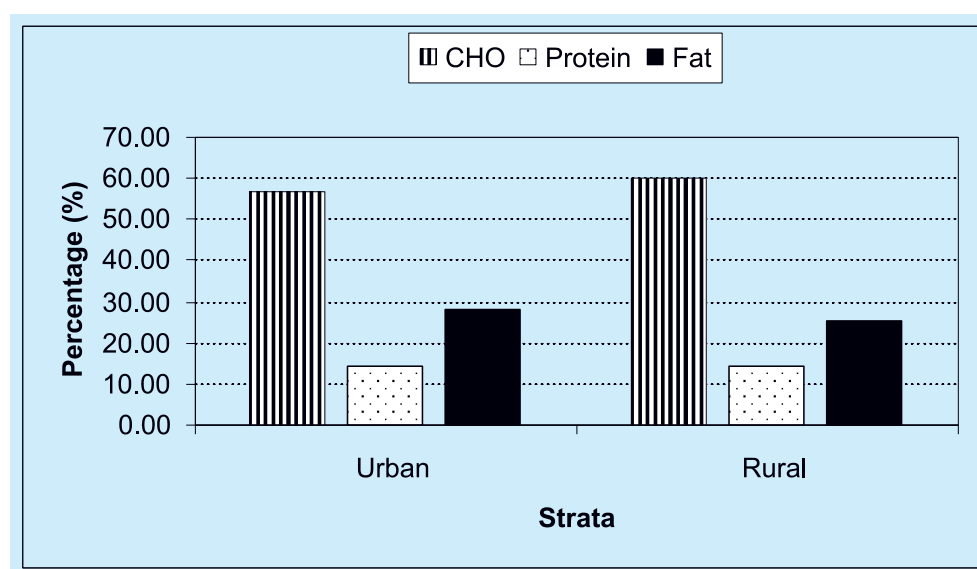


Figure 5.5.51: Median percentage of energy from macronutrients for women by strata

vii. Median percentage of energy from macronutrients for total population by ethnic group

By ethnic group, Orang Asli in Peninsular Malaysia were found to consume the highest % of energy from carbohydrate of more than 70%. The lowest consumption of carbohydrate energy was in the Chinese community (54%). Energy contribution of protein intake was lowest in the Orang Asli group (12.4%) followed closely by the Indian group (13%). As for fat intake, Orang Asli consumed the lowest % of energy (15%) while the Chinese consumed the highest (30%).

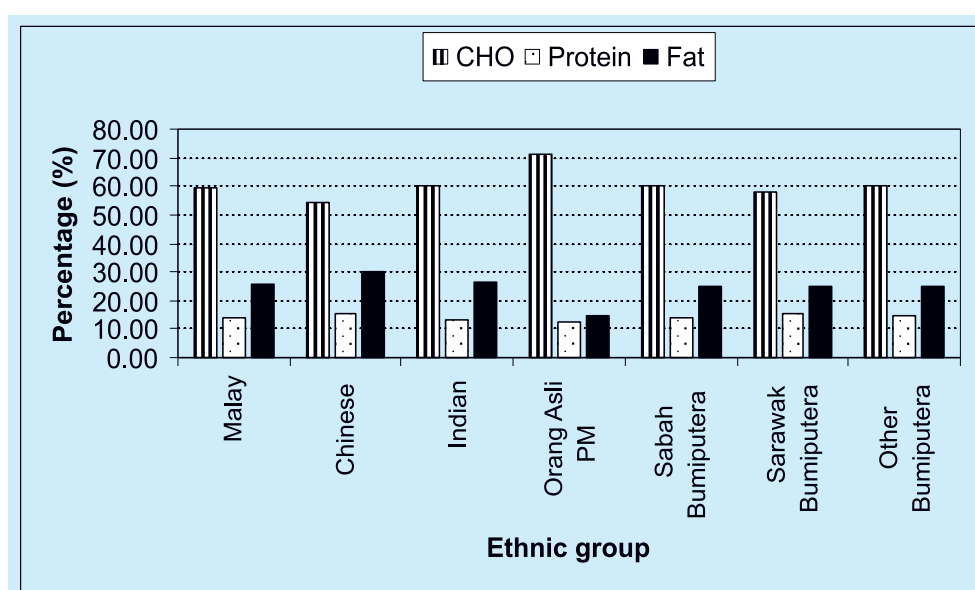


Figure 5.5.52: Median percentage of energy from macronutrients for total population by ethnic group

viii. Median percentage of energy from macronutrients in men and women by ethnic group

Taking sexes separately, a similar trend was observed in men, where Orang Asli men had the highest % of energy intake from carbohydrate (76%), while the lowest was observed in Chinese males (55%) as seen in Figure 5.5.53. The lowest % energy from fat intake was also in Orang Asli men being about 10% only while in Chinese men it was the highest. In women, percent energy contribution from carbohydrates ranged from a high 70% highest in Orang Asli women to about 52% in Chinese women (Figure 5.5.54). The consumption of energy from protein did not differ much between ethnic groups. Similar to the distribution in men, Orang Asli women consumed slightly more than 10% of energy from fat, while the highest consumption of fat energy was seen in Chinese women (30%).

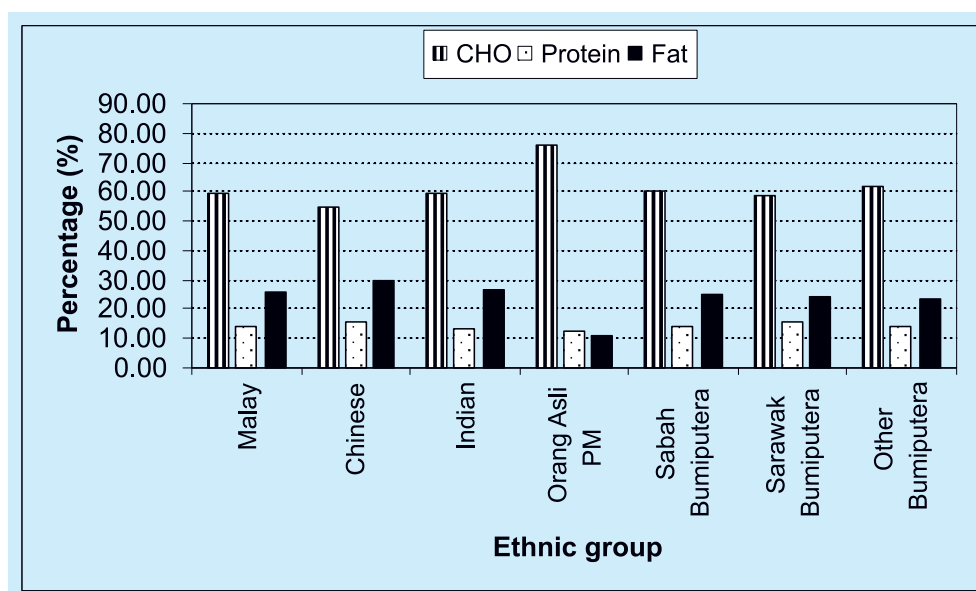


Figure 5.5.53: Median percentage of energy from macronutrients for men by ethnic group

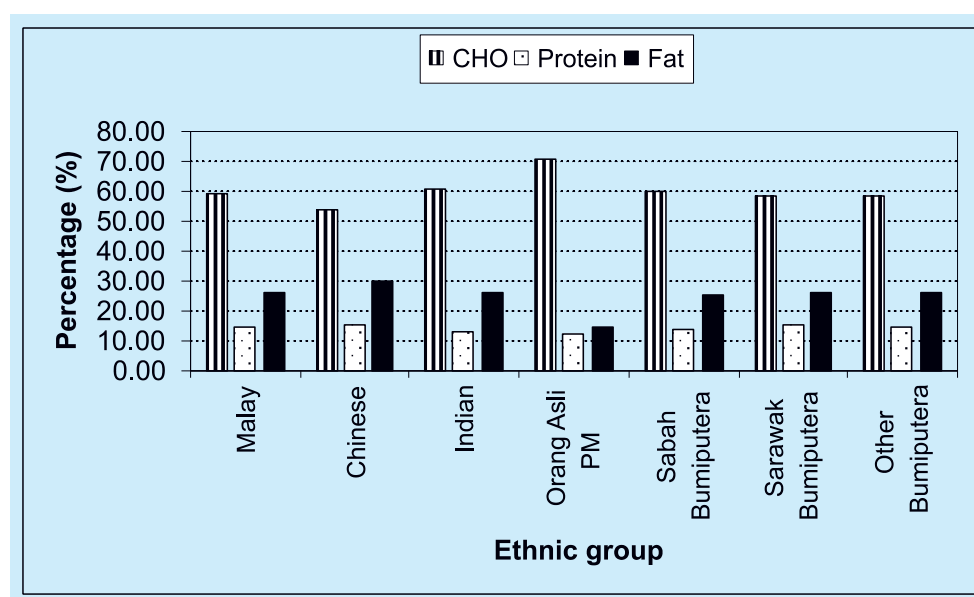


Figure 5.5.54: Median percentage of energy from macronutrients for women by ethnic group

ix. Median percentage of energy from macronutrients for total population by age group

The energy intake from macronutrients does not differ much across the age group although there appears to be gradual increase in intake from lowest in the youngest group (57%) to highest in the oldest group (59%). Protein contributed to about 14% of the energy across age groups while fat intake decreased with age being highest in the youngest group and least in the oldest group (28% vs. 25%).

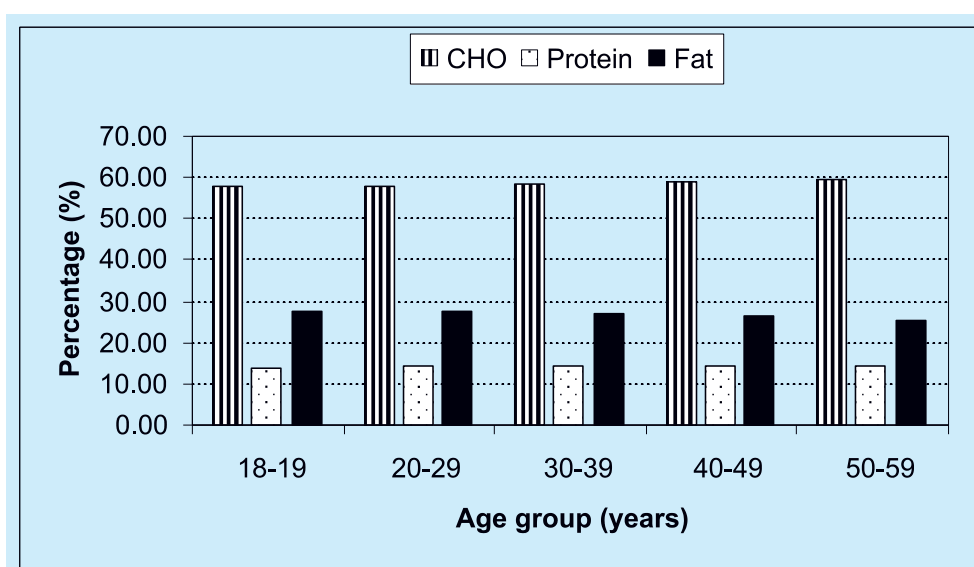


Figure 5.5.55: Median percentage of energy from macronutrients for total population by age group

x. Median percentage of energy from macronutrients in men and women by age group

In both men and women (Figure 5.5.56 & figure 5.5.57), the intake of fat % decreased with age being highest in the youngest group and lowest in the oldest group. For carbohydrate intake, % energy increased by about 2% from 57% in the 18 to 19 years group to 59% in the oldest group in women while in men, it almost similar among all age groups. Fat % intake declined with age in both sexes. In men, intake reduced from 27% in the youngest group to 25.4% in the oldest group while in women it dropped by nearly 3% from 28% in the youngest group to 25% in the oldest group.

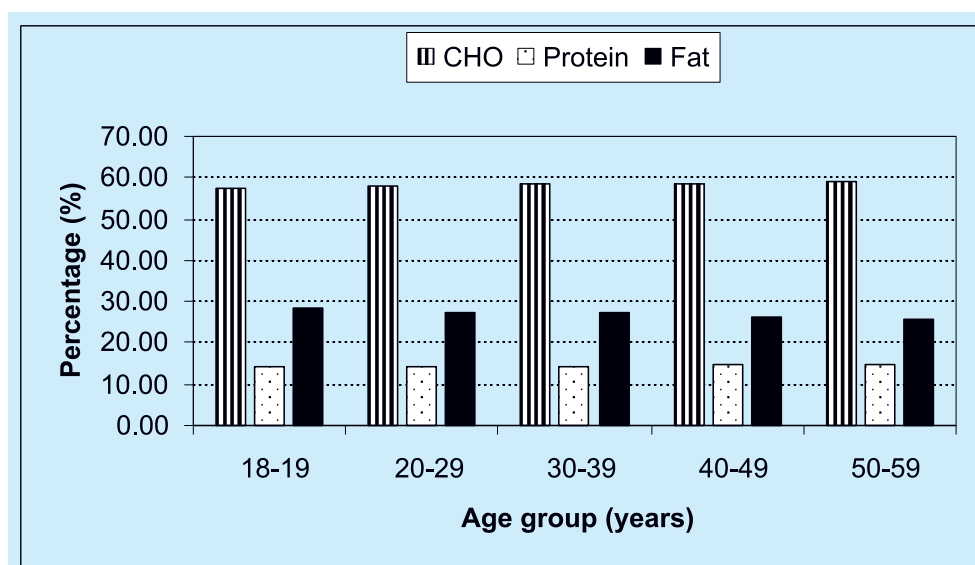


Figure 5.5.56: Median percentage of energy from macronutrients for men by age group

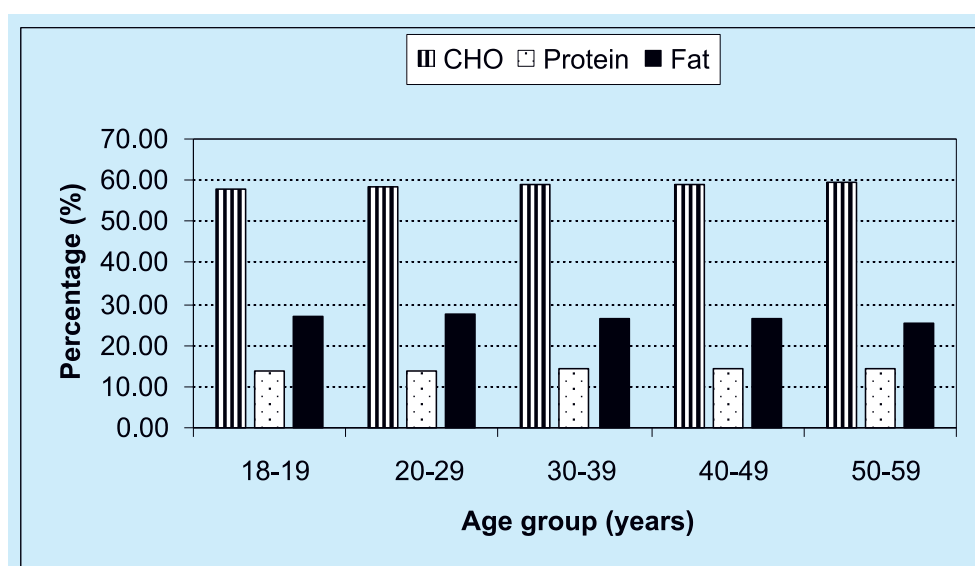


Figure 5.5.57: Median percentage of energy from macronutrients for women by age group

xi. Median percentage of energy from macronutrients for total population by BMI status

The energy intake from macronutrients did not vary much by BMI status. Generally the consumption of % energy from carbohydrate was almost 60%, while protein contributed to about 12% and fat about 28% of total energy intake across BMI groups.

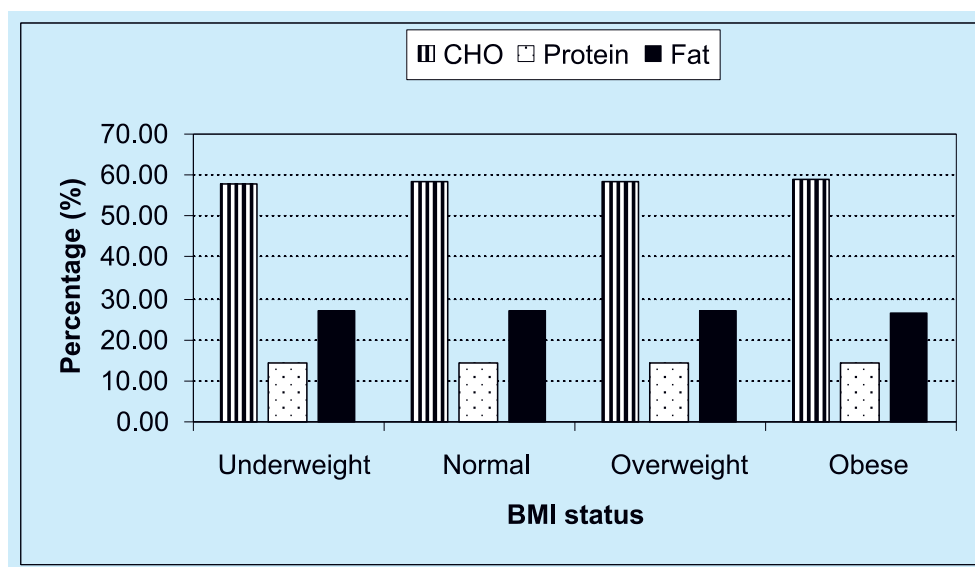


Figure 5.5.58: Median percentage of energy from macronutrients for total population by BMI status

xii. Median percentage of energy from macronutrients in men and women by BMI status

In men, the energy contributions from carbohydrate and fat intake were seen to decline slightly with increasing BMI status (Figure 5.5.59) while percent RNI achievement for protein was similar in all categories (14%). In women, percent energy intake from carbohydrate appears to increase with body weight status while for fat, a negative trend was observed (Figure 5.5.60). Protein intake was similar across BMI groups (14%).

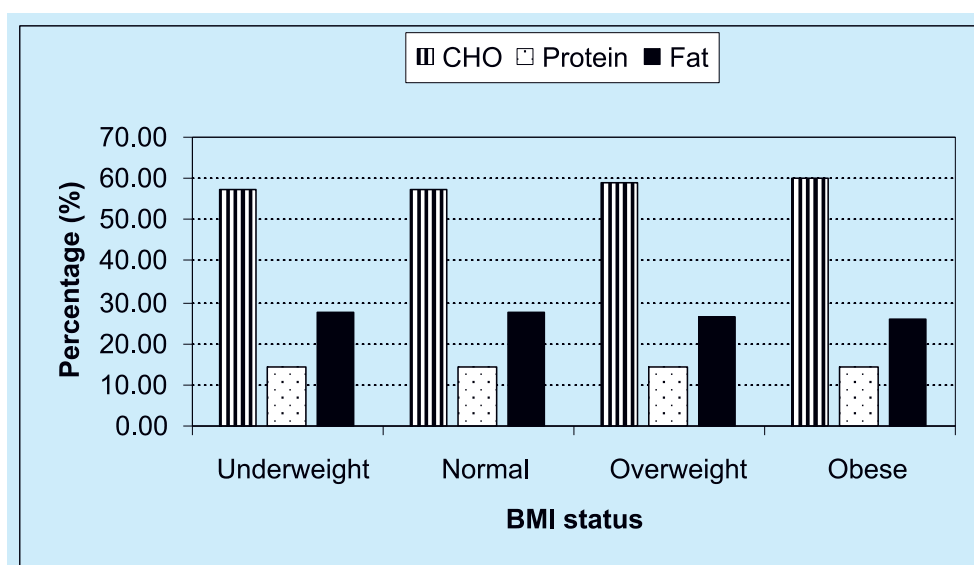


Figure 5.5.59: Median percentage of energy from macronutrients for men by BMI status

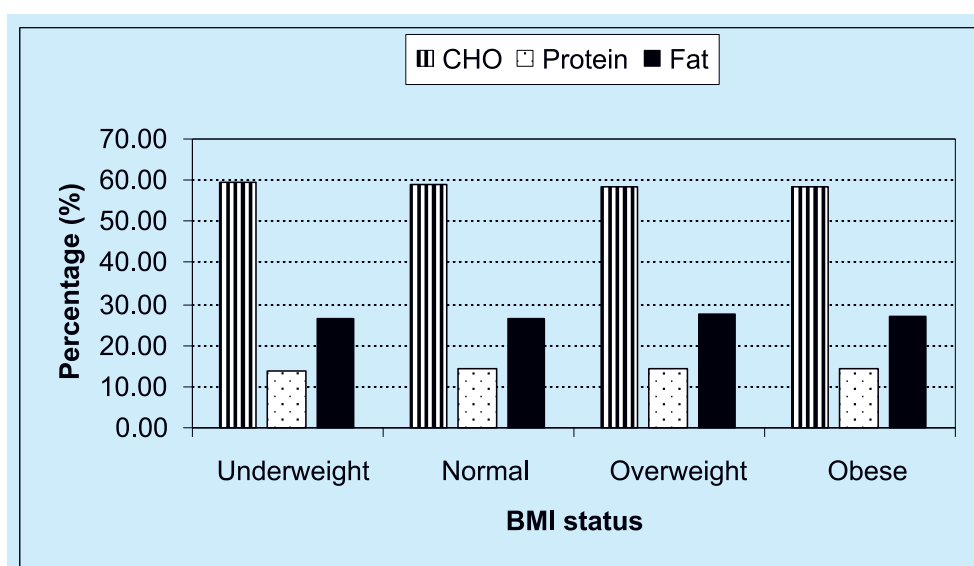


Figure 5.5.60: Median percentage of energy from macronutrients for women by BMI status

xiii. Median percentage of energy from macronutrients for total population by educational level

Respondents with no formal education have the highest (62%) proportion of energy from carbohydrates and lowest from fat intake (23%). No marked variation in energy intake from protein was evident across educational groups.

