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NATIONAL HEALTH AND MORBIDITY SURVEY (NHMS) 2024: NUTRITION

Volume II

Findings

| NHMS 2024 |

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NUTRITION

VOLUME II

FINDINGS

NATIONAL HEALTH AND MORBIDITY SURVEY (NHMS) 2024: NUTRITION

Volume II: Findings
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Volume in this series

The report comprises several volumes as follows:

Volume I	**:**	Methods
Volume II	**:**	Findings
Volume III	**:**	Food Consumption Statistics

Disclaimer:
The views expressed in this report are those of the authors alone and do not necessarily represent the opinions of the investigators participating in the survey, nor the view or policy of the Ministry of Health.

Message from the Director General of Health Malaysia

The National Health and Morbidity Survey (NHMS) has been a key pillar of public health research in Malaysia since its launch in 1986. Starting from 2011, this nationwide, population-based survey has been conducted by the Institute for Public Health annually in four to five years interval. Prior to the implementation of this survey, several nutrition-focused surveys were conducted, including the Malaysian Adult Nutrition Survey (MANS) 2002/2003 and the National Health and Morbidity Survey (NHMS) 2014: MANS. These earlier surveys primarily targeted the adult population, whereas the NHMS 2024 offers a more comprehensive assessment that encompasses not only adults, but also children, adolescents, and older persons. The current NHMS focuses on nutrition with the aim to provide current insights into nutrition-related issues which contribute to the nation's disease burden, healthcare requirements, and medical costs. In recent years, the increasing prevalence of nutrition-related issues has underscored the need for a stronger focus on dietary habits, nutrition awareness, and their impact on overall health outcomes.

Understanding the evolving trends in nutrition and associated risk factors is crucial in addressing Malaysia's healthcare challenges. The NHMS serves as a vital tool in monitoring national nutrition indicators and benchmarking progress toward global commitments such as Universal Health Coverage (UHC) and the Sustainable Development Goals (SDGs). Furthermore, this survey is crucial as they provide the evidence-base required for targeted interventions aimed at improving dietary practices, reducing malnutrition, and combating diet-related non-communicable diseases (NCDs).

The NHMS 2024 provides essential epidemiological data on key aspects of nutrition, including dietary intake, nutrient and nutritional status, and overall nutrition awareness. These insights are instrumental in guiding strategies to promote healthier eating habits, prevent diet related illnesses, and enhance public awareness of the importance of proper nutrition. The findings also support the development of comprehensive policies aligned with the World Health Organization (WHO) Global Nutrition Targets 2030, SDG 2 (Zero Hunger), and Global Action Plan for the Prevention and Control of NCD, which prioritizes addressing obesity, micronutrient deficiencies, unhealthy diets, and physical inactivity.

In conjunction with the NHMS 2024, the Ministry of Health Malaysia is also conducting the Malaysian Community Salt Study 2.0 (MyCoSS 2.0). This study focuses specifically on assessing the population's salt intake through 24-hour urine collection.

Through extensive data collection and analysis, NHMS 2024 provides insights into population health trends and informs future strategies to enhance nutritional well-being across all segments of society. The insights gained from this survey are indispensable for policymakers, healthcare professionals, and other stakeholders in shaping evidence-based nutrition policies and ensuring the efficient allocation of resources.

The success of the NHMS 2024 is a testament to the collaborative efforts of various organizations, including the Institute for Public Health, universities, and other agencies.

Datuk Dr Mahathar bin Abd Wahab
Director General of Health Malaysia
Chairman of NHMS Steering Committee
Ministry of Health Malaysia

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1. General Findings

1. General Findings

Sample Coverage

From the 135 selected Enumeration Blocks (EBs), 1,860 Living Quarters (LQs) for the adult population and 3,540 LQs for specific age populations were selected. Out of these LQs, for the adult population, there were 1,666 eligible LQs and 1,478 of the LQs were visited, while for the specific age population, there were 3,017 eligible LQs and 2,756 of the LQs were visited. Out of the LQs visited, 1,481 respondents for the adult population and 3,667 respondents for specific ages were successfully interviewed, making the overall response rate for the adult population 88.5% and for the specific age population 84.7%.

Sociodemographic Characteristics

Among the 1,481 respondents of the adult population, approximately half were from urban areas (50.9%), and the majority were female (57.1%). Nearly half of the respondents were Malay (48.5%), the majority were married (66.4%), and most had attained a secondary education level (60.3%). Half of the respondents were in the non-working group (51.9%), which included unpaid workers, homemakers, caregivers, retirees, students, the unemployed, those unable to work due to health problem and old ages. Almost three-quarters of the respondents were in the B40 household income group (74.4%).

Out of the 3,667 respondents of the specific age population, 1,757 were in the children and adolescent (5-19 years) age group, and 1,910 were in the older person (60 years old and above) age group.

Among the 1,757 children and adolescent respondents, more than half were from rural areas (53.6%), with males making up a marginally higher proportion (51.1%). Two-thirds of the respondents were Malays (67.3%). The majority of the main guardians were the parents, with 46.4% being the father and 47.7% being the mother. The majority of the respondents' main guardians had secondary education (73.8%). Two-thirds of the respondents were in the B40 household income group (67.8%).

Among the 1,910 older person respondents, more than half of them were from rural areas (53.6%), with the majority being female (55.3%), Malays (56.8%), married (66.5%) and had secondary school education (40.0%). Only one-fifth of the respondents were still employed (21.1%), and most were in the B40 household income group (80.1%).

Table 1.1: Sociodemographic characteristics of respondent, adult population, (18 years and above) NHMS 2024 (n=1,481)

Sociodemographic Characteristics	Count	Percentage (%)
Malaysia	1,481	100.0
Location		
Urban	754	50.9
Rural	727	49.1
Sex		
Male	635	42.9
Female	846	57.1
Ethnicity		
Malay[a]	718	48.5
Chinese	249	16.8
Indian	74	5.0
Other Bumiputera	317	21.4
Others	123	8.3
Marital Status		
Single[b]	496	33.6
Married or Cohabiting	981	66.4
Education Level		
No Formal Education	205	13.9
Primary Education	256	17.4
Secondary Education	889	60.3
Tertiary Education	124	8.4
Occupation		
Government Employee	95	6.5
Private Employee	346	23.8
Self-Employed	259	17.8
Not Working[c]	754	51.9

a - Malay includes Orang Asli
b - Single includes never married, divorced, separated, and widowed
c - Not working includes unpaid workers, homemakers, caregivers, retirees, students, unemployed, health problem and old ages

Table 1.2: Sociodemographic characteristics of respondent, children and adolescent (5-19 years) NHMS 2024 (n=1,757)

Sociodemographic Characteristics	Count	Percentage (%)
Malaysia	1,757	100.0
Location		
Urban	815	46.4
Rural	942	53.6
Sex		
Male	897	51.1
Female	860	48.9
Ethnicity		
Malay[a]	1,183	67.3
Chinese	200	11.4
Indian	89	5.1
Other Bumiputera	225	12.8
Others	60	3.4

a - Malay includes Orang Asli

Table 1.3: Sociodemographic characteristics of respondent, older persons (60 years and above), NHMS 2024 (n=1,910)

Sociodemographic Characteristics	Count	Percentage (%)
Malaysia	1,910	100.0
Location		
Urban	887	46.4
Rural	1,023	53.6
Sex		
Male	854	44.7
Female	1,056	55.3
Ethnicity		
Malay[a]	1,085	56.8
Chinese	502	26.3
Indian	108	5.7
Other Bumiputera	162	8.5
Others	53	2.8
Marital Status		
Single[b]	638	33.5
Married or Cohabiting	1,269	66.5
Education Level		
No Formal Education	510	26.8
Primary Education	574	30.2
Secondary Education	761	40.0
Tertiary Education	58	3.0
Occupation		
Employed	396	21.1
Unemployed	1,482	78.9

a - Malay includes Orang Asli
b - Single includes never married, divorced, separated, and widowed

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2. Nutritional Status

2. Nutritional Status

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Introduction

Children and adolescent growth and development are transformative events that greatly influence a person's health in later life. Diet affects immunological function, neurodevelopment, and cardiorespiratory fitness, as well as physical growth, in adolescents [1]. Nearly one in five teenagers worldwide was overweight or obese in 2016—a 120% rise from 1990 [2]. The World Health Organization (WHO) Growth Reference 2007 is one of several instruments for evaluating the growth status of adolescents. The growth indicators include weight-for-age, height-for-age and BMI-for-age are based on this reference, which provides age- and sex-specific references for children and adolescents aged 5 to 19 years [3]. Nutritional status is classified using five growth indicators, which include underweight, stunting, thinness, overweight and obesity.

The increasing prevalence of overweight, obesity, and abdominal obesity in all age groups, including older persons, should raise serious concerns because it is linked to heart disease, diabetes, high blood pressure, high cholesterol, and some types of cancer [4,5].

Based on a BMI cut-off of more than 25.0 kg/m^2, the prevalence of overweight and obesity among Malaysian adults and older persons increased over the last five years, from 50.1% in 2019 to 54.4% in 2023.

Similarly, the rise in abdominal obesity among Malaysian adults and older persons, based on waist circumference 90 cm and above for men and 80 cm and above for women, has witnessed a similar increase, growing from 52.6% in 2011 to 54.5% in 2023.

Objectives

General Objective

To determine the nutritional status of the Malaysian population.

Specific Objectives

1. To determine the prevalence of underweight among children aged 5-10 years in Malaysia.
2. To determine the prevalence of stunting, thinness, overweight, and obesity among children and adolescents aged 5-19 years in Malaysia.
3. To determine the prevalence of underweight, overweight, obesity, and abdominal obesity among adults (18 years and above) in Malaysia.
4. To determine the prevalence of underweight, overweight, obesity, and abdominal obesity among older persons (60 years and above) in Malaysia.

Methods

Anthropometric measurements of weight, height, and waist circumference were conducted according to standard protocols. All measuring instruments were calibrated before the survey and standard weights were used for verification during field implementation. Weight was measured to the nearest 0.1 kg using the SECA Electronic Weighing Scale (SECA 813). Standing height was measured without shoes to the nearest 0.1 cm using the SECA Portable Stadiometer (SECA 213). Waist circumference was measured to the nearest 0.1 cm at the midpoint between the lower margin of the last rib and the top of the iliac crest on the mid-axillary line, using a flexible, non-stretchable SECA Measuring Tape (SECA 201). All measurements were taken twice, and the mean of the two readings was recorded for data entry.

Variable Definition

Children and Adolescents

The nutritional status of children was assessed based on the WHO Growth Reference 2007 for individuals aged 5-19 years, as below:

- Underweight (Weight-for-Age) was defined as WAZ <-2SD below the WHO Growth Reference median (applicable for ages 5–10 years only).
- Stunting (Height-for-Age) was defined as HAZ <-2SD below the WHO Growth Reference median.
- Thinness (BMI-for-Age) was defined as BAZ <-2SD below the WHO Growth Reference median.
- Overweight (BMI-for-Age) was defined as BAZ >+1SD to ≤+2SD above the WHO Growth Reference median.
- Obesity (BMI-for-Age) was defined as BAZ >+2SD above the WHO Growth Reference median.

Adults and Older Persons

- Body mass index (BMI) was calculated by the ratio of weight in kilograms to the square of height in metres (kg/m²) and classified according to the two guidelines as follows:

BMI Categories	World Health Organization (1998)	Clinical Practice Guidelines Management of Obesity (2023)
Underweight	below 18.5 kg/m²	below 18.5 kg/m²
Normal	18.5-24.9 kg/m²	18.5-22.9 kg/m²
Overweight	25.0-29.9 kg/m²	23.0-27.4 kg/m²
Obese	≥ 30.0 kg/m²	≥ 27.5 kg/m²

- Abdominal obesity was classified using the International Diabetes Institute/ Western Pacific World Health Organization/ International Association for the Study of Obesity/ International Obesity Task Force (WHO/ IASO/ IOTF) (2000) of waist circumference (WC) cut-off values of 90 cm and above for men and 80 cm and above for women.

Findings

Children and Adolescents

Underweight

The prevalence of underweight (WAZ <-2SD) among children aged 5-10 years was 12.5% (95% CI: 8.63, 17.66), and the details are shown in **Table 2.4**.

Stunting

The prevalence of stunting (HAZ <-2SD) among children aged 5-19 years was 8.1% (95% CI: 6.77, 9.54), and the details are as **Table 2.5**. The prevalence of stunting was higher in rural areas [11.9% (95% CI: 9.78, 14.39)] compared to urban areas [6.7% (95% CI: 5.20, 8.53)].

Thinness

The prevalence of thinness (BAZ <-2SD) among children aged 5-19 years was 10.8% (95% CI: 8.86, 13.15), and the details are shown in **Table 2.6**.

Overweight

The prevalence of overweight (BAZ >+1SD - ≤+2SD) among children aged 5-19 years was 14.4% (95% CI: 12.32, 16.75), and the details are shown in **Table 2.7**.

Obesity

The prevalence of obesity (BAZ >+2SD) among children aged 5-19 years was 13.6% (95% CI: 11.72, 15.81), and the details are shown in **Table 2.8**. The prevalence of obesity was higher among males [16.8% (95% CI: 14.07, 19.95)] compared to females [10.2% (95% CI: 7.99, 12.82)].

Adults

Underweight

Based on the WHO classification of BMI (1998), the prevalence of underweight among adults (18 years and above) was 6.1% (95% CI: 4.46, 8.37), as shown in **Table 2.9**. The prevalence of underweight was higher among single individuals [10.6% (95% CI: 7.05, 15.71)] compared with those who were married or cohabiting [3.3% (95% CI: 2.02, 5.38)].

Overweight

Based on the WHO classification of BMI (1998), the prevalence of overweight among adults (18 years and above) was 30.5% (95% CI: 26.59, 34.71), as detailed in **Table 2.10**. The prevalence of overweight was highest among private employees [34.5% (95% CI: 26.00, 44.20)], followed by self-employed [30.7% (95% CI: 20.87, 42.71)], government employees [28.9% (95% CI: 18.44, 42.18)], and those not working [26.8% (95% CI: 21.85, 32.37)]. In terms of household income groups, the prevalence of overweight was highest among the T20 [39.6% (95% CI: 26.56, 54.34)] compared to M40 [30.8% (95% CI: 23.40, 39.35)] and B40 [28.6% (95% CI: 24.74, 32.87)].

Obesity

Based on the WHO classification of BMI (1998), the prevalence of obesity among adults (18 years and above) was 23.1% (95% CI: 19.91, 26.74), as detailed in **Table 2.11**. The prevalence of obesity was higher among females [27.5% (95% CI: 22.29, 33.45)] compared with males [19.3% (95% CI: 15.17, 24.14)]. Across ethnic groups, the prevalence was highest among Malays [29.4% (95% CI: 24.96, 34.31)] and Indians [29.4% (95% CI: 17.99, 44.24)], followed by Other Bumiputera [23.0% (95% CI: 18.29, 28.39)] and Chinese [14.7% (95% CI: 9.59, 21.77)]. By employment status, the prevalence of obesity was highest among government employees [41.8% (95% CI: 26.78, 58.46)], followed by self-employed individuals [25.0% (95% CI: 18.44, 32.90)], unemployed individuals [24.6% (95% CI: 19.10, 30.96)] and private employees [18.1% (95% CI: 13.37, 24.01)].

Abdominal Obesity

The prevalence of abdominal obesity among adults (18 years and above) was 52.1% (95% CI: 47.86, 56.28), as shown in **Table 2.15**. Across ethnic groups, the prevalence was highest among Indians [72.2% (95% CI: 58.18, 82.88)], followed by Malays [57.9% (95% CI: 52.75, 62.85)], Other Bumiputera [55.6% (95% CI: 47.97, 62.95)], and Chinese [47.6% (95% CI: 38.27, 57.15)].

Older Persons

Underweight

Based on the WHO classification of BMI (1998), the prevalence of underweight among older persons (60 years and above) was 5.0% (95% CI: 4.00, 6.34), and the details are shown in **Table 2.16**.

Overweight

Based on the WHO classification of BMI (1998), the prevalence of overweight among older persons (60 years and above) in Malaysia was 35.0% (95% CI: 31.99, 38.20). Among ethnicities, the prevalence of overweight was highest among Indians [48.3% (95% CI: 38.31, 58.41)], followed by Other Bumiputera [35.7% (95% CI: 28.51, 43.53)], Malays [35.2% (95% CI: 31.01, 39.68)], and Chinese [30.1% (95% CI: 24.83, 35.94)].

Obesity

Based on the WHO classification of BMI (1998), the prevalence of obesity among older persons (60 years and above) was 16.8% (95% CI: 14.51, 19.28). Among ethnicities, the prevalence of obesity was highest among Indians [21.9% (95% CI: 15.79, 29.60)], followed by Malays [20.4% (95% CI: 16.95, 24.30)], Other Bumiputera [19.6% (95% CI: 14.06, 26.58)], and Chinese [10.2% (95% CI: 7.64, 13.43)].

Abdominal Obesity

The prevalence of abdominal obesity among older persons (60 years and above) was 62.2% (95% CI: 59.22, 65.16). Among ethnicities, the prevalence of abdominal obesity was highest among Indians [80.3% (95% CI: 71.49, 86.91)], followed by Malays [62.8% (95% CI: 58.87, 66.65)], Other Bumiputera [57.5% (95% CI: 50.03, 64.69)], and Chinese [57.3% (95% CI: 52.40, 62.12)]. The prevalence of abdominal obesity was higher among females [70.7% (95% CI: 66.79, 74.30)] compared to males [53.4% (95% CI: 48.99, 57.76)].

Conclusion

Compared to the prevalence of overweight and obesity (28.0%), the prevalence of stunting (8.1%) and underweight (11.1%) among adolescents was lower. The prevalence of overweight, obesity, and abdominal obesity among adults remains high at 30.5%, 23.1%, and 52.1%, respectively. Among older persons, the prevalence of overweight, obesity, and abdominal obesity was 35.0%, 16.8%, and 62.2%, respectively.

In order to combat malnutrition in Malaysia, it is necessary to expand the reach of public health policies, nutrition standards, and programs.

Recommendations

To encourage healthy growth and weight status and address the double burden of malnutrition, the following recommendations are proposed:

1. Engage multiple sectors and foster Public-Private Partnerships (PPP) to create healthy food environments and support effective nutrition programs and policies at both national and local levels.
2. Implement massive advocacy to disseminate key preventive measures like promoting healthy eating and active living, supported with specific allocated financial and manpower.
3. Improve nutrition literacy and self-monitoring through technology-driven tools such as personalised diet planning and self-monitoring of body weight.
4. Create supportive food environments in communities by enhancing a supportive healthy eating environment, such as increased access to healthy options in cafeterias/ premises, healthier choice selections at the supermarket and an enhanced food system to be more accessible and affordable.
5. Foster a culture of well-being and productivity in workplaces to enhance both organisational and community development.
6. Expand opportunities for physical activity by building more public sports facilities. Improving the environment to encourage a physically active lifestyle, such as providing more gated walking paths, bicycle lanes and improving access to public transportation.
7. Implement early interventions in schools and communities to prevent both undernutrition and obesity, combining education, awareness, and preventive measures to reduce obesity-related disease risks in adulthood.
8. Adopt legislative approaches to address the obesogenic environment towards the formulation of legislation, including rules on food advertising, marketing, and nutrition labelling.

Table 2.1: Comparison of nutritional status among adolescents in Malaysia; WHO 2007

	*2019 (%)	2024 (%)
**Underweight (WAZ <-2SD)	15.4 (12.78, 18.52)	12.5 (8.63, 17.66)
Stunting (HAZ <-2SD)	12.7 (10.96, 14.70)	8.1 (6.77, 9.54)
Overweight (BAZ >+1SD to ≤+2SD)	15.0 (13.31, 16.82)	14.4 (12.32, 16.75)
Obese (BAZ >+2SD)	14.8 (13.06, 16.70)	13.6 (11.72, 15.81)

*2019 among children 5-17 years old
**5-10 years old

Table 2.2: Trend in nutritional status of adults (18 years and above) in Malaysia; WHO 1998

	2019 (%) 95% CI	2023 (%) 95% CI	2024 (%) 95% CI
Underweight	6.5 (5.71, 7.45)	5.1 (4.41, 5.80)	6.1 (4.46, 8.37)
Overweight	30.4 (29.00, 31.90)	32.6 (28.05, 36.43)	30.5 (26.59, 34.71)
Obesity	19.7 (18.43, 21.13)	21.8 (21.40, 29.41)	23.1 (19.91, 26.74)
Abdominal Obesity	52.6 (50.54, 54.58)	54.5 (52.50, 56.39)	52.1 (47.86, 56.28)

Table 2.3: Trend in nutritional status of older persons (60 years and above) in Malaysia; WHO, 1998

	2018 (%)	2023 (%)	2024 (%)
Underweight	5.2 (4.18, 6.46)	3.9 (3.10, 4.85)	5.0 (4.00, 6.34)
Overweight	37.0 (34.96, 30.01)	37.5 (34.93, 40.22)	35.0 (31.99, 38.20)
Obesity	17.6 (15.81, 19.63)	17.3 (15.50, 19.29)	16.8 (14.51, 19.28)
Abdominal Obesity	67.3 (64.48, 70.07)	66.8 (66.47, 69.07)	62.2 (59.22, 65.16)

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Table 2.4: Prevalence of underweight among children (5-10 years) according to Weight-for-Age (WAZ) Z-score, WHO 2007 by sociodemographic characteristics (n=561)

Sociodemographic Characteristics	Underweight (WAZ <-2SD)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	74	247,210	12.5	8.63	17.66
Location					
Urban	28	176,148	12.1	7.35	19.29
Rural	46	71,062	13.4	9.42	18.82
Sex					
Male	39	111,888	11.1	7.67	15.77
Female	35	135,322	13.9	8.47	21.92
Ethnicity					
Malay[a]	57	148,582	14.4	9.63	21.02
Chinese	3	–	–	–	–
Indian	5	–	–	–	–
Other Bumiputera	6	–	–	–	–
Others	3	–	–	–	–
Household Income Group					
B40	54	168,013	12.7	8.63	18.42
M40	14	–	–	–	–
T20	6	–	–	–	–

a - Malay includes Orang Asli

Table 2.5: Prevalence of stunting among children (5-19 years), according to Height-for-Age (HAZ) Z-score, WHO 2007 by sociodemographic characteristics (n=1,651)

Sociodemographic Characteristics	Stunting (HAZ <-2SD)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	163	583,477	8.1	6.77	9.54
Location					
Urban	52	355,966	6.7	5.20	8.53
Rural	111	227,511	11.9	9.78	14.39
Sex					
Male	77	246,469	6.5	4.80	8.70
Female	86	337,008	9.8	7.62	12.46
Ethnicity					
Malay[a]	124	306,880	9.4	7.54	11.59
Chinese	7	–	–	–	–
Indian	7	–	–	–	–
Other Bumiputera	18	66,147	8.8	6.17	12.54
Others	7	–	–	–	–
Household Income Group					
B40	127	443,680	9.5	8.04	11.21
M40	23	96,114	5.3	3.15	8.84
T20	12	41,477	5.4	2.84	10.18

a - Malay includes Orang Asli

Table 2.6: Prevalence of thinness among children (5-19 years), according to BMI-for-Age (BAZ) Z-score, WHO 2007 by sociodemographic characteristics (n=1,645).

Sociodemographic Characteristics	Thinness (BAZ <-2SD)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	174	782,029	10.8	8.86	13.15
Location					
Urban	85	608,147	11.4	8.91	14.54
Rural	89	173,883	9.1	7.22	11.44
Sex					
Male	101	444,626	11.7	9.08	15.06
Female	73	337,404	9.8	7.23	13.15
Ethnicity					
Malay[a]	115	311,585	9.5	7.41	12.20
Chinese	21	81,020	12.0	6.80	20.39
Indian	18	55,558	19.9	11.73	31.76
Other Bumiputera	18	68,051	9.1	4.99	16.09
Others	2	–	–	–	–
Household Income Group					
B40	123	537,236	11.5	9.03	14.62
M40	36	175,504	9.8	6.17	15.08
T20	15	69,290	9.1	5.42	14.89

a - Malay includes Orang Asli

Table 2.7: Prevalence of overweight among children (5-19 years), according to BMI-for-Age (BAZ) Z-score, WHO 2007 by sociodemographic characteristics (n=1,645).

Sociodemographic Characteristics	Overweight (BAZ >+1SD to ≥+2SD)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	217	1,040,782	14.4	12.32	16.75
Location					
Urban	108	800,988	15.1	12.38	18.18
Rural	109	239,793	12.6	10.47	15.00
Sex					
Male	113	589,150	15.6	12.47	19.25
Female	104	451,631	13.1	10.84	15.77
Ethnicity					
Malay[a]	137	413,864	12.7	10.35	15.43
Chinese	27	107,549	16.0	11.64	21.50
Indian	13	49,973	17.9	11.00	27.82
Other Bumiputera	32	110,348	14.8	10.52	20.40
Others	8	59,175	16.3	8.24	29.59
Household Income Group					
B40	149	667,731	14.3	11.84	17.26
M40	48	248,269	13.8	10.40	18.07
T20	20	124,782	16.4	11.03	23.66

a - Malay includes Orang Asli

Table 2.8: Prevalence of obesity among children (5-19 years), according to BMI-for-Age (BAZ) Z-score, WHO 2007 by sociodemographic characteristics (n=1,645).

Sociodemographic Characteristics	Obese (BAZ >+2SD)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	223	986,036	13.6	11.72	15.81
Location					
Urban	110	739,851	13.9	11.53	16.68
Rural	113	246,185	12.9	10.22	16.15
Sex					
Male	138	636,284	16.8	14.07	19.95
Female	85	349,752	10.2	7.99	12.82
Ethnicity					
Malay[a]	152	443,859	13.6	11.02	16.64
Chinese	33	108,183	16.1	10.67	23.44
Indian	9	38,045	13.6	7.80	22.78
Other Bumiputera	24	91,045	12.2	8.15	17.88
Others	5	–	–	–	–
Household Income Group					
B40	164	695,721	14.9	12.34	17.97
M40	37	175,930	9.8	6.39	14.66
T20	22	114,386	15.0	9.27	23.43

a - Malay includes Orang Asli

Table 2.9: Prevalence of underweight (WHO 1998) among adults (18 years and above) by sociodemographic characteristics and physical activity status (n=1,434).

Sociodemographic Characteristics	Underweight (BMI below 18.5 kg/m²)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	70	1,482,519	6.1	4.46	8.37
Location					
Urban	37	1,169,695	6.3	4.30	9.16
Rural	33	312,824	5.6	3.50	8.73
Sex					
Male	34	820,928	6.4	3.80	10.61
Female	36	661,591	5.8	3.63	9.21
Ethnicity					
Malay[a]	35	628,534	5.3	3.70	7.59
Chinese	14	–	–	–	–
Indian	4	–	–	–	–
Other Bumiputera	16	151,119	5.8	3.19	10.42
Others	1	–	–	–	–
Marital Status					
Single[b]	39	979,992	10.6	7.05	15.71
Married or cohabiting	30	494,389	3.3	2.02	5.38
Education Level					
No Formal Education	13	–	–	–	–
Primary School	9	–	–	–	–
Secondary School	46	1,125,927	6.9	4.67	9.95
Tertiary Education	2	–	–	–	–
Occupation					
Government Employee	2	–	–	–	–
Private Employee	16	–	–	–	–
Self Employed	8	–	–	–	–
Not Working[c]	41	738,620	7.5	4.57	12.15
Household Income Group					
B40	55	1,023,147	7.0	4.73	10.12
M40	13	435,844	6.3	3.62	10.80
T20	1	–	–	–	–
Physical Activity Level					
Inactive	24	607,495	8.4	4.55	15.02
Active	44	849,398	5.2	3.72	7.30

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 2.10: Prevalence of overweight (WHO 1998) among adults (18 years and above) by sociodemographic characteristics and physical activity status (n=1,434).

Sociodemographic Characteristics	Overweight (BMI 25.0 - 29.9 kg/m²)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	473	7,374,446	30.5	26.59	34.71
Location					
Urban	236	5,531,902	29.8	25.00	35.13
Rural	237	1,842,544	32.8	27.98	37.90
Sex					
Male	200	4,342,908	33.9	27.68	40.75
Female	273	3,031,538	26.7	22.41	31.40
Ethnicity					
Malay[a]	216	3,374,085	28.5	24.53	32.93
Chinese	72	1,399,523	27.1	20.11	35.41
Indian	27	625,166	42.2	30.62	54.76
Other Bumiputera	112	907,226	35.0	29.46	40.96
Others	46	1,010,125	35.8	23.71	50.03
Marital Status					
Single[b]	143	2,390,065	25.9	19.54	33.52
Married or cohabiting	329	4,973,813	33.3	29.23	37.63
Education Level					
No Formal Education	55	490,944	26.9	18.74	36.97
Primary School	87	813,887	30.3	20.63	42.09
Secondary School	285	5,123,873	31.2	26.38	36.47
Tertiary Education	46	945,742	29.4	18.91	42.68
Occupation					
Government Employee	31	385,504	28.9	18.44	42.18
Private Employee	115	3,090,562	34.5	26.00	44.20
Self Employed	91	1,167,391	30.7	20.87	42.71
Not Working[c]	229	2,627,835	26.8	21.85	32.37
Household Income Group					
B40	331	4,210,237	28.6	24.74	32.87
M40	100	2,123,896	30.8	23.40	39.35
T20	35	958,076	39.6	26.56	54.34
Physical Activity Level					
Inactive	130	1,879,969	26.0	20.34	32.64
Active	326	5,337,694	32.8	27.96	38.11

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 2.11: Prevalence of obesity (WHO 1998) among adults (18 years and above) by sociodemographic characteristics and physical activity status (n=1,434).

Sociodemographic Characteristics	Obese (BMI 30.0 kg/m² and above)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	348	5,595,952	23.1	19.91	26.74
Location					
Urban	180	4,226,002	22.8	18.87	27.23
Rural	168	1,369,950	24.4	19.61	29.81
Sex					
Male	122	2,466,865	19.3	15.17	24.14
Female	226	3,129,087	27.5	22.29	33.45
Ethnicity					
Malay[a]	186	3,477,930	29.4	24.96	34.31
Chinese	37	757,522	14.7	9.59	21.77
Indian	22	435,861	29.4	17.99	44.24
Other Bumiputera	83	595,139	23.0	18.29	28.39
Others	20	–	–	–	–
Marital Status					
Single[b]	104	1,945,878	21.1	15.70	27.76
Married or cohabiting	244	3,650,074	24.4	21.08	28.14
Education Level					
No Formal Education	46	363,976	19.9	14.25	27.17
Primary School	63	630,602	23.5	16.47	32.30
Secondary School	208	3,859,761	23.5	19.29	28.32
Tertiary Education	31	741,613	23.1	13.27	37.01
Occupation					
Government Employee	31	557,614	41.8	26.78	58.46
Private Employee	72	1,618,939	18.1	13.37	24.01
Self Employed	57	949,245	25.0	18.44	32.90
Not Working[c]	182	2,409,060	24.6	19.10	30.96
Household Income Group					
B40	254	3,405,881	23.2	19.66	27.08
M40	67	1,610,375	23.4	16.99	31.21
T20	23	552,935	22.9	14.28	34.53
Physical Activity Level					
Inactive	106	1,645,744	22.8	17.12	29.65
Active	231	3,755,231	23.1	19.26	27.46

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 2.12: Prevalence of underweight (CPG 2023) among adults (18 years and above) by sociodemographic characteristics and physical activity status (n=1,434).

Sociodemographic Characteristics	Underweight (BMI below 18.5 kg/m²)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	70	1,482,519	6.1	4.46	8.37
Location					
Urban	37	1,169,695	6.3	4.30	9.16
Rural	33	312,824	5.6	3.50	8.73
Sex					
Male	34	820,928	6.4	3.80	10.61
Female	36	661,591	5.8	3.63	9.21
Ethnicity					
Malay[a]	35	628,534	5.3	3.70	7.59
Chinese	14	–	–	–	–
Indian	4	–	–	–	–
Other Bumiputera	16	151,119	5.8	3.19	10.42
Others	1	–	–	–	–
Marital Status					
Single[b]	39	979,992	10.6	7.05	15.71
Married or cohabiting	30	494,389	3.3	2.02	5.38
Education Level					
No Formal Education	13	–	–	–	–
Primary School	9	–	–	–	–
Secondary School	46	1,125,927	6.9	4.67	9.95
Tertiary Education	2	–	–	–	–
Occupation					
Government Employee	2	–	–	–	–
Private Employee	16	–	–	–	–
Self Employed	8	–	–	–	–
Not Working[c]	41	738,620	7.5	4.57	12.15
Household Income Group					
B40	55	1,023,147	7.0	4.73	10.12
M40	13	435,844	6.3	3.62	10.80
T20	1	–	–	–	–
Physical Activity Level					
Inactive	24	607,495	8.4	4.55	15.02
Active	44	849,398	5.2	3.72	7.30

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 2.13: Prevalence of overweight (CPG 2023) among adults (18 years and above) by sociodemographic characteristics and physical activity status (n=1,434).

Sociodemographic Characteristics	Overweight (BMI 23.0 - 27.4 kg/m²)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	484	7,765,719	32.1	27.96	36.59
Location					
Urban	253	5,998,041	32.3	27.13	38.01
Rural	231	1,767,678	31.4	27.02	36.18
Sex					
Male	221	4,603,420	35.9	29.81	42.57
Female	263	3,162,299	27.8	23.39	32.71
Ethnicity					
Malay[a]	234	3,946,113	33.4	28.01	39.23
Chinese	78	1,741,418	33.7	25.80	42.64
Indian	18	356,874	24.1	13.76	38.73
Other Bumiputera	108	869,143	33.5	28.02	39.52
Others	46	1,243,649	44.1	27.45	62.17
Marital Status					
Single[b]	160	2,656,849	28.8	22.29	36.35
Married or cohabiting	324	5,108,870	34.2	29.17	39.62
Education Level					
No Formal Education	64	566,359	31.0	21.81	42.03
Primary School	81	824,517	30.7	22.92	39.74
Secondary School	299	5,270,789	32.1	27.42	37.17
Tertiary Education	40	1,104,053	34.3	23.52	47.07
Occupation					
Government Employee	34	395,622	29.6	19.32	42.55
Private Employee	118	3,081,507	34.4	26.61	43.21
Self Employed	83	1,153,248	30.3	22.69	39.28
Not Working[c]	242	3,081,736	31.4	25.31	38.23
Household Income Group					
B40	346	4,385,503	29.8	25.55	34.49
M40	102	2,604,720	37.8	29.24	47.14
T20	30	694,209	28.7	18.65	41.41
Physical Activity Level					
Inactive	140	2,546,671	35.3	27.98	43.28
Active	330	5,045,057	31.0	26.59	35.87

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 2.14: Prevalence of obesity (CPG 2023) among adults (18 years and above) by sociodemographic characteristics and physical activity status (n=1,434).