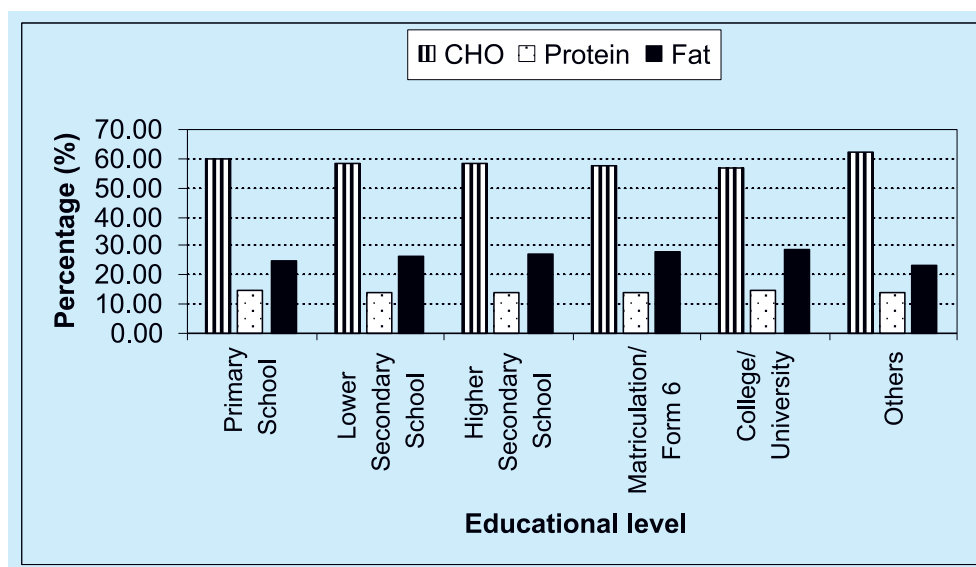


Figure 5.5.61: Median percentage of energy from macronutrients for total population by educational level

xiv. Median percentage of energy from macronutrients in men and women by educational level

As observed in Figure 5.5.62, men with college/university education consumed the lowest proportion of energy from carbohydrate (56.8%) and highest from fat (29%). Protein intake was almost the same in all educational groups (14%). A different distribution was found for women with regards to the proportion of energy from macronutrients by educational level. The highest % of energy intake from carbohydrate was in the Others group (61%). This group of women also tended to consume the least energy from fat (23%). The proportion of energy from protein intake was somewhat similar in all educational groups.

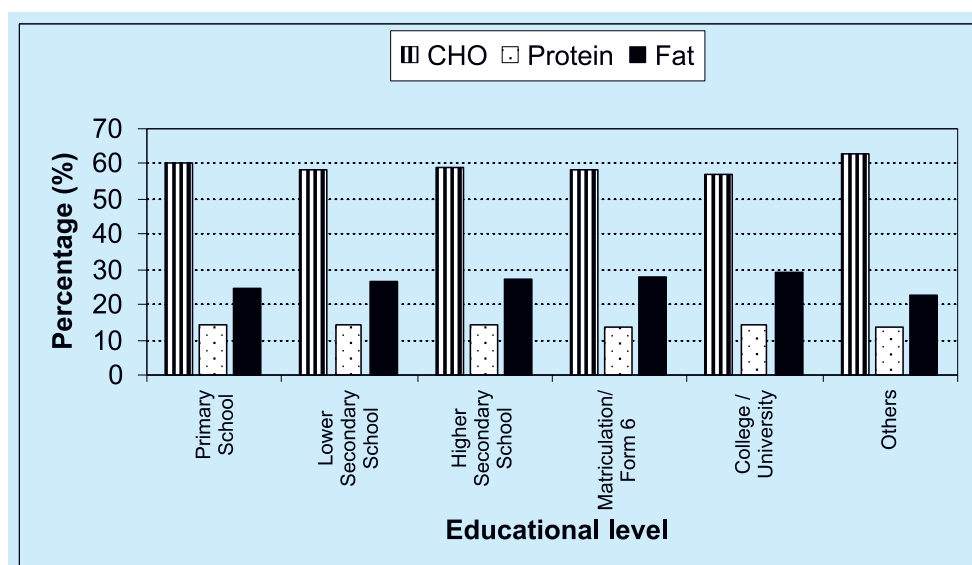


Figure 5.5.62: Median percentage of energy from macronutrients for men by educational level

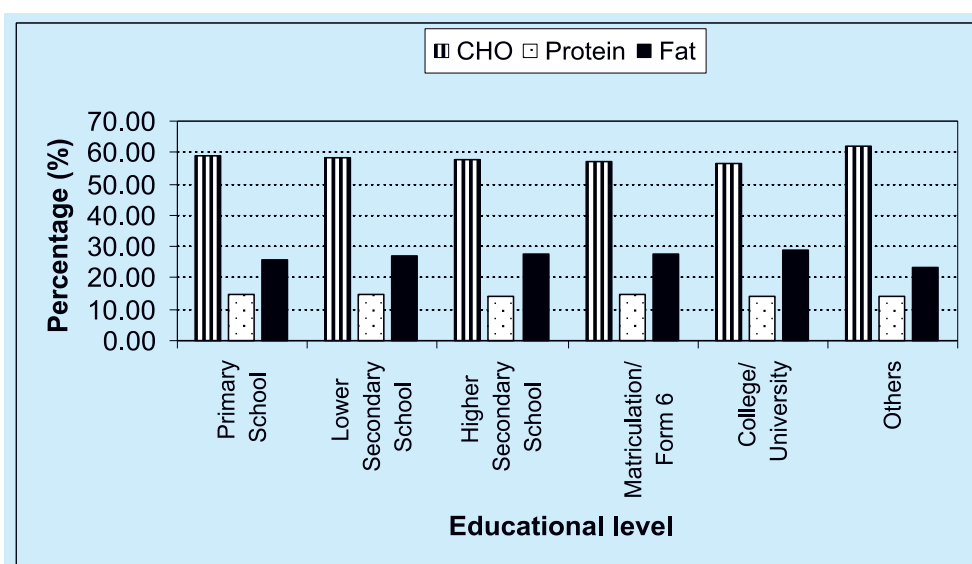


Figure 5.5.63: Median percentage of energy from macronutrients for women by educational level

5.5.4 Distribution of Population According to Percentage (%) of Energy from Macronutrients

i. Distribution of population according to percentage (%) of energy from carbohydrate, protein and fat

Figures 5.5.64 to Figures 5.5.66 show the distribution of men, women and the total population according to the percentages of energy from carbohydrate, protein and fat. More men than women had the recommended percent energy from carbohydrate (55% to 70%), protein (10% to 15%) and fat (20% to 30%). Higher percentages of women than men were observed to have less than 55% carbohydrate energy, more than 15% protein energy and more than 30% fat energy.

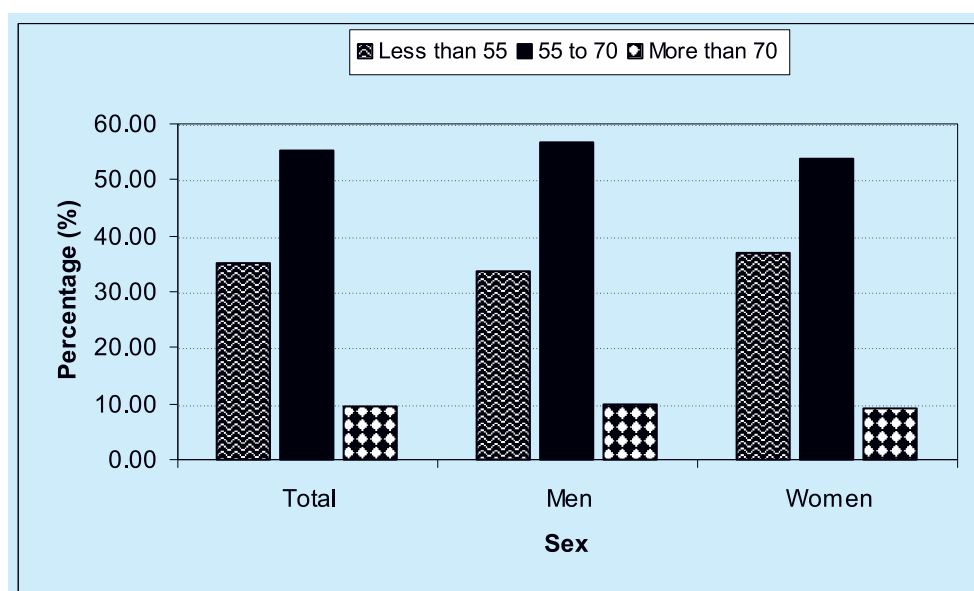


Figure 5.5.64: Distribution of population according to percentage (%) of energy from carbohydrate

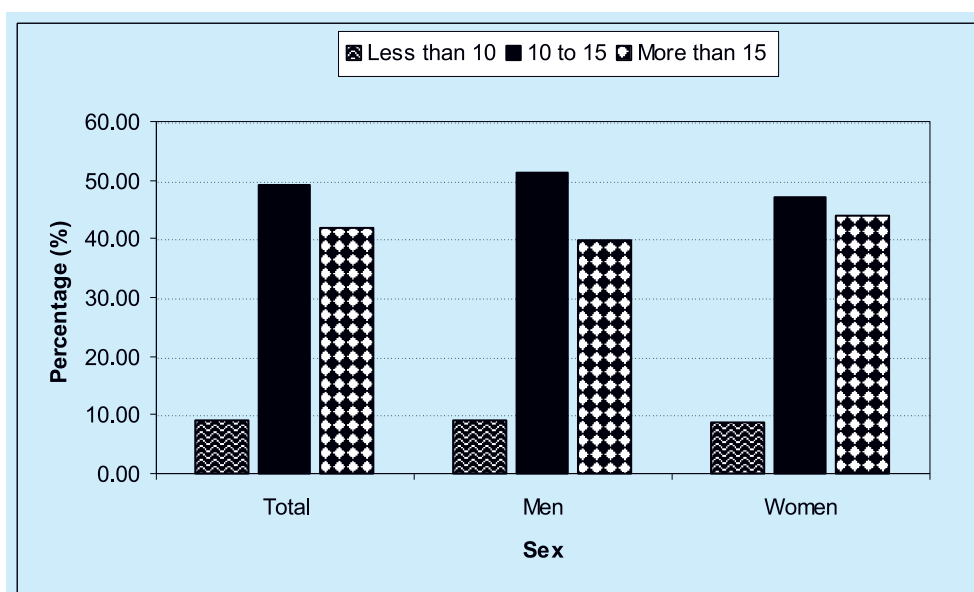


Figure 5.5.65: Distribution of population according to percentage (%) of energy from protein

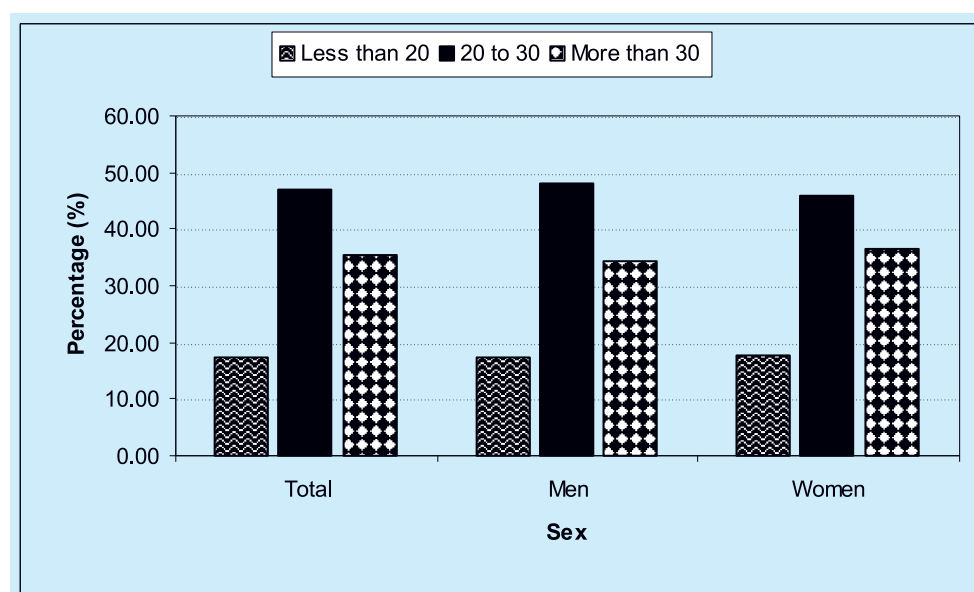


Figure 5.5.66: Distribution of population according to percentage (%) of energy from fat

ii. Distribution of population according to percentage (%) of energy from macronutrients by zone

Carbohydrate

Except for Sarawak, all zones had more than 50% of the population with 55% to 70% energy intake from carbohydrate (Figure 5.5.67). The highest and lowest percentages of population with 55% to 70% energy from carbohydrate were observed in the East Coast and Sarawak, respectively. These trends were also observed in the percent energy from carbohydrate of men and women in the East Coast and Sarawak (Figure 5.5.68). Sarawak too had the highest percentages of men and women (more than 40%) with less than 55% carbohydrate energy.

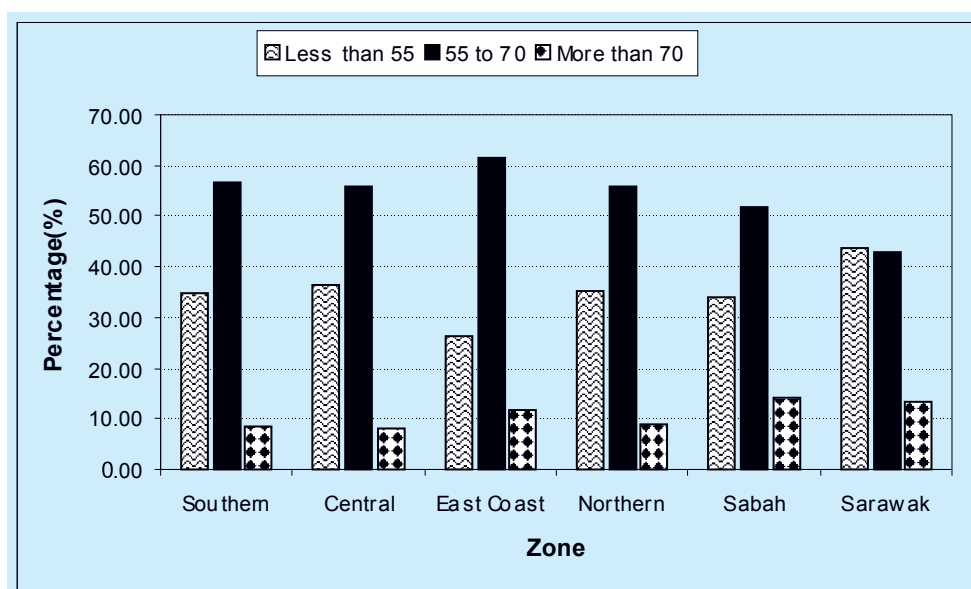


Figure 5.5.67: Distribution of population according to percentage (%) of energy from carbohydrate by zone

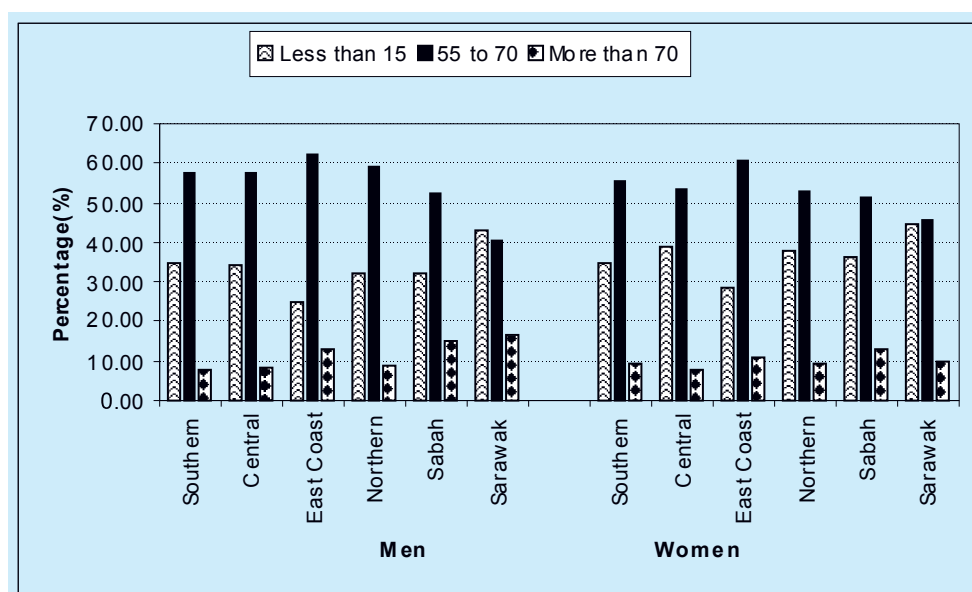


Figure 5.5.68: Distribution of population by sex according to percentage (%) of energy from carbohydrate by zone

Protein

Figure 5.5.69 and Figure 5.5.70 show the percent of men, women and total population in the various zones of Malaysia for percent of energy from protein. The Southern and Central zones had more than 50% of the population with the recommended percent protein energy (10% to 15%). These Southern and Central zones too had the highest percentages of men and women with 10% to 15% energy from protein, respectively. Although Sarawak had the lowest percentage of men, women and total population (less than 40%) with 10% to 15% protein energy, it also had the highest percentage of men, women and total population with more than 15% protein energy.

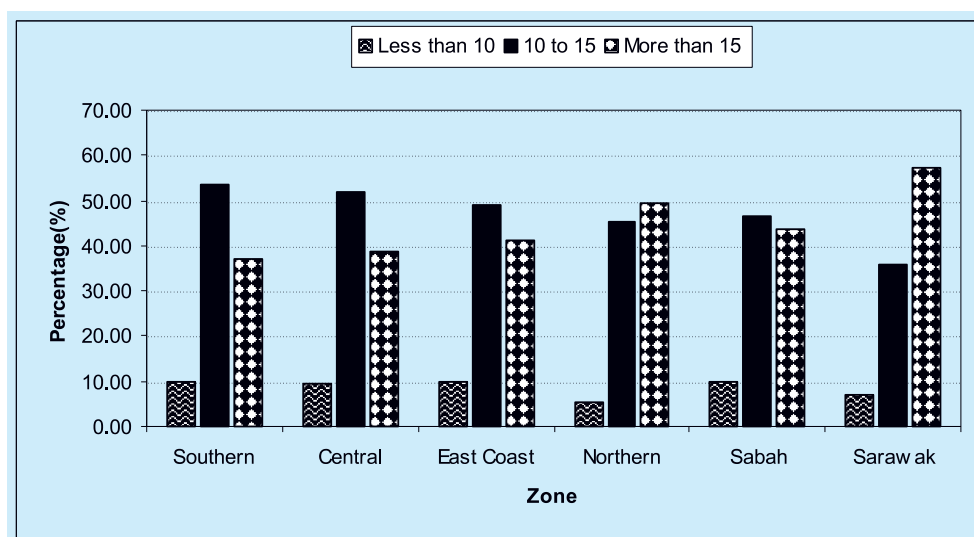


Figure 5.5.69: Distribution of population according to percentage (%) of energy from protein by zone

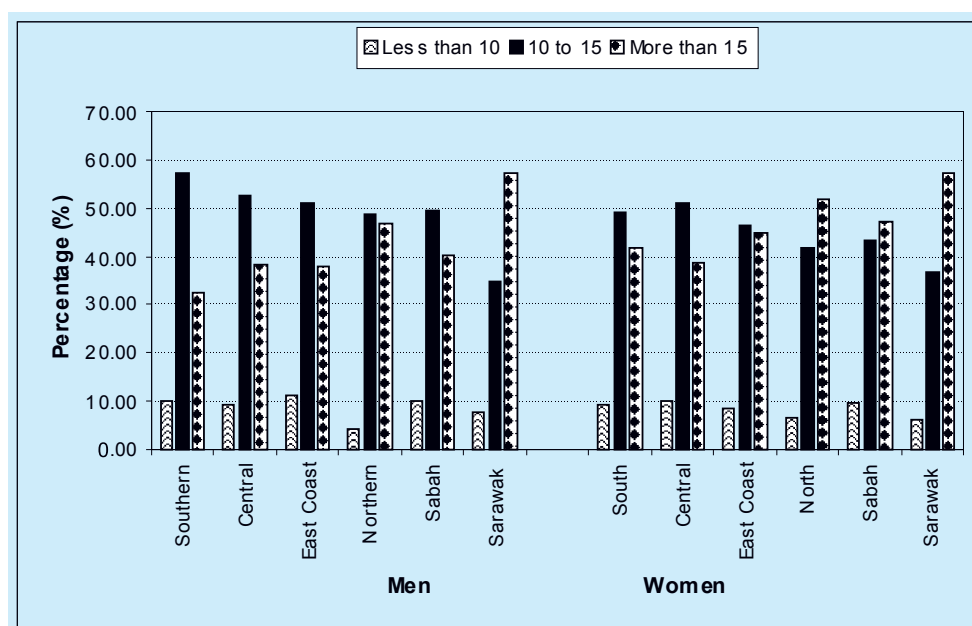


Figure 5.5.70: Distribution of population by sex according to percentage (%) of energy from protein by zone

Fat

The distribution of population in each zone with varying levels of percent energy from fat is presented in Figure 5.5.71 and Figure 5.5.72. The East Coast had the highest percentage of men, women and total population (more than 50%) with 20% to 30% total energy intake from fat. Sarawak, Southern and Central zones had similar percentages of population (35% to 40%) with percent fat energy (more than 30%) exceeding the recommendation. While Sarawak showed the lowest percentage of men with 20% to 30% fat, the Southern zone had the highest percentage of men with fat energy more than 30%. The Central zone not only had the lowest percentage of women with 20% to 30% energy intake from fat but also the highest percentage of women with high fat energy (more than 30%).

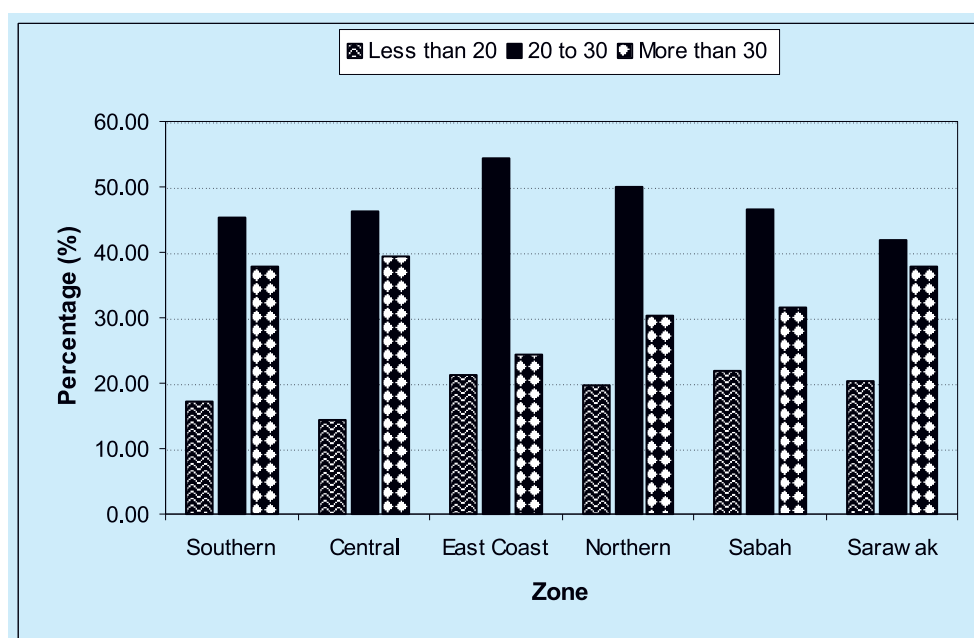


Figure 5.5.71: Distribution of population according to percentage (%) of energy from fat by zone

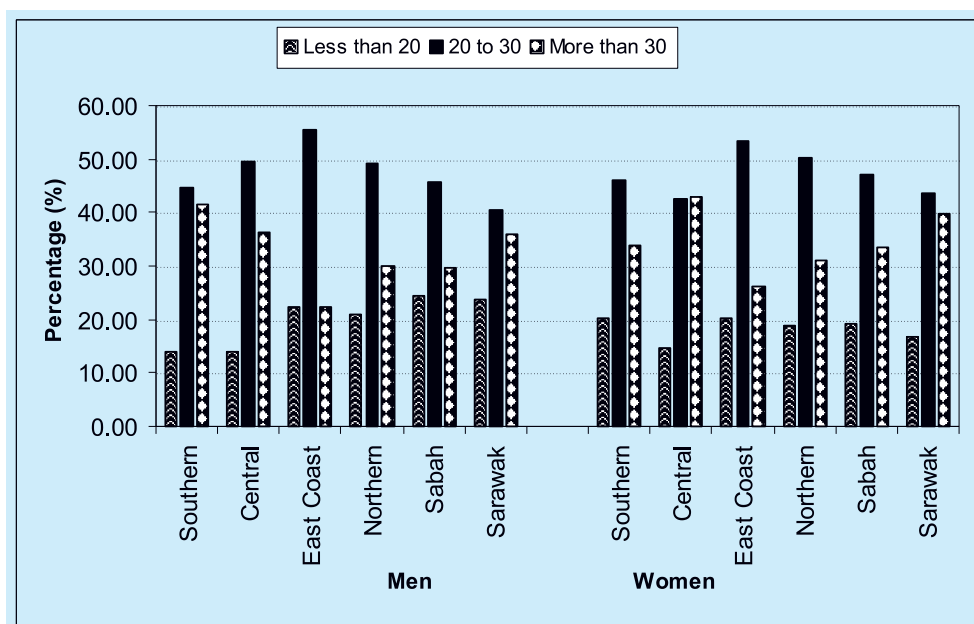


Figure 5.5.72: Distribution of population by sex according to percentage (%) of energy from fat by zone

iii. Distribution of population according to percentage (%) of energy from macronutrients by strata

Carbohydrate

Compared to the rural population (30%), a higher percentage (40%) of the urban population had less than 55% of energy from carbohydrate (Figure 5.5.73). On the other hand, the rural areas showed slightly higher percentages of population with 55% to 70% and more than 70% carbohydrate energy, respectively. Similar patterns were observed among men and women in urban and rural areas (Figure 5.5.74). While more urban and rural men had carbohydrate energy of 55% to 70%, more urban and rural women were observed to have carbohydrate energy less than 55%.

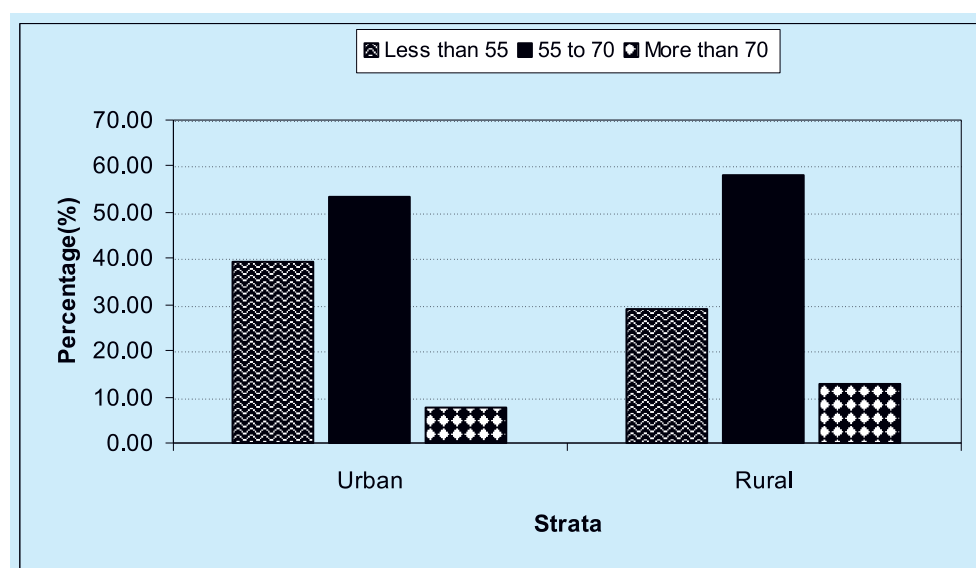


Figure 5.5.73: Distribution of population according to percentage (%) of energy from carbohydrate by strata

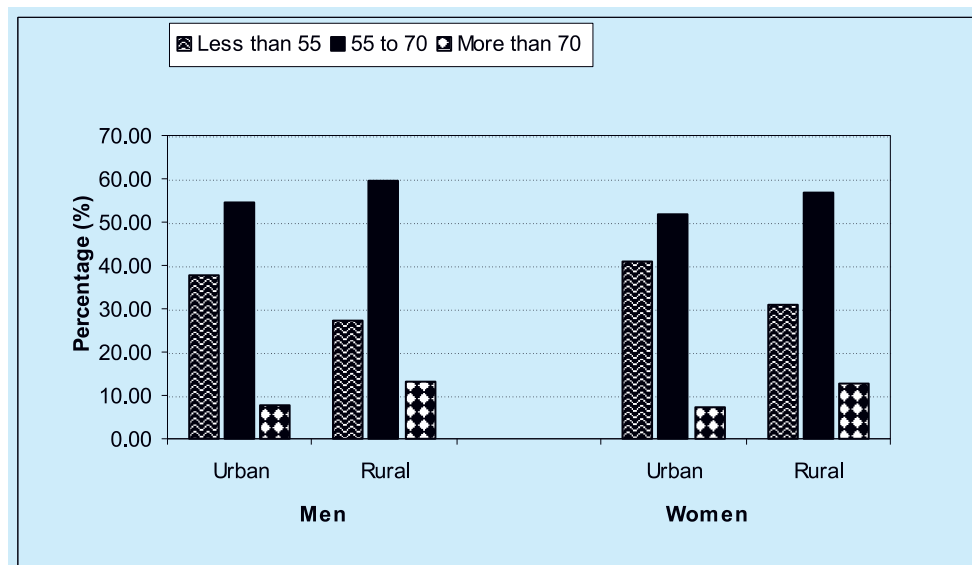


Figure 5.5.74: Distribution of population by sex according to percentage (%) of energy from carbohydrate by strata

Protein

The distribution of men, women and total population in the urban and rural areas of Malaysia according to percentage of energy from protein is shown in Figure 5.5.75 and Figure 5.5.76. About 10%, 50% and 40% of both urban and rural populations had less than 10%, 10% to 15% and more than 15% of total energy from protein, respectively. A higher percentage of men than women in urban and rural areas had protein energy of 10% to 15% however, the reverse was observed for the intake of more than 15% of energy from protein.

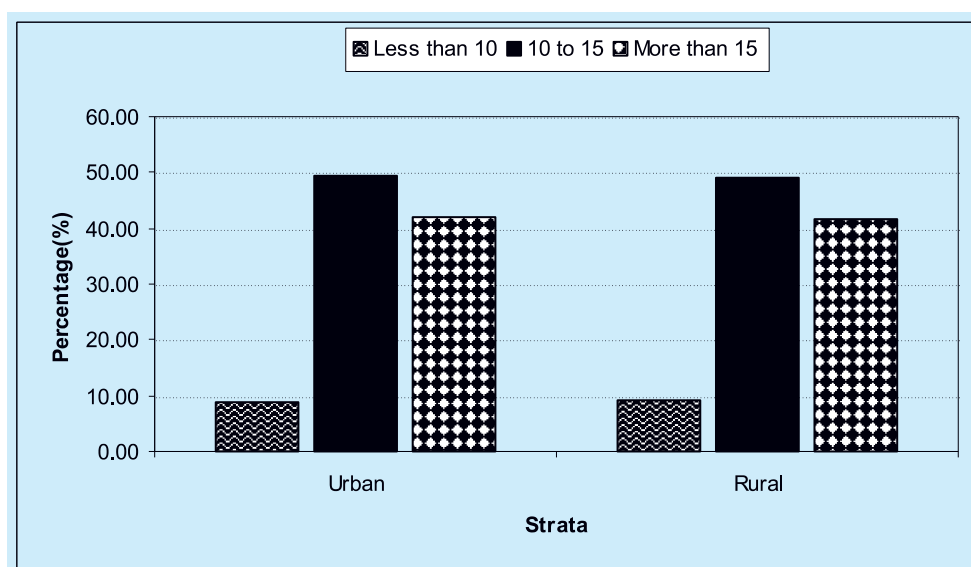


Figure 5.5.75: Distribution of population according to percentage (%) of energy from protein by strata

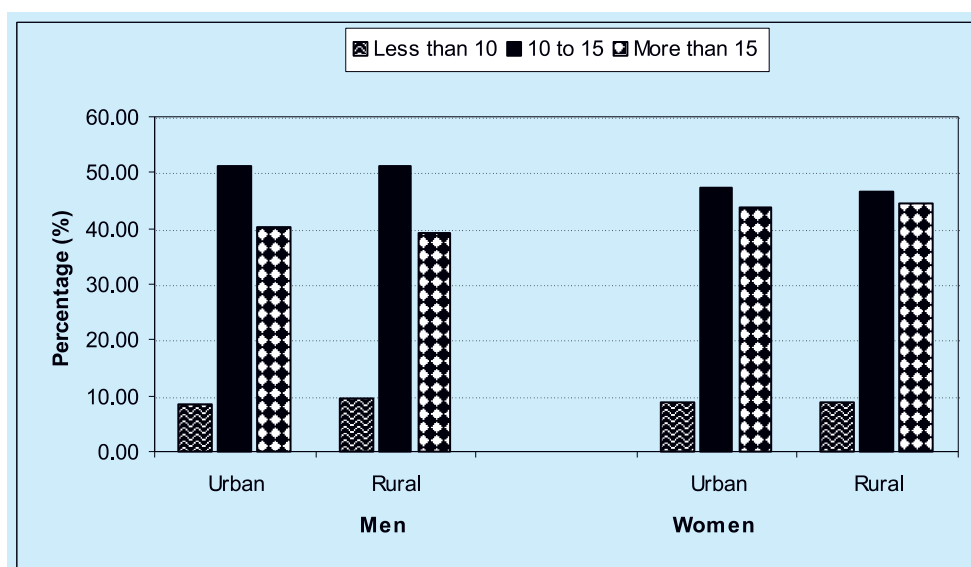


Figure 5.5.76: Distribution of population by sex according to percentage (%) of energy from protein by strata

Fat

The rural areas had higher percentages of population with less than 20% and 20% to 30% fat energy, respectively. However, more of the urban (40%) than rural population (less than 25%) had more than 30% energy from fat. Slightly higher percentages of men than women in urban and rural areas had 20% to 30% fat energy while slightly more of the urban women than men consumed more than 30% of energy from fat.

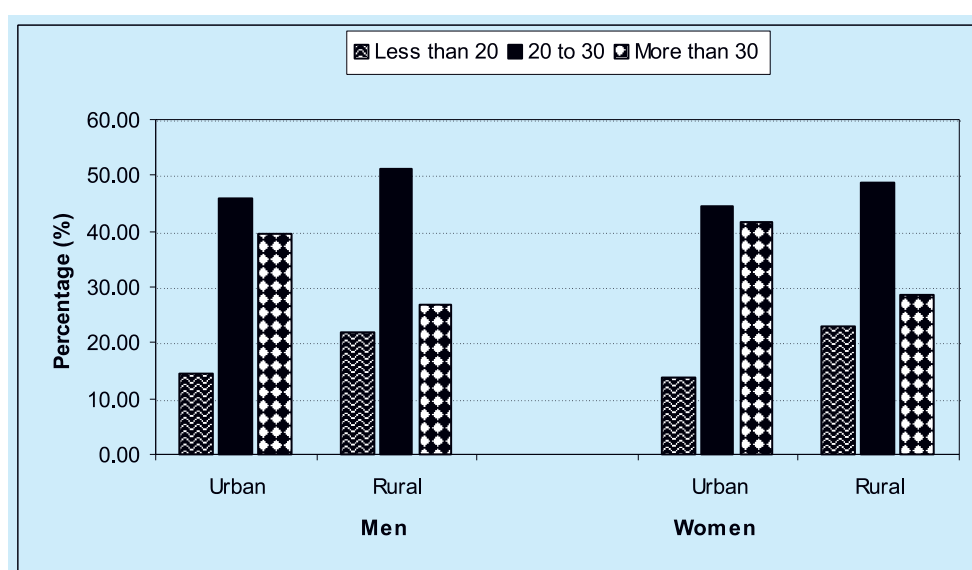


Figure 5.5.77: Distribution of population according to percentage (%) of energy from fat by strata

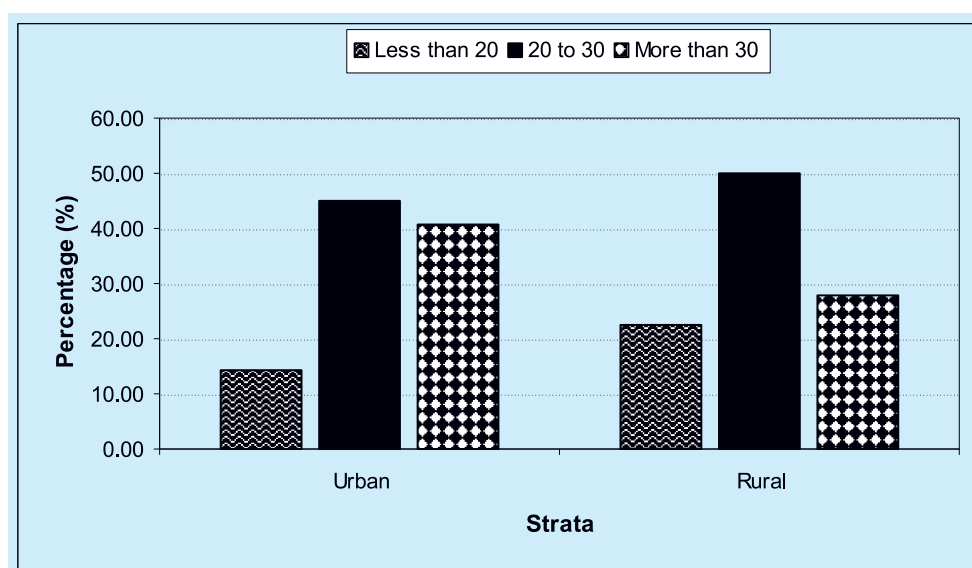


Figure 5.5.78: Distribution of population by sex according to percentage (%) of energy from fat by strata

iv. Distribution of population according to percentage (%) of energy from macronutrients by age group

Carbohydrate

All age groups, except for 18 to 19 years group, had more than 50% of the population with 55% to 70% energy intake from carbohydrate (Figure 5.5.79). However, 18 to 19 year-old adults had the highest percentage of population with less than 55% carbohydrate energy. While 18 to 19 year-old men had the lowest percentage (less than 50%) with 55% to 70% carbohydrate energy, it also had the highest percentage of population (more than 15%) consuming more than 70% of energy from carbohydrate (Figure 5.5.80). There was a decreasing trend in the distribution of women with less than 55% carbohydrate energy by age group in that the highest percentage (more than 40%) was observed in the youngest age group (18 to 19 years) while the lowest percentage (less than 35%) was in the oldest age group (50 to 60 years).