Sociodemographic Characteristics	Obese (BMI 27.5 kg/m² and above)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	564	9,144,332	37.8	33.52	42.32
Location					
Urban	290	6,968,578	37.6	32.22	43.22
Rural	274	2,175,754	38.7	33.55	44.06
Sex					
Male	205	4,520,357	35.3	28.39	42.87
Female	359	4,623,974	40.7	34.71	46.92
Ethnicity					
Malay[a]	286	5,051,770	42.7	37.52	48.12
Chinese	74	1,379,814	26.7	20.53	33.95
Indian	38	832,208	56.2	42.90	68.67
Other Bumiputera	127	970,125	37.4	31.71	43.50
Others	39	725,386	25.7	14.65	41.11
Marital Status					
Single[b]	163	3,158,957	34.3	26.60	42.83
Married or cohabiting	400	5,974,807	40.0	35.73	44.42
Education Level					
No Formal Education	67	585,549	32.1	23.53	42.01
Primary School	104	959,375	35.7	26.90	45.61
Secondary School	340	6,479,910	39.5	33.84	45.38
Tertiary Education	53	1,119,497	34.8	23.47	48.19
Occupation					
Government Employee	44	714,855	53.6	37.10	69.27
Private Employee	126	3,128,162	35.0	26.58	44.37
Self Employed	101	1,582,816	41.7	32.54	51.37
Not Working[c]	283	3,589,942	36.6	30.28	43.39
Household Income Group					
B40	404	5,537,031	37.7	33.26	42.27
M40	109	2,466,843	35.8	27.00	45.62
T20	44	1,065,101	44.0	27.49	62.02
Physical Activity Level					
Inactive	158	2,281,422	31.6	25.58	38.26
Active	388	6,613,709	40.7	35.26	46.36

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 2.15: Prevalence of abdominal obesity (WHO 2000) among adults (18 years and above) by sociodemographic characteristics and physical activity status (n=1,434).

Sociodemographic Characteristics	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	845	12,521,749	52.1	47.86	56.28
Location					
Urban	450	9,698,504	52.7	47.45	57.86
Rural	395	2,823,245	50.1	44.43	55.83
Sex					
Male	292	5,894,751	46.1	39.67	52.70
Female	553	6,626,999	58.9	52.51	64.93
Ethnicity					
Malay[a]	400	6,832,476	57.9	52.75	62.85
Chinese	132	2,435,061	47.6	38.27	57.15
Indian	53	1,068,813	72.2	58.18	82.88
Other Bumiputera	189	1,442,922	55.6	47.97	62.95
Others	71	1,402,379	50.4	34.50	66.25
Marital Status					
Single[b]	257	4,054,995	44.7	36.69	52.91
Married or cohabiting	587	8,456,186	56.6	52.53	60.56
Education Level					
No Formal Education	124	1,003,282	55.4	43.94	66.37
Primary School	153	1,444,777	53.8	43.91	63.36
Secondary School	494	8,425,929	51.6	46.33	56.91
Tertiary Education	73	1,632,505	51.1	37.67	64.31
Occupation					
Government Employee	60	871,639	65.3	48.49	79.00
Private Employee	177	4,073,137	46.2	37.98	54.64
Self Employed	140	1,998,522	52.6	43.27	61.74
Not Working[c]	455	5,417,742	55.2	48.82	61.48
Household Income Group					
B40	617	7,622,653	51.8	47.53	56.10
M40	161	3,520,247	52.0	41.70	62.10
T20	56	1,246,263	51.9	35.08	68.34
Physical Activity Level					
Inactive	254	3,420,852	47.3	39.67	54.96
Active	566	8,805,570	54.7	49.48	59.79

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 2.16: Prevalence of underweight (WHO 1998) among older persons (60 years and above) by sociodemographic characteristics and physical activity status (n=1,785).

Sociodemographic Characteristics	Underweight (BMI below 18.5 kg/m²)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	96	186,901	5.0	4.00	6.34
Location					
Urban	42	132,314	4.7	3.49	6.25
Rural	54	54,587	6.2	4.34	8.81
Sex					
Male	52	109,819	6.1	4.34	8.39
Female	44	77,082	4.1	2.95	5.60
Ethnicity					
Malay[a]	60	162,634	5.9	4.46	7.89
Chinese	19	73,385	4.2	2.67	6.41
Indian	4	–	–	–	–
Other Bumiputera	10	36,389	7.0	3.79	12.72
Others	3	–	–	–	–
Marital Status					
Single[b]	41	61,807	5.7	4.00	8.05
Married or cohabiting	54	119,479	4.6	3.36	6.19
Education Level					
No Formal Education	39	50,714	6.8	4.62	9.82
Primary School	26	41,928	3.9	2.54	6.07
Secondary School	30	90,100	5.3	3.50	8.02
Tertiary Education	1	–	–	–	–
Occupation					
Employed	13	22,189	3.1	1.56	6.00
Unemployed	82	162,888	5.6	4.35	7.14
Household Income Group					
B40	76	141,103	5.0	3.83	6.43
M40	14	30,186	5.3	3.02	9.03
T20	1	–	–	–	–
Physical Activity Level					
Inactive	44	71,428	5.7	3.91	8.23
Active	45	101,800	4.3	3.09	5.93

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed

Table 2.17: Prevalence of overweight (WHO 1998) among older persons (60 years and above) by sociodemographic characteristics and physical activity status (n=1,785).

Sociodemographic Characteristics	Overweight (BMI 25.0 - 29.9 kg/m²)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	624	1,298,202	35.0	31.99	38.20
Location					
Urban	294	995,345	35.2	31.38	39.24
Rural	330	302,857	34.4	31.13	37.92
Sex					
Male	293	658,421	36.3	32.03	40.81
Female	331	639,780	33.8	30.28	37.52
Ethnicity					
Malay[a]	351	962,924	35.2	31.01	39.68
Chinese	150	532,196	30.1	24.83	35.94
Indian	49	190,280	48.3	38.31	58.41
Other Bumiputera	56	184,328	35.7	28.51	43.53
Others	18	114,911	37.3	25.19	51.25
Marital Status					
Single[b]	189	345,699	31.9	27.59	36.46
Married or cohabiting	433	948,936	36.3	32.68	40.15
Education Level					
No Formal Education	132	216,729	28.9	24.46	33.85
Primary School	206	399,588	37.5	33.29	41.97
Secondary School	264	617,055	36.4	31.94	41.20
Tertiary Education	20	57,635	32.1	15.38	55.20
Occupation					
Employed	140	255,714	35.6	29.78	41.79
Unemployed	473	1,012,686	34.7	31.27	38.35
Household Income Group					
B40	481	956,844	33.7	30.35	37.23
M40	106	237,145	41.4	35.22	47.81
T20	30	82,057	48.2	36.67	59.94
Physical Activity Level					
Inactive	208	423,624	33.8	29.65	38.23
Active	401	846,142	35.7	31.54	40.04

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed

Table 2.18: Prevalence of obesity (WHO 1998) among older persons (60 years and above) by sociodemographic characteristics and physical activity status (n=1,785).

Sociodemographic Characteristics	Obese (BMI 30.0 kg/m² and above)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	317	621,167	16.8	14.51	19.28
Location					
Urban	141	467,108	16.5	13.73	19.76
Rural	176	154,059	17.5	15.06	20.30
Sex					
Male	109	251,176	13.9	10.99	17.32
Female	208	369,991	19.5	16.39	23.15
Ethnicity					
Malay[a]	214	557,241	20.4	16.95	24.30
Chinese	44	179,894	10.2	7.64	13.43
Indian	23	86,384	21.9	15.79	29.60
Other Bumiputera	30	101,160	19.6	14.06	26.58
Others	6	–	–	–	–
Marital Status					
Single[b]	95	174,991	16.1	12.65	20.34
Married or cohabiting	222	446,176	17.1	14.36	20.19
Education Level					
No Formal Education	82	133,834	17.9	14.15	22.30
Primary School	81	171,710	16.1	12.69	20.27
Secondary School	143	288,086	17.0	13.42	21.34
Tertiary Education	10	–	–	–	–
Occupation					
Employed	66	124,257	17.3	13.50	21.85
Unemployed	246	487,888	16.7	14.30	19.48
Household Income Group					
B40	235	463,509	16.3	13.90	19.08
M40	60	111,622	19.5	15.01	24.88
T20	16	30,534	17.9	8.65	33.53
Physical Activity Level					
Inactive	130	249,059	19.9	15.60	24.97
Active	182	359,454	15.2	12.80	17.86

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed

Table 2.19: Prevalence of underweight (CPG 2023) among older persons (60 years and above) by sociodemographic characteristics and physical activity status (n=1,785).

Sociodemographic Characteristics	Underweight (BMI below 18.5 kg/m²)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	96	186,901	5.0	4.00	6.34
Location					
Urban	42	132,314	4.7	3.49	6.25
Rural	54	54,587	6.2	4.34	8.81
Sex					
Male	52	109,819	6.1	4.34	8.39
Female	44	77,082	4.1	2.95	5.60
Ethnicity					
Malay[a]	60	162,634	5.9	4.46	7.89
Chinese	19	73,385	4.2	2.67	6.41
Indian	4	–	–	–	–
Other Bumiputera	10	36,389	7.0	3.79	12.72
Others	3	–	–	–	–
Marital Status					
Single[b]	41	61,807	5.7	4.00	8.05
Married or cohabiting	54	119,479	4.6	3.36	6.19
Education Level					
No Formal Education	39	50,714	6.8	4.62	9.82
Primary School	26	41,928	3.9	2.54	6.07
Secondary School	30	90,100	5.3	3.50	8.02
Tertiary Education	1	–	–	–	–
Occupation					
Employed	13	22,189	3.1	1.56	6.00
Unemployed	82	162,888	5.6	4.35	7.14
Household Income Group					
B40	76	141,103	5.0	3.83	6.43
M40	14	30,186	5.3	3.02	9.03
T20	1	–	–	–	–
Physical Activity Level					
Inactive	44	71,428	5.7	3.91	8.23
Active	45	101,800	4.3	3.09	5.93

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed

Table 2.20: Prevalence of overweight (CPG 2023) among older persons (60 years and above) by sociodemographic characteristics and physical activity status (n=1,785).

Sociodemographic Characteristics	Overweight (BMI 23.0 - 27.4 kg/m²)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	682	1,464,861	39.5	36.80	42.32
Location					
Urban	338	1,141,351	40.4	36.89	43.96
Rural	344	323,510	36.8	34.06	39.61
Sex					
Male	309	730,592	40.3	37.28	43.37
Female	373	734,269	38.8	34.54	43.24
Ethnicity					
Malay[a]	361	1,027,921	37.6	34.66	40.64
Chinese	206	759,152	42.9	36.60	49.51
Indian	39	153,724	39.0	30.85	47.84
Other Bumiputera	62	206,812	40.0	33.36	47.08
Others	14	85,890	27.9	15.68	44.55
Marital Status					
Single[b]	227	421,115	38.8	33.64	44.25
Married or cohabiting	454	1,040,709	39.8	36.94	42.82
Education Level					
No Formal Education	172	274,662	36.7	32.01	41.57
Primary School	196	394,447	37.0	32.34	42.01
Secondary School	297	736,744	43.5	39.13	48.00
Tertiary Education	16	55,972	31.2	20.59	44.23
Occupation					
Employed	154	313,080	43.5	37.78	49.47
Unemployed	515	1,119,017	38.4	35.31	41.53
Household Income Group					
B40	536	1,103,098	38.9	35.88	41.92
M40	106	261,316	45.6	38.14	53.24
T20	29	69,377	40.8	30.60	51.77
Physical Activity Level					
Inactive	223	458,290	36.6	32.25	41.12
Active	438	971,438	41.1	37.37	44.65

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed

Table 2.21: Prevalence of obesity (CPG 2023) among older persons (60 years and above) by sociodemographic characteristics and physical activity status (n=1,785).

Sociodemographic Characteristics	Obese (BMI 27.5 kg/m² and above)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	561	1,094,707	29.5	26.51	32.76
Location					
Urban	243	815,462	28.8	25.06	32.96
Rural	318	279,245	31.8	28.49	35.23
Sex					
Male	225	493,546	27.2	23.81	30.91
Female	336	601,161	31.8	27.65	36.19
Ethnicity					
Malay[a]	365	960,467	35.1	30.99	39.52
Chinese	87	317,201	17.9	14.23	22.36
Indian	44	164,535	41.8	31.82	52.41
Other Bumiputera	47	156,588	30.3	22.87	38.93
Others	18	112,198	36.4	24.17	50.73
Marital Status					
Single[b]	161	292,215	26.9	22.35	32.07
Married or cohabiting	399	801,962	30.7	27.20	34.45
Education Level					
No Formal Education	125	198,716	26.5	22.40	31.10
Primary School	171	337,738	31.7	27.30	36.50
Secondary School	240	491,860	29.1	24.38	34.21
Tertiary Education	23	61,487	34.3	19.25	53.29
Occupation					
Employed	120	219,844	30.6	25.27	36.44
Unemployed	432	853,612	29.3	25.92	32.86
Household Income Group					
B40	425	831,758	29.3	26.25	32.54
M40	101	182,581	31.9	24.84	39.80
T20	28	60,827	35.7	25.51	47.44
Physical Activity Level					
Inactive	213	406,474	32.4	27.57	37.71
Active	339	667,263	28.1	24.61	31.95

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed

Table 2.22: Prevalence of abdominal obesity (WHO 2000) among older persons (60 years and above) by sociodemographic characteristics and physical activity status (n=1,785).

Sociodemographic Characteristics	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	1,117	2,300,224	62.2	59.22	65.16
Location					
Urban	533	1,786,129	63.4	59.65	66.94
Rural	584	514,095	58.6	54.02	62.99
Sex					
Male	416	965,352	53.4	48.99	57.76
Female	701	1,334,872	70.7	66.79	74.30
Ethnicity					
Malay[a]	640	1,710,535	62.8	58.87	66.65
Chinese	272	1,007,954	57.3	52.40	62.12
Indian	83	316,464	80.3	71.49	86.91
Other Bumiputera	91	300,919	57.5	50.03	64.69
Others	31	197,607	64.1	48.38	77.35
Marital Status					
Single[b]	369	681,712	62.9	57.58	67.99
Married or cohabiting	746	1,612,367	61.9	58.61	65.00
Education Level					
No Formal Education	272	452,202	60.3	55.29	65.08
Primary School	324	645,753	60.3	54.58	65.72
Secondary School	486	1,098,340	65.2	60.51	69.70
Tertiary Education	34	99,771	55.6	42.83	67.69
Occupation					
Employed	227	450,409	62.7	55.05	69.79
Unemployed	874	1,811,289	62.3	58.97	65.52
Household Income Group					
B40	857	1,724,493	60.9	57.91	63.76
M40	191	405,423	70.7	62.37	77.90
T20	51	117,589	69.1	53.08	81.52
Physical Activity Level					
Inactive	390	757,483	60.6	55.38	65.59
Active	697	1,485,501	62.8	59.75	65.78

a - Malay includes Orang Asli
b - Single include never married, divorced, separated, widowed

3. Nutrient Intake

3. Nutrient Intake

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Introduction

Proper nutrient intake is essential for health and well-being, with distinct nutritional requirements across different life stages, including adolescence, adulthood, and older age. In the modern era, nutrient intake is increasingly challenged by evolving lifestyles, socio-economic disparities, and shifting dietary habits. Population-level data on nutrient intake serve as a critical foundation for developing dietary guidelines which support growth, health maintenance, and reduce the risk of chronic diseases [1]. These data are particularly crucial when considering specific age groups with unique nutritional needs.

Adolescents have higher nutritional demands, particularly energy, protein, and minerals, to support developmental growth. However, this age group is more susceptible to poor dietary habits, unhealthy lifestyles, and risk-taking behaviours, making them highly vulnerable to nutritional deficiencies due to environmental influences [2,3]. For adults, a well-balanced diet rich in nutrient-dense foods is vital for sustaining energy levels, preserving muscle mass, and mitigating the risk of chronic diseases. However, modern dietary patterns often favour calorie-dense, nutrient-poor foods, contributing to nutritional imbalances and exacerbating the dual burden of malnutrition [4]. While older persons face similar challenges as adolescents and adults, they also encounter additional age-related factors, such as reduced appetite, diminished nutrient absorption, and a higher prevalence of chronic health conditions. These factors increase the need for adequate protein, vitamin D, calcium, and magnesium to prevent sarcopenia, osteoporosis, and frailty [5].

Limited national studies exist on nutrient intake across different life stages. Thus, this survey provides updated data on the nutrient intake status of the population in Malaysia aged 10 years and above, offering insight into the population's dietary consumption patterns.

Objectives

General Objective

To determine the nutrient intake status of the population in Malaysia aged 10 years and above.

Specific Objectives

1. To determine the energy, macro, and micronutrient intake among the population in Malaysia aged 10 years and above.
2. To determine the percentage contribution of macronutrients to total energy intake among the population in Malaysia aged 10 years and above.
3. To determine the achievement of the Malaysian Recommended Nutrient Intake (RNI) among the population in Malaysia aged 10 years and above.

Methods

This survey used face-to-face interviews with a multiple-pass approach for a single 24-hour diet recall to assess nutrient intake. A food album [10], household utensils, and food packaging samples were used to help respondents estimate food quantities, while photos of consumed food were also encouraged. A nutrient analysis of food and beverages consumed was conducted using Nutritionist Pro™ software. Proximate nutrient values were obtained and imputed from available food composition databases.

Variable Definitions

1. **Energy intake** refers to the total amount of energy consumed from food and beverages, primarily from the macronutrients present in the diet. Energy intake is measured in kilocalories (kcal), which includes carbohydrates (4 kcal/g), protein (4 kcal/g), fat (9 kcal/g), and alcohol (7 kcal/g).
2. **Macronutrients** are essential nutrients that yield energy and support the body's physiological functions. The nutrients include carbohydrates, proteins, and fats. These nutrients are the building blocks of a healthy diet and play important structural roles in maintaining overall health.
3. **Micronutrients** are substances in diets that are essential for human health and are required in small amounts. They include all of the known vitamins and trace minerals (vitamin A, vitamin C, calcium, iron, thiamine, riboflavin, niacin, and phosphorus).

Findings

The final samples included in the nutrient intake analyses were 486 adolescents, 483 adults, and 776 older persons.

Adolescents (10-19 years old)

Energy intake and macronutrients

Overall, 49.7% (95% CI: 43.87, 55.48) of adolescents met the recommended energy intake based on a physical activity level (PAL) of 1.6 **(Table 3.3)**. Almost half of both males and females consumed an adequate amount of energy. In relation to total energy intake (TEI), protein consumption was generally adequate, with 83.8% (95% CI: 78.44, 88.04) meeting the recommended range of 10–20%. No marked difference was observed between males and females. In contrast, only 16.5% (95% CI: 12.89, 20.87) of adolescents achieved the recommended fat intake, while 40.2% (95% CI: 35.07, 45.55) had adequate carbohydrate intake. The prevalence of carbohydrate adequacy was higher among females [42.9% (95% CI: 35.72, 50.48)] than among males [37.7% (95% CI: 28.53, 47.91)].

Vitamins

Approximately 42.8% (95% CI: 35.57, 50.26) of adolescents met the recommended intake for vitamin A, with a higher prevalence among males [45.8% (95% CI: 35.57, 50.26)] than females [39.4% (95% CI: 31.47, 47.85)]. In contrast, adequacy for vitamin C was notably low, with only 21.9% (95% CI: 18.25, 25.98) meeting the recommended level. Similarly, only 14.6% (95% CI: 10.96, 19.21) achieved adequate thiamine intake. For niacin, 21.4% (95% CI: 17.60, 25.73) met the recommendation. Riboflavin intake showed comparatively better adequacy, with 51.7% (95% CI: 45.31, 57.96) of adolescents achieving the recommended level, and a higher prevalence among females [58.8% (95% CI: 50.17, 66.83)] than males [45.3% (95% CI: 37.77, 53.00)].

Minerals

Findings on mineral intake revealed substantial inadequacy among adolescents. Calcium intake was critically low, with nearly all participants failing to meet the recommended daily intake of 1,300 mg. Only 45.2% (95% CI: 39.66, 50.95) achieved adequate iron intake, with a marked gender difference of 55.8% (95% CI: 46.40, 64.78) among males compared to 33.5% (95% CI: 26.28, 41.65) among females. Phosphorus intake was also suboptimal, with only 32.9% (95% CI: 27.28, 39.12) meeting the recommendation. Similar to iron, adequacy was higher in males at 37.8% (95% CI: 28.70, 47.78) than in females at 27.5% (95% CI: 22.29, 33.51).

Adults (18-59 years old)

Energy intake and macronutrients

Approximately 55.7% (95% CI: 49.10, 62.00) of adults achieved adequate energy intake based on a PAL of 1.4. Protein adequacy was relatively high, with 83.3% (95% CI: 77.56, 87.83) meeting the recommended range, with 83.7% (95% CI: 78.18, 88.02) among males and 82.9% (95% CI: 73.48, 89.45) among females. In contrast, only 21.0% (95% CI: 14.84, 28.81) of adults consumed fats within 10–20% of total energy intake (TEI), with a lower prevalence among females [17.5% (95% CI: 11.46, 25.75)]. For carbohydrates, 47.5% (95% CI: 38.80, 59.78) achieved adequate intake, with a higher prevalence among males [53.5% (95% CI: 38.62, 67.84)].

Vitamins

The prevalence of adequate vitamin A and vitamin C intake among adults was 35.8% (95% CI: 30.45, 41.55) and 26.5% (95% CI: 22.04, 31.55), respectively. Males showed a higher prevalence of adequacy for vitamin A [40.5% (95% CI: 32.30, 49.25)] and slightly higher adequacy for vitamin C [27.1% (95% CI: 21.84, 33.01)] compared to females. Riboflavin intake showed moderate adequacy, with 44.0% (95% CI: 38.37, 49.81) meeting the recommendation, while 29.9% (95% CI: 23.59, 37.00) achieved adequate niacin intake. Thiamine had the lowest prevalence of adequacy [14.9% (95% CI: 11.10, 19.64)] among all vitamins assessed.

Minerals

The prevalence of adequate iron intake among adults was 42.2% (95% CI: 36.37, 48.27). However, females had a significantly lower prevalence of adequacy at 20.0% (95% CI: 14.41, 27.12) compared to males [61.6% (95% CI: 54.21, 68.54)]. Conversely, 61.9% (95% CI: 56.55, 66.91) of adults achieved adequate phosphorus intake, with males showing a significantly higher prevalence [70.0% (95% CI: 61.87, 77.05)] than females [52.6% (95% CI: 43.84, 61.13)].

Older Persons (60 years and above)

Energy intake and macronutrients

Among older persons, only half [50.8% (95% CI: 47.30, 54.40)] met the recommended energy intake, with a slightly higher prevalence among females [53.0% (95% CI: 48.60, 57.30)]. Nearly four in five older persons achieved adequate protein intake [79.8% (95% CI: 76.50, 82.80)], with a higher proportion among males [81.4% (95% CI: 75.88, 85.91)]. In contrast, only 20.0% (95% CI: 17.40, 23.00) met the recommended fat intake, with no significant difference between males and females. For carbohydrates, 44.0% (95% CI: 39.51, 48.63) achieved adequacy, with females showing a slightly higher prevalence [45.1% (95% CI: 39.47, 50.78)] than males [42.9% (95% CI: 36.26, 49.87)].

Vitamins

Among older persons, more than one-third had adequate intakes of vitamin A and vitamin C, at 35.1% (95% CI: 31.35, 39.11) and 39.0% (95% CI: 32.07, 46.36), respectively. The prevalence of adequate vitamin A intake was higher among males [36.0% (95% CI: 31.22, 41.12)], whereas females had a higher prevalence of adequate vitamin C intake [40.3% (95% CI: 32.11, 48.96)]. The survey also indicated poor adequacy for thiamine, with only 19.4% (95% CI: 14.34, 25.78) meeting the recommendation, and a lower prevalence observed among males [18.2% (95% CI: 12.23, 26.08)]. In contrast, males showed higher achievement of the RNI for riboflavin [37.0% (95% CI: 28.90, 45.91)] and niacin [25.9% (95% CI: 20.45, 32.28)] compared to the national prevalence.

Minerals

It was found that 63.7% (95% CI: 58.11, 68.87) of older persons achieved adequate iron intake, with no significant difference in prevalence between males and females. The prevalence of adequate phosphorus intake was 58.9% (95% CI: 54.69, 62.99), with females showing a slightly lower prevalence of 54.8% (95% CI: 54.69, 62.99) than males.

Conclusion

Overall, the findings indicate suboptimal nutrient intake among Malaysians across all age groups. Approximately half of adolescents, adults, and older persons met the recommended energy intake, with protein adequacy being generally high (>80%) across age groups. However, intakes of fat and carbohydrates were outside the recommended ranges, suggesting an imbalanced macronutrient distribution.

Micronutrient adequacy was low, particularly for thiamine, niacin, and vitamin C, with less than one-third of respondents meeting recommendations. Riboflavin and vitamin A showed moderate adequacy but remained below desirable levels. Mineral intake inadequacies were also notable, especially for calcium and phosphorus.

These findings highlight persistent gaps in dietary quality and nutrient sufficiency among population in Malaysia, emphasising the need for strengthened nutrition education, targeted interventions, and food policy measures to promote balanced and nutrient-dense diets across the life course.

Recommendations

1. Shift Malaysia's dietary preferences by reducing reliance on energy-dense foods and exceeding fat intake through healthy cooking workshops, including hands-on skills for healthy food selection, preparation, and nutrient optimisation. This should be implemented through programmes such as standard healthy menus based on the quarter-quarter-half concept at schools and workplaces, and leveraging digital nutrition platforms.
2. Implement an integrated supply-and-demand intervention that combines price control strategies, consumer education, and collaboration with food producers and manufacturers to ensure the affordability and availability of nutrient-dense foods.
3. Conduct massive nationwide campaigns on the Malaysian Dietary Guidelines, emphasising appropriate serving sizes for each food group and strategies to achieve dietary recommendations, boosting fruit, vegetables, legumes, and milk intake. Special attention should be given to micronutrient absorption strategies, such as pairing iron-rich plant foods with vitamin C sources and targeted outreach for elderly populations by incorporating easy-to-chew nutrient-dense foods.
4. Foster collaboration with philanthropists, corporate companies, and corporate social responsibility (CSR) projects to supply free or discounted prioritise nutrient density over calorie provision for targeted groups and support affordable meal kits featuring whole food sources of critical nutrients (e.g., vitamin A, vitamin B, vitamin C, iron and calcium).
5. Multi-sectoral collaboration should be strengthened to promote and enhance the availability and accessibility of milk and milk products in schools. The school milk program (SMP) should be expanded from the hard-core poor families to the lower-income families as well. In addition, consideration should also be given to extending the SMP to secondary schools to ensure continuity of nutritional support during adolescence.

Table 3.1: Trends in energy and macronutrient intake among adolescents in Malaysia, 2012-2024

Nutrients	Year		
	2012	2017	2024
Energy (kcal)	1,508	1,848	1,986
Protein (g)	62	71	72
Carbohydrate (g)	199	240	242
Fat (g)	54	69	81

Table 3.2: Trends in energy and macronutrient intake among adults in Malaysia, 2003-2024

Nutrients	Year		
	2003	2014	2024
Energy (kcal)	1,540	1,466	1,860
Protein (g)	55	57	72
Carbohydrate (g)	221	195	228
Fat (g)	46	46	73

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Table 3.3: The prevalence of adolescents (10–19 years) in Malaysia who consumed nutrients adequately (N=486)

Nutrients	Malaysia				
	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MACRONUTRIENTS					
Energy[α]	243	2,627,949	49.7	43.87	55.48
Protein[β]	410	4,433,745.11	83.8	78.44	88.04
Fat[€]	74	872,088	16.5	12.89	20.87
Carbohydrate[£]	192	2,126,764	40.2	35.07	45.55
VITAMINS					
Vitamin A[§]	213	2,262,100	42.8	35.57	50.26
Vitamin C[¥]	100	1,156,838	21.9	18.25	25.98
Thiamine[ᵐ]	61	772,722	14.6	10.96	19.21
Riboflavin[µ]	227	2,733,115	51.7	45.31	57.96
Niacin[π]	87	1,131,554	21.4	17.60	25.73
MINERALS					
Calcium[Ω]	8*	-	-	-	-
Iron[Σ]	210	2,393,686	45.2	39.66	50.95
Phosphorus[Δ]	150	1,742,034	32.9	27.28	39.12

Notes:
[α] Energy intake status was based on the PAL 1.6 category in the Recommended Nutrient Intakes for Malaysia (RNI), 2017. [β] Based on the recommended protein intake of 10% - 20% from the total energy intake (TEI). [€] Based on the recommended fat intake of 25% - 35% from the TEI. [£] Based on the recommended carbohydrate intake of 50% - 65% from TEI. [§] Recommended intake of vitamin A: 600 µg/day. [¥] Recommended intake of vitamin C: 70 mg/day. [ᵐ] Recommended intake of thiamine for males: 1.2 mg/day; females: 1.1 mg/day. [µ] Recommended intake of riboflavin for males: 1.3 mg/day; females: 1.0 mg/day. [π] Recommended intake of niacin: 16 mg NE/day. [Ω] Recommended intake of calcium: 1300 mg. [Σ] Recommended intake of iron for males (10 - 14 years): 10 mg; males (15 - 19 years): 12 mg; females (10 - 14 years): 9 mg; females (15 - 19 years): 21 mg. [Δ] Recommended intake of phosphorus: 1,250 mg. * Prevalence not presented because the sample size was insufficient for reliable estimation.

Table 3.4: The prevalence of adolescents (10-19 years) in Malaysia who consumed nutrients adequately, stratified by sex (N=486)

Nutrients	Male					Female				
	Count	Estimated Population	Prevalence (%)	95% CI		Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper				Lower	Upper
MACRONUTRIENTS										
Energy[α]	126	1,384,992	49.7	41.51	57.99	117	1,242,957	49.6	44.41	54.79
Protein[β]	211	2,367,325.00	85.0	79.38	89.33	199	2,066,420.12	82.4	75.53	87.73
Fat[€]	38	470,019	16.90	10.62	25.83	36	402,069	16.04	10.62	23.50
Carbohydrat[e£]	94	1,050,501	37.7	28.53	47.91	98	1,076,263	42.9	35.72	50.48
VITAMINS										
Vitamin A[§]	120	1,275,500	45.8	36.94	54.95	93	986,599	39.4	31.47	47.85
Vitamin C[¥]	48	563,008	20.2	15.75	25.57	52	593,830	23.7	19.42	28.57
Thiamine[ᵐ]	32	429,763	15.4	11.11	21.04	29*	-	-	-	-
Riboflavin[µ]	102	1,260,607	45.3	37.77	53.00	125	1,472,508	58.8	50.17	66.83
Niacin[π]	41	570,218	20.5	15.54	26.50	46	561,336	22.4	16.79	29.23
MINERALS										
Calcium[Ω]	5*	-	-	-	-	3*	-	-	-	-
Iron[Σ]	135	1,553,284	55.8	46.40	64.78	75	840,402	33.5	26.28	41.65
Phosphorus[Δ]	89	1,051,597	37.8	28.70	47.78	61	690,437	27.5	22.29	33.51

Notes:
[α] Energy intake status was based on the PAL 1.6 category in the Recommended Nutrient Intakes for Malaysia (RNI), 2017. [β] Based on the recommended protein intake of 10% - 20% from the total energy intake (TEI). [€] Based on the recommended fat intake of 25% - 35% from the TEI. [£] Based on the recommended carbohydrate intake of 50% - 65% from TEI. [§] Recommended intake of vitamin A: 600 µg/day. [¥] Recommended intake of vitamin C: 70 mg/day. [ᵐ] Recommended intake of thiamine for males: 1.2 mg/day; females: 1.1 mg/day. [µ] Recommended intake of riboflavin for males: 1.3 mg/day; females: 1.0 mg/day. [π] Recommended intake of niacin: 16 mg NE/day. [Ω] Recommended intake of calcium: 1300 mg. [Σ] Recommended intake of iron for males (10 - 14 years): 10 mg; males (15 - 19 years): 12 mg; females (10 - 14 years): 9 mg; females (15 - 19 years): 21 mg. [Δ] Recommended intake of phosphorus: 1,250 mg. * Prevalence not presented because the sample size was insufficient for reliable estimation.

Table 3.5: The prevalence of adults (18-59 years) in Malaysia who consumed nutrients adequately (N=483)

Nutrients	Malaysia				
	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MACRONUTRIENTS					
Energy[α]	256	11,334,480	55.7	49.10	62.00
Protein[β]	387	16,965,317	83.3	77.56	87.83
Fat[€]	95	4,269,784	21.0	14.84	28.81
Carbohydrate[£]	212	9,674,392	47.5	37.43	57.81
VITAMINS					
Vitamin A[§]	179	7,278,687	35.8	30.45	41.55
Vitamin C[¥]	160	5,400,961	26.5	22.04	31.55
Thiamine[ᵐ]	67	3,027,980	14.9	11.10	19.64
Riboflavin[µ]	217	8,961,686	44.0	38.37	49.81
Niacin[π]	143	6,081,007	29.9	23.59	37.00
MINERALS					
Calcium[Ω]	19*	-	-	-	-
Iron[Σ]	204	8,593,877	42.2	36.37	48.27
Phosphorus[Δ]	305	12,596,436	61.9	56.55	66.91

Notes:
[α] Energy intake status was based on the PAL 1.4 category in the Recommended Nutrient Intakes for Malaysia (RNI), 2017. [β] Based on the recommended protein intake of 10% - 20% from the total energy intake (TEI). [€] Based on the recommended fat intake of 25% - 35% from the TEI. [£] Based on the recommended carbohydrate intake of 50% - 65% from TEI. [§] Recommended intake of vitamin A: 600 µg/day. [¥] Recommended intake of vitamin C: 70 mg/day. [ᵐ] Recommended intake of thiamine for males: 1.2 mg/day; females: 1.1 mg/day. [µ] Recommended intake of riboflavin for males: 1.3 mg/day; females: 1.1 mg/day. [π] Recommended intake of niacin for males: 16 mg NE/day; females: 14 mg NE/day. [Ω] Recommended intake of calcium for males (19 - 59 years): 1000 mg; females (19 - 50 years): 1000 mg; females (51 - 59 years): 1200 mg. [Σ] Recommended intake of iron for males (19 - 59 years): 9 mg; females (19 - 50 years): 20 mg; females (51 - 59 years): 8 mg. [Δ] Recommended intake of phosphorus: 700mg. * Prevalence not presented because the sample size was insufficient for reliable estimation.