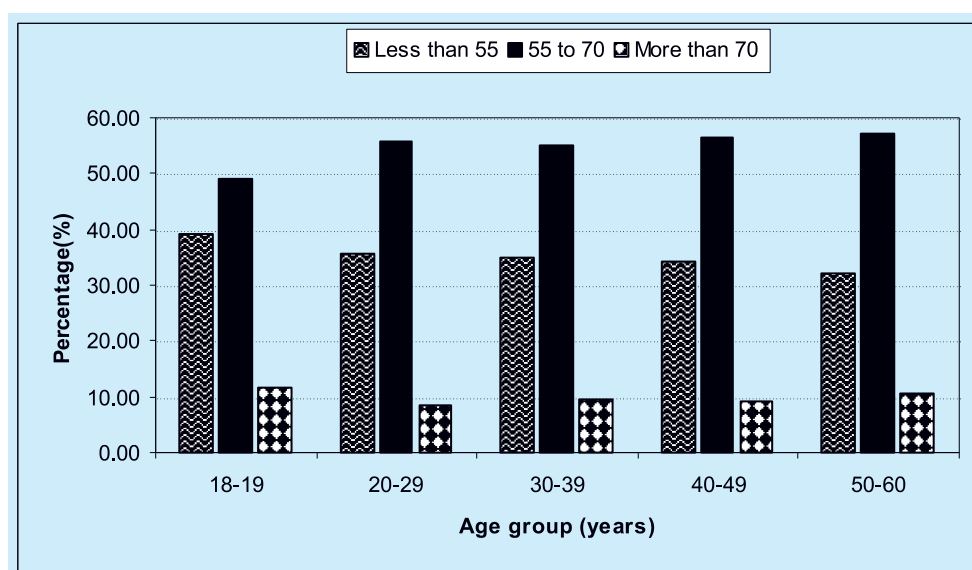


Figure 5.5.79: Distribution of population according to percentage (%) of energy from carbohydrate by age group

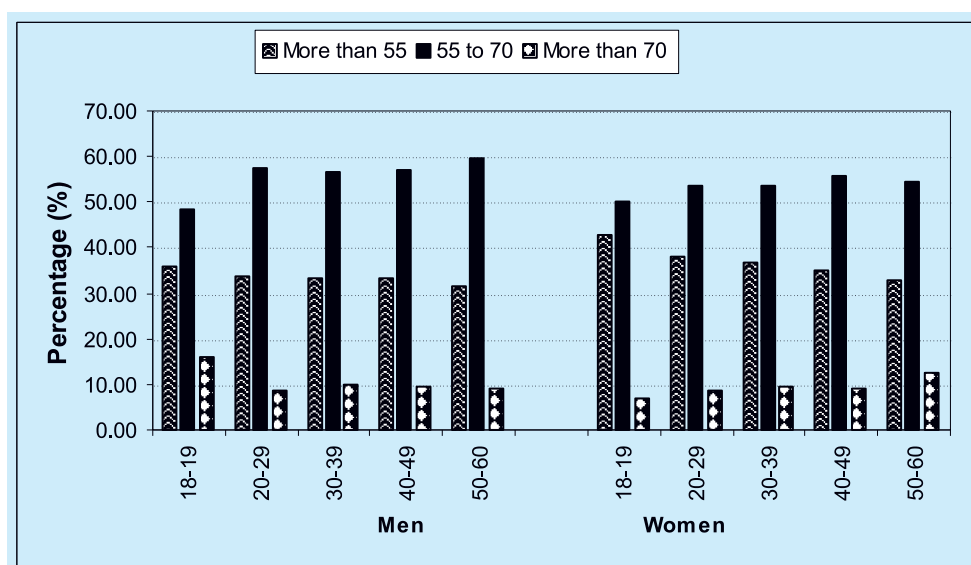


Figure 5.5.80: Distribution of population by sex according to percentage (%) of energy from carbohydrate by age group

Protein

Figure 5.5.81 and Figure 5.5.82 show the distribution of men, women and total population in the various age groups according to percentage of energy from protein. Similar percentages (50%) of adults in the age groups of 18 to 19 years, 20 to 29 years and 30 to 39 years had 10% to 15% protein energy. However, the percentages of population with 10% to 15% protein energy decreased in the older age groups (40 to 49 years and 50 to 60 years). The percentage of population with more than 15% protein energy increased with age. While the percentages of men with less than 10% protein energy decreased by age, the percentages of men with more than 15% energy from protein increased by age. For women, the percentage of population with the recommended intake (10% to 15%) decreased by age but the percentages with intake of more than 15% protein energy increased by age.

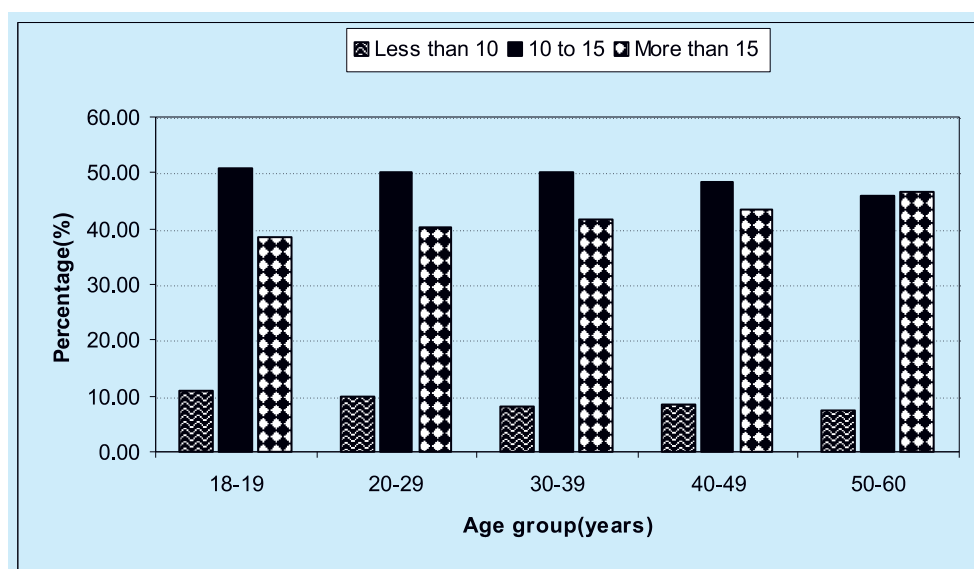


Figure 5.5.81: Distribution of population according to percentage (%) of energy from protein by age group

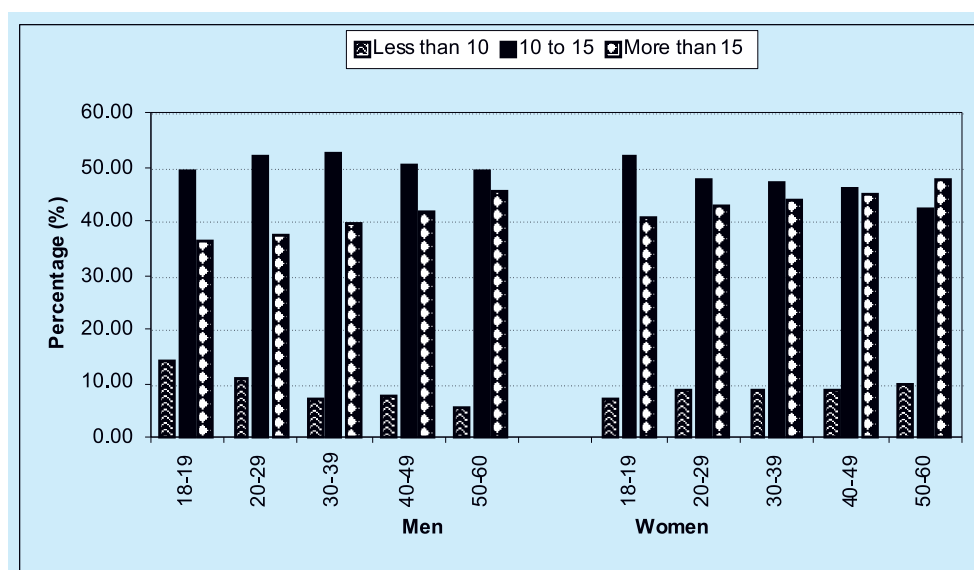


Figure 5.5.82: Distribution of population by sex according to percentage (%) of energy from protein by age group

Fat

The distribution of population in each age group with various levels of percent energy from fat is presented in Figure 5.5.83 and Figure 5.5.84. The oldest age group (50 to 60 years) had the highest percentage of men, women and total population (more than 20%) consuming less than 20% energy from fat. In all age groups, the percentage of population, including men and women, with 20% to 30% fat energy ranges from 40% to 50%. In men, the percentages of population with 20% to 30% fat energy increased from age 18 to 19 years to 30 to 39 years but decreased after that. The percentage of women and total population consuming more than 30% of total energy from fat decreased with age.

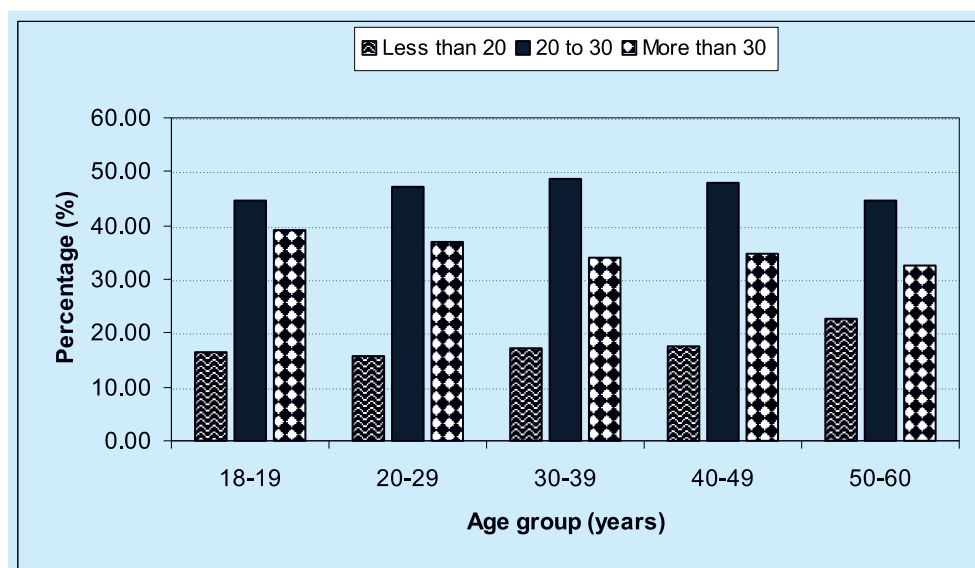


Figure 5.5.83: Distribution of population according to percentage (%) of energy from fat by age group

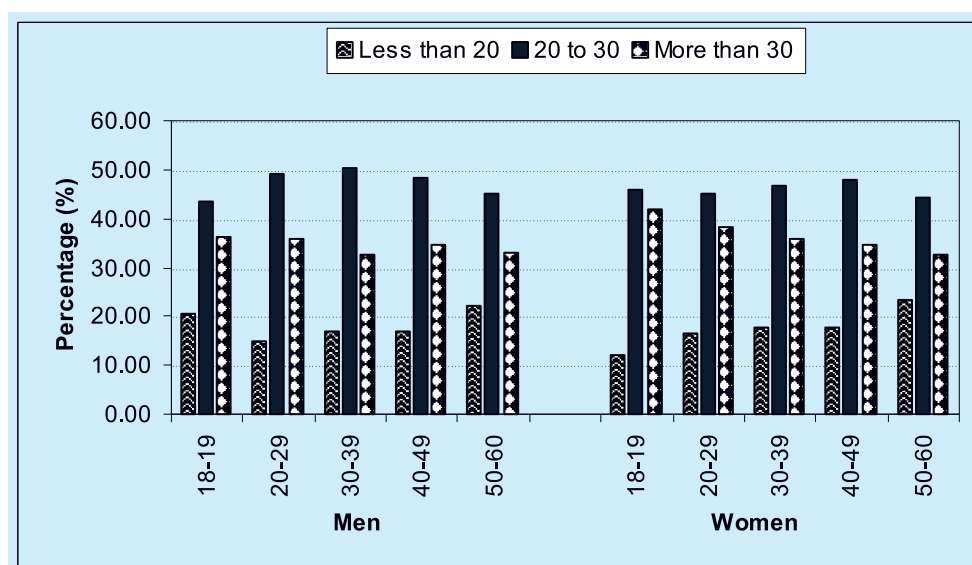


Figure 5.5.84: Distribution of population by sex according to percentage (%) of energy from fat by age group

5.5.5 Median percentage of energy from meals and snack by socio-demographic characteristics and BMI status

i) Morning Meals

Table 5.5.11 shows the median percentage of energy from morning meals by socio-demographic characteristics and BMI status of Malaysians. The median percentage of energy intake from morning meals for Malaysians was 29.90% with similar medians reported for men (29.94%) and women (29.86%).

Zone

Except for the Central and Sabah zones, men and women in other zones had similar median percentages of energy from morning meals. In both zones, men consumed more energy from morning meals than women. The range of median percentage for the total population was 25.21% to 31.48% with population in Sarawak and Southern zone had the lowest and highest median percentages, respectively. Similar trends were also observed in men but not in women. Sarawakian women consumed the lowest energy (25.25%) while women on the East Coast consumed the highest (31.96%).

Strata

Men and women of both urban and rural areas had similar energy intakes from morning meals. In each sex and total population, the rural population consumed more energy from breakfast than the urban population.

Age group

Men and women in all age groups had similar median percentage of energy from morning meals. Total (30.33%) and men (31.60%) in the youngest age group (18 to 19 years) had the highest median percentage of energy from morning meals. The lowest percentage of energy from morning meals was observed in total (29.48%) and men (29.03%) of 50 to 59 years. Women in all age groups had similar median percentages of energy from morning meals (29.40% to 30.11%).

Ethnicity

Other Bumiputera men (30.04%) had higher median percentages than women in the same group. On the other hand, Orang Asli (31.21%) and Sarawak Bumiputera (26.72%) women had higher median percentages than men. Sarawak Bumiputera total (25.69%) and men (25.46%), and Other Bumiputera women (26.31%) had the lowest median percentages. Highest median percentages were observed for Orang Asli total (31.05%) and women (31.21%) and Indian men (31.37%).

Educational level

The median percentages of energy from morning meals in all education groups were similar between men and women, except that for the Matriculation/Form 6 group. In this group, women (29.39%) consumed lower energy from morning meals than men (30.53%). Matriculation/Form 6 women (29.39%) and College/University men (29.43%) and total (29.23%) had the least median percentages. Highest median percentages were observed for Others women (30.55%), Lower Secondary School total (30.53%) and men with Matriculation/Form 6 (30.53%).

BMI status

Men and women in all BMI groups did not differ in median percentages of energy from morning meals. While underweight Malaysians (total, men and women) tend to have the lowest median percentages of energy from morning meals, obese Malaysians had the highest median percentages.

Table 5.5.11: Median percentage of energy from morning meal by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	29.90	13,027,227	29.94	6,575,195	29.86	6,452,032
Zone						
Southern	31.48	2,690,313	31.50	1,363,117	31.47	1,327,195
Central	29.91	4,870,100	30.43	2,483,004	29.28	2,387,096
East Coast	31.42	1,514,148	31.10	772,374	31.96	741,774
Northern	29.90	1,776,759	29.73	856,269	29.96	920,490
Sabah	28.46	1,066,190	29.11	550,248	28.09	515,942
Sarawak	25.21	1,109,718	24.86	550,184	25.25	559,534
Strata						
Urban	29.41	7,650,564	29.64	3,842,990	29.16	3,807,574
Rural	30.44	5,376,663	30.20	2,732,205	30.69	2,644,458
Age Groups (Years)						
18-19	30.33	1,209,905	31.60	616,230	29.63	593,675
20-29	29.99	3,784,148	29.94	1,877,338	30.11	1,906,809
30-39	29.72	3,406,998	30.03	1,709,368	29.40	1,697,630
40-49	29.96	2,775,831	30.02	1,412,695	29.93	1,363,136
50-59	29.48	1,850,346	29.03	959,564	29.95	890,782
Ethnic Groups						
Malay	30.82	7,064,253	30.83	3,580,059	30.79	3,484,194
Chinese	28.50	3,257,348	28.79	1,628,524	28.20	1,628,824
Indian	30.61	1,240,969	31.37	621,223	29.59	619,746
Orang Asli PM	31.05	69,202	29.46	38,171	31.21	31,031
Sabah Bumiputera	29.55	547,173	29.70	270,250	29.28	276,923
Sarawak Bumiputera	25.69	586,439	25.46	297,289	26.72	289,149
Other Bumiputra	27.46	261,843	30.04	139,678	26.31	122,165
Educational Level						
Primary School	29.61	2,596,818	29.48	1,171,108	29.82	1,425,710
Lower Secondary School	30.53	2,652,407	30.49	1,505,393	30.53	1,147,014
Upper Secondary School	29.95	4,466,561	30.02	2,273,440	29.92	2,193,121
Matriculation/ Form 6	29.64	720,854	30.53	283,345	29.39	437,510
College/ University	29.23	1,954,118	29.43	1,154,086	28.85	800,032
Others	30.23	620,744	29.86	187,823	30.55	432,921
BMI Status						
Underweight	28.48	1,183,162	28.75	545,610	28.30	637,552
Normal	29.96	6,461,394	29.91	3,462,905	30.11	2,998,489
Overweight	29.82	3,512,139	29.78	1,907,755	29.85	1,604,385
Obese	30.48	1,585,874	30.38	634,939	30.54	950,935

ii) Lunch

The median percentages of energy from lunch by socio-demographic characteristics and BMI status are shown in Table 5.5.12. Lunch contributed to about 30.49% (median) of the total daily energy intake of Malaysians with a higher median percentage reported for women (30.99%) than men (29.99%).

Zone

East Coast (28.44%) and Sabahan (31.65%) men consumed lower percentage of energy from lunch than East Coast (29.57%) and Sabahan (32.22%) women. While the East Coast population (men, 28.44%, women, 29.57%, total, 29.14%) had the lowest median percentages, Sarawakians (men, 31.65%, women, 32.39%, total, 32.14%) had the highest consumption of energy from lunch.

Strata

Compared to the urban men (29.97%), urban women (31.01%) had higher median percentage of energy from lunch. In both men and women, there were no urban-rural differences in energy intake from lunch.

Age group

Women in the age groups of 20 to 29 years and 30 to 39 years consumed more energy from lunch than men. Men in the age groups of 18 to 19 years (30.71%) and of 20 to 29 years (29.22%) had the highest and lowest percentages of energy from lunch, respectively. The total population (30.06% to 30.84%) and women (30.79% to 31.50%) in all age groups had similar energy intakes from lunch.

Ethnicity

Chinese, Indian, Orang Asli and Sabah Bumiputera women had higher median percentages of energy from lunch than men. The lowest median percentages were observed for Indian total (29.84%), men (29.28%) and women (30.37%) while the highest intakes were for Sarawak Bumiputera men (32.99%) and Orang Asli total (33.33%) and women (37.69%).

Educational level

Women with non-formal, higher secondary and college/university education had higher percentage of energy from lunch than men with similar educational levels. Among the educational groups, men (31.10%), women (32.84%) and total (31.94%) in Others group had the highest median percentages. The lowest median percentages were observed for total (29.34%) and women (29.59%) with Matriculation/Form 6 and men (29.14%) with higher secondary education.

BMI status

Women with normal weight (30.34%) consumed higher percentages of energy from lunch than normal weight men (29.26%). Total population (29.83%) and men (29.26%) with normal weight and underweight women (30.05%) had the lowest median percentages while obese men (32.10%), women (32.89%) and total (32.54%) had the highest median percentages.

Table 5.5.12: Median percentage of energy from lunch by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	30.49	12,551,243	29.99	6,376,417	30.99	6,174,826
Zone						
Southern	30.36	2,583,028	29.98	1,325,117	31.07	1,257,911
Central	30.27	4,691,213	29.99	2,396,524	30.49	2,294,689
East Coast	29.14	1,407,561	28.44	749,618	29.57	657,943
Northern	30.86	1,749,481	30.26	835,465	31.23	914,016
Sabah	31.30	1,013,856	30.27	511,177	32.22	502,679
Sarawak	32.14	1,106,104	31.65	558,516	32.39	547,588
Strata						
Urban	30.45	7,391,340	29.97	3,717,765	31.01	3,673,575
Rural	30.56	5,159,903	30.09	2,658,652	30.99	2,501,251
Age Groups (Years)						
18-19	30.78	1,230,800	30.71	604,313	31.50	626,487
20-29	30.06	3,724,365	29.22	1,899,288	30.79	1,825,078
30-39	30.41	3,273,441	29.42	1,642,017	31.16	1,631,424
40-49	30.84	2,604,215	30.61	1,346,585	31.04	1,257,630
50-59	30.52	1,718,422	30.49	884,215	30.81	834,208
Ethnic Groups						
Malay	29.98	6,752,996	29.61	3,494,023	30.45	3,258,973
Chinese	30.77	3,172,137	30.12	1,605,935	31.52	1,566,202
Indian	29.84	1,203,081	29.28	550,080	30.37	653,001
Orang Asli PM	33.33	65,908	29.82	38,171	37.69	27,737
Sabah Bumiputera	31.67	523,462	29.80	249,213	32.43	274,249
Sarawak Bumiputera	32.97	581,191	32.99	302,304	32.91	278,887
Other Bumiputera	31.68	252,469	31.83	136,691	31.05	115,777
Educational Level						
Primary School	31.30	2,493,790	31.01	1,119,539	31.58	1,374,252
Lower Secondary School	30.29	2,480,331	30.27	1,464,309	30.40	1,016,022
Upper Secondary School	29.99	4,321,797	29.14	2,168,498	30.66	2,153,298
Matriculation/ Form 6	29.34	715,413	29.24	276,317	29.59	439,096
College/ University	30.02	1,908,219	29.55	1,146,563	31.04	761,656
Others	31.94	620,510	31.10	197,117	32.84	423,393
BMI Status						
Underweight	30.00	1,228,876	29.85	602,137	30.05	626,739
Normal	29.83	6,240,033	29.26	3,387,309	30.34	2,852,724
Overweight	30.78	3,337,840	30.42	1,783,438	31.01	1,554,403
Obese	32.54	1,457,479	32.10	584,750	32.89	872,729

iii) Dinner

The median percentages of energy from dinner by socio-demographic characteristics and BMI status are presented in Table 5.5.13. Among the meals (breakfast, lunch and afternoon tea) consumed by Malaysians, dinner contributed the highest percentage (32.35%) of total daily energy intake with men (33.36%) had higher median percentage than women (31.14%).