Table 3.6: The prevalence of adults (18-59 years) in Malaysia who consumed nutrients adequately, stratified by sex (N=483)

Nutrients	Male					Female				
	Count	Estimated Population	Prevalence (%)	95% CI		Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper				Lower	Upper
MACRONUTRIENTS										
Energy[α]	118	6,257,951	57.6	47.30	67.40	138	5,076,530	53.4	45.50	61.20
Protein[β]	171	9,086,554	83.7	78.18	88.02	216	7,878,763	82.9	73.48	89.45
Fat[€]	51	2,610,930	24.0	15.44	35.44	44	1,658,854	17.5	11.46	25.75
Carbohydrate[£]	106	5,812,317	53.53	38.62	67.84	106	3,862,075	40.6	32.98	48.78
VITAMINS										
Vitamin A[§]	95	4,396,210	40.5	32.30	49.25	84	2,882,478	30.4	23.64	38.21
Vitamin C[¥]	72	2,938,968	27.1	21.84	33.01	88	2,461,992	25.9	20.16	32.63
Thiamine[ᵐ]	29*	-	-	-	-	38	1,570,205	16.5	11.40	23.33
Riboflavin[µ]	98	4,640,055	42.7	35.08	50.76	119	4,321,632	45.5	38.06	53.09
Niacin[π]	66	3,070,857	28.3	19.86	38.56	77	3,010,150	31.7	22.90	41.97
MINERALS										
Calcium[Ω]	14*	-	-	-	-	5*	-	-	-	-
Iron[Σ]	138	6,691,426	61.6	54.21	68.54	66	1,902,451	20.0	14.41	27.12
Phosphorus[Δ]	158	7,601,034	70.0	61.87	77.05	147	4,995,402	52.6	43.84	61.13

Notes:
[α] Energy intake status was based on the PAL 1.4 category in the Recommended Nutrient Intakes for Malaysia (RNI), 2017. [β] Based on the recommended protein intake of 10% - 20% from the total energy intake (TEI). [€] Based on the recommended fat intake of 25% - 35% from the TEI. [£] Based on the recommended carbohydrate intake of 50% - 65% from TEI. [§] Recommended intake of vitamin A: 600 µg/day. [¥] Recommended intake of vitamin C: 70 mg/day. [ᵐ] Recommended intake of thiamine for males: 1.2 mg/day; females: 1.1 mg/day. [µ] Recommended intake of riboflavin for males: 1.3 mg/day; females: 1.1 mg/day. [π] Recommended intake of niacin for males: 16 mg NE/day; females: 14 mg NE/day. [Ω] Recommended intake of calcium for males (19 - 59 years): 1000 mg; females (19 - 50 years): 1000 mg; females (51 - 59 years): 1200 mg. [Σ] Recommended intake of iron for males (19 - 59 years): 9 mg; females (19 - 50 years): 20 mg; females (51 - 59 years): 8 mg. [Δ] Recommended intake of phosphorus: 700mg. * Prevalence not presented because the sample size was insufficient for reliable estimation.

Table 3.7: The prevalence of older persons (60 years and above) in Malaysia who consumed nutrients adequately (N=776)

Nutrients	Malaysia				
	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MACRONUTRIENTS					
Energy[α]	403	1,921,776	50.8	47.30	54.40
Protein[β]	625	3,016,762	79.8	76.50	82.80
Fat[€]	170	757,871	20.0	17.40	23.00
Carbohydrate[£]	361	1,663,933	44.0	39.51	48.63
VITAMINS					
Vitamin A[§]	278	1,328,057	35.1	31.35	39.11
Vitamin C[¥]	285	1,473,443	39.0	32.07	46.36
Thiamine[∞]	126	734,439	18.2	12.23	26.08
Riboflavin[µ]	254	1,336,093	35.3	28.55	42.79
Niacin[π]	174	887,351	23.5	19.51	27.97
MINERALS					
Calcium[Ω]	14*	-	-	-	-
Iron[Σ]	466	2,401,049	63.7	58.11	68.87
Phosphorus[Δ]	451	2,226,492	58.9	54.69	62.99

Notes:
[α] Energy intake status was based on the PAL 1.4 category in the Recommended Nutrient Intakes for Malaysia (RNI), 2017. [β] Based on the recommended protein intake of 10% - 20% from the total energy intake (TEI). [€] Based on the recommended fat intake of 25% - 35% from the TEI. [£] Based on the recommended carbohydrate intake of 50% - 65% from TEI. [§] Recommended intake of vitamin A: 600 µg/day. [¥] Recommended intake of vitamin C: 70 mg/day. [∞] Recommended intake of thiamine for males: 1.2 mg/day; females: 1.1 mg/day. [µ] Recommended intake of riboflavin for males: 1.3 mg/day; females: 1.1 mg/day. [π] Recommended intake of niacin for males: 16 mg NE/day; females: 14 mg NE/day. [Ω] Recommended intake of calcium for males: 1000 mg; females: 1200mg. [Σ] Recommended intake of iron for males: 9 mg; females: 8 mg. [Δ] Recommended intake of phosphorus: 700mg. * Prevalence not presented because the sample size was insufficient for reliable estimation.

Table 3.8: The prevalence of older persons (60 years and above) in Malaysia who consumed nutrients adequately, stratified by sex (N=776)

Nutrients	Male					Female				
	Count	Estimated Population	Prevalence (%)	95% CI		Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper				Lower	Upper
MACRONUTRIENTS										
Energy[α]	177	901,889	48.6	43.60	53.60	226	1,019,887	53.0	48.60	57.30
Protein[β]	287	1,509,969	81.4	75.88	85.91	338	1,506,793	78.3	72.41	83.16
Fat[€]	75	361,905	19.5	16.03	23.54	95	395,966	20.6	17.10	24.53
Carbohydrate[£]	158	796,320	42.9	36.26	49.87	203	867,613	45.1	39.47	50.78
VITAMINS										
Vitamin A[§]	132	668,099	36.0	31.22	41.12	146	659,959	34.3	29.30	39.63
Vitamin C[¥]	129	698,472	37.7	30.08	45.89	156	774,971	40.3	32.11	48.96
Thiamine[∞]	53	336,686	18.2	12.23	26.08	73	397,752	20.7	15.20	27.44
Riboflavin[µ]	119	686,332	37.0	28.90	45.91	135	649,761	33.7	26.86	41.40
Niacin[π]	89	480,924	25.9	20.45	32.28	85	406,428	21.1	16.03	27.27
MINERALS										
Calcium[Ω]	9*	-	-	-	-	5*	-	-	-	-
Iron[Σ]	213	1,190,430	64.5	58.90	69.69	253	1,210,620	62.9	55.82	69.42
Phosphorus[Δ]	224	1,171,115	63.1	57.54	68.40	227	1,055,377	54.8	49.54	59.98

Notes:
[α] Energy intake status was based on the PAL 1.4 category in the Recommended Nutrient Intakes for Malaysia (RNI), 2017. [β] Based on the recommended protein intake of 10% - 20% from the total energy intake (TEI). [€] Based on the recommended fat intake of 25% - 35% from the TEI. [£] Based on the recommended carbohydrate intake of 50% - 65% from TEI. [§] Recommended intake of vitamin A: 600 µg/day. [¥] Recommended intake of vitamin C: 70 mg/day. [∞] Recommended intake of thiamine for males: 1.2 mg/day; females: 1.1 mg/day. [µ] Recommended intake of riboflavin for males: 1.3 mg/day; females: 1.1 mg/day. [π] Recommended intake of niacin for males: 16 mg NE/day; females: 14 mg NE/day. [Ω] Recommended intake of calcium for males: 1000 mg; females: 1200mg. [Σ] Recommended intake of iron for males: 9 mg; females: 8 mg. [Δ] Recommended intake of phosphorus: 700mg. * Prevalence not presented because the sample size was insufficient for reliable estimation.

4. Serum Folate Deficiency or Possible Deficiency among Adults

4. Serum Folate Deficiency or Possible Deficiency among Adults

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Introduction

Folate is a water-soluble B vitamin naturally found in foods such as legumes, leafy green vegetables, egg yolks, liver and some citrus fruits [1]. Folate is essential for normal cell growth and replication. Low folate status has been associated with increased risks of adverse health outcomes from megaloblastic anemia and hyperhomocysteinemia to elevated risk of a neural tube defect [2,3].

The prevalence of folate deficiency was greater than 20% in many lower-income countries, but was typically less than 5% in higher-income countries [4]. In Malaysia, two studies reported 61% with low serum folate among lower socio-economic pregnant women in the Maternity Hospital Kuala Lumpur [5], and 15.1% plasma folate deficiency among women of childbearing age in the suburbs of Kuala Lumpur [6], according to a cut-off of below 6.8 nmol/L. However, there has been no national study of folate deficiency among the Malaysian population.

Many countries worldwide have implemented mandatory or voluntary fortification of staple foods such as wheat flour, maize flour, or rice to eliminate folate insufficiency. As of 2023, 69 countries had mandatory folic acid fortification, and 47 had voluntary fortification [7]. Based on the National Health and Nutrition Examination Survey (NHANES), the prevalence of low serum folate among individuals aged four years and above in the U.S. population declined from 15.5% in 1988–1994 (pre-fortification) to 0.5% in 1999–2000 (post-fortification). Rates have remained below 1% since that time [8].

Objectives

General Objective
To determine the prevalence of serum folate deficiency or possible deficiency among adults (18 years and above) in Malaysia.

Specific Objective
To determine the prevalence of serum folate deficiency or possible deficiency by sociodemographic subgroups.

Methods

Data on serum folate were obtained from adult respondents (18 years and above) through venous blood analysis using an automated two-step immunoassay for the quantitative determination of folate in human serum using chemiluminescent microparticle immunoassay (CMIA) technology (Alinity i Folate assay, Abbott).

Variable Definition

Serum folate deficiency is defined as levels below 6.8 nmol/L, while possible deficiency ranges from 6.8 to 13.4 nmol/L [9]. This survey defines serum folate deficiency or possible deficiency as levels 13.4 nmol/L and below.

Findings

A total of 1,309 respondents were analysed for serum folate **(Table 4.1)**. The national prevalence of serum folate deficiency or possible deficiency in Malaysia was 38.6% (95% CI: 33.46, 44.05). The prevalence was higher in urban areas at 40.0% (95% CI: 33.34, 47.05) compared with rural areas at 34.6% (95% CI: 29.53, 39.98). The prevalence among males and females was 42.2% (95% CI: 35.10, 49.57) and 34.5% (95% CI: 28.49, 41.09), respectively. By ethnicity, Indians had the highest prevalence at 65.5% (95% CI: 48.79, 79.11), followed by Malays at 38.9% (95% CI: 33.36, 44.70), Other Bumiputera at 27.6% (95% CI: 20.89, 35.55), Others at 21.2% (95% CI: 10.25, 38.86) and Chinese at 14.5% (95% CI: 9.40, 21.66).

The prevalence among single individuals was 50.7% (95% CI: 41.68, 59.62), which was higher than married or cohabiting individuals; 31.4% (95% CI: 25.50, 38.02). The prevalence was highest among those with a primary education level at 41.8% (95% CI: 35.32, 48.58), government employees at 42.6% (95% CI: 27.69, 59.05) and those from the M40 group at 41.3% (95% CI: 32.66, 50.49).

Conclusion

This study revealed that 38.6% of adults in Malaysia had deficient or possibly deficient serum folate levels.

A higher prevalence of serum folate deficiency or possible deficiency was observed among individuals residing in urban areas, males, those of Indian ethnicity, singles, individuals with secondary education, government employees and those within the M40 household income.

Recommendations

Malaysia could adopt a comprehensive, multi-sectoral approach involving food fortification, dietary improvements and public health initiatives to benefit all populations. Recommended strategies include:

1. Strengthen public awareness and nutrition education on the role of folate in health maintenance and disease prevention by promoting the consumption of folate-rich foods, including legumes, leafy green vegetables and fruits, through coordinated community and school-based programmes.
2. Collaborate with the food industry to implement or expand voluntary folic acid fortification of commonly consumed foods, particularly ready-to-eat products such as bread and biscuits.
3. Develop comprehensive policy frameworks to support fortification standards, product labelling and consumer guidance.

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Table 4.1: Prevalence of serum folate deficiency or possible deficiency among adults (18 years and above) in Malaysia by sociodemographic characteristics (n=1,309)

Sociodemographic Characteristics	Serum folate deficiency or possible deficiency (13.4 nmol/L and below)				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	396	8,226,854	38.6	33.46	44.05
Location					
Urban	199	6,355,769	40.0	33.34	47.05
Rural	197	1,871,086	34.6	29.53	39.98
Sex					
Male	211	4,817,445	42.2	35.10	49.57
Female	185	3,409,409	34.5	28.49	41.09
Ethnicity					
Malay[a]	228	4,271,377	38.9	33.36	44.70
Chinese	36	606,643	14.5	9.40	21.66
Indian	41	877,796	65.5	48.79	79.11
Other Bumiputera	74	673,205	27.6	20.89	35.55
Others	17	500,595	21.2	10.25	38.86
Marital Status					
Single[b]	161	4,053,023	50.7	41.68	59.62
Married or cohabiting	235	4,173,832	31.4	25.50	38.02
Education Level					
No Formal Education	44	514,822	30.7	20.49	43.16
Primary School	63	722,578	31.3	23.34	40.47
Secondary School	256	5,998,309	41.8	35.32	48.58
Tertiary Education	32	984,931	34.2	24.19	45.75
Occupation					
Government Employee	32	548,058	42.6	27.69	59.05
Private Employee	95	280,0780	37.8	29.12	47.29
Self Employed	66	1,306,433	39.3	28.61	51.17
Not Working[c]	197	3,519,544	39.1	32.41	46.21
Household Income Group					
B40	291	4,965,853	38.1	33.03	43.38
M40	79	2,489,679	41.3	32.66	50.49
T20	23	739,871	35.1	20.19	53.63

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

5. Serum Vitamin D Insufficiency and Deficiency among Adults

5. Serum Vitamin D Insufficiency and Deficiency among Adults

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Introduction

Vitamin D (calciferol) is a fat-soluble vitamin that is crucial for calcium absorption and healthy bone mineralisation [1]. It is also essential for general physiological health aspects, such as neurocognitive well-being, glucose metabolism, neuromuscular, and immune function. It also plays a protective role against several chronic diseases, including cancer, psoriasis, and multiple sclerosis [2].

Endogenous vitamin D, synthesised in the skin upon sunlight exposure, accounts for approximately 80% of an individual's total vitamin D requirements. It can also be obtained exogenously from naturally occurring vitamin D in fatty fish, as well as in fortified foods such as milk and cereal, and in vitamin supplements [1]. The best indicator of vitamin D status is serum 25-hydroxyvitamin D levels (25(OH)D), with a normal value defined as 50 nmol/L and above. Insufficiency or deficiency is categorised as below 50 nmol/L. [3]. Globally, 44.7% of the population had reported being vitamin D insufficient or deficient [4]. Children, females, non-white individuals, and the elderly were more vulnerable to vitamin D deficiency [5].

Malaysia, despite having abundant sunlight, has reported low vitamin D levels in its population. A review of studies on vitamin D levels in Malaysia found that nearly 64% of the population had vitamin D levels below 50 nmol/L. This is more prevalent among ethnic Malays and Indians, as well as among women, with cultural and lifestyle factors contributing to low vitamin D levels [6]. A multi-ethnic study conducted among adults in 2016 also showed that 67.4% of the respondents had vitamin D levels less than 50 nmol/L [7].

Although other contributing factors often obscure direct health impacts of hypovitaminosis D, the burden on public health remains significant due to its link to various chronic diseases [5]. In mitigating the future burden of vitamin D deficiencies, some countries have implemented mandatory food fortification policies. In contrast, others adopt optional strategies, such as fortifying foods with vitamin D, including dairy products and cereal, aiming to improve vitamin D intake, especially in high-risk populations [8].

Objectives

General Objective

To determine the prevalence of serum vitamin D insufficiency or deficiency in Malaysia.

Specific Objectives

1. To determine the mean serum Vitamin D level in Malaysia.
2. To determine the prevalence of serum Vitamin D insufficiency or deficiency by sociodemographic subgroups.

Methods

Data on serum Vitamin D levels were obtained from adults (18 years and above) through venous blood analysis using a quantitative, one-step, competitive immunoassay with CMIA technology on the ARCHITECT iSystem.

Variable Definition

Serum Vitamin D insufficiency or deficiency is defined as having serum 25-hydroxyvitamin D (25(OH)D) concentrations below 50 nmol/L, while sufficiency is defined as 50 nmol/L and above (3).

Findings

A total of 1,309 respondents participated in the serum vitamin D module. The study found that the mean serum vitamin D level among adults (18 years and above) in Malaysia was 54.9 nmol/L (95%CI: 52.70, 57.08). The national prevalence of serum vitamin D sufficiency was 57.9% (95% CI: 52.39, 63.26), insufficiency was 31% (95% CI: 26.63, 35.69), and deficiency was 11.1% (95% CI:7.59, 15.95) **(Table 5.1)**.

The prevalence of serum vitamin D insufficiency or deficiency was 42.1% **(Table 5.2)**. This prevalence was higher in urban areas [46.9% (95%CI: 40.09,53.91)] compared to rural areas [27.8% (95% CI: 23.65–32.35)]. Females had a higher prevalence of insufficiency or deficiency at 62.3% (95% CI: 55.72, 68.46), while males had a prevalence of 24.6% (95% CI: 17.87–32.84). By ethnicity, Indians had the highest prevalence at 54.3% (95% CI: 42.44, 65.64), followed by Malays at 46.5% (95% CI: 40.40, 52.73), Others at 31.7% (95% CI: 18.09, 49.49), Chinese at 18.6% (95% CI: 12.27, 27.18) and Other Bumiputera at 18.1% (95% CI: 12.88, 24.91).

The prevalence among single individuals was 43.8% (95% CI: 34.40, 53.59), and 41.1% (95% CI: 35.12–47.42) among those who were married or cohabiting. The prevalence was highest among individuals with tertiary education [60% (95% CI: 45.62, 72.86)] and those who were not working [49% (95% CI: 41.89–56.08)]. By household income group, the prevalence of serum vitamin D insufficiency or deficiency was almost similar among M40 [42.8% (95% CI: 33.46, 52.72)] and B40 households [42.6% (95% CI: 37.43, 47.92)].

Conclusion

This study found that 42.1% of adults in Malaysia had insufficient or deficient serum vitamin D levels, a prevalence similar to that in Singapore, where the rate of Vitamin D deficiency was 42% [9]. This prevalence was slightly lower than the global prevalence of 44.7% reported in a review study [4]. However, it was significantly lower compared to several local studies, which reported prevalence rates of insufficient or deficient serum vitamin D levels ranging from 64% to 67%. [6-7].

Notably, higher prevalence rates were observed among individuals from urban areas, females, those of Indian ethnicity, singles, individuals with tertiary education, and those who are unemployed.

Recommendations

Strategies that can address vitamin D insufficiency and deficiency include:

1. Prioritise adequate and regular daily sun exposure for at least 30 minutes to ensure optimal vitamin D levels.
2. Encourage the inclusion of vitamin D-rich foods, such as fatty fish and eggs, in daily dietary intake.
3. Consider voluntary fortification of commonly consumed foods (e.g., milk, cereal, bread, and dairy products) with vitamin D.
4. Increase public awareness and promote better health choices regarding vitamin D by highlighting its benefits through targeted nutritional campaigns and screening programs.
5. Recommend vitamin D screening and supplementation for high-risk groups.
6. Develop Clinical Practice Guidelines on clinical management of vitamin D deficiency and the specific vitamin D requirements of high-risk groups such as older persons and those who are bedridden and housebound.

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Table 5.1: Prevalence of serum Vitamin D among adults (18 years and above) in Malaysia (n=1,309)

Indicators	Estimated Population	Prevalence (%)	95% CI	
			Lower	Upper
Sufficient	12,338,463	57.9	52.39	63.26
Insufficient	6,599,131	31.0	26.63	35.69
Deficient	2,364,371	11.1	7.59	15.95

Table 5.2: Prevalence of insufficient or deficient serum Vitamin D among adults (18 years and above), by sociodemographic characteristics (n=1,309)

Sociodemographic Characteristics	Estimated Population	Prevalence (%)	95% CI	
			Lower	Upper
MALAYSIA	8,963,501	42.1	36.74	47.61
Location				
Urban	7,459,144	46.9	40.09	53.91
Rural	1,504,357	27.8	23.65	32.35
Sex				
Male	2,810,243	24.6	17.87	32.84
Female	6,153,259	62.3	55.72	68.46
Ethnicity				
Malay[a]	5,109,927	46.5	40.40	52.73
Chinese	779,064	18.6	12.27	27.18
Indian	727,161	54.3	42.44	65.64
Other Bumiputera	441,917	18.1	12.88	24.91
Others	748,947	31.7	18.09	49.49
Marital Status				
Single[b]	3,500,263	43.8	34.40	53.59
Married or cohabiting	5,463,238	41.1	35.12	47.42
Education Level				
No Formal Education	546,538	32.6	23.25	43.48
Primary School	631,404	27.3	18.23	38.80
Secondary School	6,055,031	42.2	35.91	48.75
Tertiary Education	1,730,528	60.0	45.62	72.86
Occupation				
Government Employee	605,691	47.1	31.78	63.00
Private Employee	2,947,960	39.8	30.37	49.97
Self Employed	898,132	27.0	19.38	36.36
Not Working[c]	4,408,296	49.0	41.89	56.08
Household Income Group				
B40	5,555,131	42.6	37.43	47.92
M40	2,581,874	42.8	33.46	52.72
T20	826,496	39.2	21.31	60.57

a - Malay includes Orang Asli
b - Singles includes those who were never married, divorced, separated, or widowed
c - Not working includes unpaid workers, homemakers, retirees, students, the unemployed, those with health problems, and older persons

6. Iodine Deficiency Disorders (IDD) among Adults

6. Iodine Deficiency Disorders (IDD) among Adults

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Introduction

Iodine is an essential mineral and an integral component of thyroid hormones [1]. Iodine deficiency can cause several health problems such as hypothyroidism and goitre globally [2]. A wide variety of foods contain iodine including eggs, meat, milk products, cereal grains, dried legumes, dried vegetables, and dried fruits. Marine fish, shellfish, and seaweed are the richest natural sources of iodine; however, in many countries, the main contributors to dietary iodine intake are processed foods made with iodized salt and fortified dairy products. The iodine content of foods varies with geographic location, ranging widely from 30 to 800 µg/100 g, depending on the iodine content of the soil in which they are grown [3]. The World Health Organization (WHO) recommends that all food-grade salt used in households and food processing should be fortified with iodine as a safe and effective strategy for the prevention and control of iodine deficiency disorders (IDD). Universal Salt Iodization (USI) is an established global strategy in eliminating IDD in the population [4].

In 1996, the Ministry of Health (MOH) Malaysia conducted a nationwide IDD Survey among school children aged 8 to 10 years. Based on the WHO/ICCIDD reference [5], the prevalence of goitre in Malaysia was 17.7%, which was 18% in Sabah, 2.2% in Peninsular Malaysia and 0.7% in Sarawak. The median urinary iodine level was 82.2 µg/litre in the Peninsular, 66.0 µg/litre in Sabah and 126.0 µg/litre in Sarawak [6]. In 2008, when another National IDD Survey among school children aged 8 to 10 years was repeated, the overall median UIC was 109.0 µg/L, slightly above the WHO/UNICEF/ICCIDD recommended level of 100 µg/L, indicating borderline adequacy of iodine intake in the population [7]. However, these surveys were conducted over a decade ago and updated national data are needed to assess the current iodine status of the population.

Mandatory USI has been implemented in Sabah since 2000, followed by Sarawak in 2008 [8] and Peninsular Malaysia in November 2018 [9]. Since the implementation of nationwide USI, all salt and refined salt sold in Malaysia in packages of 20 kg or less are required to be iodized, with iodine levels ranging from 20 to 40 mg/kg, using either potassium iodide, potassium iodate, sodium iodide or sodium iodate [9]. However, there is a lack of recent national data on the iodine content of household salt.

Various strategies have been implemented in Malaysia to combat IDD prior to a nationwide USI programme in 2018. Continuous nutrition education and promotion emphasized the prevention and control of IDD, including the importance of adequate iodine intake, awareness of goitrogenic foods and the proper use of iodized salt. In addition, water iodination was introduced in endemic areas but was later discontinued due to operational and sustainability challenges, underscoring the need for a more sustainable national strategy.

Objectives

General Objective

To determine the status of iodine deficiency among adults (18 years and above) in Malaysia.

Specific Objectives

1. To assess the iodine deficiency status among adults (18 years and above) through urinary iodine concentration.
2. To determine the iodine level in household salt.

Methods

Urinary Iodine Concentration (UIC)

UIC was measured using a single 24-hour urine sample collected from adult respondents (18 years and above), using a polyethylene-lined cardboard urine collection container. After collection, the urine samples were stored frozen at a designated private laboratory before being transported under cold chain conditions to Public Health Laboratories in Sungai Buloh, Ipoh, Kota Bharu and Kota Kinabalu for analysis. The UIC was determined using an in-house modified micro-method developed by the Institute for Medical Research (IMR) [10]. Assessment of iodine status followed the epidemiological criteria by WHO/UNICEF/ICCIDD 2007 recommendations, which define iodine sufficiency based on the median UIC in a population [11].

Iodine in Household Salt

Two heaped tablespoons of salt (approximately 30 grams) were collected from the same households that provided urine samples. Each salt sample was placed in an airtight polyethylene bag and stored in a dry place, at room temperature, protected against moisture, sunlight, and heat. The presence of iodine in the salt was first tested using Rapid Test Kits. Samples were then sent to the Institute for Medical Research (IMR) for quantitative assessment. Two kits developed by the Institute for Medical Research (IMR) were used: the Salt Iodate Micro-Method Reagent (SIMR) Kit for detecting iodate, and the On-site Salt Iodine Detector (OSID) Kit for detecting iodide [12, 13]. The criteria for iodine concentration in salt are based on WHO 2014 and the Malaysian Food Regulations 1985 [4,9].

Variable Definition

A UIC of less than 20 µg/L was considered as severe iodine deficiency, 20-49 µg/L as moderate, 50-99 µg/L as mild, 100-199 µg/L as adequate, 200-299 µg/L and above 300 µg/L as more than adequate and excessive. These cut-off values were used for both school-age children and adults [14].

According to WHO/UNICEF/ICCIDD, the indicator for iodine deficiency elimination is a median UIC of more than 100 µg/L, and not more than 20% of the samples should have UIC below 50 µg/L [11].

Malaysian Food Regulations 1985 stipulated that the proportion of iodine content in the salt must be within 20–40 mg/kg [9].

Findings

Urinary Iodine Status

A total of 1,272 urine samples were collected from adult respondents and analysed for UIC. **Table 6.1** shows that the overall median UIC for Malaysia was 103.0 µg/L (25^{th}, 75^{th} percentile: 63, 163). The overall median UIC for Peninsular Malaysia was 107.8 µg/L (25^{th}, 75^{th} percentile: 66, 166) and is slightly higher than Sabah [104.2 µg/L (25^{th}, 75^{th} percentile: 61, 176)] and Sarawak [95.0 µg/L (25^{th}, 75^{th} percentile: 51, 148)].

The median UIC was higher in the rural areas [106.3 µg/L (25^{th}, 75^{th} percentile: 65, 168)] compared to urban areas [98.4 µg/L (25^{th}, 75^{th} percentile: 59, 162)]. The median UIC among males and females was 108.5 µg/L (25^{th}, 75^{th} percentile: 66, 169) and 100.2 µg/L (25^{th}, 75^{th} percentile: 59, 159), respectively. By ethnicity, Malays had the highest median UIC at 118.1 µg/L (25^{th}, 75^{th} percentile: 73, 171) followed by Others at 112.9 µg/L (25^{th}, 75^{th} percentile: 73, 224), Other Bumiputera at 93.6 µg/L (25^{th}, 75^{th} percentile: 51, 161), Indians at 83.1 µg/L (25^{th}, 75^{th} percentile: 49, 119) and Chinese at 74.3 µg/L (25^{th}, 75^{th} percentile: 48, 127). The median UIC was higher among singles [105.4 µg/L (25^{th}, 75^{th} percentile: 63, 166)], those with tertiary education [111.6 µg/L (25^{th}, 75^{th} percentile: 73, 177)], self-employed [126.8 µg/L (25^{th}, 75^{th} percentile: 74, 186)] and those from T20 group [106.8 µg/L (25^{th}, 75^{th} percentile: 63, 163)] **(Table 6.2)**.

According to WHO criteria for iodine deficiency elimination, the median UIC should be 100–199 µg/L, and no more than 20% of the population should have a UIC below 50 µg/L [11]. As shown in **Table 6.3**, 15.3% of the population had a UIC below 50 µg/L and 45.7% had a UIC below 100 µg/L. However, Sarawak was borderline, with 23.1% of the population having a UIC below 50 µg/L and 51.9% having a UIC below 100 µg/L.

Consumption of Iodized Salt

From 1,429 salt samples tested for the presence of iodine using Rapid Test Kit, 1,304 samples or 90.2% (95% CI: 86.83, 92.86) contain iodine. The highest proportion of households containing iodized salt was noted in Sabah at 99.6% (95% CI: 98.68, 99.88), followed by Sarawak at 97.0% (95% CI: 92.03, 98.89) and Peninsular Malaysia at 88.3% (95% CI: 84.11, 91.51) **(Table 6.4)**.

The proportion of households using inadequate iodized salt (below 20 mg/kg) in Malaysia was 35.6% **(Table 6.5)**. Peninsular Malaysia showed the highest proportion of using inadequately iodized salt (37.7%) followed by Sarawak (29.8%) and Sabah (28.4%) **(Table 6.5)**.

Conclusion

The overall iodine status of adults in Malaysia was at the lower end of adequacy, with a national median UIC of 103.0 µg/L. However, Sarawak shows borderline iodine insufficiency. Iodized salt coverage is generally high, especially in Sabah and Sarawak. More than one-third of households nationwide still consumed inadequately iodized salt (less than 20 mg/kg), particularly in Peninsular Malaysia.

Table 6.1: Trends in the median UIC in Malaysia

	National IDD Survey 1996*	National IDD Survey 2008*	NHMS 2024**
	Median UIC (µg/L)		
Malaysia	-	109.0	103.0
Peninsular Malaysia	82.2	104.1	107.8
Sabah	66.0	150.2	104.2
Sarawak	126.0	101.9	95.0

*School children aged 8 to 10 years
**Adults (18 years and above)

Recommendations

To effectively address iodine deficiency, strategies targeted on prevention, awareness, monitoring, and legal enforcement are of paramount importance to ensure accessible solutions for all populations as follows:

1. Strengthen the enforcement of the sale of iodized salt in the market to ensure adequate iodine content and compliance with national standards.
2. Conduct periodic monitoring and surveillance of the population's iodine status to assess intake adequacy, identify potential deficiencies and guide evidence-based policy and program adjustments.
3. Strengthen public knowledge and skills on the proper storage and use of iodized salt through targeted demonstrations, hands-on cooking sessions and the dissemination of practical guidance through social media platforms.
4. Improve the supply chain and availability of diverse seafood across Malaysia, particularly in inland and highland areas where access to marine products is limited.

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Table 6.2: Median urinary iodine concentration (UIC) among adult population (18 years and above) in Malaysia by sociodemographic characteristics (n=1,272).

Sociodemographic Characteristics	Count	Median UIC (µg/L)[a]	Percentile[a]	
			25th	75th
MALAYSIA	1,272	103.0	62.73	163.30
Zone				
Peninsular	824	107.8	65.69	166.28
Sabah	204	104.2	61.38	176.08
Sarawak	228	95.0	51.33	147.70
Location				
Urban	626	98.4	59.48	161.63
Rural	646	106.3	64.65	167.63
Sex				
Male	557	108.5	66.15	169.20
Female	715	100.2	59.31	159.20
Ethnicity				
Malay[b]	646	118.1	73.24	171.35
Chinese	197	74.3	47.95	126.80
Indian	64	83.1	48.88	119.41
Other Bumiputera	276	93.6	51.33	160.83
Others	89	112.9	73.40	223.95
Marital Status				
Single[c]	422	105.4	63.08	166.45
Married or cohabiting	847	102.9	62.54	163.01
Education Level				
No Formal Education	169	89.4	55.53	141.60
Primary School	221	95.9	54.40	152.09
Secondary School	773	109.0	65.34	168.22
Tertiary Education	104	111.6	72.52	176.58
Occupation				
Government Employee	81	107.6	68.25	161.10
Private Employee	287	111.0	66.04	183.20
Self Employed	228	126.8	73.89	185.64
Not Working[d]	654	93.6	56.55	148.30
Household Income Group				
B40	939	102.9	62.00	165.40
M40	240	103.7	63.66	163.70
T20	81	106.8	62.75	163.17

a - Median & Percentile for Sample
b - Malay includes Orang Asli
c - Never married or divorced or separated or widowed
d - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 6.3: Proportion of urinary iodine concentration (UIC) less than 50 µg/L and less than 100 µg/L among adults (18 years and above) by sociodemographic characteristics (n=1,272)

Sociodemographic Characteristics	UIC less than 50 µg/L (Severe or Moderate)				
	Count	Estimated population	Proportion (%)	95% CI	
				Lower	Upper
MALAYSIA	202	3,300,420	15.3	11.02	20.90
Zone					
Peninsular	113	2,535,804	14.6	9.56	21.76
Sabah	29	243,502	10.0	7.25	13.67
Sarawak	54	396,185	23.1¥	15.61	32.78
Location					
Urban	109	2,642,141	16.3	10.88	23.81
Rural	93	658,279	12.2	9.06	16.36
Sex					
Male	82	1,880,757	16.1	10.07	24.78
Female	120	1,419,662	14.4	11.14	18.38
Ethnicity					
Malay[a]	62	1,061,181	9.5	6.54	13.71
Chinese	51	1,239,408	28.2	19.85	38.43
Indian	16	292,066	21.6	10.78	38.55
Other Bumiputera	63	508,211	20.9	15.59	27.38
Others	10	382,068	18.0	4.01	53.62
Marital Status					
Single[b]	71	1,292,167	15.4	9.43	24.22
Married or cohabiting	130	2,000,844	15.2	10.95	20.75
Education Level					
No Formal Education	35	254,675	16.1	9.55	25.99
Primary School	47	621,850	26.7	15.69	41.60
Secondary School	108	2,094,596	14.2	10.30	19.35
Tertiary Education	11	321,891	11.2	4.22	26.65
Occupation					
Government Employee	5	61,977	5.0	1.49	15.47
Private Employee	48	1,273,023	17.0	9.30	28.91
Self Employed	24	363,097	10.5	6.75	15.94
Not Working[c]	121	1,557,910	17.1	12.51	22.96
Household Income Group					
B40	152	1,956,252	14.9	11.38	19.32
M40	37	972,753	15.8	8.38	27.81
T20	10	333,794	15.5	5.11	38.29

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age
¥ - More than 20% of the samples have UI levels below 50 µg/L

Sociodemographic Characteristics	UIC less than 100 µg/L (Severe, Moderate or Mild)				
	Count	Estimated population	Proportion (%)	95% CI	
				Lower	Upper
MALAYSIA	616	9,849,108	45.7	40.60	50.91
Zone					
Peninsular	381	7,827,492	45.2	39.00	51.52
Sabah	98	1,075,159	44.2	33.25	55.73
Sarawak	124	890,386	51.9[¥]	44.55	59.17
Location					
Urban	315	7,585,390	46.9	40.36	53.56
Rural	301	2,263,718	42.1	36.64	47.78
Sex					
Male	259	5,381,018	46.1	38.90	53.44
Female	357	4,468,090	45.3	39.24	51.43
Ethnicity					
Malay[a]	259	4,317,884	38.8	34.45	43.38
Chinese	131	2,973,752	67.7	56.69	77.06
Indian	40	857,840	63.4	48.38	76.20
Other Bumiputera	151	1,281,292	52.6	44.89	60.27
Others	35	790,936	37.3	18.75	60.49
Marital Status					
Single[b]	200	3,540,504	42.3	33.49	51.59
Married or cohabiting	413	6,286,881	47.8	42.60	53.05
Education Level					
No Formal Education	94	862,713	54.7	44.18	64.82
Primary School	119	1,265,611	54.3	44.02	64.29
Secondary School	358	6,460,369	43.9	37.89	50.11
Tertiary Education	43	1,246,870	43.5	29.51	58.65
Occupation					
Government Employee	38	502,257	40.4	25.31	57.64
Private Employee	124	3,367,204	44.8	36.45	53.55
Self Employed	93	1,384,908	40.0	31.78	48.84
Not Working[c]	349	4,498,930	49.4	42.14	56.72
Household Income Group					
B40	456	6,051,011	46.2	40.56	51.85
M40	117	2,651,026	43.1	34.21	52.39
T20	37	1,082,518	50.1	32.92	67.28

Table 6.4: Proportion of households using salt containing iodine (n=1,429)

	Presence of Iodine				
	Count	Estimated population	Proportion (%)	95% CI	
				Lower	Upper
MALAYSIA	1304	22,125,215	90.2	86.83	92.86
Zone					
Peninsular	806	17,620,757	88.3	84.11	91.51
Sabah	220	2,594,333	99.6	98.68	99.88
Sarawak	241	1,808,031	97.0	92.03	98.89

Table 6.5: Proportion of households using inadequate iodized salt (less than 20 mg/kg) (n=1,429)

	Inadequate Iodized Salt (less than 20 mg/kg)				
	Count	Estimated population	Proportion (%)	95% CI	
				Lower	Upper
MALAYSIA	510	8,736,127	35.6	31.46	40.04
Zone					
Peninsular	371	7,516,736	37.7	32.82	42.78
Sabah	68	740,913	28.4	18.88	40.43
Sarawak	68	554,849	29.8	19.92	41.92

7. Habitual Food Intake among Children (5-9 Years)

7. Habitual Food Intake among Children (5-9 Years)

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Introduction

Children aged 5 to 9 years are in a critical stage of growth and development, during which regular and balanced meal patterns play an important role in supporting concentration, learning performance, and overall health. Consistent main meals contribute to adequate nutrient intake and help build healthy eating habits from an early age. The number of main dishes or meals consumed each day reflects food variety, family eating practices, and household routines. In Malaysia, research focusing specifically on meal patterns among children aged 5 to 9 years is still limited. Understanding how frequently children in this age group consume main meals can help identify dietary gaps and guide the design of nutrition programmes and school meal policies. Most national nutrition surveys have focused on nutrient intakes or food group consumption rather than meal frequency and structure. Data from the South East Asian Nutrition Surveys (SEANUTS, 2016), which included children aged 2 to 12 years, showed that only 56.1 percent followed the recommended pattern of consuming three main meals per day, while 20.1 percent reported frequent snacking (three times a day including morning tea, afternoon tea, and supper). These findings indicate irregular eating patterns among Malaysian children, which may also affect the younger school-aged group [1]. Unhealthy meal frequency, such as skipping main meals or excessive snacking, may disrupt appetite control and increase the risk of overweight and obesity (Rolls, 2017; World Health Organization, 2020). This highlights the need for more age-specific evidence to inform national nutrition policies and school meal interventions.

Food group diversity is essential for the healthy growth and development of children aged 5-9 years. A varied diet that includes fruits, vegetables, grains, dairy, and proteins supports cognitive development and ensures adequate intake of essential nutrients. Studies show that greater dietary diversity improves health outcomes and growth, though socioeconomic factors often influence access to diverse foods [2].

Food environments, including food marketing, are key factors influencing dietary habits [3,4]. The WHO (2023) recommended the mandatory implementation of policies to restrict the marketing of foods high in saturated fatty acids, trans fats, free sugars, and/or salt to children. However, compared to global standards, policies regulating food marketing in Malaysia have been assessed as inadequate [5].

The consumption of beverages is essential for children's overall dietary habits and health outcomes. Many countries, including Malaysia, recommend plain water as the preferred beverage to meet children's daily fluid requirements based on dietary guidelines [6]. According to the Malaysian Dietary Guidelines for Children and Adolescents (2023), children aged 4 to 6 years should drink five glasses of water daily, while those aged 7 to 12 years are advised to consume seven glasses of plain water. Early childhood intake of sugar-sweetened beverages (SSB) is strongly associated with higher SSB consumption in later childhood [7].

Objectives

General Objective

To determine the prevalence of habitual food intake among children aged 5 to 9 years old in Malaysia.

Specific Objectives

1. To determine meal pattern in terms of meal frequency, unhealthy food consumption (confectionery, snacks, fast food, processed meat and instant noodles)
2. To determine the diversity of food groups consumptions
3. To determine intake of plain water and sugar-sweetened beverages
4. To assess exposure, impact, parental concern and perception on unhealthy food and beverages marketing

Methods

Data on habitual food intake for children aged 5 to 9 years old was obtained from parents/ caregivers through face-to-face interviews using adapted version of Minimum Dietary Diversity-Women and Minimum Dietary Diversity-Infant and Young Children (FAO 2021), Sugar Sweetened Beverages categories for tax implementation (WHO 2017, 2022) and Marketing of unhealthy food and beverages [3].

Variable Definition

1. **Meal Frequency**
   The mean number of main dishes in the past 24 hours (day and night).

2. **Minimum Dietary Diversity Score**
   For children, a more suitable indicator for assessment at the group level, based on the 10 food groups recommended for minimum dietary diversity for women (MDD-W), would be to use a cut-off of 5 out of 10 food groups to indicate a higher likelihood of micronutrient adequacy (Diop et al. 2021). The FGS-10 is based on the MDD-W guidelines, which include the following food groups: 1) grains, white roots and tubers, and plantains; 2) pulses; 3) nuts and seeds; 4) dairy; 5) flesh foods; 6) eggs; 7) dark-green leafy vegetables; 8) vitamin A–rich fruits and vegetables; 9) other vegetables; and 10) other fruits.

3. **Sugar-Sweetened Beverages (SSBs)**
   Adapted from WHO (2016), Malaysia defines sugar-sweetened beverages as all types of beverages containing free sugars, including self-prepared beverages, store-prepared beverages, carbonated and non-carbonated beverages, fruits/vegetables juices and drinks, liquid and powder concentrates, flavoured water, energy and sport drinks, ready-to-drink tea and coffee and flavoured drinks.

4. **Unhealthy food and beverages:**
   Foods or beverages high in sugar, salt, and fat, such as sugar confectionery like sweets and chocolates, snacks, crackers, fried chicken, burgers, nuggets, sausage, and SSBs.

Findings

Meal frequency

The study found that the mean number of main dishes in the past 24 hours among children (5-9 years) old was 3.4 (95% CI: 3.33, 3.53). There was no difference in meal frequency between urban and rural, male and female, and across household income groups. **Table 7.1** shows the Mean number of main dishes in the past 24 hours among children (5-9 years) by socio-demography.

Food group diversity

Table 7.2 shows the prevalence of not meeting the Minimum Dietary Diversity Score (MDD) among children (5-9 years) by sociodemographic. Nearly half of Malaysian children (5-9 years) [48.1% (95% CI: 43.10, 53.18)] did not meet the Minimum Dietary Diversity. Across ethnicities, Malay children (54.0%, 95% CI: 48.53, 59.29) had a higher prevalence, compared to Indian children (31.9%; 95% CI: 16.48, 52.60). By household income, B40 and M40 children (50.2%) had a higher prevalence of not meeting the MDD than those in the T20 (39.2%) groups. These findings suggest the need for targeted interventions focusing on factors related to differences in ethnicities, such as culture and socioeconomic disparities, to enhance dietary diversity in children.

Among the MDD food groups, grains and tubers were the most consumed (97.8%), followed by meat, poultry, and fish (87.8%), milk and milk products (58.1%), and eggs (55.8%). In contrast, the food group least consumed was nuts and seeds (9.6%) and pulses (8.4%), as presented in **Table 7.3**.

Plain water and sugar-sweetened beverages

A total of 704 children aged 5 to 9 years from both rural and urban areas were included in the study. According to the results, more than half (58.8%) of the children (95% CI: 53.74, 63.60) did not drink enough plain water. Plain water intake did not significantly differ between boys (56.5%) and girls (61.1%) or between urban (57.9%) and rural (61.5%) children, as shown in **Table 7.4.** Additionally, more than half of children from all ethnic backgrounds did not meet the recommended plain water intake. Similar patterns were also observed across household income groups.

Meanwhile, in **Table 7.5**, the data shows the prevalence of the most consumed sugar-sweetened beverages (SSBs) among children aged 5 to 9 years over the past 24 hours. The findings reveal that malted/ chocolate beverages are the most consumed (48.8%), followed by prepared sweetened beverages (33.4%), flavoured milk (23.0%), cultured milk/ yogurt drinks (21.0%), non-carbonated beverages (17.1%), fruit juice/fruit drinks (14.5%), carbonated beverages (14.3%), soy drinks (9.3%), energy/sport/isotonic drinks (6.2%), premix beverages (6.0%), and 100% fruit juice with no added sugar (3.8%).

Marketing of unhealthy food and beverages

The prevalence of ever being exposed to unhealthy food marketing among children (5-9 years) was 83.2% (95% CI: 78.32, 87.23) as shown in **Table 7.6.**

Table 7.7 shows opinions on effects and regulations among parents of children aged 5 - 9 years exposed to unhealthy food marketing. Among the children who were exposed to unhealthy food marketing, requests for unhealthy food were reported as "rarely" by 36.2%, "never" by 24.9%, "sometimes" by 22.2%, and "always" by 16.7%. Among these parents, 44.0% were "concerned" and 34.4% "very concerned" about the impact of unhealthy food marketing on a child's health. An estimate of 54.3% and 41.3% and of parents "strongly agree" and "agree" that governmental control of unhealthy food marketing will benefit children's health. In addition, 48.4% and 45.3% "strongly agree" and "agree" that restricting unhealthy food marketing on television during public viewing programs will benefit children's health.

Recommendations

1. **Policy Implementation to create a supportive environment**
   - Expansion of sugar-sweetened beverages (SSBs) tax to broaden the scope of the existing SSBs tax to encompass all categories of SSBs.
   - Strengthen the policy of controlling advertisements that are high in fat, sugar, and salt in Malaysia due to the high percentage of children exposed to unhealthy food marketing.
   - Expand the coverage of subsidization of milk from hardcore poor groups to B40 under the Program Susu Sekolah (PSS) program in schools to inculcate milk drinking habits.

2. **Educational and Behavioural Changes Programs and Activities:**
   - All educational institutions need to implement an intervention programs on the importance of water intake (hydration), promoting a more diverse range of food groups according to local culture and preferences, as well as raising awareness about the impact of unhealthy food marketing on children.
   - Mandatory of providing plain water in all sports activities and school programmes.
   - Mandatory all institutional education (government and private) to be supplied with clean and accessible drinking water dispensers.
   - A holistic and concerted effort from related agencies, such as the Ministry of Agriculture and Food Security, the Ministry of Finance, the Ministry of Domestic Trade and Cost of Living Affairs, and the Ministry of Health, regarding the price control and accessibility of fruits, vegetables, and milk, including policy and food chain system approaches.
   - Aggressive coverage to promote/advocate vegetables, fruits, milk, and legumes by various media platforms such as social media, electronic, and printed media by the Ministry of Health, the Ministry of Communications, the Ministry of Digital, and the Ministry of Housing and Local Government.

Conclusion

This national nutrition survey reveals critical dietary patterns and nutritional gaps among Malaysian children. Nearly half of children aged 5 to 9 years have limited dietary variety across food groups. They also consume insufficient plain water while favouring malted or chocolate beverages and prepared sweetened beverages.

The survey also highlights the influence of unhealthy food marketing, particularly on children, and parental concerns about its impact on health. Most parents support government action to restrict unhealthy food advertisements, especially on television. These findings underscore the urgent need for comprehensive measures, including stronger policy and regulations on food marketing, to improve nutritional outcomes across all age groups.

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Table 7.1: Mean number of main dishes in the past 24 hours among children (5-9 years) by sociodemographic characteristics (n=708)

Sociodemographic Characteristics	Count	Estimated Population	Mean	95% CI	
				Lower	Upper
MALAYSIA	424	N/A	3.4	3.33	3.53
Location					
Urban	187	N/A	3.4	3.33	3.56
Rural	237	N/A	3.4	3.22	3.59
Sex					
Male	218	N/A	3.4	3.31	3.57
Female	206	N/A	3.4	3.27	3.58
Ethnicity					
Malay[a]	303	N/A	3.3	3.19	3.46
Chinese	37	N/A	3.5	3.26	3.80
Indian	19	N/A	3.5	3.27	3.71
Other Bumiputera	55	N/A	3.6	3.36	3.80
Others	10	N/A	3.8	3.29	4.36
Household Income Group					
B40	282	N/A	3.4	3.30	3.56
M40	97	N/A	3.4	3.28	3.61
T20	43	N/A	3.4	3.02	3.72

a - Malay includes Orang Asli
N/A - Not Applicable

Table 7.2: Prevalence of not meeting the minimum dietary diversity score among children (5-9 years) by sociodemographic characteristics (n=709)

Sociodemographic Characteristics	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	355	1,238,887	48.1	43.10	53.18
Location					
Urban	148	932,261	48.3	41.94	54.77
Rural	207	306,625	47.5	41.65	53.45
Sex					
Male	178	617,464	46.9	41.11	52.84
Female	177	621,423	49.4	41.23	57.53
Ethnicity					
Malay[a]	266	746,818	54.0	48.53	59.29
Chinese	26	90,423	40.9	28.49	54.58
Indian	12	40,273	31.9	16.48	52.60
Other Bumiputera	36	126,143	36.1	27.63	45.53
Others	15	102,044	53.9	34.36	72.32
Household Income Group					
B40	245	732,992	50.0	44.36	55.64
M40	85	286,850	50.2	39.32	61.03
T20	25	85,859	39.2	30.44	48.75

a - Malay includes Orang Asli

Table 7.3: Prevalence of food group intake within the past 24 hours among children (5-9 years) (n=709)

Food Group	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Minimum Dietary Diversity*					
Grains, white roots and tubers, and plantains	694	2,519,011	97.8	97.8	98.85
Meat, poultry, and fish	620	2,260,506	87.8	87.8	90.87
Milk and milk products	392	1,495,352	58.1	58.1	62.66
Eggs	388	1,437,569	55.8	55.8	60.49
Other vitamin-A rich fruits and vegetables	336	1,306,627	50.8	50.8	56.76
Other fruits	322	1,120,248	43.5	43.5	48.39
Dark green leafy vegetables	257	966,782	37.6	37.6	43.31
Other vegetables	183	665,739	25.9	25.9	30.81
Nuts and seeds	77	246,478	9.6	9.6	13.89
Pulses (beans, peas, lentils)	57	216,061	8.4	8.4	11.50
Others					
Sweet food	482	1,722,408	67.0	60.71	72.77
Snacks	342	1,254,106	48.9	42.70	55.07
Processed food	316	1,143,237	44.7	38.61	50.97
Instant noodle	162	568,719	22.1	17.97	26.91
Fast-food	53	208,817	8.1	5.42	12.00

Note: The food groups are based on the Minimum Dietary Diversity Score (FAO, 2021)

Table 7.4: Prevalence of not meeting the recommended plain water intake among children (5-9 years) by sociodemographic characteristics (n=704).

Sociodemographic Characteristics	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	410	1,476,927	58.8	53.74	63.60
Location					
Urban	178	1,092,888	57.9	51.41	64.05
Rural	232	384,039	61.5	55.91	66.75
Sex					
Male	204	726,258	56.5	49.71	63.04
Female	206	750,669	61.1	55.43	66.55
Ethnicity					
Malay[a]	284	820,612	60.0	52.71	66.79
Chinese	36	125,713	60.6	49.14	71.08
Indian	17	59,824	50.9	31.35	70.24
Other Bumiputera	57	199,872	58.8	47.71	69.13
Others	16	94,729	50.0	32.76	67.31
Household Income Group					
B40	275	937,764	59.1	53.51	64.47
M40	100	403,452	61.7	50.85	71.48
T20	33	127,447	50.2	35.43	64.86

a - Malay includes Orang Asli

Table 7.5: Prevalence of sugar sweetened beverages intake in the past 24 hours among children (5-9 years) old by types (n=704).

Sugar-sweetened beverages	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Malted /chocolate beverages	329	1,248,038	48.8	43.93	53.76
Prepared sweetened beverages	265	857,136	33.4	28.21	39.09
Flavoured milk	168	587,804	23.0	19.15	27.28
Cultured milk / yogurt drinks	150	535,433	21.0	17.89	24.53
Non-carbonated beverages	147	436,988	17.1	13.54	21.35
Fruit juice or fruit drinks	106	370,781	14.5	11.92	17.43
Carbonated beverages	98	365,757	14.3	10.78	18.82
Soy drinks	71	238,159	9.3	6.79	12.63
Energy / sport / isotonic drinks	38	159,113	6.2	3.33	11.28
Premixed beverages	42	153,626	6.0	3.96	9.05
100% fruit juice with no added sugar	38	96,701	3.8	2.46	5.76

Note: "Prepared sweetened beverages" refers to beverages prepared by individuals (self-prepared) as well as those purchased ready-made from stores or food outlets (store -prepared).

Table 7.6: Prevalence of ever exposed to unhealthy food marketing among children (5-9 years) by sociodemographic characteristics (n=700).

Sociodemographic Characteristics	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	589	2,115,750	83.2	78.32	87.23
Location					
Urban	251	1,565,212	82.3	75.89	87.36
Rural	338	550,538	85.9	80.25	90.14
Sex					
Male	298	1,037,875	80.0	73.51	85.18
Female	291	1,077,875	86.7	80.20	91.23
Ethnicity					
Malay[a]	407	1,148,844	83.9	76.69	89.20
Chinese	51	169,474	77.4	65.09	86.24
Indian	28	102,112	80.8	66.02	90.14
Other Bumiputera	78	284,442	83.0	72.67	89.94
Others	25	162,145	88.8	51.30	98.34
Household Income Group					
B40	391	1,337,435	83.9	77.64	88.60
M40	140	551,463	82.0	72.68	88.60
T20	55	208,179	81.5	64.12	91.57

a - Malay includes Orang Asli

Table 7.7: Opinions on effects and regulations among parents of children (5-9 years) exposed to unhealthy food marketing (n=589).

Sociodemographic Characteristics	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Frequency of child requesting unhealthy food					
Always	96	353,817	16.7	12.89	21.42
Sometimes	138	469,743	22.2	17.23	28.13
Rarely	221	766,318	36.2	31.40	41.33
Never	134	525,872	24.9	19.75	30.77
Parental concern on the impact of unhealthy food marketing on child's health					
Very concerned	199	726,231	34.4	28.88	40.40
Concerned	271	928,358	44.0	37.95	50.20
Unconcerned	112	439,092	20.8	16.96	25.26
Very unconcerned	6	-	-	-	-
Parental agreement on governmental control of unhealthy food marketing will benefit child's health					
Strongly agree	309	1,134,049	54.3	48.08	60.34
Agree	252	862,369	41.3	35.48	**47.32**
Disagree	21	93,101	4.5	2.64	7.43
Parental agreement on restricting unhealthy food marketing on television during public viewing programme will benefit child's health					
Strongly agree	273	1,008,395	48.4	41.93	54.86
Agree	274	944,512	45.3	39.01	51.75
Disagree	29	118,308	5.7	3.74	8.52
Very disagree	3	-	-	-	-

8. Habitual Food Intake among Adolescents and Adults

8. Habitual Food Intake among Adolescents and Adults

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Introduction

Diet is a major determinant in the development of obesity and other non-communicable diseases (NCDs) (Afshin et al., 2017). The Malaysian Dietary Guidelines (MDG) 2020 recommend consumption based on food groups to improve overall health and reduce the risk of diet-related NCDs. Intake of at least 3 servings of vegetables and 2 servings of fruits a day have been associated with low mortality (Wang et al., 2022). The Malaysian Dietary Guidelines (MDG) 2020 recommendation for fruit and vegetable intake aligned with those of the World Health Organization (WHO, 2023) recommendations to consume five servings (equivalent to 400 g) per day. Understanding current eating habits in relation to these guidelines is essential for informing public health strategies to improve dietary intake.

Evidence has shown that excessive dietary sugar consumption has detrimental effect on cardiometabolic health (Huang et al., 2023). WHO (2015) recommends limiting the intake of free sugars to less than 10% of the total daily total energy intake, with a stricter target of less than 5% for additional health benefits. Free sugars encompass monosaccharides (e.g. glucose, fructose) and disaccharides (e.g. sucrose, table sugar) added to food and drinks by the manufacturer, cook, or consumer, as well as sugars naturally present in honey, syrups, fruit juices and concentrates. In Malaysia, the majority of adults consumed sweetened beverages at least once a week, mostly self-prepared (85.6%), followed by commercially packed (38.9%) and premixed (23.1%) (NHMS, 2019). Among adolescents, 32.4% reported consuming carbonated soft drinks at least once daily (NHMS, 2022). The total consumption of sweetened beverages among adolescents could be even higher. Monitoring the consumption of free sugars and sugar-sweetened beverages in Malaysia is critical to support strategies to mitigate their harmful effects on health.

Objectives

General Objective

To assess the habitual food intake among adolescents (10-19 years) and adults (18 years and above).

Specific Objectives

1. To determine the mean intake and prevalence of not meeting the recommended servings for food groups:
   a. Vegetables and/or fruits
   b. Rice, other cereals, wholegrain cereal-based products, and tubers
   c. Meat, poultry, and eggs
   d. Fish and seafood
   e. Nuts and legumes
   f. Milk and milk products
2. To determine the mean intake of free sugar and prevalence of free sugar consumption above the recommended level.
3. To determine the consumption of sugar-sweetened beverages.

Methods

Data on habitual food intake were obtained through face-to-face interviews by trained research assistants with nutrition or dietetics background using a semi-quantitative Food Frequency Questionnaire (FFQ). The food album of foods and household measurements, Album Makanan Malaysia: Edisi Kedua (IPH, 2024) and household measurements were used together with the questionnaires to assist the respondents in their answers. Each respondent was asked on the frequency of consumption of each food based on their habitual intake during the last one month. For each food item, the respondent was asked on the frequency of intake of each food item either per day, per week, per month or never. They were also asked on the number of servings each time the food was eaten. Each food item listed was given a standard serving size as cooked food or foods ready for consumption e.g. plate, scoop, piece, one whole fruit, medium size, cup, spoon, glass, and others.

The average consumption per day of each food item in grams was estimated using the following formula:

Amount of food per day (g) = frequency of intake x conversion factor x serving size x total number of servings x weight of food in one serving

The analysis excluded those with implausible diet reporting, defined as total energy intake per day of less than 500 kcal or more than 5000 kcal. A total of 945 adolescents (10-19 years) and 1383 adults aged 18 and above were included into the analysis. Mean total energy intake of adolescents was 2,195 kcal/day and for adults was 1,989 kcal/day.

Variable Definitions

The prevalence of food groups consumption according to recommended servings as stated in the Malaysian Dietary Guidelines 2020 was defined as below:

1. **Fruits:**
   1 serving of fruit was based on 15g of carbohydrate
   Recommendation:
   2 servings for all adolescents and adults,
   2-3 servings for adolescents aged 13 to 18 years

2. **Vegetables:**
   1 serving of vegetable was based on 1 cup of raw vegetables and ½ cup of cooked vegetables
   Recommendation: At least 3 servings for both adolescent and adult.

3. **Fruits and Vegetables:**
   Recommendation:
   Achieving both at least 3 servings of vegetables and 2 servings of fruits a day.

4. **Rice, other cereals, wholegrain cereal-based products, and tubers:**
   1 serving of cereal, cereal products and tubers was based on 30g of carbohydrate
   Recommendation:
   3-5 servings for all except 3-6 servings for males aged 16-18 years.

5. **Meat, poultry, and egg:**
   1 serving of meat, poultry and egg was based on 14g of protein.
   Recommendation:
   1-2 servings for all adolescents and adults.

6. **Fish and seafood:**
   1 serving of fish and fish products was based on 14g of protein
   Recommendation:
   1 serving for all adolescents and adults.

7. **Nuts and legumes:**
   For standardized purpose, 1 serving nuts and legumes was based on 14g of protein.
   Recommendation:
   1 serving for all adolescents and adults.

8. **Milk and milk products:**
   1 serving of milk and milk products was based on 8g of protein
   Recommendation:
   2 servings for all adolescents aged 10 to 12 years and adults.
   2-3 servings for adolescents aged 13 to below 18 years.

9. **Free sugar:**
   Free sugar definition: "Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates" (WHO 2015). Therefore, sugars naturally present in fruits, vegetables, and milk products (except flavoured milk) were not included in the calculation of free sugar.

   Recommendation of 37.5 g of free sugar was calculated as 10% of 1500 kcal, a minimum recommended daily energy intake based on Recommended Nutrient Intakes (MOH, 2017).

10. **Sugar-sweetened beverages (SSB):**
    Adapted from WHO (2016), Malaysia defines sugar-sweetened beverage as all types of beverages containing free sugars, including self-prepared beverages, store-prepared beverages, carbonated or non-carbonated beverages, fruit/ vegetable juices and drinks, liquid and powder concentrates, flavoured water, energy and sports drinks, ready-to-drink tea, ready-to drink coffee and flavoured milk drinks (WHO 2016).

Findings

A. Food Groups

Fruits

The prevalence of adolescents achieving at least 2 servings per day of fruit intake was 12.8% (95% CI: 10.27, 15.81). Majority of adolescents consumed less than 1 serving per day [68.9% (95% CI: 64.8, 72.7)]. The prevalence of adolescents with fruit intake less than 2 servings per day was 87.2% (95% CI: 84.2, 89.7). The prevalence of inadequate fruit intake was lowest among adolescents from T20-households (71.5%) compared to B40 and M40 households **(Table 8.1)**. Mean fruit intake among all adolescents was 0.9 servings per day (95% CI: 0.8, 1.0). Adolescents from lower-income households (B40 and M40) reported lower fruit consumption (0.9 and 0.8 serving per day, respectively) compared to higher-income households (T20) (1.5 servings per day) **(Table 8.2)**.

The prevalence of adults with fruit intake meeting the recommended servings was 17.1% (95% CI: 14.42, 20.11). The majority of adults [61.6% (95% CI: 56.78, 66.16)] had fruit intake of less than 1 serving/day, which was less than half of the recommended servings. In general, the prevalence of adults with fruit intake less than 2 servings per day was 82.9% (95% CI: 79.89, 85.58) **(Table 8.3)**. Mean intake of fruits among adults was 1.15 servings per day.

Vegetables

The prevalence of adolescents with vegetable consumption meeting the recommendation of at least 3 servings per day was 5.2% (95% CI: 3.40, 7.79). Majority 74.2% (95% CI: 69.59, 78.28%) consumed less than 1 serving, whilst 15.7% (95% CI: 12.88, 18.99) consumed 1.00-1.99 servings and 5.0% (95% CI: 3.32, 7.37) consumed 2.00-2.99 servings per day. Overall prevalence of adolescents not meeting the recommended 3 servings per day was 94.8% (95% CI: 92.21, 96.60) **(Table 8.4)**. Mean vegetable intake among all adolescents was 0.8 servings/day (95% CI: 0.67, 0.89). Mean intake was higher among Chinese adolescents compared to Malay adolescents (1.2 versus 0.6 servings per day).

The prevalence of vegetables intake consuming at least 3 servings per day among adults was 12.2% (95% CI: 9.41, 15.76), whilst 87.8% (95% CI: 84.32, 90.65) did not achieve the recommended amount. Majority of adults [48.5% (95% CI: 43.17, 53.90)] recorded vegetables intake of less than 1 serving/day, whilst 25.8% (95% CI: 22.27, 29.66) had 1-1.99 servings and 13.5% (95% CI: 10.99, 16.53) had 2.299 servings/ day. Mean vegetable intake among adults was 1.50 servings/ day (95% CI: 1.36, 1.64). Malay recorded lower vegetable intake compared to other Bumiputera (1.3 versus 1.9 servings/ day). Primary education recorded lower vegetable intake compared to tertiary educated (1.3 vs 1.8 servings/day). Self-employed had lower vegetable intake compared to private sector employees (1.2 vs 1.6 servings/day).

Fruit and Vegetables

The overall prevalence of adolescents who did not fulfil the recommendations of both fruits and vegetables was 98.1% (95% CI: 96.65, 98.94). Only an estimated 1.9% (95% CI: 1.06, 3.35) of adolescents met both the recommendations for fruits and vegetables. Adolescents from the Malay ethnic group had a higher prevalence of inadequate consumption of fruits and vegetables (99.0%, 95% CI: 97.45, 93.11), compared to the Chinese ethnic group (98.4%, 95% CI: 93.11, 99.65) and Other ethnic groups (89.4%, 95% CI: 61.97, 97.77).

The prevalence of adults who did not fulfil the recommendations for both fruits and vegetables was 96.9% (95% CI: 94.99, 98.10). Only 3.1% (95% CI: 1.90, 5.01) of adults met had 2 servings and 3 servings of vegetables a day. There was no difference across sociodemographic groups.

Rice, other cereals, wholegrain cereal-based products, and tubers

The prevalence of adolescents with cereal, cereal products, and tuber consumption within recommended servings was 33.6% (95% CI: 30.43, 36.88), whilst below and above recommended servings were 12.5% (95% CI: 9.79, 15.86) and 53.9% (95% CI: 49.96, 57.82), respectively. **Table 8.5** presented the prevalence of cereal, cereal products, and tuber consumption above recommended servings by socio-demography characteristics among adolescents. Overall mean intake of cereal was 6.1 servings/day (95% CI: 5.81, 6.34). It was significantly more among males (6.9 servings (95% CI: 6.52, 7.32) than females (5.2 servings/day (95% CI: 4.92, 5.46) **(Table 8.6)**.

Among adults, the prevalence of consumption within recommended servings of cereal, cereal products and tubers consumption was 32.9% (95% CI: 29.02, 36.98). The prevalence below and above recommended servings was 18.4% (95% CI: 15.37, 21.86) and 48.7% (95% CI: 44.37, 53.11), respectively. Mean intake of cereal, cereal products and tubers was 5.4 servings/day (95% CI: 5.11, 5.58). Urban population recorded lower intake (5.2 (95% CI: 4.92, 5.51)) compared to rural population (5.8 servings/day (95% CI: 5.50, 6.02). Males also have higher intake than females (6.2 versus 4.4 servings/ day).

Meat, poultry, and eggs

Among adolescents, the prevalence of meat, poultry, and egg consumption below, within and above recommended servings was 28.1% (95% CI: 24.45, 32.09), 39.1% (95% CI: 34.25, 44.15) and 32.8% (95% CI: 28.43, 37.49), The mean intake of meat, poultry and eggs was 1.87 (95% CI: 1.74, 2.00) servings per day. Other Bumiputera recorded higher intake of meat, poultry and eggs compared to Indian ethnicity (2.4 versus 1.5 servings per day).

Among adults, the prevalence of meat, poultry and egg consumption within recommended servings was 35.4% (95% CI: 31.32, 39.77. The prevalence of below and above recommended servings was 40.8% (95% CI: 36.55, 45.25) and 23.7% (95% CI: 20.35, 27.49, respectively. Mean intake of meat, poultry and eggs was 1.5 servings/day (95% CI: 1.41, 1.64). Indian ethnicity recorded lower intake compared to Other Bumiputera (0.9 vs 1.8 servings/day). Adults with no formal education (1.1 servings/day) also have lower intake of meat, poultry and eggs compared to secondary (1.6 servings/ day) and tertiary educated (1.6 servings/day).

Fish and seafood

The prevalence of adolescents consuming below the recommended one serving of fish and seafood a day was 76.6% (95% CI: 73.67, 79.37). An estimated 16.8% (95% CI: 14.10, 19.80) met the recommended 1 serving a day, whilst 6.6% (95% CI: 5.10, 8.51) consumed 2 or more servings a day. Mean intake of fish was 0.75 servings/day (95% CI: 0.68, 0.81). Rural adolescents eat more fish than urban adolescents (0.9 versus 0.7 servings/day).

The prevalence of adults consuming at least one serving of fish and seafood a day was 23.0% (95% CI: 18.41, 28.34), whilst the majority consume below the recommended servings was 65.3% (95% CI: 59.75, 70.51) and 11.7% (95% CI: 9.10, 14.86) consumed 2 servings or more a day. Mean intake of fish and seafood among adults was 1.0 serving (95% CI: 0.91, 1.12). Rural adults recorded higher intake than urban adults (1.3 versus 0.9 servings/day). Chinese (0.7 servings/ day) and Indian ethnicity (0.8 servings/day) had lower intake compared to Malay (1.1 servings/day) and Other Bumiputera (1.3 servings/day).

Nuts and Legumes

Prevalence of adolescents meeting the recommendation of 1 serving of nuts and legumes was only 1.3% (95% CI: 0.63, 2.83) and not meeting the recommendation was 98.7% (95% CI: 97.17, 99.37). An estimated 95.6% (CI: 93.82, 96.93) of adolescents consume less than 0.5 servings of nuts and legumes a day. In total, a majority of 86.2% (95% CI: 83.65, 88.47) consumed less than 0.25 servings/day. The mean intake of nuts and legumes among adolescents was 0.11 servings/day.

Prevalence of adults meeting the recommended 1 serving of nuts and legumes was only 2.8% (95% CI: 1.95, 4.02) and 97.2% (95% CI: 96.01, 98.07) did not meet the recommended one serving. Majority of adults (79.7% (95% CI: 75.68, 83.23) consumed less than 0.25 servings of nuts and legumes, and 91.3% (95% CI: 88.66, 93.40) consumed less than 0.5 servings a day. Mean intake of nuts and legumes among adults was 0.18 servings/day (95% CI: 0.15, 0.21). Intake was higher among urban adults compared to rural adults (0.20 vs 0.13 servings/day). Mean intake of nuts and legumes among the Chinese was more than Indian ethnicity (0.27 vs 0.15 servings/day). No formal education consumed lower than secondary and tertiary education groups (0.09 vs 0.18 and 0.28, respectively). Government employees consumed lesser than private sector employees (0.1 vs 0.2 servings/day).

Milk and milk products

Prevalence of adolescents meeting the age-specific recommendation for milk and dairy products (2-3 servings/day) was 2.9% (95% CI: 1.79, 4.58) and not meeting the recommendation was 97.1% (95% CI: 95.42, 98.21). Majority of adolescents [88.2% (95% CI: 85.32, 90.53)] consumed less than 1 serving/day of milk and dairy products.

Mean intake of milk was 0.4 servings/day (95% CI: 0.32, 0.41). Adolescents from B40 households recorded lower intake of milk compared to those from T20 households (0.3 versus 0.5 servings/day). In terms of frequency, 4.6% (95% CI: 3.17, 6.69) had milk and dairy products at least twice a day.