Zone

In all zones, men consumed more percentage of energy from dinner than women. The lowest median percentages were observed among population (men, 31.96%, women, 27.77%, total, 29.90%) on the East Coast, while the highest were among the Sarawakians (men, 34.97%, women, 33.19%, total, 34.19%).

Strata

Urban (34.26%) and rural (32.25%) men consumed higher percentages of energy from dinner than urban (32.71%) and rural (29.70%) women. In general, urban population had higher median percentages than rural population.

Age group

Men aged 20 years and older had higher median percentages of energy from dinner than women in the same age group. Individuals (men, women and total population) in the oldest age group (50 to 59 years) had the lowest median percentage energy intake from dinner. Total population (34.67%) and women (34.82%) in the youngest age group (18 to 19 years) and men 20 to 9 years (35.64%) consumed the highest percentage energy during dinner.

Ethnicity

Except for Chinese and Indian, men in other ethnic groups had higher median percentages than women. While Chinese total (36.11%), men (36.23%) and women (36.09%) had most energy during dinner, the Orang Asli total (27.71%) and women (22.66%) and Malay men (32.13%) had the least.

Educational level

In all education groups, higher median percentages were reported for men than women. Malaysians (men, 35.69%, women, 33.42%, total, 34.67%) with college/university education had the highest median percentage of energy from dinner. Lowest median percentage of energy from dinner was observed among Malaysians with non-formal education (men, 32.12%, women, 30.14%, total, 30.75%).

BMI status

Underweight men and women had similar median percentages of energy from dinner but in other BMI groups, men had higher median percentages than women. While obese women (30.20%) reported the least median percentage of energy from dinner, obese men (34.92%) reported the highest median percentage. Underweight women (34.36%) and normal weight men (33.01%) had the highest and lowest median percentages, respectively. For the total population, underweight individuals (34.40%) had the least percentage of energy from dinner while overweight individuals (32.17%) had the highest.

Table 5.5.13: Median percentage of energy from dinner by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	32.35	13,357,420	33.36	6,834,077	31.14	6,523,343
Zone						
Southern	32.45	2,769,460	33.73	1,414,750	31.18	1,354,710
Central	33.48	5,127,395	34.01	2,641,183	32.66	2,486,211
East Coast	29.90	1,502,806	31.96	782,049	27.77	720,757
Northern	31.34	1,764,240	32.80	863,448	30.29	900,792
Sabah	31.60	1,048,464	33.19	543,776	30.07	504,688
Sarawak	34.19	1,145,055	34.97	588,871	33.19	556,184
Strata						
Urban	33.65	7,975,060	34.26	4,062,588	32.71	3,912,472
Rural	30.86	5,382,360	32.25	2,771,489	29.70	2,610,871
Age Groups (Years)						
18-19	34.67	1,298,043	34.67	648,633	34.82	649,411
20-29	33.63	3,978,838	35.64	2,043,893	32.18	1,934,944
30-39	31.48	3,474,628	32.17	1,774,848	30.63	1,699,780
40-49	32.01	2,769,336	33.17	1,420,490	30.79	1,348,845
50-59	30.80	1,836,575	31.91	946,212	29.70	890,362
Ethnic Groups						
Malay	30.51	7,179,132	32.13	3,748,734	28.90	3,430,398
Chinese	36.11	3,420,415	36.23	1,713,676	36.09	1,706,739
Indian	32.91	1,310,349	33.09	628,712	32.83	681,637
Orang Asli PM	27.71	61,634	32.82	36,710	22.66	24,924
Sabah Bumiputera	31.05	539,515	32.36	269,865	29.36	269,651
Sarawak Bumiputera	34.15	588,911	35.16	303,633	32.44	285,277
Other Bumiputera	31.00	257,465	33.46	132,748	30.11	124,717
Educational Level						
Primary School	31.52	2,539,694	32.91	1,162,627	30.60	1,377,067
Lower Secondary School	32.43	2,707,372	33.08	1,547,763	30.66	1,159,609
Upper Secondary School	32.34	4,600,174	33.20	2,367,322	31.61	2,232,852
Matriculation/ Form 6	31.13	737,747	32.67	293,995	30.39	443,753
College/ University	34.67	2,117,485	35.69	1,261,488	33.42	855,998
Others	30.75	635,148	32.12	196,809	30.14	438,339
BMI Status						
Underweight	34.40	1,275,694	34.58	629,927	34.36	645,767
Normal	32.18	6,633,782	33.01	3,588,238	30.94	3,045,544
Overweight	32.17	3,560,872	33.17	1,926,315	30.93	1,634,557
Obese	32.50	1,591,617	34.92	666,661	30.20	924,956

iv) Afternoon Tea

Table 5.5.14 shows the median percentage of energy from afternoon tea for Malaysians who reported taking afternoon tea. Afternoon tea contributed about 16.79% of the total daily energy intake with similar median percentages observed for men (16.51%) and women (17.09%).

Zone

While men and women in the Southern and Central zones had similar percentage of energy from afternoon tea, women in other zones had higher percentage energy than men. In general, population on the East Coast had the highest (19.13%) while those in Sarawak (12.32%) had the lowest median percentages of energy from afternoon tea. The percentage energy from afternoon tea was lowest among Sarawakian men (10.84%) and women (13.59%) and highest among men and women of the Central (18.21%) and East Coast (20.41%) regions, respectively.

Strata

Similar percentage energy was observed in urban men and women but higher percentage was reported for rural women (16.69%) than men (15.43%). Compared to the urban population (17.44%), the rural population (16.01%) had lower median percentage of energy from afternoon tea. Similarly, rural men (15.43%) and women (16.69%) had lower median percentages of energy from afternoon tea than urban men (17.30%) and women (17.50%).

Age group

Men and women in all age groups, except for 18 to 19 years and 40 to 49 years, had similar percentages of energy from afternoon tea. There was a decreasing trend in the percentage of energy from afternoon tea with increasing age of the population. The 18 to 19 age group showed the highest (19.32%) median percentage while the 50 to 59 age group had the lowest (14.34%) energy percentage from afternoon tea. Similar pattern was observed among men but the percentage contribution of energy from afternoon tea was variable in women. In women, the highest and lowest percentages of energy were observed in 20 to 29 years and 50 to 59 years, respectively.

Ethnicity

Orang Asli, Sabah Bumiputera and Sarawak Bumiputera women had higher percentages of energy than men while the reverse was true for Chinese. Among the ethnic groups, the Orang Asli had the highest (23.59%) percentage of energy from afternoon tea. While Orang Asli men consumed the lowest (8.40%) energy percentage from afternoon tea, the Orang Asli women had the highest (26.50%) energy percentage. Malay men (17.92%) and Sarawak Bumiputrea women (12.10%) had the highest and lowest percentage of energy from afternoon tea, respectively.

Educational level

Men with matriculation/form 6 education groups consumed lower percentage energy than women in the same education group. On the other hand, women than men with non-formal, primary and college/university education had higher percentage energy intake. The lowest median percentage of energy from afternoon tea was observed in population (14.09%), men (12.07%) and women (14.53%) in the 'Others' group. Total population (17.80%) and men (19.02%) with matriculation/Form 6 education and women with lower secondary school education (17.83%) had the highest energy percentage from afternoon tea.

BMI status

Except for underweight group, men and women in the other BMI groups had similar percentages of energy. Population (16.17%), men (15.74%) and women (16.61%) with normal BMI had the lowest median percentage of energy from afternoon tea. While obese population (17.76%) and women (17.71%) consumed the highest energy percentage from afternoon tea, underweight men had the highest (18.18%) energy percentage.

Table 5.5.14: Median percentage of energy from afternoon tea by socio-demographic characteristics and BMI status

Characteristic	Total		Men		Women	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	16.79	7,514,065	16.51	3,848,783	17.09	3,665,282
Zone						
Southern	16.53	1,490,825	16.85	766,392	16.25	724,433
Central	18.07	2,772,347	18.21	1,433,970	17.83	1,338,377
East Coast	19.13	962,810	16.80	489,745	20.41	473,065
Northern	17.47	954,724	16.56	457,657	18.18	497,067
Sabah	14.19	630,320	13.18	342,081	15.06	288,239
Sarawak	12.32	703,040	10.84	358,939	13.59	344,101
Strata						
Urban	17.44	4,347,772	17.30	2,248,506	17.50	2,099,266
Rural	16.01	3,166,293	15.43	1,600,278	16.69	1,566,015
Age Groups (Years)						
18-19	19.32	724,957	20.21	412,505	17.45	312,451
20-29	18.39	2,125,686	18.11	1,049,862	18.67	1,075,824
30-39	17.05	2,052,986	17.05	1,043,256	17.02	1,009,731
40-49	15.35	1,520,827	14.55	784,242	16.67	736,585
50-59	14.34	1,089,609	13.68	558,918	14.60	530,691
Ethnic Groups						
Malay	18.24	4,411,502	17.92	2,250,051	18.62	2,161,450
Chinese	15.42	1,484,822	16.18	783,495	14.47	701,326
Indian	14.28	729,063	14.32	359,961	14.05	369,102
Orang Asli PM	23.59	39,909	8.40	27,201	26.50	12,709
Sabah Bumiputera	14.79	325,072	12.05	168,889	15.39	156,183
Sarawak Bumiputera	10.97	368,365	9.73	180,852	12.10	187,513
Other Bumiputera	14.43	155,333	14.41	78,335	14.43	76,999
Educational Level						
Primary School	15.09	1,459,386	13.76	664,257	16.36	795,129
Lower Secondary School	17.38	1,533,517	17.23	865,591	17.83	667,925
Upper Secondary School	17.36	2,638,572	17.19	1,395,874	17.48	1,242,698
Matriculation/ Form 6	17.80	427,517	19.02	160,599	17.34	266,918
College/ University	16.46	1,097,323	15.77	637,697	17.34	459,626
Others	14.09	351,064	12.07	120,691	14.53	230,373
BMI Status						
Underweight	17.19	735,471	18.18	358,166	16.62	377,306
Normal	16.17	3,674,760	15.74	2,031,540	16.61	1,643,220
Overweight	16.85	2,002,822	16.85	1,080,097	16.84	922,725
Obese	17.76	906,916	18.07	365,707	17.71	541,209

5.5.6 Median intake of energy and macronutrients by weekdays and weekend by socio-demographic characteristics and BMI

In Malaysia, the weekdays and weekends vary by states –

1. Kedah, Kelantan and Terengganu – weekdays (Sunday to Thursday) and weekends (Friday to Saturday)
2. Other states – weekdays (Monday to Friday) and weekends (Saturday to Sunday)

i. Median energy intake of Malaysians during the weekdays and weekend

As shown in Table 5.5.15, the median energy intake of Malaysians during the weekdays (1530 kcal) was similar to the weekend intake (1582 kcal). Similarity in weekend and weekdays energy intake is defined as a difference of less than 100 kcal between the two intakes.

Zone

Similar median energy intake for weekdays and weekend was observed in all zones except for the East Coast and Northern zones. In these zones, the median energy intake was higher during the weekend than weekdays. During the weekdays, Sabahans had the highest energy intake (1683 kcal) while Central zone had the lowest intake (1474 kcal). On weekend, the East Coast (1754 kcal) and Southern (1496 kcal) zones consumed energy the highest and lowest, respectively.

Strata

For the urban population, the weekday and weekend median energy intakes were similar. While the rural and urban populations consumed about the same energy on weekdays, weekend energy intake was higher for rural (1651 kcal) than urban (1541 kcal) populations.

Age group

Malaysian adults in the 18 to 19 age group were found to have higher weekend (1644 kcal) than weekday (1533 kcal) energy intakes. When compared to other age groups, individuals in the oldest age group (50 to 59 years) consumed the least on weekdays (1439 kcal) and weekend (1456 kcal). Malaysians in 20 to 29 years (1594 kcal) and 18 to 19 years (1644 kcal) groups had the highest weekday and weekend energy intakes, respectively.

Ethnicity

The median energy intake on weekend was higher than that of the weekday for all ethnic groups except for the Sabah Bumiputera. The Sabah Bumiputera had the highest energy intake on weekend (1695 kcal) and weekdays (1706 kcal) while the Orang Asli (1014 kcal) and Indian (1401 kcal) consumed the least on weekdays and weekend, respectively.

Educational level

The median energy intake was similar during the weekend and weekdays in all education groups except for the Matriculation/Form 6 group. In this group, the weekend energy intake (1703 kcal) was higher than the weekday intake (1532 kcal). Malaysian adults in the 'Others' education group had the lowest energy intake on weekdays (1339 kcal) and weekend (1424 kcal) while those in the College/University (1600 kcal) and Matriculation/Form 6 groups (1703 kcal) consumed the highest on weekdays and weekend, respectively.

BMI status

With the exception of underweight adults, other BMI groups had similar energy intakes on weekdays and weekend. The underweight adults consumed energy the most (1675 kcal) on weekend while adults with normal weight had the highest energy intake (1574 kcal) on weekdays. The obese adults consumed the least energy on both weekdays (1433 kcal) and weekend (1523 kcal).

Table 5.5.15: Median intake of energy (kcal) by weekdays and weekend according to socio-demographic characteristics and BMI status

Characteristic	Weekdays		Weekend	
	Median	Estimated Population	Median	Estimated Population
Malaysia	1,530	10,582,997	1,582	3,518,110
Zone				
Southern	1,483	2,122,991	1,496	840,310
Central	1,474	3,940,544	1,518	1,424,188
East Coast	1,631	1,264,841	1,754	346,335
Northern	1,489	1,476,386	1,608	405,493
Sabah	1,683	867,733	1,654	228,556
Sarawak	1,644	910,502	1,679	273,228
Strata				
Urban	1,504	6,120,633	1,541	2,281,877
Rural	1,562	4,462,364	1,651	1,236,233
Age Groups (Years)				
18-19	1,533	1,113,922	1,644	335,069
20-29	1,594	3,111,087	1,595	1,117,966
30-39	1,548	2,735,854	1,633	895,158
40-49	1,483	2,150,692	1,550	738,458
50-59	1,439	1,471,442	1,456	431,459
Ethnic Groups				
Malay	1,567	5,838,153	1,644	1,830,290
Chinese	1,478	2,555,993	1,518	985,016
Indian	1,361	987,227	1,401	385,222
Orang Asli PM	1,014	69,202	NA	
Sabah Bumiputera	1,706	443,352	1,695	120,895
Sarawak Bumiputera	1,612	469,818	1,688	143,292
Other Bumiputera	1,516	219,251	1,631	53,397
Educational Level				
Primary School	1,426	2,069,456	1,486	615,059
Lower Secondary School	1,540	2,155,561	1,537	705,297
Upper Secondary School	1,599	3,664,006	1,662	1,224,183
Matriculation/ Form 6	1,532	601,104	1,703	184,221
College/ University	1,600	1,542,195	1,600	642,205
Others	1,339	539,492	1,424	138,529
BMI Status				
Underweight	1,511	952,040	1,675	409,786
Normal	1,574	5,264,239	1,572	1,681,829
Overweight	1,495	2,817,166	1,578	948,067
Obese	1,433	1,317,824	1,523	402,984

ii. Median energy intake of Malaysians during the weekdays and weekend for men and women

The energy intakes of men and women during the weekdays and weekend are presented in Table 5.5.16. For Malaysian men and women, the weekday and weekend energy intakes did not differ (less than 100 kcal) very much.

Zone

The median intakes of energy for men and women on weekday and weekend were similar in all zones, except for women in the East Coast who had higher energy intake on weekend (1664 kcal) than weekdays (1442 kcal). On weekdays, Sarawakian men (1871 kcal) and Sabahan women (1537 kcal) consumed the highest energy while men (1624 kcal) and women (1324 kcal) in the Central zone consumed the least energy. On weekend, men (1898 kcal) and women (1664 kcal) in the East Coast had the highest energy intakes while Central men (1669 kcal) and Southern women (1314 kcal) had the lowest energy intakes.

Strata

Regardless of gender, rural and urban populations had similar median energy intakes on both weekdays and weekend. Similarly, rural men and women did not consume much more calories than the urban men and women.

Age group

In the youngest age group (18 to 19 years), the men consumed higher energy during the weekdays (1872 kcal) than weekend (1676 kcal) while the women consumed more on weekend (1558 kcal) than weekdays (1312 kcal). Men and women in other age groups did not consume more energy on weekend than weekdays. For men, those in the oldest age group (50 to 59 years) tend to consume the least energy on weekdays (1594 kcal) and weekend (1513 kcal) while men age 18 to 19 years (1872 kcal) and 30 to 39 years (1816 kcal) consumed the highest energy on weekdays and weekend, respectively. For women, 18 to 19 year olds had the lowest weekday energy intake (1312 kcal) and highest weekend energy intake (1558 kcal).

Ethnicity

Among the ethnic groups, the median intakes for men and women were similar on weekdays and weekends except for Sabah Bumiputera and Other Bumiputera men and Sarawak Bumiputera and Other Bumiputera women. These groups' median intakes were higher during the weekend than weekdays. On weekdays, Sarawak Bumiputera men (1829 kcal) and Sabah Bumiputera women (1543 kcal) had the highest energy intakes while Orang Asli men (1369 kcal) and women (987 kcal) had the lowest intakes. On weekend, the Sabah Bumiputera men (2056 kcal) and Sarawak Bumiputera women (1590 kcal) consumed the most energy while the Indian men (1506 kcal) and women (1249 kcal) consumed the least energy.

Educational level

Except for men and women with Matriculation/Form 6 education, men and women in all other educational groups had similar energy intakes on weekdays and weekend. Men and women with Matriculation/Form 6 education had higher intakes on weekend than on weekdays. In both gender groups, 'Others' group had the least weekday and weekend intakes of energy. Men with Matriculation/Form 6 education had the highest energy intakes on weekdays (1794 kcal) and weekend (1923 kcal) while women in Higher Secondary (1468 kcal) and Matriculation/Form 6 groups (1572 kcal) had the highest energy intakes on weekdays and weekend, respectively.

BMI status

Obese men and underweight women tend to consume more energy on weekend than weekdays while men and women in other BMI groups had similar weekday and weekend energy intakes. During the weekdays, obese (1583 kcal) and normal weight (1748 kcal) men had the lowest and highest energy intakes, respectively. The energy intakes of men on weekend did not differ much by BMI status. Underweight women consumed the most energy intakes during weekdays (1432 kcal) and weekend (1691 kcal) while overweight (1311 kcal) and obese (1360 kcal) women had the least weekday and weekend intakes, respectively.