Prevalence of adults meeting the recommendation for milk and milk products of 2 servings/day was 0.7% (95% CI: 0.39, 1.35), whilst 99.3% (95% CI: 98.65, 99.61) did not achieve the recommended servings. Majority of adults [95.3% (95% CI: 93.01, 96.80)] consumed less than 1 serving/day of milk and milk products, whilst 4.0% (95% CI: 2.57, 6.23) consumed 1-1.99 servings/day. Mean intake of milk and dairy products was 0.21 servings/day (95% CI: 0.17, 0.24). Female adults have higher milk intake than male adults (0.26 vs 0.17 servings/day). In terms of mean intake, Malay ethnicity (0.15 serving/day) recorded lower milk intake compared to other ethnicities (Indian=0.34, Chinese = 0.25, and Other Bumiputera = 0.24 servings/day).

B. Sugar

The prevalence of adolescents with total free sugar intake above the recommended level (less than 10% of total energy intake) was 63.1% (95% CI: 58.74, 67.35) **(Table 8.13)**. Mean total free sugar intake was 56.6g (95% CI: 52.49, 60.67), which was higher among Other Bumiputera compared to Chinese adolescents (62.2g vs 45.2g). An estimated 24.9g (95% CI: 22.38, 27.33) of free sugar intake was from beverages, which was lower among Chinese compared to Indian adolescents (19.1g vs 32.0g) **(Table 8.14)**.

The prevalence of adults with total free sugar intake above the recommended level was 47.0% (95% CI: 43.35, 50.77). The prevalence was higher among males than females (55.5% vs 37.5%), Other Bumiputera compared to Chinese (50.4% vs 29.2%), and those with Secondary education (50.1%) than those with no formal education (27.8%) **(Table 8.15)**. Mean total free sugar intake among adults was 42.8 g per day (95% CI: 40.39, 45.24). Mean intake was lower among Chinese (33.1 g) and Indian (35.1 g) compared to Malay (42.6 g) and Bumiputera (44.3 g) adults. Furthermore, mean total free sugar intake was higher among private sector employees (46.8 g) followed by non-employed (38.0 g) and government sector employees (37.5 g). Mean total sugar intake from beverages among all adults, was 21.9 g, which was lower among married (19.7 g) than single (25.7 g) and among government sector employed (17.7 g) than self-employed (26.6 g) **(Table 8.16)**.

C. Sugar-Sweetened Beverages

An estimated 66.3% (95% CI: 61.63, 70.66) of adolescents had at least one serving of sugar sweetened beverages a day **(Table 8.17)**. On average, adolescents consumed 12.7 servings per week of total sugar-sweetened beverages (SSB), equivalent to 452.1 ml/day. The average consumption of prepared SSB was 6.2 servings/week while pre-packed SSB was 6.5 servings/week **(Table 8.18)**.

The prevalence of adults with one or more serving of sugar sweetened beverage in a day was 63.8% (95% CI: 59.29, 68.06). The prevalence was lower among Chinese (52.3%) vs Indian (71.35%) and Other Bumiputera (74.6%) **(Table 8.19)**. On average, adults consumed 11.8 (95% CI: 10.98, 12.65) servings/week of total sugar-sweetened beverages (SSB), equivalent to 422.1 ml/day. Prepared SSB was 7.3 servings/week while pre-packed SSB was 4.6 servings/week.

Conclusion

The average adolescent or adult fall short of recommended intakes for fruits, vegetables, fish, nuts, legumes, and milk and milk products food groups, while more than half exceed the recommended amount for the 'Rice, other cereals, wholegrain cereal-based products, and tubers' and about one quarter exceed the recommendation for the 'meat, poultry, and eggs' food group. Both age groups demonstrated an average free sugar intake more than the recommended limit, of which half of it was from beverages.

Recommendations

1. **Policy implementation to create a supportive environment:**

    - Expansion of Sugar-Sweetened Beverages (SSBs) tax to all categories of SSBs.
    - Implementation of the 'NutriGrade' initiative to grade the sugar content of all foods and beverages.
    - Implement food supply chain policy and strategies that prioritize price control and enhance the accessibility of fruits, vegetables, and milk through coordinated effort by the Ministry of Agriculture and Food Security, Ministry of Finance, Ministry of Domestic Trade and Consumer Affairs, and Ministry of Health.
    - Introduce ready-to-eat fruits, vegetables and legumes in convenience stores and fast-food restaurants.
    - Reduction of sugar sachet packaging from 5g to 3g as a standardization for sugar intake in Malaysia.
    - Disseminate the health impact of excessive sugar intake to health through an aggressive 'War on Sugar' campaign through the involvement of multiple agencies such as the ministries, NGOs, academic institutions, and food industries.

2. **Educational and Behavioural Changes Programs and Activities:**

    - Educate all levels of population on the appropriate serving sizes of food groups as recommended in Malaysian Food Pyramid.
    - Advocate the preparation of food and beverages that are tasty and low in sugar, salt, and fat.
    - Recognize and appoint social media influencers, local leaders, or members of parliament as 'less sugar ambassador/icon.'
    - Promote consumption of vegetables, fruits, milk, and legumes aggressively on various media platforms such as the social media, electronic and printed media by the Ministry of Health, Ministry of Communications, Ministry of Digital and Ministry of Housing and Local Government.

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Table 8.1: Prevalence of fruit and vegetable intake below recommended servings[b,c] among adolescents (10-19 years) by sociodemographic characteristics (n=945)

Sociodemographic Characteristics	Fruits less than 2 servings/day [b]					Vegetables less than 3 servings/day [c]				
	Count	Estimated Population	Prevalence (%)	95% CI		Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper				Lower	Upper
MALAYSIA	824	4,185,891	87.2	84.19	89.73	903	4,551,381	94.8	92.21	96.60
Location										
Urban	398	3,123,508	88.4	84.38	91.42	426	3,357,474	95.0	91.47	97.08
Rural	426	1,062,383	84.0	79.98	87.40	477	1,193,907	94.4	90.50	96.80
Sex										
Male	401	2,135,975	87.0	82.62	90.44	441	2,312,029	94.2	90.52	96.50
Female	423	2,049,916	87.4	83.23	90.67	462	2,239,352	95.5	92.55	97.30
Ethnicity										
Malay[a]	564	1,703,652	87.8	83.55	91.12	622	1,876,750	96.8	94.19	98.21
Chinese	97	377,413	91.0	84.03	95.16	100	380,681	91.8	81.75	96.58
Indian	42	141,202	82.9	67.51	91.84	50	166,618	97.8	85.48	99.70
Other Bumiputera	104	370,092	87.8	79.50	93.07	109	388,399	92.2	85.79	95.83
Others	17	105,675	60.2	37.16	79.46	22	144,454	82.3	60.80	93.29
Household Income Group										
B40	561	2,726,464	88.5	84.96	91.24	613	2,948,004	95.7	93.06	97.31
M40	190	1,050,996	91.0	84.82	94.82	201	1,079,740	93.5	86.04	97.10
T20	68	375,153	71.5	57.71	82.18	83	485,556	92.5	83.52	96.81

a - Malay includes Orang Asli
b - None or less than 2 servings/day
c - None or less than 3 servings/day
d - Did not achieve at least 2 servings/day of fruits and /or 3 servings/day of vegetables

Table 8.2: Intake of fruits and vegetables among adolescents (10-19 years) old by sociodemographic characteristics (n=945)

Sociodemographic Characteristics	Count	Estimated Population	Mean fruits intake			Mean vegetable intake		
			Mean (servings/ day)	95% CI		Mean (servings/ day)	95% CI	
				Lower	Upper		Lower	Upper
MALAYSIA	945	N/A	0.92	0.83	1.02	0.78	0.67	0.89
Location								
Urban	450	N/A	0.89	0.76	1.02	0.80	0.66	0.94
Rural	495	N/A	1.02	0.90	1.14	0.73	0.61	0.86
Sex								
Male	463	N/A	0.95	0.81	1.09	0.81	0.67	0.95
Female	462	N/A	0.90	0.79	1.01	0.75	0.63	0.87
Ethnicity								
Malay[a]	642	N/A	0.88	0.75	1.01	0.58	0.51	0.66
Chinese	108	N/A	0.83	0.64	1.01	1.20	0.89	1.52
Indian	51	N/A	1.02	0.64	1.39	0.71	0.54	0.88
Other Bumiputera	118	N/A	1.06	0.77	1,35	0.90	0.63	1.17
Others	26	N/A	1.51	0.79	2.22	1.45	0.67	2.22
Household Income Group								
B40	639	N/A	0.87	0.76	0.97	0.72	0.62	0.82
M40	212	N/A	0.84	0.63	1.04	0.87	0.64	1.11
T20	88	N/A	1.47	1.07	1.86	0.98	0.70	1.27

a - Malay includes Orang Asli
N/A - Not Applicable

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Table 8.3: Prevalence of fruits and vegetable intake below recommended servings[d,e] by sociodemographic among adults (18 years and above) (n=1,383)

Sociodemographic Characteristics	Fruits less than 2 servings/day [d]					Vegetable less than 3 servings/day [e]				
	Count	Estimated Population	Prevalence (%)	95% CI		Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper				Lower	Upper
MALAYSIA	1132	19,024,092	82.9	79.89	85.58	1211	20,158,021	87.8	84.32	90.65
Location										
Urban	551	14,405,932	83.0	79.21	86.17	586	15,275,234	88.0	83.33	91.46
Rural	581	4,618,161	82.8	77.86	86.79	625	4,882,787	87.4	83.83	90.25
Sex										
Male	489	10,199,157	83.8	79.18	87.52	523	10,784,947	88.5	84.58	91.56
Female	643	8,824,935	82.0	77.80	85.48	688	9,373,074	87.0	82.26	90.69
Ethnicity										
Malay[a]	565	9,781,946	83.4	78.34	87.46	613	10,485,640	89.4	83.33	93.51
Chinese	187	4,049,838	86.2	79.08	91.19	192	4,144,648	88.2	84.76	92.70
Indian	61	1,246,446	82.1	71.00	89.54	67	1,420,281	93.5	85.52	97.46
Other Bumiputera	237	2,000,378	80.1	73.85	85.16	253	2,034,424	81.5	70.36	86.22
Others	82	1,723,689	70.4	53.89	82.85	86	2,047,098	83.6	63.27	92.01
Marital Status										
Single[b]	381	7,334,486	85.5	79.49	89.95	400	7,804,443	91.0	87.04	93.78
Married or cohabiting	750	11,681,468	81.5	77.65	84.74	810	12,346,038	86.0	81.03	89.89
Education Level										
No Formal Education	156	1,428,605	83.9	74.02	90.56	162	1,537,315	90.3	84.11	94.28
Primary School	205	1,930,508	80.0	68.07	88.19	222	2,264,975	93.8	89.81	96.31
Secondary School	679	13,245,352	84.1	80.33	87.31	723	13,745,175	87.3	82.86	90.65
Tertiary Education	90	2,398,784	79.5	69.40	86.87	100	2,552,401	84.6	72.99	91.75
Occupation										
Government Employee	81	1,239,945	86.5	72.85	93.88	79	1,233,261	86.1	74.48	92.88
Private Employee	258	6,718,165	82.5	76.03	87.55	260	6,871,546	84.3	78.09	89.03
Self Employed	193	2,798,049	77.3	67.66	84.78	220	3,411,980	94.3	90.30	96.73
Not Working[c]	580	8,032,763	84.7	80.84	87.88	630	8,404,512	88.6	84.39	91.79
Household Income Group										
B40	836	11,522,850	82.8	79.03	86.05	898	12,084,462	86.9	81.95	90.59
M40	217	5,539,927	83.6	76.05	89.12	227	5,980,090	90.1	85.13	93.58
T20	70	1,900,572	84.7	76.51	90.34	76	1,939,510	86.4	76.22	92.64

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age
d - None or less than 2 servings/day
e - None or less than 3 servings/day
f – Did not achieve at least 2 servings/day of fruits and 3 servings/day of vegetables

Sociodemographic Characteristics	Fruits and/or Vegetables less than 5 servings/day [f]				
	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	1,331	22,240,534	96.9	94.99	98.10
Location					
Urban	652	16,816,667	96.9	94.26	98.30
Rural	679	5,423,867	97.1	94.81	98.36
Sex					
Male	573	11,851,884	97.3	94.95	98.56
Female	758	10,388,650	96.5	94.30	97.84
Ethnicity					
Malay[a]	659	11,354,148	96.8	92.53	98.62
Chinese	215	4,604,866	98.0	95.28	99.20
Indian	72	1,505,098	99.1	96.33	99.79
Other Bumiputera	285	2,369,598	94.9	91.42	96.99
Others	100	2,379,676	97.2	93.17	98.85
Marital Status					
Single[b]	436	8,394,282	97.8	95.79	98.90
Married or cohabiting	893	13,830,575	96.4	93.39	98.05
Education Level					
No Formal Education	179	1,674,893	98.4	95.06	99.50
Primary School	235	2,387,356	98.9	96.08	99.69
Secondary School	801	15,211,922	96.6	93.83	98.12
Tertiary Education	112	2,908,209	96.4	90.25	98.70
Occupation					
Government Employee	89	1,365,987	95.3	84.76	98.67
Private Employee	300	7,823,130	96.0	92.60	97.87
Self Employed	234	3,542,804	97.9	95.25	99.11
Not Working[c]	683	9,242,979	97.4	95.48	98.57
Household Income Group					
B40	977	13,456,171	96.7	94.33	98.12
M40	257	6,468,156	97.5	94.46	98.88
T20	85	2,157,253	96.1	90.19	98.51

Table 8.4: Fruits and vegetable intake among adults (18 years and above) by sociodemographic characteristics (n=1383)

Sociodemographic Characteristics	Count	Estimated Population	Fruits intake			Vegetable intake		
			Mean (servings/ day)	95% CI		Mean (servings/ day)	95% CI	
				Lower	Upper		Lower	Upper
MALAYSIA	1383	N/A	1.15	1.06	1.25	1.50	1.36	1.64
Location								
Urban	685	N/A	1.15	1.03	1.27	1.55	1.37	1.72
Rural	698	N/A	1.18	1.02	1.34	1.36	1.19	1.53
Sex								
Male	595	N/A	1.11	0.98	1.23	1.46	1.31	1.60
Female	788	N/A	1.21	1.08	1.34	1.55	1.35	1.75
Ethnicity								
Malay[a]	681	N/A	1.15	1.01	1.30	1.33	1.15	1.51
Chinese	222	N/A	1.11	0.93	1.29	1.76	1.54	1.98
Indian	74	N/A	1.20	0.87	1.54	1.51	1.16	1.86
Other Bumiputera	301	N/A	1.25	1.07	1.44	1.80	1.54	2.07
Others	105	N/A	1.38	0.91	1.85	1.84	1.40	2.29
Marital Status								
Single[b]	451	N/A	1.02	0.88	1.15	1.32	1.14	1.51
Married or cohabiting	929	N/A	1.22	1.11	1.35	1.60	1.43	1.77
Education Level								
No Formal Education	183	N/A	0.94	0.71	1.17	1.32	1.04	1.59
Primary School	239	N/A	1.06	0.83	1.29	1.30	1.06	1.53
Secondary School	838	N/A	1.13	1.01	1.25	1.49	1.32	1.65
Tertiary Education	118	N/A	1.41	1.14	1.68	1.82	1.54	2.11
Occupation								
Government Employee	94	N/A	1.30	0.86	1.73	1.67	1.18	2.16
Private Employee	317	N/A	1.16	1.00	1.33	1.63	1.43	1.84
Self Employed	241	N/A	1.15	0.90	1.39	1.23	1.06	1.40
Not Working[c]	706	N/A	1.14	1.01	1.27	1.47	1.28	1.66
Household Income Group								
B40	1012	N/A	1.10	1.00	1.21	1.52	1.35	1.69
M40	268	N/A	1.25	1.07	1.43	1.51	1.27	1.75
T20	91	N/A	1.14	0.80	1.48	1.37	1.05	1.68

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age
N/A - Not Applicable

Table 8.5: Prevalence of cereal, cereal products, and tuber intake above recommended servings[b] among adolescents (10-19 years) by sociodemographic characteristics (n=945)

Sociodemographic Characteristics	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	533	2,587,596	53.9	49.96	57.82
Location					
Urban	246	1,845,189	52.2	47.10	57.24
Rural	287	742,407	58.7	53.74	63.54
Sex					
Male	314	1,547,823	63.1	57.13	68.63
Female	219	1,039,773	44.3	39.59	49.19
Ethnicity					
Malay[a]	358	1,026582	52.9	47.41	58.37
Chinese	62	238,047	57.4	45.32	68.70
Indian	30	98,025	57.5	39.01	74.15
Other Bumiputera	68	243,595	57.8	49.56	65.64
Others	15	100,295	57.1	31.36	79.54
Household Income Group					
B40	358	1,684,719	54.7	49.06	60.16
M40	114	581,782	50.4	42.26	58.47
T20	57	295,380	56.3	41.11	70.38

a - Malay includes Orang Asli
b - Above recommended servings = > 5 servings for all and > 6 servings for males aged 16-18 years

Table 8.6: Intake of cereal, cereal products, and tuber food group among adolescents (10-19 years) by sociodemographic characteristics (n=945)

Sociodemographic Characteristics	Count	Estimated Population	Mean (servings/day)	95% CI	
				Lower	Upper
MALAYSIA	945	N/A	6.08	5.81	6.34
Location					
Urban	450	N/A	5.99	5.65	6.33
Rural	495	N/A	6.32	6.00	6.64
Sex					
Male	463	N/A	6.92	6.52	7.32
Female	482	N/A	5.19	4.92	5.46
Ethnicity					
Malay[a]	642	N/A	5.89	5.54	6.24
Chinese	108	N/A	6.30	5.54	7.06
Indian	51	N/A	5.80	5.12	6.47
Other Bumiputera	118	N/A	6.79	6.30	7.27
Others	26	N/A	6.32	4.81	7.83
Household Income Group					
B40	639	N/A	6.05	5.71	6.38
M40	212	N/A	6.17	5.59	6.76
T20	88	N/A	6.10	5.46	6.74

a - Malay includes Orang Asli
N/A - Not Applicable

Table 8.7: Prevalence of cereal, cereal products, and tubers intake above recommended servings[d] among adults (18 years and above) by sociodemographic characteristics (n=1,383)

Sociodemographic Characteristics	Above recommended servings				
	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	603	11,184,074	48.7	44.37	53.11
Location					
Urban	278	8,197,071	47.2	41.66	52.83
Rural	325	2,987,003	53.5	48.69	58.16
Sex					
Male	344	7,647,761	62.8	56.69	68.48
Female	259	3,536,314	32.8	26.83	39.47
Ethnicity					
Malay[a]	294	5,348,505	45.6	39.61	51.68
Chinese	76	1,582,346	33.7	25.44	43.07
Indian	34	748,662	49.3	36.77	61.91
Other Bumiputera	147	1,272,157	50.9	44.92	56.93
Others	52	1,407,565	57.5	44.62	69.39
Marital Status					
Single[b]	201	4,489,653	52.3	44.67	59.88
Married or cohabiting	399	6,672,587	46.5	41.28	51.80
Education Level					
No Formal Education	71	560,917	33.0	23.58	43.93
Primary School	93	1,179,567	48.9	38.22	59.59
Secondary School	388	7,920,020	50.3	44.55	56.00
Tertiary Education	48	1,480,103	49.0	36.66	61.55
Occupation					
Government Employee	45	857,153	59.8	45.58	72.56
Private Employee	153	4,624,626	56.8	49.31	63.90
Self Employed	120	1,762,407	48.7	37.47	60.10
Not Working [c]	271	3,753,346	39.6	32.56	47.04
Household Income Group					
B40	430	6,578,948	47.3	41.92	52.72
M40	128	3,561,222	53.7	45.38	61.77
T20	38	983,485	43.8	29.26	59.51

a -Malay includes Orang Asli
b -Never married or divorced or separated or widowed
c -Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age
d -Above recommended servings = > 5 servings

Table 8.8: Intake of cereal, cereal products, and tubers food group among adults (18 years and above) by sociodemographic characteristics (n=1,383)

Sociodemographic Characteristics	Above recommended servings				
	Count	Estimated Population	Mean (servings/day)	95% CI	
				Lower	Upper
MALAYSIA	1383	N/A	5.35	5.11	5.58
Location					
Urban	685	N/A	5.22	4.92	5.51
Rural	698	N/A	5.76	5.50	6.02
Sex					
Male	595	N/A	6.18	5.82	6.53
Female	788	N/A	4.41	4.17	4.65
Ethnicity					
Malay[a]	681	N/A	5.07	4.79	5.36
Chinese	222	N/A	4.67	4.22	5.11
Indian	74	N/A	5.18	4.60	5.76
Other Bumiputera	301	N/A	5.70	5.35	6.06
Others	105	N/A	5.53	5.01	6.05
Marital Status					
Single[b]	451	N/A	5.62	5.18	6.05
Married or cohabiting	929	N/A	5.18	4.91	5.45
Education Level					
No Formal Education	183	N/A	4.86	4.24	5.47
Primary School	239	N/A	5.48	4.81	6.15
Secondary School	838	N/A	5.43	5.10	5.75
Tertiary Education	118	N/A	5.07	4.53	5.60
Occupation					
Government Employee	94	N/A	5.39	4.82	5.97
Private Employee	317	N/A	5.89	5.35	6.43
Self Employed	241	N/A	5.49	4.90	6.07
Not Working[c]	706	N/A	4.82	4.56	5.07
Household Income Group					
B40	1012	N/A	5.30	5.03	5.57
M40	268	N/A	5.47	5.06	5.87
T20	91	N/A	5.31	4.42	6.20

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age
N/A - Not Applicable

Table 8.9: Prevalence of protein source food groups below recommended servings* among adolescents (10-19 years) by sociodemographic characteristics (n=945)

Sociodemographic Characteristics	Meat, poultry, and egg [b]					Fish and seafood [c]				
	Count	Estimated Population	Prevalence (%)	95% CI		Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper				Lower	Upper
MALAYSIA	241	1,348,694	28.1	24.45	32.09	707	3,678,405	76.6	73.67	79.37
Location										
Urban	133	1,083,496	30.6	25.90	35.85	359	2,813,245	79.6	75.90	82.82
Rural	108	265,198	21.0	16.84	25.88	348	865,160	68.4	63.54	72.95
Sex										
Male	98	601,871	24.5	19.55	30.33	337	1,846,912	75.2	70.81	79.21
Female	143	746,823	31.8	27.12	36.98	370	1,831,493	78.1	73.94	81.76
Ethnicity										
Malay[a]	168	570,790	29.4	24.19	35.66	471	1,470,923	75.8	71.83	79.43
Chinese	31	119,842	28.9	20.62	42.70	92	342,621	82.7	71.86	89.89
Indian	18	69,802	41.0	23.79	55.26	40	135,221	79.4	60.63	90.56
Other Bumiputera	17	59,595	14.1	9.69	20.68	88	306,243	72.7	61.54	81.55
Others	7	-	-	-	-	16	104,031	59.3	34.52	80.05
Household Income Group										
B40	165	866,017	28.1	22.82	34.10	475	2,364,121	76.7	72.43	80.51
M40	58	353,215	30.6	23.80	38.34	160	873,240	75.6	68.16	81.79
T20	16	112,663	21.5	13.10	33.16	67	407,766	77.7	67.53	85.39

a - Malay includes Orang Asli
b - Meat, poultry, and egg Below recommended servings: None or less than 1 serving
c - Fish and seafood: Below recommended servings: None or less than 1 serving
d - Nuts and legumes: Below recommended servings: None or less than 1 serving
e - Milk and dairies: Below recommended servings: None or less than 2 serving

Sociodemographic Characteristics	Nuts and legumes [d]					Milk and dairies [e]				
	Count	Estimated Population	Prevalence (%)	95% CI		Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper				Lower	Upper
MALAYSIA	936	4,735,172	98.7	97.17	99.37	918	4,661,809	97.1	95.42	98.21
Location										
Urban	442	3,477,916	98.4	96.38	99.28	435	3,424,852	96.9	94.62	98.21
Rural	494	1,257,256	99.4	96.13	99.92	483	1,236,957	97.8	95.31	99.02
Sex										
Male	458	2,420,994	98.6	96.48	99.48	446	2,370,938	96.6	92.99	98.38
Female	478	2,314,178	98.7	96.46	99.52	472	2,290,871	97.7	95.67	98.78
Ethnicity										
Malay[a]	639	1,921,325	99.1	96.04	99.78	626	1,891,076	97.5	95.42	98.64
Chinese	106	407,964	98.4	93.35	99.64	106	406,158	98.0	92.44	99.48
Indian	51	-	-	-	-	49	164,267	96.4	82.30	99.35
Other Bumiputera	115	410,372	97.4	92.09	99.17	113	399,374	94.8	85.37	98.26
Others	25	165,096	94.0	65.82	99.23	24	156,336	89.1	61.10	97.68
Household Income Group										
B40	636	3,054,885	99.1	97.03	99.75	623	3,010,673	97.7	94.98	98.96
M40	207	1,124,440	97.4	92.33	99.12	207	1,125,182	97.4	93.39	99.02
T20	87	517,766	98.7	90.93	99.82	82	487,872	93.0	83.89	97.11

Table 8.10: Intake of protein source food groups among adolescents (10-19 years) by sociodemographic characteristics (n=945)

Sociodemographic Characteristics	Count	Estimated Population	Meat, poultry, and egg			Fish and seafood		
			Mean (servings/ day)	95% CI		Mean (servings/ day)	95% CI	
				Lower	Upper		Lower	Upper
MALAYSIA	945	N/A	1.87	1.74	2.00	0.75	0.68	0.81
Location								
Urban	450	N/A	1.81	1.65	1.97	0.68	0.61	0.75
Rural	495	N/A	2.04	1.83	2.25	0.93	0.75	1.10
Sex								
Male	463	N/A	1.98	1.79	2.17	0.78	0.68	0.89
Female	482	N/A	1.75	1.62	1.89	0.71	0.63	0.79
Ethnicity								
Malay[a]	642	N/A	1.83	1.68	1.97	0.73	0.66	0.79
Chinese	108	N/A	1.85	1.49	2.21	0.68	0.50	0.86
Indian	51	N/A	1.47	1.10	1.83	0.66	0.55	0.78
Other Bumiputera	118	N/A	2.41	1.98	2.84	0.75	0.56	0.94
Others	26	N/A	1.84	1.25	2.42	1.98	0.52	3.44
Household Income Group								
B40	639	N/A	1.90	1.74	2.06	0.76	0.67	0.85
M40	212	N/A	1.82	1.58	2.05	0.72	0.61	0.84
T20	88	N/A	1.82	1.47	2.17	0.72	0.50	0.95

a - Malay includes Orang Asli
N/A - Not Applicable

Sociodemographic Characteristics	Nuts and legumes			Milk and dairies		
	Mean (servings/ day)	95% CI		Mean (servings/ day)	95% CI	
		Lower	Upper		Lower	Upper
MALAYSIA	0.11	0.09	0.13	0.36	0.32	0.41
Location						
Urban	0.12	0.09	0.15	0.39	0.33	0.45
Rural	0.08	0.06	0.10	0.29	0.23	0.35
Sex						
Male	0.12	0.09	0.14	0.38	0.30	0.45
Female	0.10	0.07	0.14	0.35	0.29	0.41
Ethnicity						
Malay[a]	0.08	0.05	0.11	0.37	0.31	0.43
Chinese	0.16	0.10	0.22	0.36	0.28	0.44
Indian	0.13	0.07	0.18	0.41	0.24	0.57
Other Bumiputera	0.14	0.10	0.19	0.38	0.22	0.55
Others	0.19	0.02	0.36	0.47	0.11	0.83
Household Income Group						
B40	0.11	0.07	0.14	0.32	0.26	0.38
M40	0.12	0.08	0.17	0.41	0.30	0.52
T20	0.11	0.07	0.16	0.54	0.37	0.71

Table 8.11: Prevalence of protein source food groups below recommended servings among adults (18 years and above) by sociodemographic characteristics (n=1,383)

Sociodemographic Characteristics	Meat, poultry, and egg [d]					Fish and seafood [e]				
	Count	Estimated Population	Prevalence (%)	95% CI		Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper				Lower	Upper
MALAYSIA	655	9,370,900	40.8	36.55	45.25	842	14,992,386	65.3	59.75	70.51
Location										
Urban	312	6,896,806	39.7	34.40	45.29	454	11,976,082	69.0	61.71	75.41
Rural	343	2,474,094	44.3	38.76	49.94	388	3,016,304	54.0	48.09	59.77
Sex										
Male	258	4,444,348	36.5	30.40	43.02	361	7,804,577	64.1	56.03	71.37
Female	397	4,926,552	45.8	39.75	51.88	481	7,187,809	66.8	60.60	72.38
Ethnicity										
Malay[a]	332	5,762,431	49.1	43.85	54.38	379	6,818,591	58.1	52.08	63.90
Chinese	83	1,768,248	37.6	29.14	46.99	175	3,908,210	83.2	76.07	88.53
Indian	44	910,310	59.9	46.49	72.04	51	1,987,142	65.0	51.61	76.38
Other Bumiputera	136	1,163,703	46.6	38.04	55.36	181	1,474,087	59.0	50.83	66.75
Others	60	1,201,097	49.0	34.68	63.57	56	1,283,606	52.4	34.24	69.97
Marital Status										
Single[b]	212	2,894,147	33.7	26.73	41.53	292	5,758,548	67.1	58.30	74.87
Married or cohabiting	441	6,461,076	45.0	39.98	50.18	549	9,225,700	64.3	58.54	69.66
Education Level										
No Formal Education	117	1,087,496	63.9	52.42	73.99	101	1,018,068	59.8	47.05	71.39
Primary School	143	1,318,466	54.6	44.48	64.38	145	1,324,160	54.8	42.74	66.41
Secondary School	351	5,901,708	37.5	32.00	43.27	511	10,264,220	65.2	58.43	71.33
Tertiary Education	40	1,005,076	33.3	22.19	46.64	83	2,341,539	77.6	67.70	85.11
Occupation										
Government Employee	32	612,436	42.7	29.40	57.21	61	851,022	59.4	41.68	74.94
Private Employee	117	2,703,934	33.2	26.26	40.91	206	5,681,338	69.7	60.84	77.33
Self Employed	116	1,570,172	43.4	33.87	53.45	138	2,269,667	62.7	52.37	72.06
Not Working[c]	374	4,357,719	45.9	39.88	52.12	420	5,981,621	63.1	56.93	68.80
Household Income Group										
B40	517	6,187,146	44.5	39.36	49.71	598	8,869,835	63.8	58.07	69.08
M40	105	2,520,181	38.0	29.73	46.99	176	4,606,439	69.4	58.07	78.83
T20	27	563,232	25.1	14.20	40.39	61	1,427,647	63.6	44.99	78.87

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age
d - Meat, poultry, and egg Below recommended servings: None or less than 1 serving
e - Fish and seafood: Below recommended servings: None or less than 1 serving
f - Fish and seafood: Below recommended servings: None or less than 1 serving
g - Milk and dairies: Below recommended servings: None or less than 2 serving

Sociodemographic Characteristics	Nuts and legumes [f]					Milk and dairies [g]				
	Count	Estimated Population	Prevalence (%)	95% CI		Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper				Lower	Upper
MALAYSIA	1343	22,311,672	97.2	96.01	98.07	1370	22,783,926	99.3	98.65	99.61
Location										
Urban	660	16,854,215	97.1	95.45	98.12	676	798,171	99.2	98.39	99.63
Rural	683	5,457,457	97.7	96.47	98.46	694	5,555,982	99.4	98.60	99.77
Sex										
Male	575	1,1792,924	96.8	94.91	98.00	592	12,135,270	99.6	98.59	99.89
Female	768	10,518,748	97.7	96.02	98.66	778	10,648,656	98.9	97.75	99.46
Ethnicity										
Malay[a]	660	11,337,542	96.6	94.51	97.92	677	11,237,614	99.3	97.86	99.76
Chinese	213	4,495,785	95.7	91.44	97.90	218	4,063,977	98.4	95.78	99.43
Indian	73	1,508,795	99.3	95.44	99.91	74	-	-	-	-
Other Bumiputera	295	2,434,417	97.5	94.00	98.96	296	2,874,172	97.7	94.29	99.06
Others	102	2,253,759	92.0	67.49	98.47	105	-	-	-	-
Marital Status										
Single[b]	437	8,296,246	96.7	94.14	98.16	446	8,498,268	99.0	97.39	99.66
Married or cohabiting	903	13,993,592	97.5	96.10	98.43	921	14,263,824	99.4	98.73	99.72
Education Level										
No Formal Education	183	-	-	-	-	182	1,693,919	99.5	96.67	99.94
Primary School	236	2,392,180	99.1	96.50	99.76	236	2,377,434	98.5	94.84	99.56
Secondary School	805	15,246,836	96.8	95.09	97.92	832	15,691,565	99.6	99.00	99.85
Tertiary Education	114	2,906,506	96.3	89.71	98.73	115	2,956,698	98.0	93.08	99.42
Occupation										
Government Employee	93	1,426,145	99.5	96.43	99.93	94	-	-	-	-
Private Employee	303	7,815,391	95.9	93.05	97.62	314	8,092,434	99.3	97.50	99.81
Self Employed	235	3,555,059	98.3	95.74	99.31	237	3,568,940	98.7	96.07	99.55
Not Working[c]	687	9,249,443	97.5	95.49	98.64	700	9,423,749	99.4	98.45	99.73
Household Income Group										
B40	988	13,540,301	97.3	95.48	98.43	1004	13,800,277	99.2	98.31	99.62
M40	258	6,484,415	97.7	94.69	99.05	265	6,614,752	99.7	99.03	99.91
T20	85	2,128,001	94.8	89.52	97.49	89	2,209,942	98.4	92.37	99.70

Table 8.12: Intake of protein source food groups among adults (18 years and above) by demographics (n=1,383)

Sociodemographic Characteristics	Count	Estimated Population	Meat, poultry, and egg			Fish and seafood		
			Mean (servings/ day)	95% CI		Mean (servings/ day)	95% CI	
				Lower	Upper		Lower	Upper
MALAYSIA	1383	N/A	1.52	1.41	1.64	1.02	0.91	1.12
Location								
Urban	685	N/A	1.49	1.36	1.62	0.93	0.80	1.06
Rural	698	N/A	1.63	1.37	1.88	1.28	1.10	1.46
Sex								
Male	595	N/A	1.63	1.46	1.80	1.07	0.90	1.24
Female	788	N/A	1.40	1.25	1.54	0.96	0.85	1.06
Ethnicity								
Malay[a]	681	N/A	1.28	1.16	1.40	1.11	1.01	1.21
Chinese	222	N/A	1.42	1.27	1.58	0.74	0.54	0.93
Indian	74	N/A	0.94	0.74	1.14	0.77	0.59	0.95
Other Bumiputera	301	N/A	1.84	1.41	2.28	1.29	0.97	1.61
Others	105	N/A	1.32	0.96	1.68	1.60	0.97	2.22
Marital Status								
Single[b]	451	N/A	1.67	1.52	1.83	0.94	0.80	1.08
Married or cohabiting	929	N/A	1.43	1.29	1.57	1.06	0.94	1.18
Education Level								
No Formal Education	183	N/A	1.06	0.83	1.29	1.11	0.87	1.36
Primary School	239	N/A	1.26	1.00	1.51	1.34	0.99	1.69
Secondary School	838	N/A	1.59	1.46	1.73	0.98	0.88	1.09
Tertiary Education	118	N/A	1.63	1.32	1.94	0.85	0.62	1.08
Occupation								
Government Employee	94	N/A	1.51	1.15	1.87	0.98	0.80	1.16
Private Employee	317	N/A	1.69	1.49	1.88	1.03	0.81	1.24
Self Employed	241	N/A	1.42	1.19	1.64	1.09	0.87	1.32
Not Working[c]	706	N/A	1.42	1.28	1.56	0.98	0.88	1.09
Household Income Group								
B40	1012	N/A	1.45	1.31	1.58	1.06	0.95	1.17
M40	268	N/A	1.60	1.40	1.81	0.94	0.75	1.13
T20	91	N/A	1.80	1.53	2.06	0.97	0.54	1.39

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age
N/A - Not Applicable

Sociodemographic Characteristics	Nuts and legumes			Milk and dairies		
	Mean (servings/ day)	95% CI		Mean (servings/ day)	95% CI	
		Lower	Upper		Lower	Upper
MALAYSIA	0.18	0.15	0.21	0.21	0.17	0.24
Location						
Urban	0.20	0.16	0.24	0.22	0.17	0.27
Rural	0.13	0.12	0.15	0.16	0.13	0.20
Sex						
Male	0.19	0.15	0.23	0.17	0.11	0.21
Female	0.18	0.15	0.21	0.26	0.21	0.31
Ethnicity						
Malay[a]	0.19	0.14	0.24	0.15	0.11	0.19
Chinese	0.27	0.21	0.32	0.25	0.19	0.31
Indian	0.15	0.10	0.20	0.34	0.18	0.49
Other Bumiputera	0.15	0.11	0.20	0.24	0.17	0.31
Others	0.25	0.08	0.43	0.29	0.07	0.50
Marital Status						
Single[b]	0.19	0.13	0.24	0.19	0.14	0.23
Married or cohabiting	0.18	0.15	0.21	0.22	0.17	0.26
Education Level						
No Formal Education	0.09	0.06	0.13	0.14	0.07	0.21
Primary School	0.13	0.09	0.17	0.16	0.08	0.23
Secondary School	0.18	0.15	0.22	0.20	0.16	0.23
Tertiary Education	0.28	0.15	0.41	0.33	0.20	0.45
Occupation						
Government Employee	0.10	0.07	0.13	0.24	0.14	0.33
Private Employee	0.20	0.15	0.26	0.19	0.14	0.24
Self Employed	0.17	0.11	0.22	0.17	0.10	0.24
Not Working[c]	0.19	0.15	0.23	0.23	0.18	0.28
Household Income Group						
B40	0.19	0.15	0.23	0.19	0.16	0.23
M40	0.16	0.13	0.20	0.20	0.15	0.25
T20	0.23	0.14	0.32	0.29	0.13	0.45

Table 8.13: Prevalence of free sugar intake exceeding the recommended level[b] among adolescents (10-19 years) by sociodemographic characteristics (n=945)

Sociodemographic Characteristics	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	607	3,026,657	63.1	58.74	67.35
Location					
Urban	277	2,164,821	61.3	55.64	66.76
Rural	330	861,836	68.2	62.44	73.40
Sex					
Male	317	1,614,608	66.0	59.68	71.73
Female	290	1,412,049	60.2	55.30	64.93
Ethnicity					
Malay[a]	424	1,845,810	65.4	60.89	69.72
Chinese	50	372,386	45.5	30.58	61.28
Indian	33	237,470	67.3	48.79	81.70
Other Bumiputera	78	428,853	67.5	56.27	76.99
Others	22	142,138	86.1	71.48	93.89
Household Income Group					
B40	425	2,021,536	65.7	60.82	70.33
M40	121	649,293	56.2	45.70	66.21
T20	56	327,908	62.5	50.91	72.80

a - Malay includes Orang Asli
b - Recommended level is 37.5g (based on 10% of 1500kcal).

Table 8.14: Mean of free sugar intake and sugar from beverages among adolescents (10-19 years) by sociodemographic characteristics (n=945)

Sociodemographic Characteristics	Free sugar				Sugar from beverages		
	Count	Mean (g/day)	95% CI		Mean (g/day)	95% CI	
			Lower	Upper		Lower	Upper
MALAYSIA	944	56.58	52.49	60.67	24.85	22.38	27.33
Location							
Urban	449	54.72	49.65	59.80	24.00	20.82	27.19
Rural	495	61.75	55.41	68.09	27.23	24.11	30.35
Sex							
Male	462	57.58	52.31	62.84	25.10	21.99	28.22
Female	482	55.53	50.79	60.27	24.59	21.54	27.64
Ethnicity							
Malay[a]	642	58.38	54.01	62.76	25.84	22.92	28.76
Chinese	108	45.15	36.24	54.05	19.09	14.60	23.57
Indian	51	61.64	42.26	81.02	31.95	18.27	45.63
Other Bumiputera	117	62.19	52.40	72.00	30.79	24.49	37.10
Others	26	70.80	53.09	88.50	37.88	24.32	51.44
Household Income Group							
B40	638	58.04	53.50	62.59	26.62	23.47	29.77
M40	212	53.82	46.82	60.82	21.91	18.80	25.01
T20	88	53.74	43.48	64.01	20.26	14.16	26.36

a - Malay includes Orang Asli

Table 8.15: Prevalence of free sugar intake exceeding the recommended level[d] among adults (18 years and above) by sociodemographic characteristics (n=1,383)

Sociodemographic Characteristics	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	602	10,797,357	47.0	43.35	50.77
Location					
Urban	292	8,000,122	46.1	41.52	50.70
Rural	310	2,797,234	50.1	44.87	55.25
Sex					
Male	317	6,757,000	55.5	50.52	60.30
Female	285	4,040,357	37.5	32.26	43.10
Ethnicity					
Malay[a]	318	5,398,617	46.0	41.64	50.43
Chinese	68	1,371,422	29.2	21.23	38.68
Indian	28	651,286	42.9	33.56	52.74
Other Bumiputera	145	1,259,333	50.4	43.44	57.40
Others	43	1,167,949	47.7	33.00	62.79
Marital Status					
Single[b]	211	4,582,041	53.4	45.29	61.34
Married or cohabiting	390	6,207,775	43.3	37.93	48.76
Education Level					
No Formal Education	57	472,489	27.8	19.25	38.26
Primary School	95	1,068,220	44.2	36.64	52.13
Secondary School	396	7,898,714	50.1	45.34	54.95
Tertiary Education	53	1,350,393	44.7	33.97	56.03
Occupation					
Government Employee	37	520,126	36.3	25.01	49.32
Private Employee	166	4,478,065	55.0	48.01	61.71
Self Employed	119	2,003,649	55.4	46.92	63.55
Not Working[c]	268	3,617,509	38.1	32.46	44.16
Household Income Group					
B40	427	6,599,498	47.4	42.37	52.55
M40	130	3,224,984	48.6	39.34	57.97
T20	37	878,317	39.1	24.93	55.43

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age
d - Recommended level is 37.5g (based on 10% of 1500kcal).

Table 8.16: Mean of free sugar intake and sugar from beverages among adults (18 years and above) by sociodemographic characteristics (n=1,383)

Sociodemographic Characteristics	Free Sugar				Sugar from beverages		
	Count	Mean (g/day)	95% CI		Mean (g/day)	95% CI	
			Lower	Upper		Lower	Upper
MALAYSIA	1,383	42.81	40.39	45.24	21.90	20.20	23.59
Location							
Urban	685	42.30	39.27	45.33	21.24	19.14	23.34
Rural	698	44.42	41.21	47.63	23.95	21.55	26.35
Sex							
Male	595	47.59	43.95	51.22	25.03	22.30	27.75
Female	788	37.41	34.38	40.44	18.36	16.51	20.21
Ethnicity							
Malay[a]	681	42.62	39.57	45.68	21.44	19.37	23.52
Chinese	222	33.11	27.78	38.47	17.90	13.95	21.85
Indian	74	35.13	30.04	40.23	18.58	15.00	22.16
Other Bumiputera	301	44.28	40.00	48.57	24.00	20.90	27.11
Others	105	41.77	33.14	50.40	18.40	14.20	22.59
Marital Status							
Single[b]	451	48.83	42.85	54.81	25.66	21.36	29.96
Married or cohabiting	929	39.22	35.89	42.56	19.66	17.70	21.63
Education Level							
No Formal Education	183	30.62	23.99	37.25	17.24	12.69	21.78
Primary School	239	43.48	35.97	50.99	22.83	18.42	27.24
Secondary School	838	44.45	41.37	47.54	22.99	20.84	25.13
Tertiary Education	118	40.94	35.96	45.91	18.37	14.78	21.96
Occupation							
Government Employee	94	37.53	32.52	42.53	17.69	14.54	20.85
Private Employee	317	46.78	42.05	51.52	23.30	20.05	26.54
Self Employed	241	47.98	41.52	54.43	26.61	21.61	31.60
Not Working[c]	706	37.97	34.46	41.49	19.14	16.81	21.47
Household Income Group							
B40	1,012	43.27	40.05	46.49	22.58	20.37	24.81
M40	268	43.68	38.83	48.53	21.31	18.24	24.38
T20	91	37.23	30.26	45.04	19.35	13.88	24.83

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 8.17: Prevalence of sugar sweetened beverages intake at least one serving a day among adolescents (10-19 years) by sociodemographic characteristics (n=945)

Sociodemographic Characteristics	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	639	3,181,829	66.3	61.63	70.66
Location					
Urban	292	2,293,287	64.9	59.02	70.30
Rural	347	888,542	70.3	62.70	76.90
Sex					
Male	327	1,681,763	68.5	62.79	73.74
Female	312	1,500,066	64.0	57.34	70.10
Ethnicity					
Malay[a]	436	1,277,864	65.9	59.78	71.50
Chinese	61	230,341	55.6	42.94	67.51
Indian	38	126,245	74.1	54.79	87.09
Other Bumiputera	83	292,108	69.3	55.53	80.35
Others	21	142,834	81.4	60.79	92.48
Household Income Group					
B40	443	2,071,680	67.2	61.79	72.23
M40	136	759,992	65.8	57.16	73.51
T20	55	317,771	60.6	46.22	73.29

a - Malay includes Orang Asli
*2 servings for female and male

Table 8.18: Intake of sugar sweetened beverages by categories among adolescent (10-19 years) (n=945)

SSB Categories	Mean (servings/week)	95% CI	
		Lower	Upper
Total SSB	**12.66**	**11.59**	**13.72**
Prepared SSB	**6.20**	**5.58**	**6.82**
Self-prepared beverages	4.45	3.83	5.07
Store-prepared beverages	1.75	1.47	2.02
Pre-packed SSB	**6.46**	**5.78**	**7.13**
Pre-mixed beverages	0.66	0.49	0.83
Cordial	1.36	1.07	1.65
RTD tea / coffee/ malt-choc	0.40	0.31	0.48
Fruit drinks	0.52	0.41	0.63
Carbonated beverages	1.10	0.69	1.50
Isotonic / sport drinks	0.41	0.31	0.51
Energy drink	-	-	-
Soya drink	0.42	0.33	0.52
Yogurt drink / Cultured milk / Flavoured milk	1.07	0.94	1.20
Other RTD	0.43	0.35	0.51

* RTD: Ready-to-drink whether in cans, packets or bottles

Table 8.19: Prevalence of sugar sweetened beverages intake at least one serving a day among adults (18 years and above) by sociodemographic characteristics (n=1,383)

Sociodemographic Characteristics	Count	Estimated population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	920	14,639,995	63.8	59.29	68.06
Location					
Urban	434	10,707,017	61.7	56.02	67.01
Rural	486	3,932,979	70.4	64.89	75.35
Sex					
Male	431	8,253,155	67.7	61.41	73.49
Female	489	6,386,841	59.3	53.59	64.79
Ethnicity					
Malay[a]	450	7,462,211	63.6	59.08	67.87
Chinese	131	2,455,159	52.3	44.19	60.23
Indian	53	1,082,179	71.3	60.66	79.94
Other Bumiputera	218	1,862,054	74.6	68.80	79.58
Others	68	1,683,853	68.8	56.15	79.09
Marital Status					
Single[b]	315	5,683,971	66.2	56.84	74.52
Married or cohabiting	604	8,948,485	62.4	57.30	67.17
Education Level					
No Formal Education	119	953,080	56.0	42.50	68.68
Primary School	167	1,596,067	66.1	56.53	74.53
Secondary School	566	10,467,496	66.4	61.29	71.25
Tertiary Education	66	1,601,185	53.1	39.91	65.79
Occupation					
Government Employee	54	807,081	56.3	41.02	70.49
Private Employee	216	5,417,636	66.5	57.62	74.31
Self Employed	171	2,567,112	71.0	63.35	77.55
Not Working[c]	462	5,658,016	59.7	53.40	65.60
Household Income Group					
B40	688	9,286,633	66.8	62.06	71.13
M40	172	4,014,702	60.5	51.38	68.96
T20	51	1,231,650	54.9	37.75	70.90

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 8.20: Intake of sugar sweetened beverages by categories among adults (18 years and above) (n=1,383)

Sociodemographic Characteristics	Intake in a week		
	Mean (servings/week)	95% CI	
		Lower	Upper
Total SSB	**11.82**	**10.98**	**12.65**
Prepared SSB	**7.25**	**4.06**	**5.07**
Self-prepared beverages	4.97	4.38	5.57
Store-prepared beverages	2.28	1.83	2.72
Pre-packed SSB	**4.57**	**4.06**	**5.07**
Pre-mixed beverages	1.30	1.05	1.56
Cordial drinks	0.84	0.66	1.01
RTD tea / coffee/ malt-choc	0.20	0.07	0.33
Fruit drinks / juices	0.54	0.43	0.66
Carbonated beverages	0.40	0.29	0.52
Isotonic / sport drinks	0.41	0.27	0.54
Energy drink	0.09	0.03	0.15
Soya drink	0.23	0.18	0.29
Yogurt drink / Cultured milk / Flavoured milk	0.38	0.29	0.46
Other RTD	0.17	0.11	0.22

* RTD: Ready-to-drink whether in cans, packets or bottles

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9. Meal Patterns

9. Meal Patterns

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Introduction

The term “meal pattern” refers to the structured assessment or analysis of how individuals or households typically organise and distribute their food intake over a specified period [1]. The process involves gathering data on the timing and frequency of food intake from a representative sample of a nation’s population [2].

Understanding meal patterns is important because they are closely linked to nutritional outcomes such as nutrient adequacy, weight status, and risk of diet-related chronic diseases. For example, irregular meal timing or low meal frequency has been associated with poorer diet quality and increased risk of overweight and obesity.

Analysing meal patterns is critical as it reveals dietary behaviours that directly influence public health strategies and nutritional recommendations [3]. Meal pattern analysis is fundamental for developing dietary guidelines and interventions that improve population health and address nutrition-related issues across diverse demographic groups [4].

Meal pattern constructs—such as eating frequency, timing, and regularity—offer deeper insight into the complexity of individuals’ eating behaviors and their influence on overall diet quality. Thus, meal pattern-based approaches complement existing nutrition strategies and can be integrated into broader health promotion and dietary policy frameworks [5].

Objectives

Objective

To determine the meal patterns among adolescents, adults, and older persons in Malaysia.

Specific Objectives

1. To determine the prevalence of breakfast, lunch, dinner and heavy meal intake after dinner, and the source of food.
2. To determine the prevalence of eating-out practices including eating at restaurants 12-6am at least once a week.
3. To determine the prevalence of eating at franchised fast food at least once a week.
4. To determine the prevalence of usage of food delivery at least once in a week.
5. To determine the prevalence of bringing home-packed food to school/work at least once a week.
6. To determine the prevalence of practicing vegetarian diet at least once per week.
7. To determine the mean pocket money spent per day on food and/or beverages at school among students aged 10 to 17 years old.

Methods

Data was collected from respondents aged 10 years and above through face-to-face interviews using an English and Malay version structured and validated questionnaire.

Variable Definition

1. **Breakfast:** defined as the first meal consumed after waking, typically between 7:00 a.m. and 11:00 a.m.
2. **Lunch:** defined as the meal consumed between 11.00 am to 3.00 pm. Meals consumed after 3.00 pm are not considered as lunch.
3. **Dinner:** defined as meals consumed between 6.00 pm to 10.00 pm. Meals consumed after 10.00 pm are not considered as dinner.
4. **Heavy meal after dinner:** defined as the consumption of a substantial meal between 10:00 p.m. and 6:00 a.m., taking into consideration whether dinner was consumed or not beforehand. Small snacks, including items such as crackers or a glass of milk, are excluded from this definition.
5. **Source of food intake. Home prepared:** Food or meals that are cooked or prepared at home. **Cafe/Restaurant:** Food or meals obtained from cafes, restaurants, school canteen or other formal dining establishments. Hawker/ **Food stall:** Meals purchased from informal or semi-formal street vendors, hawker centres, or food stalls. **Others:** Any food or meals obtained from sources not covered in the above categories. This could include meals shared by friends or neighbours, food provided at workplaces or schools, or pre-packaged items consumed directly without preparation.
6. Eating at a restaurant or hawker stall from 12 AM to 6 AM, specifically excluding any food purchased for takeout or consumption at home

7. **Franchised fast food outlets:** refer to a type of restaurant that emphasizes the preparation of food within a short period. The characteristics of fast-food outlets are: fast service, limited menu, self-service, consistent quality, affordable cost, and franchise networks.
8. **Food delivery app:** Refers to meals ordered through and delivered by services such as GrabFood, Foodpanda, Shopee Delivery, Misi, or similar platforms.
9. **Bringing Home-Packed Food to School or Work:** practice of bringing meals prepared at home as a source of food while at school or work.
10. **Practicing a Vegetarian Diet:** Practicing a vegetarian diet in the past month, with options of full-time, certain days only.
11. **Pocket money spent:** obtain information about the amount of money that respondents aged 10 until 17 years old typically spend per day on food and/or beverages at school.

Findings

A total of 4,428 respondents responded to the meal pattern module. The meal pattern questions were answered by 1,476 adults, 1,046 adolescents and 1,906 older person respondents.

Adults

The prevalence of daily breakfast intake per week was 66.5% (95% CI: 62.09, 70.63) and 8.4% (95% CI: 6.21, 11.30) not consuming breakfast at all. The main food sources were home-prepared (65.8%, 95% CI: 61.74, 69.57) and hawkers / food stalls (17.8%, 95% CI: 14.86, 21.18) **(Table 9.1)**. For lunch, 82.2% (95% CI: 78.94, 85.03) of adults consumed it daily and 4.7% (95% CI: 3.30, 6.80) skipped it entirely. The primary sources were home-prepared (66.0%, 95% CI: 60.74, 70.89) and cafes / restaurants (23.0%, 95% CI: 18.62, 28.15) **(Table 9.2)**. The prevalence of daily dinner consumption was 80.0% (95% CI: 76.49, 83.05), while 2.1% (95% CI: 1.39, 3.29) reported not eating dinner at all. Home-prepared meals (86.8%, 95% CI: 83.78, 89.28) and cafes / restaurants (7.7%, 95% CI: 5.68, 10.49) were the main sources **(Table 9.3)**. For heavy meals after dinner, 6.3% (95% CI: 4.82, 8.16) reported daily intake, while 66.5% (95% CI: 62.13, 70.62) reported not consuming them. The most common sources were home-prepared meals (74.4%, 95% CI: 68.07, 79.91) and cafes / restaurants (10.5%, 95% CI: 6.67, 16.23) **(Table 9.4)**.

The prevalence of eating at restaurants between 12:00 a.m. and 6:00 a.m. was 5.0% (95% CI: 3.16–7.89). Urban areas exhibited a slightly higher prevalence of 5.3% (95% CI: 3.00–9.10) compared to 4.1% (95% CI: 2.30–7.20) in rural areas **(Table 9.5)**. Meanwhile, the consumption of franchised fast food showed a considerably higher prevalence of 16.6% (95% CI: 12.75–21.43). This behaviour was more prominent in urban settings (19.3%, 95% CI: 14.40–25.50) in contrast to rural communities, where the prevalence was 7.8% (95% CI: 5.60–11.00) **(Table 9.6)**. Furthermore, the use of food delivery applications demonstrated a prevalence of 11.4% (95% CI: 8.57–15.11). The practice was notably higher in urban areas (14.0%, 95% CI: 10.30–18.70) compared to 3.0% (95% CI: 1.60–5.80) in rural regions **(Table 9.7)**. In addition, the prevalence of bringing home-packed food to work was 19.2% (95% CI: 15.06–24.23), with urban areas showing a slightly higher rate (19.4%, 95% CI: 14.30–25.90) compared to 18.5% (95% CI: 14.10–23.90) in rural areas **(Table 9.8)**.

Additionally, 2.9% (95% CI: 1.92, 4.44) of adults reported practicing a vegetarian diet at least once per week.

Adolescents

The prevalence of daily breakfast intake per week was 57.6% (95% CI: 53.43, 61.76) and 9.5% (95% CI: 7.40, 12.22) not consuming breakfast at all. The main food sources were home-prepared 60.5% (95% CI: 56.35, 64.58) and cafe/ restaurant 30.4% (95% CI: 26.71, 34.31) **(Table 9.9)**. For lunch, 78.1% (95% CI: 74.28, 81.50) of adolescents consumed it daily and 3.06% (95% CI: 1.79, 5.20) skipped it entirely. The primary sources were home-prepared 69.8% (95% CI: 65.32, 73.93) and cafes / restaurants 22.7% (95% CI: 19.20, 26.66) **(Table 9.10)**. The prevalence of daily dinner consumption was 79.6% (95% CI: 76.25, 82.55). Home-prepared meals (89.0% (95% CI: 85.73, 91.54) and cafes / restaurants (7.1% (95% CI: 4.97, 9.90) were the main sources **(Table 9.11)**. For heavy meals after dinner, 7.1% (95% CI: 5.10, 9.70) reported daily intake, while 58.2% (95% CI: 54.09, 62.24) reported not consuming them. The most common sources were home-prepared meals 79.5% (95% CI: 74.54, 83.76) and cafes / restaurants 10.2% (95% CI: 6.81, 15.06) **(Table 9.12)**.

The prevalence of eating at restaurants between 12:00 a.m. and 6:00 a.m. was 7.5% (95% CI: 5.47–10.21). Urban areas exhibited a slightly higher prevalence of 7.8% (95% CI: 5.28–11.50) compared to 6.6% (95% CI: 4.49–9.46) in rural areas **(Table 9.13)**. Meanwhile, the consumption of franchised fast food demonstrated a markedly higher prevalence of 24.7% (95% CI: 20.79–29.04). Urban residents reported a significantly greater prevalence (28.8%, 95% CI: 23.81–34.39) in contrast to their rural counterparts (13.0%, 95% CI: 8.70–18.97) **(Table 9.14)**. Furthermore, the use of food delivery applications was observed in 13.1% (95% CI: 10.15–16.71) of the population, with the prevalence in urban settings (16.8%, 95% CI: 12.90–21.70) notably exceeding that of rural areas **(Table 9.15)**. In addition, the practice of bringing home-packed meals to school or work reflected a prevalence of 23.8% (95% CI: 20.74–27.21). This behaviour was slightly more common in urban areas (24.6%, 95% CI: 20.78–28.97) compared to 21.4% (95% CI: 17.53–25.83) in rural communities **(Table 9.16)**.

For the total pocket money spent among the adolescents, the overall mean was RM 5.64 (95% CI: 5.11, 6.18). A higher mean was observed in urban areas (RM 5.71; 95% CI: 5.08, 6.34) and among T20 households (RM 8.41; 95% CI: 5.18, 11.64), respectively. The mean in rural areas was RM 5.45 (95% CI: 4.43, 6.48). Meanwhile, the mean for B40 and M40 household income were RM 5.06 (95% CI: 4.53, 5.59) and RM 5.99 (95% CI: 5.17, 6.82) respectively **(Table 9.17)**.

Older Persons

The prevalence of daily breakfast intake per week was 91.9% (95% CI: 90.10, 93.31), and 1.1% (95% CI: 0.60, 1.86) not consuming breakfast at all. The main food sources were home-prepared 75.5% (95% CI: 72.01, 78.77), and hawkers / food stalls 16.8% (95% CI: 13.92, 20.13) **(Table 9.18)**. For lunch, 87.9% (95% CI: 85.78, 89.75) of older persons consumed it daily and 3.1% (95% CI: 2.30, 4.23) skipped it entirely. The primary sources were home-prepared 83.1% (95% CI: 79.44, 86.17), and hawkers / food stalls 9.2% (95% CI: 7.22, 11.75) **(Table 9.19)**. The prevalence of daily dinner consumption was 85.1% (95% CI: 82.32, 87.43), while 2.6% (95% CI: 1.80, 3.76) reported not eating dinner at all. Home-prepared meals 89.5% (95% CI: 86.95, 91.59) and hawkers / food 6.6% (95% CI: 5.16, 8.43) were the main sources **(Table 9.20)** For heavy meals after dinner, 7.9% (95% CI: 6.70, 9.34) reported daily intake, while 77.3% (95% CI: 74.31, 80.03) reported not consuming them. The most common sources were home-prepared meals 85.1% (95% CI: 79.09, 89.64) and hawkers/ food stall 7.0% (95% CI: 4.10, 11.54) **(Table 9.21)**.

The prevalence of eating at restaurants between 12:00 a.m. and 6:00 a.m. was 2.0% (95% CI: 1.33–2.94). Urban areas exhibited a slightly higher prevalence of 2.1% (95% CI: 1.31–3.39) compared to 1.5% (95% CI: 0.97–2.47) in rural areas **(Table 9.22)**. Meanwhile, the consumption of franchised fast food demonstrated a prevalence of 6.2% (95% CI: 4.71–8.00). This behaviour was more common among urban residents, with a prevalence of 7.4% (95% CI: 5.58–9.71) in contrast to 2.2% (95% CI: 1.14–4.14) observed in rural populations **(Table 9.23)**. Furthermore, the use of food delivery applications recorded a national prevalence of 2.9% (95% CI: 2.02–4.26), with urban areas reporting a higher prevalence of 3.8% (95% CI: 2.60–5.42) **(Table 9.24)**. In addition, the percentage of individuals bringing home-packed food to work was 17.9% (95% CI: 12.78–24.46). This practice was slightly more prevalent in urban areas (19.4%, 95% CI: 12.50–28.83) compared to 15.0% (95% CI: 9.32–23.23) in rural areas **(Table 9.25)**.

Additionally, 3.5% (95% CI: 2.37, 5.20) of older persons reported practicing a vegetarian diet at least once per week.

Conclusion

The findings reveal distinct meal patterns among adults, adolescents, and older persons in Malaysia. Adults displayed a high prevalence of regular meal intake, particularly for lunch (82.2%) and dinner (80.0%), with home-prepared meals being the most common source across all meals. Adolescents and older persons also showed high prevalence for regular meal consumption, with older persons exhibiting the highest breakfast intake at 91.9%. Urban residents consistently reported higher prevalence of eating out, using food delivery apps, and consuming fast food compared to their rural counterparts, reflecting differences in lifestyle and access.

Adolescents reported the highest prevalence of fast-food consumption (24.7%) and bringing home-packed food (23.8%), suggesting a preference for convenience and external food sources. On the other hand, older persons exhibited a stronger reliance on home-prepared meals for all meal times, with comparatively minimal dependence on cafes, restaurants, or food stalls. Heavy meal consumption after dinner was notably low among older persons (22.7% for daily and 1–6 days combined) compared to adults (33.5%) and adolescents (41.8%), indicating more restrained dietary habits in this group.

The data also emphasize the growing impact of urbanisation and socioeconomic factors on dietary practices. Urban populations showed higher reliance on food delivery apps and fast food, especially among adolescents and adults, reflecting modern eating patterns. In contrast, rural areas demonstrated a greater prevalence of traditional practices like bringing home-packed meals. These findings underscore the need for targeted nutritional interventions and policies that address urban-rural disparities and promote balanced dietary habits across age groups.

Recommendations

Eating patterns can be improved across all age groups by implementing the following measures to address nutritional disparities and promoting healthier lifestyles nationwide.

1. **Advocate healthy home-prepared meals:** Strengthen nutrition advocacy to empower families and caregivers on healthy meal preparations including packed food preparation at household level and encourage Malaysians to bring home-packed meals to better control ingredients and save cost.
2. **Enhance breakfast intake:** Develop a nutrition-focus programme to promote healthy, affordable, and quick breakfast options to encourage breakfast intake amongst adults and adolescents as it provides essential energy and nutrients to start the day.
3. **Develop policies offering healthy breakfast in schools and workplaces:** Propose government/ agencies for having healthy breakfast programmes in school or workplace to improve morning eating habits amongst adults and adolescents.
4. **Discourage heavy meals after dinner:** Educate the community about the potential health risks associated with heavy meals late at night either by eating out or having at home. Having dinner right before bed time is linked to a higher risk of metabolic syndrome and its associated factors, including obesity and hypertension.
5. **Strengthen school canteen food policy:** Ensure all school canteens provide healthy set menus as listed in the Healthy School Canteen Guidelines to ensure students receive adequate nutrition and better spending of pocket money.

6. **Healthier meal options in restaurants and fast-food outlets:** Encourage restaurants and fast-food outlets to implement calorie labelling on their menus and promote healthier meal options with reduced portion sizes, lower salt, sugars, and fats and advocate Malaysians to choose dine-in restaurants or pre-packaged products with healthier options.
7. **Healthier food options on delivery platforms:** Encourage food delivery companies to develop healthier food options and foster transparency in nutritional information to promote public health and nutritional well-being.
8. **Regulation on fast food marketing:** Strengthen regulations and guidelines on fast food advertising across all media platforms, including schools, social media, and public spaces, to restrict the promotion of unhealthy foods.