Table 5.5.16: Median intake of energy (kcal) for men and women by weekdays and weekend according to socio-demographic characteristics and BMI status

Characteristic	Men				Women			
	Weekdays		Weekend		Weekdays		Weekend	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	1,710	5,283,837	1,744	1,899,518	1,394	5,299,160	1,415	1,618,592
Zone								
Southern	1,674	1,066,836	1,738	460,060	1,373	1,056,155	1,314	380,249
Central	1,624	1,991,745	1,669	754,106	1,324	1,948,799	1,397	670,082
East Coast	1,821	634,766	1,898	193,161	1,442	630,076	1,664	153,175
Northern	1,649	668,886	1,732	244,883	1,383	807,500	1,318	160,610
Sabah	1,795	440,212	1,791	124,265	1,537	427,521	1,552	104,291
Sarawak	1,871	481,393	1,838	123,044	1,470	429,109	1,501	150,184
Strata								
Urban	1,660	3,035,527	1,693	1,237,706	1,377	3,085,106	1,387	1,044,170
Rural	1,748	2,248,310	1,790	661,812	1,415	2,214,054	1,454	574,421
Age Group (years)								
18-19	1,872	563,349	1,676	171,621	1,312	550,574	1,558	163,449
20-29	1,759	1,581,240	1,760	575,873	1,465	1,529,847	1,447	542,093
30-39	1,763	1,319,139	1,816	514,999	1,414	1,416,715	1,415	380,159
40-49	1,645	1,067,522	1,697	410,853	1,352	1,083,170	1,394	327,605
50-59	1,594	752,588	1,513	226,173	1,337	718,854	1,413	205,286
Ethnic Group								
Malay	1,736	2,954,294	1,798	1,001,189	1,412	2,883,859	1,439	829,101
Chinese	1,649	1,229,541	1,646	556,645	1,364	1,326,452	1,332	428,371
Indian	1,524	482,578	1,506	186,904	1,260	504,650	1,249	198,317
Orang Asli PM	1,369	38,171	NA		987	31,032	NA	
Sabah Bumiputera	1,825	212,910	2,056	62,959	1,543	230,442	1,521	57,936
Sarawak Bumiputera	1,829	240,620	1,741	72,209	1,473	229,198	1,590	71,083
Other Bumiputera	1,583	125,723	1,817	19,613	1,476	93,528	1,577	33,783
Educational Level								
Primary School	1,603	910,082	1,660	298,668	1,331	1,159,373	1,394	316,391
Lower Secondary School	1,687	1,182,637	1,696	465,704	1,408	972,925	1,333	239,594
Higher Secondary School	1,773	1,843,485	1,793	663,463	1,468	1,820,521	1,515	560,720
Matriculation/Form 6	1,794	234,159	1,923	74,320	1,384	366,945	1,572	109,900
College/Universiti	1,784	931,416	1,743	360,712	1,395	610,779	1,402	281,494
Others	1,393	177,985	1,484	36,651	1,316	361,507	1,312	101,878
BMI Status								
Underweight	1,714	435,185	1,669	230,985	1,432	516,855	1,691	178,802
Normal	1,748	2,829,567	1,756	914,310	1,423	2,434,672	1,408	767,519
Overweight	1,698	1,493,069	1,754	553,891	1,311	1,324,098	1,395	394,176
Obese	1,583	504,237	1,749	196,903	1,371	813,586	1,360	206,081

iii. Median carbohydrate intake of Malaysians during the weekdays and weekend

Table 5.5.17 shows the median intake of carbohydrate by weekdays and weekend. The median intake of carbohydrate among Malaysians was similar during the weekdays (219.22 g) and weekend (224.95 g). Similarity in carbohydrate intakes on weekdays and weekend is defined as a difference of less than 15 g or 1 serving of carbohydrate between the two intakes.

Zone

While the East Coast and Northern zone had higher carbohydrate intakes on weekend (231 g to 262 g) than on weekdays (210 g to 239 g), the other zones had similar weekdays and weekend carbohydrate intakes. The Southern zone had the lowest median intake (208.73 g) on weekdays and weekend (213.42 g). While Sabahans had the highest weekday carbohydrate intake (246.48 g), Malaysians on the East Coast consumed the highest carbohydrate (262.19 g).

Strata

There was not much difference (less than 15 g) in the median carbohydrate intake during the weekdays and weekend for urban and rural populations. On weekdays, the carbohydrate intake of urban population (211.16 g) was lower compared to that of rural population (228.53 g). Rural-urban difference was also observed in weekend carbohydrate intakes with higher intake among the rural (235.14 g) than urban (217.92 g) populations.

Age group

In all age groups, Malaysians did not consume much more carbohydrate on weekdays than weekend. On weekdays (207.31 g) and weekend (208.26 g), the oldest group consumed the least amount of carbohydrate. Adults in 20 to 29 (227.76 g) and 30 to 39 (233.78 g) age groups had the highest carbohydrate intakes on weekdays and weekend, respectively.

Ethnicity

All ethnic groups with the exception of Sabah Bumiputera and Other Bumiputera had similar weekdays and weekend carbohydrate intakes. Higher carbohydrate intake on weekdays (254.91 g) than weekend (234.54 g) was observed among Sabah Bumiputera but lower carbohydrate intake on weekdays (224.89 g) than weekend (247.95 g) for Other Bumiputera. The Chinese had the lowest median intakes on weekdays (196.68 g) and weekend (198.36 g) while Sabah Bumiputera (254.91 g) and Other Bumiputera (247.95 g) had the highest weekday and weekend intakes, respectively.

Educational level

In all education groups except for Matriculation/Form 6, similar carbohydrate intakes were observed during weekdays and weekend. In this group, higher intake was observed on weekend (237.94 g) than weekdays (218.10 g). Adults with no formal education (Others) consumed the least amount of carbohydrate on weekdays (201.37 g) and weekend (206.75 g). Highest weekdays and weekend intakes were observed in Higher Secondary (229.31 g) and Matriculation/Form 6 (237.94 g) groups, respectively.

BMI status

With the exception of the obese group, the median carbohydrate intakes for all BMI groups were similar for weekdays and weekend. Obese adults tend to consume more on weekend (226.98 g) than on weekdays (206.76 g). On weekdays, normal and obese groups had highest (226.48 g) and lowest (206.7 g) carbohydrate intakes, respectively. However, on weekend, carbohydrate intakes did not vary much (difference of less than 15 g) by BMI status.

Table 5.5.17: Median intake of carbohydrate (g) by weekdays and weekend according to socio-demographic characteristics and BMI status

Characteristic	Weekdays		Weekend	
	Median	Estimated Population	Median	Estimated Population
Malaysia	219.22	10,582,997	224.95	3,518,110
Zone				
Southern	208.73	2,122,991	213.42	840,310
Central	210.43	3,940,544	216.46	1,424,188
East Coast	239.09	1,264,841	262.19	346,335
Northern	210.51	1,476,386	231.48	405,493
Sabah	246.48	867,733	231.79	228,556
Sarawak	229.23	910,502	229.64	273,228
Strata				
Urban	211.16	6,120,633	217.92	2,281,877
Rural	228.53	4,462,364	235.14	1,236,233
Age Group (years)				
18-19	218.95	1,113,922	221.77	335,069
20-29	227.76	3,111,087	229.07	1,117,966
30-39	224.89	2,735,854	233.78	895,158
40-49	210.17	2,150,692	221.88	738,458
50-59	207.31	1,471,442	208.26	431,459
Ethnic Group				
Malay	229.16	5,838,153	236.79	1,830,290
Chinese	196.68	2,555,993	198.36	985,016
Indian	201.68	987,227	210.21	385,222
Orang Asli PM	215.09	69,202	NA	
Sabah Bumiputera	254.91	443,352	234.54	120,895
Sarawak Bumiputera	230.73	469,818	234.17	143,292
Other Bumiputera	224.89	219,251	247.95	53,397
Educational Level				
Primary School	207.30	2,069,456	221.58	615,059
Lower Secondary School	220.33	2,155,561	220.16	705,297
Higher Secondary School	229.31	3,664,006	230.29	1,224,183
Matriculation/Form 6	218.10	601,104	237.94	184,221
College/Universiti	219.84	1,542,195	221.72	642,205
Others	201.37	539,492	206.75	138,529
BMI Status				
Underweight	217.83	952,040	230.09	409,786
Normal	226.48	5,264,239	221.88	1,681,829
Overweight	213.78	2,817,166	225.62	948,067
Obese	206.76	1,317,824	226.98	402,984

iv. Median carbohydrate intake of Malaysians during the weekdays and weekend for men and women

As shown in Table 5.5.18, the median carbohydrate intakes of Malaysian men and women were similar during the weekdays and weekend.

Zone

The carbohydrate intakes for both men and women in each zone did not differ much between the weekdays and weekend. On weekdays, while men (270.11 g) and women (223.37 g) in Sabah consumed the highest carbohydrate, men (234.88 g) and women (186.28 g) in Central zone consumed the least. On weekend, East Coast men (279 g) and women (237.48 g) had the highest carbohydrate intakes while Central men (239.81 g) and Northern women (192.62 g) had the lowest intakes

Strata

For men in urban areas and women in both urban and rural areas, the intakes of carbohydrate did not vary much (less than 15 g) between the weekdays and weekend. However, in rural areas, men tend to consume more carbohydrate on weekend (270 g) than weekdays (251 g). On weekdays and weekend, rural women had higher intakes of carbohydrate than urban women. While weekday carbohydrate intakes were similar for urban and rural men, higher weekend intake was observed for rural (270 g) than urban (240 g) men.

Age group

Similar weekday and weekend carbohydrate intakes were observed in men and women of all age groups except for 18 to 19 year old men and women. While men in this age group had higher median carbohydrate intake on weekdays (266.85 g) than weekend (230.29 g), the reverse was true for women. On weekdays, men aged 18 to 19 years (267 g) and women aged 20 to 29 years (207 g) had the highest intakes while the lowest intakes were observed in men aged 50 to 59 years (229 g) and in women aged 18 to 19 years (184 g). On weekends, men and women in 30 to 39 and 50 to 59 age groups had the highest and lowest carbohydrate intakes, respectively.

Ethnicity

Of the ethnic groups, only Other Bumiputera men and women had higher carbohydrate intakes on weekend than weekdays. In both gender groups, Chinese and Other Bumiputera consumed the least and highest carbohydrate on weekend. During the weekdays, Sabah Bumiputera men (286.20 g) and women (232.85 g) had the highest carbohydrate intakes while Indian men (219.64 g) and Orang Asli women (162.19 g) had the lowest carbohydrate consumption.

Educational level

Malaysian men and women in all education groups, except for men with no formal (Others) and Primary school education as well as women with Lower Secondary and Matriculation/Form 6 education, had similar weekday and weekend intakes of carbohydrate. Women with Lower Secondary education had higher carbohydrate intake on weekdays (199 g) than weekend (183 g) while women with Matriculation/Form 6 education had higher carbohydrate intake on weekend (234.34 g) than weekdays (193.45 g). Men with no formal and primary school education consumed higher amount of carbohydrate on weekend than weekdays. While men in Others education group had the lowest carbohydrate intake (210.96 g) on weekdays, men with Matriculation/Form 6 (253.58 g) consumed the highest carbohydrate on weekdays. Carbohydrate intakes of men during the weekend and women during the weekdays did not vary much by educational level. However, for women, the lowest (183.01 g) and highest (234.34 g) carbohydrate intakes during the weekend were observed for women with Lower Secondary and Matriculation/Form 6 educational levels, respectively.

BMI status

Except for obese men, men and women in other BMI groups had similar median carbohydrate intakes on weekdays and weekend. Obese men had higher carbohydrate intake on weekend (245 g) than weekdays (228 g). On weekdays, while women in all BMI groups had similar carbohydrate intakes, normal weight (250 g) and obese (228 g) men had the highest and lowest intakes, respectively. On weekend, men's carbohydrate intakes did not differ much by BMI status but underweight (222 g) and normal weight (192 g) women consumed the highest and least amount of carbohydrate, respectively.

Table 5.5.18: Median intake of carbohydrate (g) for men and women by weekdays and weekend according to socio-demographic characteristics and BMI status

Characteristic	Men				Women			
	Weekdays		Weekend		Weekdays		Weekend	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	245.53	5,283,837	247.44	1,899,518	198.20	5,299,160	199.96	1,618,592
Zone								
Southern	237.67	1,066,836	240.93	460,060	193.43	1,056,155	185.56	380,249
Central	234.88	1,991,745	239.81	754,106	186.28	1,948,799	193.65	670,082
East Coast	269.06	634,766	279.00	193,161	214.63	630,076	237.48	153,175
Northern	236.23	668,886	249.37	244,883	194.23	807,500	192.62	160,610
Sabah	270.11	440,212	269.04	124,265	223.37	427,521	213.27	104,291
Sarawak	251.88	481,393	263.17	123,044	202.47	429,109	214.00	150,184
Strata								
Urban	238.23	3,035,527	239.96	1,237,706	190.65	3,085,106	192.25	1,044,170
Rural	251.10	2,248,310	269.67	661,812	209.81	2,214,054	207.88	574,421
Age Group (years)								
18-19	266.85	563,349	230.29	171,621	183.82	550,574	199.74	163,449
20-29	250.22	1,581,240	251.85	575,873	206.68	1,529,847	202.05	542,093
30-39	252.08	1,319,139	268.95	514,999	204.74	1,416,715	202.52	380,159
40-49	236.19	1,067,522	239.96	410,853	191.27	1,083,170	198.78	327,605
50-59	228.59	752,588	228.11	226,173	184.27	718,854	185.65	205,286
Ethnic Group								
Malay	252.70	2,954,294	264.63	1,001,189	207.29	2,883,859	207.89	829,101
Chinese	221.27	1,229,541	227.23	556,645	178.58	1,326,452	172.37	428,371
Indian	219.64	482,578	228.11	186,904	184.75	504,650	195.02	198,317
Orang Asli PM	254.81	38,171			162.19	31,032		
Sabah Bumiputera	286.20	212,910	292.85	62,959	232.85	230,442	213.03	57,936
Sarawak Bumiputera	247.94	240,620	258.50	72,209	219.92	229,198	226.35	71,083
Other Bumiputera	252.16	125,723	302.94	19,613	200.80	93,528	235.94	33,783
Educational Level								
Primary School	235.87	910,082	257.69	298,668	192.40	1,159,373	202.51	316,391
Lower Secondary School	243.11	1,182,637	242.53	465,704	198.85	972,925	183.01	239,594
Higher Secondary School	251.14	1,843,485	256.64	663,463	207.43	1,820,521	208.03	560,720
Matriculation/Form 6	253.58	234,159	244.92	74,320	193.45	366,945	234.34	109,900
College/Universiti	245.62	931,416	245.14	360,712	191.27	610,779	190.28	281,494
Others	210.96	177,985	230.77	36,651	200.48	361,507	192.32	101,878
BMI Status								
Underweight	245.87	435,185	244.61	230,985	199.17	516,855	221.65	178,802
Normal	250.44	2,829,567	252.80	914,310	200.89	2,434,672	192.14	767,519
Overweight	240.97	1,493,069	245.14	553,891	191.56	1,324,098	201.29	394,176
Obese	227.68	504,237	245.27	196,903	194.23	813,586	194.39	206,081

v. Median protein intake of Malaysians during the weekdays and weekend

Table 5.5.19 shows the median intake of protein by weekdays and weekend. The median protein intake for Malaysians was similar during the weekdays (55.02 g) and weekend (56.25 g). Similarity in protein intakes on weekdays and weekend is defined as a difference of less than 7 g or 1 serving of protein carbohydrate between the two intakes.

Zone

Malaysians in Southern and Northern did not consume more protein on weekend than weekdays. Sarawak had the highest intake of protein on weekdays (62 g) and weekend (63 g). The Central (51 g) and Southern (52 g) zones had the lowest protein intake on weekdays and weekend, respectively.

Strata

Urban and rural populations did not differ in weekday and weekend protein intakes. Similarly, there is no rural-urban difference in median protein intakes on either weekdays or weekend.

Age group

In all age groups, the median protein intakes were similar for weekdays and weekend. On weekdays or weekend, the protein intakes were similar in all groups.

Ethnicity

All ethnic groups had similar intakes of protein during weekdays and weekend. Among the ethnic groups, the Orang Asli (17.78 g) and Indian (45.16 g) had the lowest weekday and weekend protein intakes, respectively. Sarawak Bumiputera consumed the most protein on both weekdays (61.76 g) and weekend (66.16 g).

Educational level

Similar protein intakes were observed during the weekdays and weekend for all education groups. Adults with non formal education (Others) consumed the least protein on weekdays (45 g) and weekend (48 g). Matriculation/Form 6 (58 g) and Higher Secondary (58 g) groups had the highest protein intakes on weekdays and weekend, respectively.

BMI status

All BMI groups consumed similar amount of protein on weekdays and weekend. In addition, the weekday or weekend protein intake did not vary much (less than 7 g) by BMI status.

Table 5.5.19: Median intake of protein (g) by weekdays and weekend according to socio-demographic characteristics and BMI status

Characteristic	Weekdays		Weekend	
	Median	Estimated Population	Median	Estimated Population
Malaysia	55.02	10,582,997	56.25	3,518,110
Zone				
Southern	52.79	2,122,991	52.05	840,310
Central	51.11	3,940,544	53.82	1,424,188
East Coast	56.35	1,264,841	62.04	346,335
Northern	56.54	1,476,386	54.86	405,493
Sabah	60.81	867,733	60.94	228,556
Sarawak	62.43	910,502	63.42	273,228
Strata				
Urban	54.48	6,120,633	54.98	2,281,877
Rural	55.44	4,462,364	57.96	1,236,233
Age Group (years)				
18-19	55.48	1,113,922	57.89	335,069
20-29	56.35	3,111,087	55.79	1,117,966
30-39	56.48	2,735,854	58.04	895,158
40-49	53.59	2,150,692	55.21	738,458
50-59	52.39	1,471,442	52.83	431,459
Ethnic Group				
Malay	54.99	5,838,153	55.75	1,830,290
Chinese	57.01	2,555,993	58.45	985,016
Indian	44.08	987,227	45.16	385,222
Orang Asli PM	17.78	69,202		
Sabah Bumiputera	61.32	443,352	59.03	120,895
Sarawak Bumiputera	61.76	469,818	66.16	143,292
Other Bumiputera	57.61	219,251	59.86	53,397
Educational Level				
Primary School	52.09	2,069,456	55.09	615,059
Lower Secondary School	55.15	2,155,561	54.90	705,297
Higher Secondary School	57.02	3,664,006	58.18	1,224,183
Matriculation/Form 6	57.64	601,104	57.07	184,221
College/Universiti	57.61	1,542,195	57.07	642,205
Others	44.82	539,492	48.13	138,529
BMI Status				
Underweight	56.11	952,040	58.23	409,786
Normal	56.77	5,264,239	55.69	1,681,829
Overweight	53.60	2,817,166	57.38	948,067
Obese	49.86	1,317,824	51.90	402,984

vi. Median protein intake of Malaysians during the weekdays and weekend for men and women

The median protein intakes for men and women on weekdays and weekend are presented in Table 5.5.20. The median protein intakes of Malaysian men and women were similar during the weekdays and weekend.

Zone

For both men and women, the intakes of protein did not differ very much between the weekdays and weekend. During the weekdays, Sarawak men (70.72 g) and Sabah women (56.08 g) had the highest protein intakes while Central men (55.92 g) and women (46.01 g) had the lowest intakes. On weekend, protein intakes were highest in Sabah men (67.60 g) and Sarawak women (58.05 g) and lowest in Southern men (58.32 g) and women (45.87 g).

Strata

For both men and women in urban and rural areas, the protein intakes were similar on weekdays and weekend. In both gender groups, weekday or weekend protein intakes did not vary much by strata.

Age group

Men and women in all age groups had similar protein intakes on weekdays and weekend. In both gender groups, weekday protein intakes did not differ much by age groups. However, on weekend, while highest protein intakes were observed in men aged 30 to 39 years (66.32 g) and women aged 18 to 19 years (57.46 g), men in the oldest age group (50 to 59 years) (55.09 g) and women aged 40 to 49 years (48.76 g) consumed the least.

Ethnicity

In all ethnic groups, men and women consumed similar amount of protein on weekdays and weekend. The Orang Asli men (45.47 g) and women (17.35 g) had the lowest protein intakes on weekdays while the Indian men (50.31 g) and women (38.87 g) had least intakes on weekend. The Sarawak Bumiputera men and Sabah Bumiputera men had the highest weekday and weekend intakes, respectively. The Sarawak Bumiputera women had the highest weekday and weekend protein intakes.

Educational level

The protein intakes did not differ very much on weekdays and weekend for men and women in all education groups. Men and women with no formal education (Others) consumed the least protein on weekdays and weekend. Men with College/Universiti (63.16 g) and Higher Secondary (63.13 g) had the highest protein intakes on weekdays and weekend, respectively. On weekdays (55.84 g) and weekend (54.86 g), women with Matriculation/Form 6 education consumed the highest protein.

BMI status

Men and women in all BMI groups had similar median protein intakes on weekdays and weekend. For men, weekdays of weekend intakes of protein did not vary much by BMI status. While weekdays protein intakes were similar for women in all BMI groups, underweight and obese women had the highest and lowest weekend intakes of protein, respectively.