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Table 9.1: Prevalence of breakfast intake per week among adults (18 years and above) in Malaysia (n=1,474)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	1,105	16,465,923	66.5	62.09	70.63
1-6 Days	285	6,219,906	25.1	20.90	29.80
None	84	2,083,079	8.4	6.21	11.30
Source*					
Home prepared	979	14,935,855	65.8	61.74	69.57
Cafe/ Restaurant	169	3,447,759	15.2	12.02	18.99
Hawker/ Food stall	227	4,043,726	17.8	14.86	21.18
Others	15	-	-	-	-

Note:*Among those who take breakfast

Table 9.2: Prevalence of lunch intake per week among adults (18 years and above) in Malaysia (n=1,475)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	1195	20,394,440	82.2	78.94	85.03
1-6 Days	223	3,250,929	13.1	10.80	15.80
None	57	1,167,976	4.7	3.30	6.80
Source*					
Home prepared	1075	15,593,134	66.0	60.74	70.89
Cafe/ Restaurant	209	5,443,941	23.0	18.62	28.15
Hawker/ Food stall	123	2,426,682	10.3	7.74	13.51
Others	11	-	-	-	-

Note: *Among those who take lunch

Table 9.3: Prevalence of dinner intake per week among adults (18 years and above) in Malaysia (n=1,476)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	1169	19,845,213	80.0	76.49	83.05
1-6 Days	267	4,437,717	17.9	15.01	21.17
None	40	532,479	2.1	1.39	3.29
Source*					
Home prepared	1262	21,041,745	86.8	83.78	89.28
Cafe/ Restaurant	82	1,878,847	7.7	5.68	10.49
Hawker/ Food stall	82	1,218,864	5.0	3.74	6.72
Others	10	-	-	-	-

Note: *Among those who take dinner

Table 9.4: Prevalence of heavy meal after dinner intake per week among adults (18 years and above) in Malaysia (n=1,474)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	98	1,551,800	6.3	4.82	8.16
1-6 Days	331	6,715,612	27.2	23.41	31.36
None	1045	16,419,740	66.5	62.13	70.62
Source*					
Home prepared	327	6,162,118	74.4	68.07	79.91
Cafe/ Restaurant	34	871,674	10.5	6.67	16.23
Hawker/ Food stall	41	673,107	8.1	5.07	12.79
Others	27	570,992	6.9	3.80	12.21

Note: *Among those who take heavy meal after dinner

Table 9.5: Prevalence of eating at restaurants between 12:00 a.m. and 6:00 a.m. among adults (18 years and above) in Malaysia (n=1,474)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	53	1,239,412	5.0	3.16	7.89
Location					
Urban	30	1,002,375	5.3	3.00	9.10
Rural	23	237,037	4.1	2.30	7.20

Table 9.6: Prevalence of consumption of franchised fast food among adults (18 years and above) in Malaysia (n=1,475)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	174	4,110,8301	16.6	12.75	21.43
Location					
Urban	127	3,657,686	19.3	14.40	25.50
Rural	47	453,145	7.8	5.60	11.00

Table 9.7: Prevalence of using food delivery apps among adults (18 years and above) in Malaysia. (n=1,476)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	98	2,828,071	11.4	8.57	15.11
Location					
Urban	83	2,652,889	14.0	10.30	18.70
Rural	15	175,182	3.0	1.60	5.80

Table 9.8: Prevalence of bringing home-packed food to work among adults (18 years and above) in Malaysia. (n=1,082)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	181	3,695,324	19.2	15.06	24.23
Location					
Urban	98	2,869,877	19.4	14.30	25.90
Rural	83	825,447	18.5	14.10	23.90

Table 9.9: Prevalence of breakfast intake per week among adolescents (10-19 years) in Malaysia (n=1,045)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	595	3,067,926	57.6	53.43	61.76
1-6 Days	361	1,746,126	32.8	29.36	36.46
None	89	507,828	9.5	7.40	12.22
Source*					
Home prepared	564	2,915,515	60.5	56.35	64.58
Cafe/ Restaurant[a]	297	1,463,094	30.4	26.71	34.31
Hawker/ Food stall	52	244,635	5.1	3.66	7.01
Others	43	192,702	4.0	2.53	6.27

Note: *Among those who take breakfast
a - including school canteen

Table 9.10: Prevalence of lunch intake per week among adolescents (10-19 years) in Malaysia (n=1,044)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	814	4,153,627	78.1	74.28	81.50
1-6 Days	206	1,001,822	18.8	15.79	22.32
None	24	162,966	3.06	1.79	5.20
Source*					
Home prepared	721	3,604,115	69.8	65.32	73.93
Cafe/ Restaurant[a]	222	1,172,888	22.7	19.20	26.66
Hawker/ Food stall	45	240,945	4.7	3.55	6.12
Others	32	145,366	2.8	1.70	4.62

Note: *Among those who take lunch
a - including school canteen

Table 9.11: Prevalence of dinner intake per week among adolescents (10-19 years) in Malaysia (n=1,046)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	791	4,240,462	79.6	76.25	82.55
1-6 Days	242	1,030,177	19.3	16.39	22.67
None	13	57,799	1.1	0.53	2.21
Source*					
Home prepared	927	4,682,482	89.0	85.73	91.54
Cafe/ Restaurant[a]	57	371,061	7.1	4.97	9.90
Hawker/ Food stall	45	196,489	3.7	2.55	5.44
Others	4	13,214	0.3	0.06	1.07

Note: *Among those who take dinner
a - including school canteen

Table 9.12: Prevalence of heavy meal after dinner intake per week among adolescents (10-19 years) in Malaysia (n=1,044)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	66	375,401	7.1	5.10	9.70
1-6 Days	363	1,845,997	34.7	31.30	38.30
None	615	3,095,509	58.2	54.09	62.24
Source*					
Home prepared	341	1,776,341	79.5	74.54	83.76
Cafe/ Restaurant[a]	26	129,158	5.8	3.79	8.73
Hawker/ Food stall	41	228,223	10.2	6.81	15.06
Others	23	99,761	4.5	2.49	7.88

Note: *Among those who take heavy meal after dinner
a - including school canteen

Table 9.13: Prevalence of eating at restaurants between 12:00 am and 6:00 am among adolescents (10-19 years) in Malaysia (n=1,043)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	61	397,637	7.5	5.47	10.21
Location					
Urban	32	306,441	7.8	5.28	11.50
Rural	29	91,196	6.6	4.49	9.46

Table 9.14: Prevalence of consumption of franchised fast food among adolescents (10-19 years) in Malaysia (n=1,046)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	201	1,315,058	24.7	20.79	29.04
Location					
Urban	143	1,134,187	28.8	23.81	34.39
Rural	58	180,871	13.0	8.70	18.97

Table 9.15: Prevalence of using food delivery apps among adolescents (10-19 years) in Malaysia (n=1,046)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	91	697,353	13.1	10.15	16.71
Location					
Urban	80	663,207	16.8	12.90	21.70
Rural	11	34,146	2.5	0.96	6.13

Table 9.16: Prevalence of bringing home-packed food to school or work among adolescents (10-19 years) in Malaysia (n=1,002)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	237	1,216,907	23.8	20.74	27.21
Location					
Urban	129	941,331	24.6	20.78	28.97
Rural	108	275,576	21.4	17.53	25.83

Table 9.17: Mean pocket money distribution among adolescents (10-17 years) in Malaysia by sociodemographic factors (n=882)

Variables	Count	Mean (RM)	95% CI	
			Lower	Upper
MALAYSIA	882	5.64	5.11	6.18
Location				
Urban	420	5.71	5.08	6.34
Rural	462	5.45	4.43	6.48
Household Income				
B40	598	5.06	4.53	5.59
M40	194	5.99	5.17	6.82
T20	85	8.41	5.18	11.64

Table 9.18: Prevalence of breakfast intake per week among older persons (60 years and above) in Malaysia (n=1,906)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	1744	3,620,008	91.9	90.10	93.31
1-6 Days	143	279,556	7.1	5.72	8.77
None	19	41,637	1.1	0.60	1.86
Source*					
Home prepared	1472	2,946,478	75.5	72.01	78.77
Cafe/ Restaurant	103	288,316	7.4	5.52	9.84
Hawker/ Food stall	307	655,165	16.8	13.92	20.13
Others	6	-	-	-	-

Note: *Among those who take breakfast

Table 9.19: Prevalence of lunch intake per week among older persons (60 years and above) in Malaysia (n=1,905)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	1692	3,462,711	87.9	85.78	89.75
1-6 Days	164	353,232	9.0	7.32	10.94
None	49	123,086	3.1	2.30	4.23
Source*					
Home prepared	1625	3,172,545	83.1	79.44	86.17
Cafe/ Restaurant	88	275,331	7.2	5.19	9.93
Hawker/ Food stall	139	352,899	9.2	7.22	11.75
Others	6	-	-	-	-

Note: *Among those who take lunch

Table 9.20: Prevalence of dinner intake per week among older persons (60 years and above) in Malaysia (n=1,904)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	1583	3,351,217	85.1	82.32	87.43
1-6 Days	264	486,227	12.3	10.29	14.74
None	57	102,685	2.6	1.80	3.76
Source*					
Home prepared	1696	3,431,837	89.5	86.95	91.59
Cafe/ Restaurant	44	132,802	3.5	2.28	5.23
Hawker/ Food stall	99	253,480	6.6	5.16	8.43
Others	9	-	-	-	-

Note: *Among those who take dinner

Table 9.21: Prevalence of heavy meal after dinner intake per week among older persons (60 years and above) in Malaysia (n=1,906)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Intake					
Daily	155	311,954	7.9	6.70	9.34
1-6 Days	306	582,556	14.8	12.56	17.33
None	1445	3,045,353	77.3	74.31	80.03
Source*					
Home prepared	390	765,939	85.1	79.09	89.64
Cafe/ Restaurant	13	34,717	3.9	1.99	7.35
Hawker/ Food stall	38	62,565	7.0	4.10	11.54
Others	22	36,622	4.1	2.06	7.89

Note: *Among those who take heavy meal after dinner

Table 9.22: Prevalence of eating at restaurants between 12:00 am and 6:00 am among older persons (60 years and above) in Malaysia. (n=1,906)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	39	77,967	2.0	1.33	2.94
Location					
Urban	20	63,514	2.1	1.31	3.39
Rural	19	14,453	1.5	0.97	2.47

Table 9.23: prevalence of consumption of franchised fast food among older persons (60 years and above) in Malaysia (n=1,906)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	84	242,479	6.2	4.71	8.00
Location					
Urban	66	222,062	7.4	5.58	9.71
Rural	18	20,417	2.2	1.14	4.14

Table 9.24: Prevalence of using food delivery apps among older persons (60 years and above) in Malaysia (n=1,905)

Variables	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	35	115,836	2.9	2.02	4.26
Location					
Urban	31	113,041	3.8	2.60	5.42
Rural	4	-	-	-	-

Table 9.25: Percentage of bringing home-packed food to work among working older persons (60 years and above) in Malaysia (n=353)

Variables	Unweighted Count	Percentage (%)	95% CI	
			Lower	Upper
MALAYSIA	50	17.9	12.78	24.46
Location				
Urban	**24**	**19.4**	**12.50**	**28.83**
Rural	**26**	**15.0**	**9.32**	**23.23**

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10. Food Labelling

10. Food Labelling

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Introduction

The Food and Agriculture Organization (FAO) promotes food labelling as an effective tool to protect consumer health in terms of food safety and nutrition. Food labelling conveys information about the product's identity and contents and how to handle, prepare, and consume it healthily and safely. As consumer health awareness grows, food labelling is vital for promoting transparency, safety, and informed decisions. Food labelling provides key information on a product's nutrition and ingredients; thus, it helps consumers choose their food based on their diets, ethics, and health goals [1].

Food labelling is a potent tool for improving public health, especially in nutrition. With rising obesity and non-communicable diseases, clear labels can promote healthier eating and help reduce the consumption of high-calorie, high-sugar, and high-fat foods [2]. Moreover, food labelling plays a critical role in combating misinformation and food fraud by providing verified and standardized information. This helps build consumer trust in food products and brands especially in an era where online misinformation can easily mislead consumers. Accurate food labelling also prevents deceptive marketing practices, such as using "low-fat" or "sugar-free" claims that may hide unhealthy ingredients [3].

The Ministry of Health (MOH) Malaysia has gazetted and enforced regulations on food and nutrition labelling. To support these efforts, nutrition programs and activities aimed at promoting and assisting consumers in making better food choices are outlined in the National Plan of Action for Nutrition of Malaysia III, 2016-2025.

In Malaysia, the practice of food label reading was still relatively low, with the 2014 national survey showing that less than half of Malaysian adults read food labels [4], compared to other countries in which more than half do so [5,6,7]. In contrast, the 2017 national survey found that more than half of Malaysian adolescents read the food labels [8]. However, there is limited information on the nationwide prevalence of food label reading among older persons in Malaysia.

Objectives

General Objective

To determine the prevalence of food label reading among adolescents, adults, and older persons in Malaysia.

Specific Objectives

1. To determine the practice of reading the information on food labels when buying or receiving food, including reading the type of nutrition facts and front of pack.
2. To determine the practice of reading Healthier Choice Logo (HCL) and frequency of choosing HCL products.

Methods

Data on reading food labels were obtained from respondents aged 10 years and above through face-to-face interviews using questionnaires adapted from the previous National Health and Morbidity Survey (NHMS) [4,8]. The questionnaire consists of four (4) questions to provide information on whether the respondents read the label, types of information were being read, types of nutrition facts were being prioritized, and the frequency of choosing HCL products.

Variable Definition

Food label included any tag, brand, mark, pictorial, or other descriptive matter, written, printed, stencilled, marked, painted, embossed, or impressed on, or attached to or included in, belonging to, or accompanying any food [9]. Always reading food labels, was defined as respondents who answered "Yes, always" to the question, "Do you read the food label for the first time you bought or received food from others?". Sometimes reading food labels was defined as those who responded "Yes, sometimes" or "Yes, rarely" [4,8]. Food label reading included both always and sometimes reading food labels.

Nutrition facts include information on the nutrition information panel (NIP), a table in one section of a food label declaring the amount of energy and nutrients contained in the food [8,10].

Healthier Choice Logo is point-of-sale information that helps the consumer make informed food choices that meet the nutrient criteria specified by the MOH [11], where those who read were those who answered "Yes" to the specific question of either read or review HCL during the first time of buying or receiving foods, and those who always chose food products with HCL logo were those who answered "Yes, always" to the specific question, while those who sometimes

chose food products with HCL were those who answered either "Yes, sometimes" or "Yes, rarely" to the specific question and those who never chose food products with HCL were those who responded as "Never" to the specific question.

Findings

A total of 4,248 respondents responded to the food labelling module. The food labelling questions were answered by 1,031 adolescents, 1,433 adults, and 1,784 older persons.

Adolescents

The survey found that the national prevalence of always read food labels among adolescents was 18.0% (95% CI: 14.99, 21.51), sometimes read was 53.2% (95% CI: 48.95, 57.49) and never read was 28.7% (95% CI: 24.25, 33.67). By location, among those reported as always reading food labels, adolescents in urban areas [18.4% (95% CI: 14.66, 22.95)] showed a higher prevalence compared to those living in rural areas [16.8% (95% CI: 13.04, 21.44)]. The prevalence of sometimes read food labels was higher in rural areas [55.7% (95% CI: 48.72, 62.41)]. The prevalence of never read food labels was highest among adolescents living in urban areas [29.2% (95% CI: 23.84 – 35.12). The prevalence of always and sometimes read was seen higher among females (72.0%) as compared to males (70.6%). However, for never read food labels, the prevalence was higher among males [29.4% (95% CI: 24.33 – 34.95)]. By ethnicity, Other Bumiputera adolescents had the highest prevalence of always read [20.6% (95% CI: 13.59, 30.01) and sometimes read [55.4% (95% CI: 43.17, 66.98)] food labels. Meanwhile, the other ethnic group [35.3% (95% CI: 17.58, 17.58)] showed the highest prevalence of never read food labels. The prevalence of always read food labels was highest among adolescents those from M40 group at 22.3% (95% CI: 15.75, 30.53). Meanwhile, B40 showed the highest prevalence among those sometimes and never read food labels at 53.7% (95% CI: 48.29, 59.12) and 30.0% (95% CI: 24.81, 35.65) respectively **(Table 10.2)**.

Based on types of food labels information, the adolescents who always read food labels are more concerned on expiry date at 95.0% (95% CI: 89.39, 97.72) and followed by those who sometimes read labels [90.3% (95% CI: 85.78, 93.50)]. Adolescents were less concerned about reading food additives, both among those who always read [24.9% (95% CI: 18.54, 32.64)] and those who sometimes read [9.1% (95% CI: 6.55, 12.45)] food labels **(Table 10.3)**.

In the context of nutrition facts, adolescent who always read fat content [77.8% (95% CI: 63.61, 87.55)], followed by total energy or calorie [76.7% (95% CI: 64.73, 85.51)] and total sugars [72.8% (95% CI: 64.57, 79.80)]. On the other hand, among those who sometimes read labels, the most frequently checked item was total sugars [63.7% (95% CI: 54.96–71.55)], followed by fat content [54.1% (95% CI: 45.27–62.59)] and protein content [49.7% (95% CI: 41.04–58.39)]. Those who always read food labels were less concerned about salt or sodium content [48.3% (95% CI: 35.61, 61.14)] and fibre content [48.4% (95% CI: 34.28, 62.69)]. Whereas those who sometimes read food labels were less concerned about fibre content [23.5% (95% CI: 18.43, 29.36)]. Among those who always read the HCL, most adolescents always chose HCL products at 47.5% (95%CI: 31.57, 63.95)] Meanwhile, among those who sometimes read HCL, most adolescents sometimes chose HCL products at 51.8% (95% CI: 42.55, 60.92) **(Table 10.4)**.

Adults

The national prevalence of always read food labels among adults was 31.6% (95% CI: 27.27, 36.20), sometimes read was 45.7% (95% CI: 40.61, 50.90) and never read was 22.7% (95% CI: 18.62, 27.43). By location, among those reported as always reading food labels, adults in urban areas [32.9% (95% CI: 27.57, 38.67)] showed a higher prevalence than those residing in rural areas. Meanwhile, those who sometimes and never read food labels showed the highest prevalence in rural areas at 47.4% (95% CI: 40.35, 54.51) and 25.4% (95% CI: 20.24, 31.32), respectively. Females showed the highest prevalence of always read [32.9% (95% CI: 27.20, 39.19)] and sometimes read [46.0% (95% CI: 40.04, 52.15)] meanwhile, male [24.2% (95% CI: 18.56, 30.93)] showed the highest prevalence for never read food labels. By ethnicity, Indians had the highest prevalence of always read [31.1% (95% CI: 21.27, 43.02)] and sometimes read [48.5% (95% CI: 36.01, 61.10)] food labels. Other ethnic group showed the highest prevalence of never reading food labels [34.9% (95% CI: 18.33, 56.10)] compared to other ethnicities. There was little difference in the prevalence of always reading food labels between single adults [31.4% (95% CI: 24.20, 39.73)] and those who were married or cohabiting [31.7% (95% CI: 27.03, 36.72)].

However, the prevalence of sometimes reading food labels was higher among single adults [46.9% (95% CI: 39.56, 54.42)] compared to their married or cohabiting counterparts [45.0% (95% CI: 39.21, 50.84)]. The prevalence of always read food labels was significantly higher among those with a tertiary education level [(52.4% (95% CI: 39.19, 65.22)] compared to other education levels. No significant difference was found among education levels for those sometimes and never read food labels. The government employees showed the highest prevalence of always read [43.4% (95% CI: 28.63, 59.39) and sometimes read [51.2% (95% CI; 35.80, 66.38)] food labels. By household income group, M40 group [35.8% (95% CI; 28.83, 43.46)] showed the highest prevalence for always read, while the T20 group [49.4% (95% CI: 35.24, 63.68)] showed the highest prevalence for sometimes read food labels **(Table 10.5)**.

Among those adults who always read food labels, the expiry date [95.9% (95% CI: 91.51, 98.03)] is the information most often read. Most of the adults who sometimes read are also concerned about the expiry date [97.7% (95% CI: 96.54, 98.46)]. However, food additives were the less concerned label among those who always read [20.0% (95% CI: 14.61, 26.78)] and sometimes read [8.7% (95% CI: 6.01, 12.42)] food labels **(Table 10.6)**. Among those who always read nutrition facts, total sugars [(78.1% (95% CI: 67.57, 85.90)], fat content [58.0% (95% CI: 48.32, 67.12)] and total energy or calorie [55.8% (95% CI: 46.01, 65.21)] was the three most concerning labels compared to other nutritional information. Meanwhile, total sugars [(73.2% (95% CI: 63.08, 81.37)], fat content [48.4% (95% CI: 36.76, 60.20)] and total energy or calorie [48.3% (95% CI: 38.54, 58.25)] were among the information most commonly read for those who sometimes read nutrition facts on food labels. Fibre content was the least read nutrition fact among those who always read [37.9% (95% CI: 28.25, 48.68)] and sometimes read [23.5% (95% CI: 16.53, 32.33)] food labels **(Table 10.6)**. Among those who always read HCL, most adults always chose HCL products at 47.4% (95%CI: 32.71, 62.49)]. Meanwhile, among those who sometimes read HCL, only 18.5% (95% CI: 6.97, 40.69) of adults always chose HCL products **(Table 10.7)**.

Older Persons

This survey also showed the national prevalence of always read food labels among older persons was 19.6% (95% CI: 15.99, 23.89), sometimes read was 39.9% (95% CI: 35.80, 44.05) and never read was 40.5% (95% CI: 35.37, 45.87). By location, older persons in urban areas showed the highest prevalence of always read [21.3% (95% CI: 16.81, 26.68)] and sometimes read [40.2% (95% CI: 35.10, 45.44)] food labels. Females showed the highest prevalence of always read [21.3% (95% CI: 16.89, 26.42)] and sometimes read [41.5% (95% CI: 37.26, 45.78)] meanwhile, male older persons [43.8% (95% CI: 37.77, 50.07)] showed the highest prevalence of never read food labels.

By ethnicity, Others had the highest prevalence of always reading [29.4% (95% CI: 14.68, 50.16)] and never read [58.3% (95% CI: 38.65, 75.65)] food labels. The prevalence of sometimes read food labels was highest among Indians at 45.4% (95% CI: 32.91, 58.48). By marital status, married & cohabiting older persons showed higher prevalence of always read [20.9% (95% CI: 17.13, 25.15)] and sometimes read [41.9% (95% CI: 37.27, 46.66)] food labels compared to single older persons. Single older persons [48.6% (95% CI: 43.22, 53.99) showed the highest prevalence of never read food labels. By educational level, the prevalence of always read food labels was highest among those with tertiary education level [47.2 % (95% CI: 32.59, 62.24)] and the prevalence of sometimes read food labels was higher among those with secondary education level [48.8% (95% CI: 44.22, 53.39)]. Older persons with no formal education [70.2% (95% CI: 63.28, 76.23)] showed highest prevalence for never read food labels. There were also no significant differences in the prevalence for always, sometimes and never read food labels among employed and unemployed older persons.

The prevalence of always read food labels was highest among those from the B40 group [20.1% (95% CI: 16.26, 24.48)] and sometimes read food labels was highest among those from the M40 group (49.3% (95% CI: 42.35, 56.20)]. Meanwhile, never reading food labels was highest among those from the T20 group [47.5% (95% CI: 34.12, 61.33)] **(Table 10.8)**.

Based on types of information on food labels, most of the older persons always read and sometimes read about expiry date at 98.4% (95% CI: 94.50, 99.55) and 94.7% (95% CI: 92.72, 96.18) respectively. Among older persons who always read food labels, the least-read information was energy icon [18.8% (95% CI: 13.21, 26.16)] and among those who sometimes read food labels, the least-read information was energy icon [5.5% (95% CI: 3.59, 8.34)].

Among those who always read nutrition facts, the findings showed that the most nutritional information read was total sugars [78.4%CI: 67.97, 86.16)] followed by fat content [63.5% (95% CI: 52.90, 72.92)] and total energy or calorie [63.0% (95% CI: 49.98, 74.29)].

Similarly, among those who sometimes read nutrition facts, the findings showed that the top three of nutritional information items read were total sugars [78.4% (95% CI: 67.97, 86.16)] followed by fat content [63.5% (95% CI: 52.90, 72.92)] and total energy or calorie [63.0% (95% CI: 49.98, 74.29)] **(Table 10.9)**. Among those who always read HCL, 46.7% (95% CI: 33.04, 60.82) older persons always choose HCL products. Meanwhile, among those who sometimes read HCL labels, the majority [65.8% (95% CI: 46.46-81.05)] also sometimes chose HCL products, while only 9.6% (95% CI: 2.87–27.47) reported always choosing them **(Table 10.10)**.

Conclusion

This survey shows that more than half of adolescents, adults, and older persons in Malaysia, read food labels when the “always” and “sometimes” categories are combined. The behaviour is more common among those living in urban areas, females, and individuals from the M40 income group. Compared to NHMS 2014 [4], the prevalence of food labels reading among adults shows an improving trend, while the prevalence of food labels reading among adolescents shows a decreasing trend compared to NHMS 2017 [8].

Table 10.1: Trend in the prevalence of food labels reading among adolescents and adults

Reading food labels	Adolescents		Adults	
	NHMS 2017 (%)	NHMS 2024 (%)	NHMS 2014 (%)	NHMS 2024 (%)
Always	33.2	18.1	23.0	31.6
Sometimes	51.3	53.2	22.0	45.7
Never	15.5	28.7	55.0	22.7

More than 90% of adolescents, adults, and older persons read expiry dates on food labels. Adolescents, adults, and older persons in Malaysia are more concerned about fat and total sugars than with other nutrients. This survey also reveals that Malaysian adolescents, adults, and older persons read the HCL less frequently when buying or receiving foods. However, among those who read the HCL logo, the majority chose products bearing the logo.

Recommendations

1. Incorporate policy interventions from the list of the World Health Organisation's "best buys" and other recommended interventions for front of pack (FOP) labelling by implementing mandatory FOP labelling.
2. Increase consumer awareness in retail settings by promoting nutrition labelling and HCL in supermarkets and convenience stores across Malaysia.
3. Encourage consumers to recognize and choose food and beverage products with HCL by producing engaging videos on food and nutrition labels and disseminate them through social media, print, and electronic channels.
4. Empower adults and adolescents by leveraging Key Opinion Leaders (KOLs) to raise awareness on food and nutrition labelling and encourage label reading in their daily lives.
5. Strengthen Public-Private Partnerships (PPP) by collaborating with industries to organize roadshows and campaigns to promote food label literacy and healthy choices.
6. Empower parents and teachers to educate children on how to read food labels through structured programs like Jurulatih Utama (JU) Cara Hidup Anda Terbaik (C-HAT) and expand to childcare centres and kindergartens by including food and nutrition label reading as part of their syllabus curriculum.
7. Empower communities in rural areas and low-income groups by organizing educational initiatives through Program Community Feeding (PCF) to improve food and nutrition label literacy.
8. Enhance enforcement activities for prepackaged products in terms of quantitative ingredients declaration (QUID) and food additives are declared according to Food Regulations 1985.

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Table 10.2: Prevalence of reading food labels among adolescents (10-19 years) in Malaysia by sociodemographic characteristics (n=1,031)

Sociodemographic characteristics	Always read					Sometimes read				
	Count	Estimated population	Prevalence (%)	95% CI		Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)				Lower (%)	Upper (%)
MALAYSIA	182	951,617	18.0	14.99	21.51	570	2,811,179	53.2	48.95	57.49
Location										
Urban	92	720,549	18.4	14.66	22.95	260	2,046,585	52.4	47.14	57.60
Rural	90	231,068	16.8	13.04	21.44	310	764,594	55.7	48.72	62.41
Sex										
Male	90	509,376	18.5	14.77	23.03	276	1,430,804	52.1	46.88	57.26
Female	92	442,241	17.5	13.75	21.91	294	1,380,375	54.5	49.17	59.72
Ethnicity										
Malay[a]	116	344,878	16.3	13.01	20.16	391	1,135,998	53.6	47.85	59.24
Chinese	25	96,673	19.2	12.94	27.54	63	233,866	46.5	35.19	58.11
Indian	10	-	-	-	-	30	92,970	53.6	36.60	69.83
Other Bumiputera	27	93,308	20.6	13.59	30.01	71	250,668	55.4	43.17	66.98
Others	4	-	-	-	-	15	108,144	52.8	33.11	71.61
Household Income Group										
B40	123	557,162	16.3	13.21	19.94	383	1,837,215	53.7	48.29	59.12
M40	43	285,371	22.3	15.75	30.53	130	667,240	52.1	44.18	59.91
T20	16	109,084	20.1	11.27	33.28	52	279,745	51.6	35.10	67.69

a - Malay includes Orang Asli

Sociodemographic Characteristics	Never read				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)
MALAYSIA	279	1,516,832	28.7	24.25	33.67
Location					
Urban	144	1,139,111	29.2	23.84	35.12
Rural	135	377,720	27.5	19.98	36.57
Sex					
Male	152	806,458	29.4	24.33	34.95
Female	127	710,374	28.0	22.55	34.28
Ethnicity					
Malay[a]	185	638,748	30.1	24.32	36.67
Chinese	41	172,829	34.3	24.49	45.74
Indian	13	-	-	-	-
Other Bumiputera	28	108,604	24.0	14.43	37.16
Others	12	72,433	35.3	17.58	58.35
Household Income Group					
B40	194	1,023,791	30.0	24.81	35.65
M40	59	328,221	25.6	18.83	33.85
T20	25	153,718	28.3	16.19	44.72

Table 10.3: Types of food label information among always and sometimes read by adolescents (10-19 years) in Malaysia

Type of information	Always read (n=182)					Sometimes read (n=570)				
	Count	Estimated population	Prevalence (%)	95% CI		Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)				Lower (%)	Upper (%)
Nutrition facts	91	492,870	51.8	42.55	60.92	200	1,036,161	36.9	31.17	42.94
Total energy or calorie	65	378,021	76.7	64.73	85.51	100	512,215	49.4	41.38	57.52
Carbohydrate content	55	308,666	62.6	49.32	74.26	80	427,540	41.3	33.74	49.22
Total sugars	68	359,050	72.8	64.57	79.80	123	659,659	63.7	54.96	71.55
Protein content	69	356,435	72.3	57.99	83.18	97	515,035	49.7	41.04	58.39
Fat content	67	383,472	77.8	63.61	87.55	108	560,077	54.1	45.27	62.59
Fibre content	44	238,329	48.4	34.28	62.69	45	243,027	23.5	18.43	29.36
Vitamin content	55	326,912	66.3	52.07	78.12	83	411,864	39.7	32.98	46.93
Mineral content	44	253,470	51.4	39.44	63.25	64	350,545	33.8	25.87	42.82
Salt/sodium content	43	237,868	48.3	35.61	61.14	57	318,867	30.8	24.41	37.96
Healthier choice logo	68	371,186	39.0	31.14	47.49	138	662,484	23.6	18.95	28.90
Energy icon	64	345,684	36.3	27.61	46.05	109	539,076	19.2	15.58	23.37
List of ingredients	67	377,293	39.6	32.02	47.82	135	716,129	25.5	20.60	31.05
Nutrition claims	76	419,578	44.1	36.52	51.95	168	901,514	32.1	26.56	38.13
Expiry date	174	904,004	95.0	89.39	97.72	519	2,538,696	90.3	85.78	93.50
Food additives	37	237,241	24.9	18.54	32.64	46	255,230	9.1	6.55	12.45
Storage instructions	64	375,396	39.4	30.95	48.63	101	571,788	20.3	16.37	24.99

Table 10.4: Frequency of choosing healthier choice logo products among adolescents (10-19 years) in Malaysia who always and sometimes read those logos

Healthier Choice Logo products	Always read (n=68)					Sometimes read (n=138)				
	Count	Estimated population	Prevalence (%)	95% CI		Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)				Lower (%)	Upper (%)
Always choose	35	176,287	31.57	63.95	60.92	21	492,870	51.8	42.55	60.92
Sometimes choose	27	159,714	28.25	59.16	47.49	89	371,186	39.0	31.14	47.49
Never choose	6	35,184	3.70	22.20	46.05	28	345,684	36.3	27.61	46.05

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Table 10.5: Prevalence of reading food labels among adults (18 years and above) in Malaysia by sociodemographic characteristics (n=1,433)

Sociodemographic Characteristics	Always read					Sometimes read				
	Count	Estimated population	Prevalence (%)	95% CI		Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)				Lower (%)	Upper (%)
MALAYSIA	432	7,658,103	31.6	27.27	36.20	622	11,088,701	45.7	40.61	50.90
Location										
Urban	248	6,121,640	32.9	27.57	38.67	313	8,416,055	45.2	38.94	51.61
Rural	184	1,536,463	27.2	21.96	33.25	309	2,672,646	47.4	40.35	54.51
Sex										
Male	173	3,916,543	30.4	25.09	36.24	263	5,856,032	45.4	38.56	52.45
Female	259	3,741,560	32.9	27.20	39.19	359	5,232,669	46.0	40.04	52.15
Ethnicity										
Malay[a]	209	3,559,615	29.3	24.65	34.43	331	5,843,505	48.1	42.20	54.06
Chinese	60	1,423,656	28.0	20.73	36.65	95	2,048,497	40.3	30.17	51.32
Indian	23	461,124	31.1	21.27	43.02	36	718,159	48.5	36.01	61.10
Other Bumiputera	102	756,309	29.8	21.31	39.89	115	976,565	38.4	29.66	48.04
Others	38	793,690	28.1	15.51	45.32	45	1,048,459	37.1	22.35	54.65
Marital Status										
Single[b]	137	2,878,144	31.4	24.20	39.73	195	4,294,501	46.9	39.56	54.42
Married or cohabiting	295	4,779,959	31.7	27.03	36.72	426	6,783,632	45.0	39.21	50.84
Education Level										
No Formal Education	27	313,020	17.6	9.46	30.26	48	492,033	27.6	17.79	40.15
Primary School	53	435,091	16.3	10.70	24.03	101	1,130,094	42.3	30.58	55.01
Secondary School	286	5,158,963	31.4	26.40	36.90	421	8,060,878	49.1	43.59	54.60
Tertiary Education	65	1,736,402	52.4	39.19	65.22	51	1,366,061	41.2	29.06	54.51
Occupation										
Government Employee	42	607,325	43.4	28.63	59.39	44	716,970	51.2	35.80	66.38
Private Employee	119	2,749,272	30.8	23.35	39.48	148	4,107,083	46.1	37.57	54.78
Self Employed	74	1,361,030	35.6	26.34	46.03	116	1,748,952	45.7	36.11	55.65
Not Working[c]	195	2,923,752	29.8	23.94	36.51	300	4,303,445	43.9	37.20	50.90
Household Income Group										
B40	298	4,380,575	29.8	24.96	35.15	445	6,613,468	45.0	39.84	50.28
M40	101	2,464,954	35.8	28.83	43.46	121	3,107,505	45.1	35.12	55.59
T20	30	789,271	32.6	21.22	46.41	51	1,197,573	49.4	35.24	63.68

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Sociodemographic Characteristics	Never read				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)
MALAYSIA	379	5,513,629	22.7	18.62	27.43
Location					
Urban	176	4,081,785	21.9	16.93	27.89
Rural	203	1,431,844	25.4	20.24	31.32
Sex					
Male	181	3,121,717	24.2	18.56	30.93
Female	198	2,391,912	21.0	16.38	26.61
Ethnicity					
Malay[a]	155	2,744,656	22.6	17.84	28.18
Chinese	84	1,611,596	31.7	23.57	41.13
Indian	14	302,778	20.4	11.47	33.71
Other Bumiputera	91	807,502	31.8	21.94	43.59
Others	35	986,536	34.9	18.33	56.10
Marital Status					
Single[b]	144	1,979,335	21.6	15.64	29.11
Married or cohabiting	234	3,526,156	23.4	18.80	28.65
Education Level					
No Formal Education	111	978,302	54.9	40.58	68.38
Primary School	93	1,104,789	41.4	29.06	54.88
Secondary School	166	3,201,950	19.5	15.58	24.13
Tertiary Education	8	-	-	-	-
Occupation					
Government Employee	7	-	-	-	-
Private Employee	74	2,060,802	23.1	16.23	31.80
Self Employed	64	715,827	18.7	13.34	25.60
Not Working[c]	223	2,567,963	26.2	20.73	32.56
Household Income Group					
B40	303	3,701,207	25.2	20.55	30.47
M40	54	1,310,367	19.0	12.33	28.22
T20	15	-	-	-	-

Table 10.6: Types of food label information among always and sometimes read by adults (18 years and above) in Malaysia

Type of information	Always read (n=432)					Sometimes read (n=622)				
	Count	Estimated population	Prevalence (%)	95% CI		Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)				Lower (%)	Upper (%)
Nutrition facts	204	3,921,359	51.2	42.49	59.85	197	3,729,576	33.6	27.97	39.82
Total energy or calorie	119	2,189,224	55.8	46.01	65.21	91	1,802,335	48.3	38.54	58.25
Carbohydrate content	110	1,852,470	47.2	37.71	56.98	75	1,252,898	33.6	26.51	41.50
Total sugars	166	3,061,818	78.1	67.57	85.90	139	2,730,182	73.2	63.08	81.37
Protein content	110	2,045,599	52.2	42.61	61.56	76	1,581,700	42.4	32.26	53.24
Fat content	131	2,274,853	58.0	48.32	67.12	106	1,804,781	48.4	36.76	60.20
Fibre content	89	1,487,397	37.9	28.25	48.68	51	877,159	23.5	16.53	32.33
Vitamin content	105	1,907,156	48.8	37.61	60.17	69	1,379,188	37.0	27.50	47.59
Mineral content	92	1,543,248	39.4	29.35	50.34	59	1,219,141	32.7	23.72	43.13
Salt/sodium content	104	1,723,942	44.0	34.11	54.32	71	1,177,389	31.6	22.35	42.50
Healthier choice logo	128	2,232,332	29.1	21.70	37.91	101	1,876,434	16.9	13.18	21.46
Energy icon	100	2,050,534	26.8	19.17	36.06	67	1,538,657	13.9	9.70	19.46
List of ingredients	192	3,243,746	42.4	32.71	52.62	140	3,148,520	28.4	22.47	35.17
Nutrition claims	177	3,138,579	41.0	33.19	49.26	199	4,102,975	37.0	29.96	44.64
Expiry date	414	7,341,238	95.9	91.51	98.03	595	10,832,188	97.7	96.54	98.46
Food additives	92	1,532,593	20.0	14.61	26.78	47	964,406	8.7	6.01	12.42
Storage instructions	145	2,427,516	31.7	24.65	39.71	133	3,155,686	28.5	21.48	36.64

Table 10.7: Frequency of choosing healthier choice logo products among adults (18 years and above) in Malaysia who always and sometimes read those logos

Healthier Choice Logo products	Always read (n=126)					Sometimes read (n=101)				
	Count	Estimated population	Prevalence (%)	95% CI		Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)				Lower (%)	Upper (%)
Always choose	58	1,047,471	47.4	32.71	62.49	13	346,705	18.5	6.97	40.69
Sometimes choose	53	904,920	40.9	28.16	55.04	73	1,221,442	65.1	45.56	80.60
Never choose	15	258,864	11.7	6.99	18.96	15	308,286	16.4	8.47	29.45

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Table 10.8: Prevalence of reading food labels among older persons (60 years and above) in Malaysia by sociodemographic characteristics (n=1,784)