Table 5.5.20: Median intake of protein (g) for men and women by weekdays and weekend according to socio-demographic characteristics and BMI status

Characteristic	Men				Women			
	Weekdays		Weekend		Weekdays		Weekend	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	59.96	5,283,837	60.67	1,899,518	50.47	5,299,160	50.52	1,618,592
Zone								
Southern	57.20	1,066,836	58.34	460,060	48.93	1,056,155	45.87	380,249
Central	55.92	1,991,745	59.38	754,106	46.01	1,948,799	47.12	670,082
East Coast	62.78	634,766	64.46	193,161	51.83	630,076	57.28	153,175
Northern	60.80	668,886	58.75	244,883	53.60	807,500	49.84	160,610
Sabah	64.65	440,212	67.60	124,265	56.08	427,521	57.78	104,291
Sarawak	70.72	481,393	66.34	123,044	55.56	429,109	58.05	150,184
Strata								
Urban	58.78	3,035,527	59.39	1,237,706	49.76	3,085,106	48.92	1,044,170
Rural	61.31	2,248,310	63.15	661,812	50.96	2,214,054	52.91	574,421
Age Group (years)								
18-19	63.31	563,349	57.97	171,621	46.72	550,574	57.46	163,449
20-29	60.16	1,581,240	60.09	575,873	52.21	1,529,847	51.26	542,093
30-39	61.58	1,319,139	66.32	514,999	51.63	1,416,715	50.80	380,159
40-49	57.53	1,067,522	62.38	410,853	48.70	1,083,170	48.76	327,605
50-59	57.00	752,588	55.09	226,173	47.72	718,854	50.78	205,286
Ethnic Group								
Malay	58.68	2,954,294	61.17	1,001,189	50.83	2,883,859	49.71	829,101
Chinese	62.23	1,229,541	62.06	556,645	52.06	1,326,452	54.94	428,371
Indian	48.05	482,578	50.31	186,904	41.13	504,650	38.87	198,317
Orang Asli PM	45.47	38,171			17.35	31,032		
Sabah Bumiputera	67.32	212,910	70.11	62,959	53.42	230,442	53.04	57,936
Sarawak Bumiputera	67.53	240,620	66.29	72,209	59.19	229,198	64.78	71,083
Other Bumiputera	63.99	125,723	64.33	19,613	54.09	93,528	58.54	33,783
Educational Level								
Primary School	57.04	910,082	60.88	298,668	48.99	1,159,373	50.45	316,391
Lower Secondary School	59.02	1,182,637	59.26	465,704	50.68	972,925	48.64	239,594
Higher Secondary School	60.78	1,843,485	63.13	663,463	52.47	1,820,521	53.27	560,720
Matriculation/Form 6	62.30	234,159	57.51	74,320	55.84	366,945	54.86	109,900
College/Universiti	63.16	931,416	62.48	360,712	51.14	610,779	49.78	281,494
Others	46.41	177,985	49.32	36,651	44.12	361,507	47.13	101,878
BMI Status								
Underweight	58.55	435,185	59.30	230,985	52.55	516,855	56.63	178,802
Normal	60.78	2,829,567	60.68	914,310	51.85	2,434,672	49.85	767,519
Overweight	58.70	1,493,069	60.27	553,891	47.58	1,324,098	50.09	394,176
Obese	57.75	504,237	62.87	196,903	47.43	813,586	45.17	206,081

vii. Median fat intake of Malaysians during the weekdays and weekend

Table 5.5.21 presents the median intakes of fat by weekdays and weekend. The median fat intake among Malaysians was similar during the weekdays (44.97 g) and weekend (47.26 g). Similarity in fat intakes on weekdays and weekend is defined as a difference of less than 5 g or 1 serving of fat between the two intakes.

Zone

Malaysians in all zones consumed similar amount of fat during the weekdays and weekend. While fat intakes on weekdays did not vary much by zones, populations in Sarawak and the Central zone had the highest and lowest fat intakes on weekend, respectively.

Strata

The median fat intakes during the weekdays and weekend for urban and rural populations were similar. There was no difference in weekday or weekend fat intakes by strata.

Age group

In all age groups, the median fat intakes were similar for weekdays and weekend. The median fat intakes tend to decrease as age group increased. On weekdays and weekend, adults in the youngest age group (18 to 19 years) consumed the most fat (48.75 g to 50.66 g) on while adults in the oldest age group (50 to 59 years) had the least fat intakes (40.19 g to 44.46 g).

Ethnicity

All ethnic groups, except for the Sabah Bumiputera, had similar fat intakes during the weekdays and weekend. The Sabah Bumiputera consumed more fat on weekend (51.29 g) than weekday (45.52 g). The Chinese had the highest median fat intakes on weekdays (47.89 g) and weekend (52.06 g) while the Orang Asli (13.96 g) and Indian (40.72 g) had the lowest weekday and weekend intakes, respectively.

Educational level

With the exception of adults with no formal education (Others), adults in all education groups did not consume more fat on weekend than weekdays. On both weekdays and weekend, Malaysians with Matriculation/Form 6 and no formal education (Others) consumed the most and the least fat compared to other education groups.

BMI status

All BMI groups had similar fat intakes for weekdays and weekend. While there was not much difference in fat intakes on weekend by BMI status, normal weight (46.89 g) and obese (40.09 g) adults had the most and least fat intakes on weekdays, respectively.

Table 5.5.21: Median intake of fat (g) by weekdays and weekend according to socio-demographic characteristics and BMI status

Characteristic	Weekdays		Weekend	
	Median	Estimated Population	Median	Estimated Population
Malaysia	44.97	10,582,997	47.26	3,518,110
Zone				
Southern	44.79	2,122,991	46.74	840,310
Central	44.37	3,940,544	45.77	1,424,188
East Coast	45.25	1,264,841	48.59	346,335
Northern	43.97	1,476,386	48.03	405,493
Sabah	46.24	867,733	48.34	228,556
Sarawak	48.63	910,502	50.82	273,228
Strata				
Urban	46.13	6,120,633	47.84	2,281,877
Rural	44.05	4,462,364	46.32	1,236,233
Age Group (years)				
18-19	48.75	1,113,922	50.66	335,069
20-29	48.02	3,111,087	48.19	1,117,966
30-39	44.63	2,735,854	48.56	895,158
40-49	42.76	2,150,692	45.30	738,458
50-59	40.19	1,471,442	44.46	431,459
Ethnic Group				
Malay	44.79	5,838,153	47.64	1,830,290
Chinese	47.89	2,555,993	52.06	985,016
Indian	38.69	987,227	40.72	385,222
Orang Asli PM	13.96	69,202	NA	
Sabah Bumiputera	45.52	443,352	51.29	120,895
Sarawak Bumiputera	45.44	469,818	43.25	143,292
Other Bumiputera	42.91	219,251	42.80	53,397
Educational Level				
Primary School	39.49	2,069,456	41.88	615,059
Lower Secondary School	44.74	2,155,561	46.04	705,297
Higher Secondary School	47.49	3,664,006	50.86	1,224,183
Matriculation/Form 6	49.86	601,104	50.67	184,221
College/Universiti	49.96	1,542,195	51.62	642,205
Others	32.45	539,492	37.98	138,529
BMI Status				
Underweight	46.19	952,040	46.04	409,786
Normal	46.89	5,264,239	47.34	1,681,829
Overweight	43.97	2,817,166	48.63	948,067
Obese	40.09	1,317,824	44.95	402,984

viii. Median fat intake of Malaysians during the weekdays and weekend for men and women

Table 5.5.22 shows the median fat intake for men and women on weekdays and weekend. The median fat intakes of Malaysian men and women were similar during the weekdays and weekend.

Zone

By zone, only men in Sabah had higher median fat intake on weekend (52.74 g) than weekdays (47.42 g). Similarly, women in Central and East Coast regions consumed more fat on weekend than on weekdays. On weekdays and weekend, Sarawak men consumed the most fat while the least weekday and weekend intakes were observed in Northern (45.93 g) and Central (49.52 g) men, respectively. Women in Sabah (45.73 g) and the East Coast (47.87 g) had the highest fat intakes on weekdays while women in the Central (39.02 g) and Southern (39.23 g) zones consumed the least fat.

Strata

Men and women in urban and rural areas consumed similar amount of fat on weekdays and weekend. The weekday or weekend fat intakes in both men and women did not differ much by strata.

Age group

In men, those aged 40 to 49 years consumed more fat on weekend (52.19 g) than weekdays (46.24 g) while the oldest age (50 to 59 years) group had higher weekday (47.26 g) than weekend (42.19 g) fat intake. Only women aged 50 to 59 years had different weekday and weekend fat intakes with higher fat intake on weekend (44.84 g) than weekdays (36.55 g). On weekdays, men in the 18 to 19 age group (56.92 g) consumed the highest while men in 40 to 49 age group (46.24 g) consumed the least. On weekend, 30 to 39 years old and 50 to 59 years old men had the highest and lowest fat intake, respectively. Women aged 20 to 29 years had the highest fat intakes on weekdays (44.40 g) and weekend (45.49 g) while those in 50 to 59 and 40 to 49 age groups had the least fat intakes on weekdays and weekend, respectively.

Ethnicity

By ethnic group, Sabah Bumiputera men had higher fat intake on weekend (60.13 g) than weekdays (47.76 g) while the Sarawak Bumiputera men consumed more fat on weekdays (50.10 g) than weekend (42.83 g). With the exception of Sarawak Bumiputera women, all women in other ethnic groups had similar weekday and weekend fat intakes. Sarawak Bumiputera women had higher fat intakes on weekend (48.82 g) than weekdays (41.77 g). Orang Asli men (15.74 g) and women (13.96 g) consumed the least fat while Chinese men (52.79 g) and Sabah Bumiputera women (43.75 g) consumed the most fat on weekdays. On weekend, Sarawak Bumiputera men (42.83 g) and women (48.82 g) had the lowest and highest fat intakes, respectively. Indian women had the least weekend fat intake (36.53 g) compared to other ethnic groups.

Educational level

Except for Malaysian men with no formal education (Others), men and women in all education groups had similar weekday and weekend fat intakes. While men in Matriculation/Form 6 group had highest fat intakes on weekday (56.69 g) and weekend (55.54 g), men in Others education group had the lowest weekday (32.19 g) and weekend (42.13 g) fat intakes. For women, the lowest fat intake on weekdays (32.67 g) and weekend (35.97 g) was observed for women with Others education level. Women with Matriculation/Form 6 (46.26 g) and higher secondary education (48.04 g) had the highest fat intakes on weekdays and weekend, respectively.

BMI status

With the exception of underweight men and women, men and women in other BMI groups tend to consume similar amount of fat on weekdays and weekend. On weekdays, men in all BMI groups had similar (47.6 to 50.35 g) fat intakes. On weekend, overweight (54.39 g) and underweight (45.01 g) men had the highest and lowest fat intakes, respectively. For women, those who were underweight consumed most fat on weekdays (43.35 g) and weekend (49.29 g), while obese women had the least on weekdays (37.29 g) and weekend (39.93 g).

Table 5.5.22: Median intake of fat (g) for men and women by weekdays and weekend according to socio-demographic characteristics and BMI status

Characteristic	Men				Women			
	Weekdays		Weekend		Weekdays		Weekend	
	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population	Median	Estimated Population
Malaysia	49.93	5,283,837	51.27	1,899,518	40.65	5,299,160	43.65	1,618,592
Zone								
Southern	52.43	1,066,836	52.82	460,060	39.33	1,056,155	39.23	380,249
Central	48.82	1,991,745	49.52	754,106	39.02	1,948,799	44.30	670,082
East Coast	49.89	634,766	50.94	193,161	40.11	630,076	47.87	153,175
Northern	45.93	668,886	49.89	244,883	41.15	807,500	41.64	160,610
Sabah	47.42	440,212	52.74	124,265	45.73	427,521	43.45	104,291
Sarawak	53.88	481,393	56.85	123,044	44.10	429,109	46.95	150,184
Strata								
Urban	50.35	3,035,527	51.99	1,237,706	41.63	3,085,106	44.59	1,044,170
Rural	49.03	2,248,310	50.82	661,812	39.85	2,214,054	41.59	574,421
Age Group (years)								
18-19	56.92	563,349	53.39	171,621	41.24	550,574	45.38	163,449
20-29	52.23	1,581,240	51.27	575,873	44.40	1,529,847	45.49	542,093
30-39	49.77	1,319,139	54.47	514,999	41.09	1,416,715	43.64	380,159
40-49	46.24	1,067,522	52.19	410,853	38.64	1,083,170	39.18	327,605
50-59	47.26	752,588	42.19	226,173	36.55	718,854	44.84	205,286
Ethnic Group								
Malay	49.66	2,954,294	50.93	1,001,189	39.96	2,883,859	44.22	829,101
Chinese	52.79	1,229,541	55.62	556,645	43.67	1,326,452	46.70	428,371
Indian	43.74	482,578	44.89	186,904	35.24	504,650	36.53	198,317
Orang Asli PM	15.74	38,171			13.96	31,032		
Sabah Bumiputera	47.67	212,910	60.13	62,959	43.75	230,442	40.11	57,936
Sarawak Bumiputera	50.10	240,620	42.83	72,209	41.77	229,198	48.82	71,083
Other Bumiputera	43.05	125,723	43.22	19,613	42.24	93,528	42.80	33,783
Educational Level								
Primary School	44.01	910,082	45.86	298,668	37.60	1,159,373	39.67	316,391
Lower Secondary School	49.03	1,182,637	50.38	465,704	40.08	972,925	42.40	239,594
Higher Secondary School	51.23	1,843,485	54.62	663,463	43.62	1,820,521	48.04	560,720
Matriculation/Form 6	56.69	234,159	55.54	74,320	46.26	366,945	41.89	109,900
College/Universiti	55.87	931,416	55.25	360,712	44.67	610,779	46.19	281,494
Others	32.19	177,985	42.13	36,651	32.67	361,507	35.97	101,878
BMI Status								
Underweight	50.35	435,185	45.01	230,985	43.35	516,855	49.29	178,802
Normal	50.28	2,829,567	51.16	914,310	43.39	2,434,672	42.40	767,519
Overweight	50.09	1,493,069	54.39	553,891	37.61	1,324,098	42.02	394,176
Obese	47.62	504,237	51.75	196,903	37.29	813,586	39.93	206,081

5.6 DISCUSSION

A review of dietary intake studies of different population groups in Peninsular Malaysia and East Malaysia found 15 published studies in the past two decades, with a great deal of variation in sample size, age group, methods used and nutrients studied (Tee and Cavalli-Sforza, 1992). Data from a representative cohort of adult Malaysian men and women between the ages of 18 to 59 who participated in the Malaysian Adult Nutrition Survey have been made available here and compared with past findings and with other countries in the Asia Pacific region.

Intake of energy and macronutrients

The study found a median intake of energy that was lower than what has been reported for Malaysians in the literature during the past two decades (Chong et al., 1984, Zanariah et al., 1986, Ismail 1989, Chee et al, 1997). Mean energy intakes reported in these studies ranged from 1600 kcals to about 2300 kcals. However these studies, while being reference points, may not be comparable to the present study as the dietary assessment methods used in the latter were different, sample sizes were relatively small and mean intakes were reported.

It is well documented that dietary assessment methods have a strong bias towards underestimation of habitual dietary intake and this is especially true for the 24-hour diet recall. Under-reporting of food intake can seriously distort the interpretation of results from dietary surveys. When a person reports an energy intake that is not biologically plausible, they are identified as a low-energy reporter (Black et al 1991). Black & Cole (2001) estimated under-reporting in dietary assessment methods to be 64%, 88% and 25% of the results using diet records, diet recall and diet history, respectively. An analysis of the EI/BMR ratio in the study population found it to be 1.212 and half (54.8%) of the population were under-reporters. Women's EI/BMR ratio was lower than that of men (1.178 vs. 1.243) and more women (58%) than men (51%) were under-reporters. Low energy reporting is not unique to the Malaysian situation alone. In a large U.S. survey (CSFI II/DHSK, 1997), 1224 (17%) of 8334 adults were also found to be low-energy reporters with women forming the greater proportion (42%). The low food intake level in women in this study is also reflected in other studies which indicate that women in general are low energy reporters. Many factors may affect the ability and willingness of subjects to report or omit various foods.

Among these is the problem of memory which affects food reporting in two ways. The subject may either forget to recall foods that were actually consumed (*errors of omission*) or may report foods that were not consumed during the recalled day (*errors of commission*) (Slimani, 2002).

Distinct differences in dietary intake were seen among the socio-demographic characteristics and BMI categories of the population. The intake of energy by Malaysian men was found to be higher than that of women by about 300 kcal, a finding that has been shown in earlier studies (Chee et al., 1997). The estimates of median nutrient intake reported here for men (1722 kcal) and women (1400 kcal) are below the recommended intakes for adults. The differences observed between reported and average recommendations may be due to under-reporting of food intake by some subjects and/or may reflect lower levels of activity in the population. The higher energy intake in men compared with women is to be expected and can be attributed to the higher proportion of lean body mass in men who may also be more physically active. It could also be due to the fact that women tend to under-report their food intake (Pryer et al., 1997). However, when strata is taken into consideration, gender difference disappears which then concurs with the study of Chee et al (1997) that found men and women in rural and urban areas were not different in their energy intakes.

By age group, the oldest group (50 to 59 years) showed the lowest energy intake. The decline in energy intake with age is compatible with the reduction in energy requirement with aging, a consequence of reduction in basal metabolic rate due to the loss of fat-free mass and a possible reduction in physical activity. By ethnic groups, the Orang Asli community had the lowest intake of energy, a finding that reflects the poor socioeconomic status of this community. There appears to be no improvement in energy intake by the Orang Asli community from that reported by Khor (1988) and Ismail (1988) on Orang Asli Semai population. The Indian community were the ethnic group that had the second lowest intake of energy. The Sabah Bumiputera and Sarawak appeared to consume the largest amount of energy. Comparable studies are not available but a study by Kandiah et al. (1984) found a mean intake of about 1990 kcal among the Dusuns in the Bengkoka Peninsular of Sabah. Lower average energy intakes were reported for Malay and Indian women estate workers (1538 kcal) and urban office workers (1527 kcal) (Chee et al. 1996; Fatimah et al., 1996). A recent study on dietary intake of women in rural areas of Selangor found that the mean energy intake ranged from 1550 kcal to 1581 kcal (Zalilah & Khor, 2005).

Energy intake varied with education levels being highest in the college/university group and lowest in the group with the least education. The median energy intake by BMI categories showed a decreasing trend with BMI status. Studies published over the past decade have also shown that low-energy reporting is more prevalent and more severe among obese subjects compared with lean subjects (Macdiarmid & Bludell, 1997). These studies and others have found that the obese subjects underestimate their energy intake to a greater degree (ranging from 30% to 47%) than their lean counterparts. Thus, it is now well accepted that the obese are inclined to underestimate their dietary intakes.

The median intakes of macronutrients in the diets of Malaysians are 221 g for carbohydrate, protein 55 g and fat 46 g. The carbohydrate intake of the population has decreased by about 52 g in the last 10 years from that reported by Chee et al. (1997). In comparison to neighboring countries such as Singapore, carbohydrate intake is less by about 40 g. Protein intake reported here is similar to that observed in varying Malaysian communities (Chee et al 1997). Despite increasing disposable incomes, the consumption of protein appears to have remained the same as it was ten years ago. A survey on Singaporeans found protein intake to be higher by about 18 g (Singapore Ministry of Health, 2001). Women's intake of protein is nearly 10 g less than that of men, an observation that is reflective of their lower energy intake. Ethnic group differences are very clear for protein intake. The Orang Asli community showed the lowest intake which was about 43 g lower than that of the Sabah Bumiputera group which had the highest consumption (61 g) which is known for its backwardness in socioeconomic development has also the lowest intake of protein. Protein intake was found to decline with age being lowest in the 50 to 59 years group. This observation is comparable to that of the Singapore Nutrition Survey (Singapore Ministry of Health, 2001).

Fats in the diet include both fats and oils and the types and amounts of fats eaten have a bearing on health. High intakes of dietary fat have been linked to increased risk of cardiovascular diseases and some cancers (WHO, 2003). The median fat intake was around 46 g which generally decreased with age being lowest in the oldest group. Both men and women in urban areas had higher intakes of fat than their rural counterparts. Ethnic differences in fat intake were marked. The Chinese recorded the highest intake of fat among all the ethnic groups. A similar finding was reported in the Singapore Nutrition Survey. By weight status, the obese women had the lowest intake of fat while in men the reverse was seen. In a study by Mattison et al., (2001) women with a BMI above 25 were found to have decreased risk of high fat intake, while men had a tendency of increased risk

with increasing BMI. Median fat intake increased with level of education being lowest in those with no formal education and highest in the tertiary educated group.

Percentage of energy from macronutrients

Percentage energy derived from macronutrients has been used to assess the quality of diet and distribution of macronutrient intakes of individuals, to compare macronutrients between different subgroups and to plan menus for heterogeneous groups (Mattison et al., 2001). In this survey, the relative contribution of carbohydrate (59%), protein (14%) and fat (27%) to total dietary energy of Malaysians by all demographic characteristics and BMI status are well within dietary guidelines for a healthy diet and the population nutrient goals recommended by WHO (2003). However, in comparison to the study by Chee et al (1997) done a decade ago, Malaysians in general appear to have increased their fat derived energy intake from 23% to 27% (+4%) while energy intake from carbohydrate decreased during the same period from 63% to 59%. Energy percent from protein intake however remained unchanged. The contribution of energy by macronutrients was similar in both men and women. A recent study on dietary intake of women in rural areas of Selangor found that the mean % energy intake from carbohydrates, fats and protein were 55% to 60%, 26% to 31% and 13% to 4%, respectively (Zalilah and Khor, 2005). A higher percentage of energy from fats (23% to 30%) and protein (12% to 16%) have been reported by Chee et al., (1996) and Fatimah et al., (1996) in their studies on rural and urban female workers respectively. While this study found that male and female rural subjects were somewhat similar to their urban counterparts in their intake of energy from macronutrients, earlier studies have reported significant difference in percent energy intake between rural and urban subjects (Fatimah et al 1996, Ng, 1995 and Chee et al 1997). Energy contributions by carbohydrate in these studies ranged from 55% to 65%, protein 14% and fat 19% to 35%. Marked differences in the proportion of energy from macronutrients particularly from carbohydrate and fat were observed among ethnic groups. The highest proportion of energy from carbohydrate was seen in the Orang Asli (70%) while the lowest in the Chinese community (55%). Fat percent energy in the Chinese was twice (30%) that of the Indian group. The percentage intake of energy from protein did not vary much by ethnic groups. The distribution of % energy from macronutrients was similar with regards to carbohydrate (58% to 61%) and protein (14%) was similar across the education groups. However, for energy from fat, an increasing trend in fat intake was observed with lowest in the group with the least education (22%) while the tertiary educated group had the highest (30%). By age group and BMI status, little variation was seen in the distribution of energy from macronutrients.

The distribution of energy from macronutrients in the diets of Malaysians as found in this study is also comparable to that of Singaporeans (carbohydrate: 55%, protein: 15%, fat: 30%) and the Hong Kong Chinese (carbohydrate: 53%, protein 18%, fat: 29%) but proportionately less carbohydrate and more fat than the Japanese (carbohydrate: 59%, protein: 25%, fat: 16%) (25). In comparison to their Western counterparts, however, Malaysians consume proportionately more carbohydrate but less fat compared to the British (carbohydrate: 45%, protein: 16%, fat: 39%), Australians (carbohydrate: 45%, protein: 17%, fat: 32%) and New Zealanders (Russell et al., 1999). High intake of fat has been linked to increased risk of chronic conditions such as coronary heart disease (Kritchevsky & Hegsted, 1997; Caggiula & Mustad, 1997), obesity (Bray & Popkin, 1998), insulin resistance (Virtanen & Aro, 1994), and some forms of cancer (World cancer Research Fund, 1997).

Population distribution by percentage of energy from macronutrients

About 40% to 60% of Malaysians had adequate percentage of energy from carbohydrate, protein and fat. For carbohydrate energy, 30% to 40% and 10% of the population had less than 55% and more than 70% of energy from carbohydrate, respectively. However, for protein and fat, higher percentages of the population (protein – 40% to 45%, fat – 30% to 40%) had excess protein (more than 15%) and fat (more than 30%) energy while less than 10% and 10% to 20% of the population consumed less than 10% and less than 20% of protein and fat energy, respectively. These findings are in accordance to changes in food consumption of Malaysians towards higher consumption of meat, poultry, fish, eggs, milk, fats and oils and declining intake of cereals (Khor, 2006). In addition, the rapid growth of fast food industry and its readily available and accessible outlets to the population have partly contributed to higher energy and fat intakes among Malaysians (Ismail, 2002). Studies have shown that fast food consumption may not only contribute to higher energy and fat intakes but may also compromise the intakes of healthful nutrients (Paeratakul et al., 2003; French et al., 2001).

The findings on the percentage of the population deriving energy from macronutrients of Malaysians by zones indicated that Sarawak not only has the highest percentage of men, women and total population consuming less than 55% of carbohydrate energy but also the highest percentage with protein energy more than 15%. Among the zones, the Central and Southern and Sarawak had higher percentages of population with fat energy more than 30%. The different foods, food preparation methods and food habits in the various zones of Malaysia may contribute to the observed patterns of percentage of energy from

carbohydrate, protein and fat.

The distribution of rural and urban population according to percentage of energy from protein was similar. However, while the rural population may consume both the animal and plant foods for protein, the animal foods may be the main source of protein for the urban population. Thus, there may be a difference in protein quality in the diets of urban and rural populations. The findings also showed that a lower proportion of the rural population (less than 30%) and 40% of urban population had fat energy more than 30%. Chee et al (1997) reported that urban men (30%) and women (30%) had higher fat energy percentage than rural men (19%) and women (20%). Perhaps, processed, hawker and fast foods are more available and accessible in the urban than rural areas which could partly explain the higher percentages of the urban population with fat energy more than 30%.

While there is an increasing trend in the percentages of population consuming excess protein energy (more than 15%) as age increases, consumption of fat energy more than 30% tend to decrease as population ages. Similar trends are also observed in men and women by age group. As perceived susceptibility to diet-related chronic diseases increases with age, there is an increasing awareness on the detrimental health effects of unhealthy dietary patterns (i.e. high fat and sugar intakes, low intakes of fruits and vegetables) which could initiate behavioral changes towards healthy lifestyle (Randall et al., 1991).

Intake of micronutrients

The recommended intakes for calcium for adults have been increased for calcium (NCFFN, 2005), yet intakes of Malaysian adults observed in this study are less than recommended. Women in particular across socio-economic groups took less of it than men. By age group, the lowest intake of calcium was recorded for the youngest group particularly in females. By zone, Sarawak (389 mg) respondents had the highest intake of calcium and Northern subjects had the lowest, which is about (369 mg). Across ethnic group, Orang Asli had the lowest intake of calcium (273 mg) while Sarawak Bumiputera had the highest (394 mg). By BMI category calcium intake was lowest in the obese group. By educational level, calcium intake showed an increasing trend with educational status being highest in the college/university educated group.

Various studies in the country have reported that iron deficiency and anemia continue to be significant problems. Tee et al (1998) documented that 25% of women aged 18 to less than 60 years in rural areas and estates had anemia while a survey in remote communities in Sarawak found a high prevalence of anemia in men more than 40 years and in young women. This study found Malaysians' iron consumption to be less than the recommended intake. The median intake of iron among Malaysia was about 8.7 mg with men having a higher intake than women. These figures are less than what was reported in the Singapore Nutrition Survey (Singapore Ministry of Health, 2001) where intake was found to be twice that of Malaysians (17 g) and women had significantly lower intake than men. Among ethnic groups Orang Asli had the lowest intake of iron (5 mg) with women in this group having the lowest intake. No particular trend was seen in iron intake by BMI categories although overweight and obese had lower intake than their normal and underweight counterparts. By educational level, the group with no formal education had the lowest median intake for iron.

Sodium intake has been consistently associated with blood pressure which is a major risk factor for coronary heart disease and stroke (WHO, 2003). The median intake of sodium found in this study is about 2300 mg and it is higher in men than women by about 500 mg while its consumption declined with age. Although rural urban differences were not obvious, sodium intake was found to be highest in the group with the highest educational level (2529 mg). An estimated sodium intake more than 2300 mg, has been shown to be significantly related to the slope of blood pressure increase with increasing age (INTERSALT Cooperative Research Group, 1988). It is recommended that dietary intake of sodium, from all sources, influences blood pressure levels in populations and should be limited so as to reduce the risk of coronary heart disease and stroke (Sacks et al., 2001).

Malaysian's intake of Vitamin A was around 380 mg. With respect to zones, Sarawak had the highest intake of Vitamin A and the lowest was observed in Central zone (348 mg). In terms of strata, rural resident's intake of Vitamin A was higher than that of the urban residents by about 30 mg. Ethnic group differences in Vitamin A intake were marked while age group distribution showed intake of Vitamin A to be lowest in the 18 to 19 years group and highest in the 30 to 39 years group. By BMI status, Vitamin A intake was seen to be lowest in the obese group. Vitamin A intake increased with educational level being lowest in the group which had no formal education or little education to highest in the college/university group. Amounts of Vitamin A intake observed by all socioeconomic groups and BMI are lower by about 300 mg than Singaporeans where the sample studied

was multiethnic in nature (Singapore Ministry of Health, 2001).

Chronic inadequacy of thiamin in the early part of the 20th century led to beri-beri in migrant workers in tin mines and estates. Today, this nutritional deficiency has been practically eliminated. Yet this study found Malaysian's median intake of thiamin to be 0.65 mg which is less than the recommended intake. Women in general had lower intakes than men across socio-economic characteristics. While among age groups thiamin intake was quite similar, differences in intake were observed by geographic locations (zones), ethnic groups and by educational level. By BMI status, the obese group had the lowest intake of thiamin in comparison to other weight categories. The intakes reported here are lower than that reported for rural and urban adults by Chee et al., (1997).

Adequacy of dietary intake

Recommended Nutrient Intakes (RNIs) are the levels of essential nutrients considered adequate to meet the nutritional needs of most healthy individuals which are based on estimates of requirements for age and sex groups and as such are used to assess the adequacy of a diet (NCFFN, 2005). The recommended energy intakes for men and women are based on persons maintaining a light-to-moderate level of activity so as to promote the maintenance of muscle mass and well-being (NCFFN, 2005). Malaysians in general had an energy intake that met only 70% of RNI. Earlier studies have also reported energy intakes below RDA (Chong et al., 1984, Ismail, 1989 and Chee et al., 1997). These studies with the exception of the study by Chee et al. (1997), did not examine the issue of under-reporting which may have led to underestimation of energy intake. The present study found a high prevalence of underreporting which may have contributed to the low median intake of energy observed. Protein intake as was noted to be adequate in all ethnic groups with the exception of Orang Asli but was lower than earlier Malaysian studies and than that reported for Singaporeans (Singapore Ministry of Health, 2001).

Dietary intakes of Malaysians with respect to adequacy of micronutrient intake in relation to RNI could be described as low particularly for calcium and iron intake. Malaysians achieved less than 50% of RNI for calcium intake. Women especially were found to achieve as low as 38%, which is about 14% lower than what was found in the study of Chee et al. (1997).

Low calcium intake poses a public health concern as it is increasingly recognized that inadequate calcium intake during the pre-menopausal years reduces bone density and increases risk of osteoporosis after menopause (Allender et al., 1996). Low calcium intakes have also been implicated as a risk factor for colorectal cancer and hypertension (Wu et al., 2002), which are increasingly becoming common in the Malaysian population. By ethnic group, Orang Asli had the lowest intake of calcium being only about 34%. By age group, the 18 to 19 years group had the lowest intake of RNI (39%). By educational level, the lowest intake was in the group with the least number of years of education. By BMI status, intake of percent of RNI was lowest in the obese group but this could be a function of possible underreporting in this group.

Median percentage of RNI for iron intake by Malaysians was below 50% and it fell to as low as 38% in the youngest age group. Women in all socioeconomic categories achieved less than half of RNI for iron. In the study by Chee et al. (1997), iron intakes satisfied less than half of RDA in women particularly in those residing in rural areas. Marked differences in intake between rural and urban sectors, educational status, zones, ethnic groups and BMI status were also noted. It is well established that iron consumption is influenced negatively by poverty. In a longitudinal study done between 1992 and 1994 in Russia, Kohlmeier et al. (1998) found iron intake to be inadequate in women in the reproductive age and in poorer women. These data suggest that a large proportion of the populations are at risk of iron deficiency. However, this cannot be determined from dietary intakes alone as individuals generally adapt to poor dietary intakes by increasing their rate of absorption and by using body stores to maintain equilibrium, individual rates of absorption and losses may differ greatly from predicted values (Hallberg et al., 2000). Thus, true iron status as determined by biochemical measures is necessary to determine the extent of prevalence of deficiency.

Comparison of intakes of other micronutrients such as vitamin A, vitamin C and thiamin with RNI found all to be less than adequate in all socio-economic groups and BMI categories. Earlier studies such as that of Chee et al. (1997) had also reported low intakes for these vitamins. With reduction in energy intake, the intake of many micronutrients will be expected to decrease, hence the lower intake of all these nutrients in women and with increasing age with the exception of vitamin C.

Percentage of energy from meals and snacks

Meal and snack patterns may have an effect on body weight, lipid profiles, carbohydrate tolerance and cardiovascular outcomes (May et al., 2003; Titan et al., 2001; Mann, 1997; Jenkins, 1997; Redondo et al., 1997; Fabry et al., 1968). It is important to determine the relationship between meal and snack patterns with energy, macronutrient and micronutrient intake as it may be a marker of some other variables (e.g. diet quality, nutrient composition) that are affecting health (Kerver et al., 2006). Furthermore, information on meal and snack patterns of population will assist in understanding the association between health-related behaviors and diet-related diseases with specific meal and snack patterns.

About 90% of Malaysian population consumed morning meals and the median percentage of total daily energy intake from morning meals is 29.90%. This value is higher than the 15% to 20% energy distribution from breakfast of adults as reported by other dietary surveys (Song et al., 2005; Singapore Ministry of Health, 2001; Nicklas et al., 1998). However, this higher value could also be due to the inclusion of morning tea as breakfast is defined as any food consumed between 12 am to 11 am. There are variations in energy percentage from breakfast by zones, strata, ethnicity, age group, BMI status and educational level. The variations indeed reflect many factors such as the type of foods consumed for breakfast, breakfast habits, propensity to eat, body image, economic productivity, and cultural influences. For examples, the rural people may consume more energy-dense (i.e. rice, noodles, tapioca) foods for breakfast due to their labor intensive work and people on the East Coast are more likely to consume rice (i.e. nasi kerabu, nasi berlauk, nasi dagang) for breakfast than populations in other regions of Malaysia. Promoting breakfast consumption and healthy breakfast food choices is important as breakfast has been shown to confer many health benefits to adults such as sustenance of energy level throughout the morning, provision of quality diets, enhancement of physical activity and mental alertness, increased efficiency in energy expenditure and self-control and maintenance of healthy body weight (Song et al., 2005; Holt et al., 1999; Kirwan et al., 1998; Nicklas et al., 1998; Benton and Parker, 1998).

Lunch was taken by 88.5% of Malaysians and provided about 30.49% of total daily energy intake for Malaysians. Dinner was consumed by 91.9% of the population and provided the most (32.35%) energy among the three meals. The findings from the National Nutrition Survey of Singapore (Singapore Ministry of Health, 2001) indicated that the percentages of energy from lunch and dinner are 31.6% and 36%, respectively. Several trends in lunch and

dinner patterns by zone, age group and BMI status were observed. Sarawak has the lowest percentage energy from morning meals but the highest from lunch and dinner. On the other hand, the East Coast was among the zones with highest energy percentage from morning meals but consistently had lowest energy contribution from lunch and dinner. While the younger age groups seemed to have higher energy intakes for morning meals and dinner, the older age groups had lower energy intakes for these meals. Compared to other BMI groups, overweight and obese Malaysians tend to consume more energy for morning meals and lunch and less for dinner (except for obese men).

Afternoon tea is the most sought snack time among Malaysians which is taken between late afternoon and dinner. In this survey, afternoon tea was consumed by 54% of the population. A study on snacking patterns among adults and children in the US also indicated that afternoon was the most popular time for snacking in all age groups while morning was the least common snack time (Cross et al., 1994). A variety of traditional sweet and savory cakes, bakery products, sweet porridge and spicy foods are commonly consumed by Malaysians during afternoon tea. Afternoon tea contributed to about 16.8% of total daily energy for Malaysians who reported of consuming this meal

For Singaporeans, the recommendation on the percentage of energy from snack is 20% and the reported energy percentage from snack was 13.5% (Singapore Ministry of Health, 2001). However, the finding did not specify the time (e.g. morning, afternoon or evening) that the snack was consumed. By socio-demographic characteristics, the highest percentages of energy from afternoon snack could be observed in the East Coast (zone) and among 18 to 19 year-old adults (age group), adults with Matriculation/Form 6 education, urban population (strata) and the Orang Asli of Peninsular Malaysia.

Snack foods consumed between meals can contribute significantly to daily energy and nutrient intakes (Haveman-Nies et al., 1998; Siega-Riz et al., 1998; Cross et al., 1994). Kerver et al. (2006) reported that adults consuming breakfast, lunch, dinner and snacks (1 or more than or equal to 2) had lower total fat intakes and higher energy, carbohydrate and micronutrient intakes except for cholesterol, vitamin B6 and sodium than adults consuming the three meals without snack. Besides the frequency and amount of snacks and the percentage energy contributed by snacks, it is also important to consider the quality of snacks in the relationship between snack consumption with energy and nutrient intakes. However, this report is not able to describe the latter.

Percentage of energy and macronutrients by weekdays and weekend

The median energy intake of Malaysian men and women on weekdays and on weekend did not differ very much. However, there are categories within zone, ethnicity, age group, educational level and BMI status that showed weekday-weekend differences in energy intake with many of these categories had higher energy intake on weekend than on weekdays. Similarly, carbohydrate, protein and fat intakes of Malaysians were similar on weekdays and weekend except for several categories within ethnic and education groups. For example, women with Matriculation/Form 6 education had higher weekend intake of carbohydrate and Sabah Bumiputera men consumed more fat on weekend than weekdays.

The group and individual mean energy and nutrient intakes per day may vary with the day of the week. Studies have shown that there are weekday-weekend differences in dietary intakes and patterns in various groups (Van Staveren et al., 1982; Thompson et al., 1986; Farrior and Steinfeld, 1995; Cullen et al, 1998). Van Staveren et al. (1982) reported that the mean daily dietary fiber intakes of male and female Dutch adults were lower on weekends than on weekdays. In a nationwide food consumption survey of adults aged 23 to 74 years in USA, there were significant differences in weekday and weekend intakes in relation to the number of meals and snacks taken, energy intake distribution throughout the day, sources and nature of food eaten and nutrient intake (Thompson et al., 1986). For example, the adults consumed more meals and snacks on weekdays although weekend energy protein and fat were greater on weekend. The latter could be due to higher intakes of eggs, bacon, meat and alcoholic beverages and less desserts and cereals on weekends than on weekdays. The researchers also reported that the weekday-weekend differences were greater in women than in men and in younger than older adults. Cullen et al. (1998) found that among children, juice and fruits were consumed more often on weekdays than on weekend. The greater weekday consumption of juice and fruit was due to its availability during school breakfast and at home lunches, respectively. Among the elderly population, the weekday-weekend effect on dietary intake is inconsistent. A study on elderly participants in a home delivered meal program showed that weekend intakes of energy and most nutrients were significantly lower than weekday intakes (Farrior and Steinfeld, 1995). Maisey et al. (1995), however, reported that the intakes of vegetable-derived micronutrients (e.g. carotene, retinol, folate and vitamin C) among elderly population were higher on weekend.

Strengths and limitations of the study

The strengths of our study are listed as below:-

1. Large sample representative of the population
2. The use of an interactive 24-HDR which aimed to minimize potential sources of error by ensuring completeness and consistency of the data collected.
3. Data were collected by enumerators (mostly state nutrition officers and nutrition graduates) well-trained in interviewing and probing skills, quantification of foods and recipes with the use photographs on specific foods and household measurements and who are familiar with local food customs
4. Data processors who were trained to identify and describe foods and recipes and carry out quality control checks

Limitations include the fact that nutrient intake estimates were derived from a single 24-hour recall. Multiple 24-hour recalls would have provided better estimates of intake, but would have also increased respondent burden, which in turn may contribute to decreased participation in this study. Another limitation of this study is that the 24-HDR like any other dietary method is not free of error as it tends to underestimate food and nutrient intakes.

5.7 CONCLUSION

The present study provides the first national estimates of intake of energy and nutrients for the Malaysian population. The study found that intake of energy among Malaysians falls short of the recommended intake while intakes of macronutrients were well within the recommendations for a healthy diet. The intakes of micronutrients studied were all less than two thirds of the RNI with calcium and iron being the most inadequate particularly in women across socio-demographic groups and BMI status. As nearly half of the studied population had under-reported their energy intake, cautious interpretation of the current findings are needed. At the national level, ongoing nutrition surveys will continue to provide valuable information concerning trends in food and nutrient intake, particularly among age and ethnically diverse subgroups of the population. Future studies are needed to explore associations between diet and chronic disease among Malaysians and to identify healthful patterns of food and nutrient intake. These studies also need to address the inevitable issue of underreporting inherent in all dietary surveys. Finally, continued nutrition monitoring is needed to measure public adherence to dietary recommendations.

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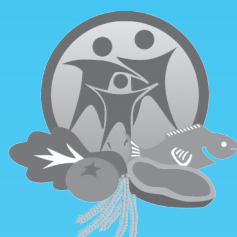
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**Nutrition Section
Family Health Development Division
Ministry of Health Malaysia
Level 7, Block E10
Federal Government Administrative Centre
62590 Putrajaya
Malaysia
Tel.: 603-88834086 Fax: 603-88884647**

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