Sociodemographic Characteristics	Always read					Sometimes read				
	Count	Estimated population	Prevalence (%)	95% CI		Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)				Lower (%)	Upper (%)
MALAYSIA	333	741,122	19.6	15.99	23.89	704	1,504,054	39.9	35.80	44.05
Location										
Urban	187	623,624	21.3	16.81	26.68	339	1,174,167	40.2	35.10	45.44
Rural	146	117,497	13.8	10.81	17.50	365	329,888	38.8	34.51	43.27
Sex										
Male	139	334,806	18.0	14.35	22.26	317	712,069	38.2	32.84	43.89
Female	194	406,316	21.3	16.89	26.42	387	791,985	41.5	37.26	45.78
Ethnicity										
Malay[a]	190	535,177	19.3	15.46	23.78	434	1,220,257	44.0	39.30	48.74
Chinese	86	360,116	19.7	13.23	28.19	175	686,064	37.4	30.45	45.00
Indian	14	63,169	15.3	7.47	28.92	48	186,829	45.4	32.91	58.48
Other Bumiputera	33	109,043	21.8	14.05	32.12	40	139,168	27.8	19.01	38.63
Others	10	81,161	29.4	14.68	50.16	7	-	-	-	-
Marital Status										
Single[b]	89	188,441	16.9	12.23	22.89	192	384,792	34.5	29.72	39.64
Married or cohabiting	244	552,681	20.9	17.13	25.15	509	1,110,080	41.9	37.27	46.66
Education Level										
No Formal Education	45	62,432	8.5	5.13	13.75	92	156,835	21.3	16.86	26.65
Primary School	71	129,190	11.9	8.41	16.64	210	414,404	38.2	32.03	44.87
Secondary School	194	463,405	26.5	22.03	31.46	372	854,098	48.8	44.22	53.39
Tertiary Education	23	86,095	47.2	32.59	62.24	29	75,681	41.5	27.77	56.61
Occupation										
Employed	77	143,476	19.5	14.44	25.86	154	289,654	39.41	33.73	45.39
Unemployed	254	590,523	19.9	16.00	24.45	537	1,178,557	39.7	35.41	44.14
Household Income Group										
B40	260	575,405	20.1	16.26	24.48	525	1,104,932	38.5	33.58	43.71
M40	49	110,759	18.7	11.69	28.42	137	292,541	49.3	42.35	56.20
T20	15	31,052	16.9	9.35	28.56	27	65,443	35.6	22.86	50.72

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed

Sociodemographic Characteristics	Never read				
	Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)
MALAYSIA	747	1,528,817	40.5	35.37	45.87
Location					
Urban	330	1,125,956	38.5	32.14	45.30
Rural	417	402,861	47.4	42.31	52.51
Sex					
Male	356	816,651	43.8	37.77	50.07
Female	391	712,166	37.3	32.06	42.81
Ethnicity					
Malay[a]	385	1,019,998	36.8	31.98	41.79
Chinese	217	786,062	42.9	32.86	53.56
Indian	43	161,582	39.3	25.31	55.22
Other Bumiputera	76	252,960	50.5	41.53	59.39
Others	26	161,058	58.3	38.65	75.65
Marital Status					
Single[b]	296	541,755	48.6	43.22	53.99
Married or cohabiting	451	987,061	37.3	31.40	43.49
Education Level					
No Formal Education	303	515,485	70.2	63.28	76.23
Primary School	260	539,907	49.8	42.31	57.36
Secondary School	173	432,874	24.7	20.93	28.97
Tertiary Education	6	20,768	11.4	5.64	21.61
Occupation					
Employed	151	301,804	41.1	34.34	48.14
Unemployed	582	1,200,100	40.4	34.88	46.21
Household Income Group					
B40	596	1,188,171	41.4	35.62	47.47
M40	95	190,545	32.1	24.01	41.40
T20	34	87,450	47.5	34.12	61.33

Table 10.9: Types of food label information among always and sometimes read by among older persons (60 years and above) in Malaysia

Type of information	Always read (n=333)					Sometimes read (n=704)				
	Count	Estimated population	Prevalence (%)	95% CI		Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)				Lower (%)	Upper (%)
Nutrition facts	115	299,144	40.4	33.80	47.30	146	342,082	22.7	17.90	28.45
Total energy or calorie	71	188,322	63.0	49.98	74.29	62	136,500	39.9	30.16	50.52
Carbohydrate content	70	172,713	57.7	45.44	69.14	53	116,063	33.9	26.18	42.64
Total sugars	94	234,593	78.4	67.97	86.16	95	225,073	65.8	55.13	75.07
Protein content	61	150,583	50.3	38.72	61.92	49	110,065	33.2	23.97	41.65
Fat content	74	189,930	63.5	52.90	72.92	73	161,290	47.1	37.48	57.04
Fibre content	54	138,028	46.1	34.61	58.10	41	93,247	27.3	18.63	38.01
Vitamin content	64	159,008	53.2	44.19	61.92	48	117,849	34.5	26.59	43.26
Mineral content	59	147,398	49.3	39.86	58.74	46	108,178	31.6	23.76	40.70
Salt/sodium content	64	160,032	53.5	41.24	65.34	59	136,423	39.9	30.15	50.48
Healthier choice logo	62	148,213	20.0	15.16	25.92	57	121,916	8.1	5.97	10.92
Energy icon	54	139,671	18.8	13.21	26.16	40	82,613	5.5	3.59	8.34
List of ingredients	130	331,165	44.7	37.15	52.47	114	280,340	18.6	14.35	23.85
Nutrition claims	119	286,232	38.6	29.07	49.14	145	363,588	24.2	20.09	28.79
Expiry date	330	729,349	98.4	94.50	99.55	668	1,424,443	94.7	92.72	96.18
Food additives	63	170,715	23.0	16.20	31.66	33	76,242	5.1	3.07	8.25
Storage instructions	106	259,970	35.1	25.93	45.47	125	305,813	20.3	16.03	25.46

Table 10.10: Frequency of choosing healthier choice logo products older persons (60 years and above) in Malaysia who always and sometimes read those logos

Healthier Choice Logo products	Always read (n=62)					Sometimes read (n=57)				
	Count	Estimated population	Prevalence (%)	95% CI		Count	Estimated population	Prevalence (%)	95% CI	
				Lower (%)	Upper (%)				Lower (%)	Upper (%)
Always choose	26	67,700	46.7	33.04	60.82	4	11,656	9.6	2.87	27.47
Sometimes choose	24	52,052	35.9	26.46	46.54	39	80,259	65.8	46.46	81.05
Never choose	11	25,303	17.4	8.03	33.82	14	30,001	24.6	13.07	41.47

11. Food Insecurity

11. Food Insecurity

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Introduction

Malaysia embraced the Food and Agriculture Organization of the United Nations (FAO) definition of food security in 2002, which defines it as a situation where all individuals, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and preferences for an active and healthy life. This definition encompasses the ability of individuals to obtain a food supply that is sufficient in quantity and quality, culturally acceptable, and available at all times throughout the year [1].

The Food Insecurity Experience Scale (FIES), developed by FAO, the International Fund for Agricultural Development (IFAD), and the World Food Programme (WFP), is utilised to evaluate individuals' experiences with food insecurity. The FIES is a reliable and validated tool that has been utilized by Non-Governmental Organizations (NGOs), governments, and researchers to monitor and assess food security policies and programs in both developed and developing nations [2]. One key advantage of the FIES is facilitate cross-country and regional comparisons of food insecurity levels. Policymakers and government agencies utilize the data acquired from the FIES index to determine vulnerable areas and social groups within the country that require social protection, as well as to develop poverty alleviation programs and enhance living conditions [2].

Beyond the issue of hunger, the global prevalence of moderate or severe food insecurity (SDG Indicator 2.1.2) continues to be significantly higher than pre-pandemic levels, exhibiting little change over the past four years. This trend emerged after the substantial increase observed between 2019 and 2021, primarily attributed to the COVID-19 pandemic. In 2023, an estimated 28.9% of the global population, comprising approximately 2.33 billion individuals, experienced moderate or severe food insecurity indicating a lack of consistent access to sufficient and nutritious food. These figures encompass 10.7% of the population, or over 864 million people, who were severely food insecure, having resorted to food shortages at times during the year and, in extreme cases, enduring an entire day or more without sustenance. Notably, the prevalence of severe food insecurity at the global level experienced a gradual rise from 9.1% in 2019 to 11.1% in 2021 and stabilized at 10.8% in 2022 and 10.7% in 2023 [3].

According to FAO, IFAD, UNICEF, WFP and WHO (2024) [3], the prevalence of moderate or severe food insecurity in Malaysia was estimated at 16.7% on average between 2021 and 2023, while the prevalence of severe food insecurity was estimated at 5.8%. However, it is important to note that these estimates are based on model predictions rather than direct measurements.

Objectives

General Objective
To determine the prevalence of food insecurity in Malaysia.

Specific Objectives
1. To determine the prevalence of moderate or severe food insecurity by sociodemographic subgroups.
2. To determine the prevalence of severe food insecurity by sociodemographic subgroups.

Methods

Data on food insecurity was obtained from adult respondents (18 years and above) through face-to-face interview using the validated FIES [3,5].

Variable Definition

Food insecurity was defined as limited access to food, at the level of individuals or households, due to lack of money or other resources [5].

Findings

A total of 3,386 respondents responded to the food insecurity module. The food insecurity questions were answered by 1,477 adults and 1,909 older person respondents. The analysis of FIES data using the Rasch model demonstrated the validity of the FIES measurement. The Infit value was within the normal range of 0.7 to 1.3, and the reliable Rasch reliability value for both was 0.76 among adults and older persons.

Adults

The study found that the prevalence of moderate or severe food insecurity among adult was 8.6% (95% CI: 6.68, 10.48) and severe food security was 1.1% (95% CI: 0.72, 1.42) **(Table 11.1)**.

The prevalence of moderate or severe food insecurity was higher in the rural areas [11.1% (95% CI: 7.62, 14.56)] compared to urban areas [7.8% (95% CI: 5.58, 10.05)]. The prevalence among males and females were 8.2% (95% CI: 5.71, 10.75) and 9.0% (95% CI: 6.88, 11.04) respectively.

By ethnicity, the Others category had the highest prevalence at 17.2% (95% CI: 7.42, 26.89) followed by the Other Bumiputera group at 16.1% (95% CI: 10.03, 22.24), Indians at 8.0% (95% CI: 3.21, 12.85), Malays at 6.6% (95% CI: 4.85, 8.26) and Chinese at 5.8% (95% CI: 3.20, 8.41). The prevalence among singles and married or cohabiting were 8.3% (95% CI: 5.35, 11.31) and 8.7% (95% CI: 6.31, 11.17) respectively. The prevalence of overall moderate or severe food insecurity was highest among those without formal education at 21.5% (95% CI: 11.93, 31.06), not working 9.4% (95% CI: 6.29, 12.58) and those from B40 group [11.9% (95% CI: 9.04, 14.80)] **(Table 11.2)**.

Older Person

Table 11.3 shows that the prevalence of moderate or severe food insecurity among older persons was 6.2% (95% CI: 4.65, 7.72). The prevalence of moderate or severe food insecurity was higher in the rural areas [7.9% (95% CI: 5.44, 10.46)] compared to urban areas [5.6% (95% CI: 3.80, 7.47)]. The prevalence among males and females were 6.3% (95% CI: 4.29, 8.37) and 6.0% (95% CI: 4.59, 7.51) respectively. By ethnicity, Other Bumiputera had the highest prevalence at 15.6% (95% CI: 8.98, 22.13) followed by Malays at 6.7% (95% CI: 4.64, 8.82) and Chinese at 4.4% (95% CI: 2.23, 6.54). The prevalence among singles and married or cohabiting were 7.8% (95% CI: 5.28, 10.27) and 5.5% (95% CI: 3.87, 7.15) respectively. The prevalence of overall moderate or severe food insecurity was highest among those without formal education at 8.6% (95% CI: 5.48, 11.75), and those from employed group [7.9% (95% CI: 4.89, 10.84)].

Conclusion

This study revealed that 8.6% of Malaysian adults experienced moderate or severe food insecurity, with 1.1% experiencing severe food insecurity. Notably, older individuals had a lower prevalence of moderate or severe food insecurity, at 6.2%.

The findings demonstrated that the prevalence of moderate or severe food insecurity in Malaysia was lower (8.6%) than the estimates (16.7%), whilst severe food insecurity was only 1.1% than the estimates (5.8%) reported by the FAO, IFAD, UNICEF, WFP, and the WHO [3].

The findings also indicated that adult respondents from rural areas, those without formal education, those who were not working, female and married and those from B40 income groups were more prone to experiencing moderate or severe food insecurity. Furthermore, with regards by ethnicity, the "Others" and "Other Bumiputera" groups were more likely to encounter moderate or severe food insecurity.

Recommendations

1. Establish a multi-sectoral approach/ programme package to address food insecurity within local communities.
2. Improve food accessibility by expanding affordable food outlets and markets, e.g: kedai harga patut, pasar tani/ tamu.
3. Enhance social safety nets and food assistance aids, (eg: food basket, cash transfer) for the vulnerable groups. Ensure that information on the available support programmes is easily accessible to everyone.
4. Incorporate nutrition components into the national emergency preparedness and response frameworks.
5. Initiate programmes to increase food access through collaboration with local farmers, communities, and organisations (eg. meal delivery services, food banks, community kitchens.)
6. Conduct further research focusing on specific target groups specifically "Other Bumiputera" and "Others", who have reported experiencing severe food insecurity, with inter-sectoral local agencies' involvement.

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Table 11.1: Prevalence of food insecurity by severity among adults (18 years and above) in Malaysia (n=1,477)

Indicators	Estimated Population	Prevalence (%)	95% CI	
			Lower	Upper
Moderate or Severe	2,128,566	8.6	6.68	10.48
Severe	265,540	1.1	0.72	1.42

Table 11.2: Prevalence of moderate and severe food insecurity among adults (18 years and above) in Malaysia by sociodemographic characteristics (n=1,477)

Sociodemographic Characteristics	Estimated Population	Prevalence (%)	95% CI	
			Lower	Upper
MALAYSIA	2,128,566	8.6	6.68	10.48
Location				
Urban	1,488,083	7.8	5.58	10.05
Rural	640,483	11.1	7.62	14.56
Sex				
Male	1,077,558	8.2	5.71	10.75
Female	1,051,008	9.0	6.88	11.04
Ethnicity				
Malay[a]	782,365	6.6	4.85	8.26
Chinese	270,389	5.8	3.20	8.41
Indian	187,710	8.0	3.21	12.85
Other Bumiputera	508,876	16.1	10.03	22.24
Others	468,277	17.2	7.42	26.89
Marital Status				
Single[b]	786,291	8.3	5.35	11.31
Married or cohabiting	1,342,275	8.7	6.31	11.17
Education Level				
No Formal Education	418,715	21.5	11.93	31.06
Primary School	454,781	16.5	11.90	21.01
Secondary School	1,073,416	6.4	4.68	8.16
Tertiary Education	-	-	-	-
Occupation				
Government Employee	-	-	-	-
Private Employee	740,167	8.1	4.98	11.29
Self Employed	319,732	8.3	5.19	11.36
Not Working[c]	956,178	9.4	6.29	12.58
Household Income Group				
B40	1,797,171	11.9	9.04	14.80
M40	264,366	3.8	1.17	6.37
T20	-	-	-	-

a - Malay includes Orang Asli
b - Single includes never married, divorced, separated, and widowed
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 11.3: Prevalence of moderate or severe food insecurity among older persons (60 years and above) in Malaysia by sociodemographic characteristics (n=1,909)

Sociodemographic Characteristics	Estimated Population	Prevalence (%)	95% CI	
			Lower	Upper
MALAYSIA	244,002	6.2	4.65	7.72
Location				
Urban	169,630	5.6	3.80	7.47
Rural	74,372	7.9	5.44	10.46
Sex				
Male	122,365	6.3	4.29	8.37
Female	121,638	6.0	4.59	7.51
Ethnicity				
Malay[a]	196,735	6.7	4.64	8.82
Chinese	83,089	4.4	2.23	6.54
Indian	-	-	-	-
Other Bumiputera	85,330	15.6	8.98	22.13
Others	-	-	-	-
Marital Status				
Single[b]	92,830	7.8	5.28	10.27
Married or cohabiting	151,172	5.5	3.87	7.15
Education Level				
No Formal Education	71,439	8.6	5.48	11.75
Primary School	80,823	7.1	4.95	9.35
Secondary School	84,636	4.7	2.49	6.99
Tertiary Education	-	-	-	-
Occupation				
Employed	59,445	7.9	4.89	10.84
Unemployed	175,480	5.6	4.24	7.02

a - Malay includes Orang Asli
b - Single includes never married, divorced, separated, and widowed

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12. Nutritional Health of Older Persons

12. Nutritional Health of Older Persons

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Introduction

Nutritional health is pivotal in healthy ageing, which is maintained by a state of equilibrium in which nutrient intake and requirements are balanced. Malnutrition among older persons in Malaysia is a significant public health concern driven by aging, socioeconomic factors, and the burden of chronic diseases. The increasing prevalence of malnutrition in the older persons has been associated with several health problems including nutrient deficiency–related symptoms, decreased bone mass leading to osteoporosis, immune dysfunction, and delayed healing and recovery [1]. Malnutrition is not only associated with increased mortality and morbidity but also with physical decline, which affects everyday activities and quality of life in general [2].

In 2018, the national findings of older person's health revealed that the prevalence of at risk of malnutrition or malnourished among older persons in Malaysia was 30.8% [3]. The Health White Paper for Malaysia (HWP) aims to reform the nation's health system to achieve better health and well-being for all. With Malaysia's demographic shift toward an ageing population, healthy ageing has become a key focus, addressing essential domains such as nutrition, mobility, cognitive function, and overall functional ability. Understanding the current nutritional health of older persons is crucial for the establishment of targeted interventions that are in line with the Malaysian Dietary Guidelines for Older Persons, the Elderly Health Services Action Plan 2023–2030, and the National Plan of Action for Nutrition of Malaysia III 2016–2025, with the aim of achieving optimal nutritional well-being among Malaysians [4-6].

Objectives

General Objective

To determine the prevalence of nutritional health among older persons (60 years and above) in Malaysia.

Specific Objective

To determine the prevalence of at risk of malnutrition or malnourished among older persons (60 years and above), by sociodemographic characteristics.

Methods

The nutritional health of the older person was assessed among respondents (60 years and above) through face-to-face interviews using the Mini Nutritional Assessment Short Form (MNA-SF) [7,8]. This tool incorporates anthropometric, dietary, and health status indicators. It consists of two parts. Part 1 consists of five questions assessing recent weight loss, mobility, food intake, psychological stress, and neuropsychological issues, with scores assigned accordingly. Part 2 is the anthropometric component, where calf circumference (CC) was used as an alternative to Body Mass Index (BMI) [8,9] as recommended by the World Health Organization (WHO) [10]. The widest part of the calf was measured using a flexible and non-stretchable SECA measuring tape (SECA 201) to the nearest 0.1 centimetre. The calf circumference measurements were taken twice, and the average value was used for data entry. A local cut-off point for CC was used to compute the final score of MNA-SF. If the CC reading is below 30.1 cm (males) or below 27.3 cm (females), assign a score of "0". If the reading is 30.1 cm and above (males) or 27.3 cm and above (females), assign a score of "3" [11]. The MNA-SF total scores were categorised into three different categories where a score below 8 indicates malnourished, 8-11 indicates at risk of malnutrition and 12-14 represents well-nourished status [8].

Variable Definition

1. Malnourished referred to a score of less than 8.
2. At risk of malnutrition referred to a score of 8-11.
3. Well-nourished referred to a score of 12-14.

Findings

A total of 1860 older persons (60 years and above) responded to the nutritional health module. This study found that the prevalence of being well-nourished was 72.4% (95% CI: 69.20, 75.38), at risk of malnutrition was 24.1% (95% CI: 21.40, 27.03), and malnourished was 3.5% (95% CI: 2.52, 4.84) **(Table 12.2)**.

The prevalence of at risk of malnutrition or malnourished among older persons (60 years and above) was 27.6% (95% CI: 24.62, 30.80) **(Table 12.3)**. The prevalence was higher among individuals residing in rural areas [34.1% (95% CI: 30.09, 38.27)], males [28.1% (95% CI: 24.35, 32.16)], other Bumiputera [46.2% (95% CI: 39.40, 53.06)], those who were single [33.0% (95% CI: 28.54, 37.88)], with no formal education [39.1% (95% CI: 33.18, 45.32)], unemployed [29.1% (95% CI: 25.98, 32.43)], and in the B40 household income group [27.7% (95% CI: 24.66, 30.89)] compared to other categories within their respective groups.

Conclusion

In NHMS 2024, at risk of malnutrition or malnourished among older persons aged 60 years and above was 27.6% and common among those living in rural areas. In comparison with the NHMS 2018, the prevalence of at risk of malnutrition or malnourished among older persons has shown improvement.

Table 12.1: Prevalence of at risk of malnutrition or malnourished among older persons (60 years and above) in NHMS 2018 and NHMS 2024 (%)

	NHMS 2018 (%)	NHMS 2024 (%)
At risk of malnutrition or malnourished	30.8	27.6

Recommendations

1. **Strengthen community-based integrated care for older persons**
   - Establish a long-term care ecosystem inclusive of allied health professionals' services.
   - Expand public–private partnerships to tailor services to individual needs.

2. **Improve nutrition services and access**
   - Enhance delivery of nutrition services nationwide, with special focus on remote, rural, Bumiputera, and other underserved ethnic populations through intra- and intersectoral collaboration.
   - Strengthen meal services with tailored food assistance or financial-based meal options.
   - Empower families and communities with initiatives such as social dining, especially for rural and Bumiputera populations.

3. **Increase screening and early intervention for malnutrition**
   - Implement routine screening for malnutrition among older persons through community outreach programmes (government, NGOs, etc.).
   - Provide nutrition education and support to caregivers to maintain healthy body weight among older persons.

4. **Strengthen policy support for healthy ageing**
   - Develop and enforce government policies on nutrition to support healthy ageing.
   - Establish one-stop centres to coordinate facilities and services for older persons, ensuring accessibility, especially in rural and Bumiputera communities.

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Table 12.2: Prevalence of nutritional health among older persons (60 years and above) in Malaysia (n=1,860)

Classification	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
Well nourished	1,312	2,762,696	72.4	69.20	75.38
At risk of malnutrition	478	919,893	24.1	21.40	27.03
Malnourished	70	133,539	3.5	2.52	4.84

Table 12.3: Prevalence of at risk of malnutrition or malnourished among older persons (60 years and above) in Malaysia by sociodemographic characteristics (n=1,860)

Sociodemographic Characteristics	Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	548	1,053,432	27.6	24.62	30.80
Location					
Urban	229	739,157	25.5	22.00	29.45
Rural	319	314,275	34.1	30.09	38.27
Sex					
Male	247	521,882	28.1	24.35	32.16
Female	301	531,550	27.1	23.45	31.18
Ethnicity					
Malay[a]	320	847,857	30.1	26.47	33.93
Chinese	92	314,938	17.2	13.74	21.23
Indian	41	155,535	39.2	30.28	49.00
Other Bumiputera	71	248,049	46.2	39.40	53.06
Others	24	139,402	44.5	29.75	60.23
Marital Status					
Single[b]	206	384,536	33.0	28.54	37.88
Married or cohabiting	342	668,896	25.2	21.85	28.92
Education Level					
No Formal Education	197	319,157	39.1	33.18	45.32
Primary School	166	317,609	28.6	23.73	34.10
Secondary School	175	386,558	22.8	18.89	27.24
Tertiary Education	8	-	-	-	-
Occupation					
Employed	86	148,871	20.3	15.50	26.10
Unemployed	448	875,849	29.1	25.98	32.43
Household Income Group					
B40	439	806,354	27.7	24.66	30.89
M40	69	140,213	23.7	17.38	31.40
T20	17	49,783	27.4	18.09	39.23

a - Malay includes Orang Asli
b - Never married or divorced or separated or widowed

13. Malaysian Community Salt Intake (MyCoSS 2.0)

13. Malaysian Community Salt Intake (MyCoSS 2.0)

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Introduction

Sodium (Na^+) is essential for cellular functions, but excessive intake contributes to hypertension, a key risk factor for cardiovascular diseases (CVD) [1]. Hypertension prevalence in Malaysia has remained between 30% and 32% for the past 15 years [2-5], and the prevalence of high sodium intake for the adult population in Malaysia was reported at 79% in 2018 [6]. The World Health Organization (WHO) encourages member countries to reduce the average salt (sodium chloride, NaCl) intake to less than 5 g/day (equivalent to 2,000 mg/day) by designing their national salt reduction strategies [7]. In line with this global recommendation, the Ministry of Health (MOH) Malaysia, through the Salt Reduction Strategy to Prevent and Control Non-communicable Disease (NCD) for Malaysia 2021 to 2025, aims to reduce sodium intake by 30% and achieve a target of 6 grams of salt intake/day (approximately 2,400 mg sodium/day) in the population by 2025 [8].

However, addressing sodium intake alone is insufficient. Potassium (K^+) intake is also recommended by the WHO at a minimum of 3,510 mg/day for adults, as it plays a vital role in counterbalancing sodium's effects on blood pressure and supporting cardiovascular health.

Furthermore, a balanced sodium-to-potassium ratio is more critical for health than the intake of either electrolyte alone, with the WHO recommending a nearly 1:1 ratio [9, 10]. However, studies from various populations, including Chile and Jamaica, revealed mean sodium-to-potassium ratios as high as 2:1 to 4:1 [11,12], far exceeding healthy levels. This imbalance increases the risk of hypertension and CVD, highlighting the urgent need for dietary interventions to promote potassium-rich foods and reduce sodium intake [13].

The gold standard for measuring sodium intake is 24-hour urine collection, as it accurately reflects daily sodium excretion and true dietary intake [6]. To complement this method, food frequency questionnaires (FFQs) are often used to provide additional insights into dietary habits [6].

The FFQ was used to assess the frequency and typical portion sizes of foods consumed by the population, to provide insights into their dietary habits, particularly in relation to sodium intake. Identifying the food sources that contribute to sodium intake is an essential step in reducing overall sodium intake [12].

Objectives

General Objective

To determine the prevalence of high sodium and low potassium intake among the adult population in Malaysia.

Specific Objectives

1. To determine the prevalence of high sodium intake among the adult population in Malaysia by socio-demographic characteristics.
2. To determine the prevalence of low potassium intake among the adult population in Malaysia by socio-demographic characteristics.
3. To determine the sodium-to-potassium ratio among the adult population in Malaysia.
4. To determine the main sources of sodium in the diet.

Methods

Sodium and potassium intake were determined using a single 24-hour urine collection involving respondents (18 years and above). Sodium and potassium content in the urine were measured through an indirect ion-selective electrode (ISE) method. Creatinine content in the urine was measured by the Creatinine Jaffee kinetic method (alkaline picrate with Lloyd's reagent) using the ARCHITECT c machine in a laboratory. Suspected inaccurate 24-hour urine samples (e.g., urinary creatinine less than 4 mmol/day for women or less than 6 mmol/ day for men, 24-hour urine collection of less than 500 ml for either sex) and extreme outliers for urinary creatinine (e.g., more than 3 standard deviations (SDs) from the mean) were excluded. Sodium in mmol was converted to mg by multiplying by 23, and to g of salt by dividing by 17. Meanwhile, potassium in mmol was converted to mg by multiplying by 39.1 [6].

Data on main sources of sodium were obtained through face-to-face interview using a validated FFQ [14]. The FFQ used in this study contained 99 food items adapted from previous studies that were frequently consumed and with high salt content (0.25 g and above of salt/serving or 0.1 g and above of sodium/serving) [6,14].

Variable Definition

High sodium intake was defined as urinary sodium more than 2,000 mg/day as recommended by WHO [7]. Low potassium intake was defined as urinary potassium less than 3,500 mg/day [15].

Findings

A 24-hour urine sample was collected from a total of 1,481 respondents. A total of 886 (59.8%) from 1,481 respondents had completed urine samples and fulfilled the creatinine assessment for further analysis. A total of 879 (59.4%) respondents completed the FFQ and provided valid 24-hour urinary sodium data.

Sodium intake

The prevalence of high sodium intake was 75.9 % (95% CI: 70.78, 80.33) as in Table 1. The mean sodium intake was 2,892 mg/day (95% CI: 2,758, 3,026), equivalent to 7.3 grams of salt (95% CI: 7.0, 7.7) as presented in Table 3. The highest prevalence was observed among adults of higher household income [89.5% (95% CI: 68.08, 97.17)], followed by government employees [83.1% (95% CI: 72.27, 90.23)], Indian ethnicity [80.5% (95% CI: 64.02, 90.52)], and males [78.0% (95% CI: 69.78, 84.41)]. **Table 13.1** shows the national prevalence of high sodium intake by socio-demographic characteristics.

Potassium intake

The prevalence of low potassium intake (less than 3,500 mg/day) was high at 98.7% (95% CI: 97.18, 99.42), with a mean intake of 1,141 mg/day (95% CI: 1,097, 1,186).

Sodium-to-Potassium ratio

The mean sodium-to-potassium ratio was 2.81 (95% CI: 2.64, 2.98), indicating an imbalance in sodium and potassium intake. The prevalence of low potassium intake by socio-demographic characteristic is presented in **Table 13.2**, while the mean of potassium intake and sodium-potassium ratio are presented in **Table 13.3**.

Source of sodium in the diet

Table 13.4 demonstrates the top 50 high-sodium foods most commonly consumed by the adult population with high urinary sodium (more than 2,000mg/day) and their mean serving/month.

The findings showed that the most preferred high-sodium foods which was consumed by more than 50% of the population were fried chicken with or without spices [80.8% (95% CI: 75.36, 85.32)], fried vegetable [78.0% (95% CI: 71.40, 83.46)], fried rice [73.8% (95% CI: 68.12, 78.83)], nasi lemak [68.9% (95% CI: 63.68, 73.59)], white bread [63.3% (95% CI: 56.45, 69.64)], instant noodle [61.9% (95% CI: 55.31, 68.07)], fried savoury 'kuih' [57.2% (95% CI: 50.63, 63.47)], omelette (*telur dadar*) [56.7% (95% CI: 49.41, 63.76)], chicken curry [52.7% (95% CI: 46.25, 58.97)] and chicken soup [52.1% (95% CI: 45.77, 58.26)].

In terms of high sodium food intake by items, mean intake (serving/month) ranged from 1.67 serving/month to 16.25 serving/month. Dark soy sauce and light soy sauce had the highest mean intake with mean value of 16.25 and 15.82 serving/month, respectively.

Conclusion

The prevalence and mean for sodium intake were lower than those reported in the previous MyCoSS 2018, which reported a prevalence of 78.6% and a mean intake of 3,167 (95% CI: 2,987, 3,346) mg/day [6]. However, the current sodium intake still exceeds the WHO recommendation of less than 2,000 mg/day and remains above Malaysia's 2021–2025 Salt Reduction Strategy to Prevent and Control NCD target approximately 2,400 mg/day by 2025. Despite that, the mean sodium intake in this study was lower than the global average (4,319 mg/day) [17] and that reported in Asian countries such as Thailand (3,305 mg/day) [16], China (4,318 mg/day) [21], and Nepal (5,232 mg/day) [23]. Additionally, the result was also lower when compared to western countries: the United States (3,608 mg/ day) [18], Australia (3,560 mg/day) [19], and Canada (3,325 mg/d) [25]. However, the mean sodium intake of the current study was found to be higher than that reported in Indonesia (2,364 mg/day) [20] and Bangladesh (2,635 mg/day) [23].

As for the mean potassium intake, the result was lower than the mean global intake of 2,250 mg/day [22], as well as lower than those reported in other countries such as Thailand (1,221 mg/day) [16], China (1,573 mg/day) [21], the United States (2,155 mg/day) [18], and Canada (2,935 mg/day) [24].

In terms of the sodium-to-potassium ratio, the result was higher than the WHO recommendation of 1.0 and above. Although the ratio in the current study was higher than those reported in other countries such as North Saudi Arabia (1.6) [26], New Zealand (2.2) [27] and Slovenia (2.66) [28], it was still lower than the ratios reported in Japan (3.2) [29] and China (5.0) [21].

In conclusion, the prevalence of sodium intake is high while the opposite occurs for potassium intake, and the sodium-to-potassium ratio is high among the adult population in Malaysia. The main sources of sodium were cooked foods and processed or fast foods, followed by sauces and seasonings.

Recommendations

1. **Awareness**
   - Strengthen the implementation of the *Penyajian Hidangan Sihat Semasa Mesyuarat* (PHSSM) initiative by emphasising the selection of menus that are lower in sodium, supported with guidance for caterers and a standardized list of healthier menu options.
   - Implement a community-based program through the *Komuniti Sihat Pembina Negara* (KOSPEN) platform to raise awareness about high salt foods and cooking modifications in addition to emphasizing the need for high-potassium foods including vegetables and fruits.
   - More actively support and promote awareness on the risks of excessive salt intake and educate the public about reading food labels and choosing low sodium food products through all types of media campaigns.
   - Intensify advocacy to target groups by age, especially young people including school children and university students, to increase awareness of the importance and methods of salt reduction.
   - Increase public awareness and skills in assessing sodium content in food through the MOH's Salt Counting Points System (SMART-Na^+) initiative.

2. **Products**
   - Establish minimum sodium standards for selected high-sodium products to encourage reformulation and healthier options.
   - Accelerate the implementation of mandatory maximum sodium levels in high sodium processed foods to provide the availability of healthier food options and mitigate the health risks associated with excessive sodium intake.
   - Increase enforcement actions on compliance of mandatory sodium in food labelling for processed foods to generate informed consumers to reduce salt intake.
   - Increase collaboration with industry to reduce the salt content of widely consumed food products through reformulation measures.
   - Introduce mandatory Nutri-Grade Malaysia (front-of-pack labelling) for high salt products to raise awareness among consumers and encourage the industry to reduce salt content in food products.

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Table 13.1: Prevalence of high sodium intake (more than 2,000mg/day) by sociodemographic characteristics (n=886)

Sociodemographic Characteristics	Unweighted Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	622	18,860,649	75.9	70.78	80.33
Location					
Urban	321	14,511,900	76.3	69.65	81.79
Rural	301	4,348,749	74.7	69.74	79.01
Sex					
Male	289	10,229,791	78.0	69.78	84.41
Female	333	8,630,858	73.6	67.21	79.05
Ethnicity					
Malay[a]	307	9,099,635	73.2	67.60	78.08
Chinese	102	4,037,484	76.0	62.26	85.90
Indian	29	1,222,173	80.5	64.02	90.52
Other Bumiputera	136	1,800,747	67.6	59.43	74.74
Others	48	2,279,709	78.0	55.09	91.12
Marital Status					
Single[b]	187	6,825,422	77.8	68.89	84.66
Married or cohabiting	434	12,025,619	74.9	68.21	80.57
Education Level					
No Formal Education	62	1,187,038	73.4	54.33	86.51
Primary School	90	1,665,742	73.5	62.75	82.02
Secondary School	398	12,744,628	76.1	70.54	80.86
Tertiary Education	69	3,194,763	77.2	59.39	88.66
Occupation					
Government Employee	46	1,321,682	83.1	72.27	90.23
Private Employee	151	6,498,627	75.6	64.61	84.07
Self Employed	111	2,840,584	76.4	66.94	83.83
Not Working[c]	304	7,985,038	74.5	67.42	80.49
Household Income Group					
B40	433	11248369	75.5	70.16	80.20
M40	123	4955723	70.7	58.85	80.23
T20	58	2433840	89.5	68.08	97.17

a - Malay includes Orang Asli
b - Not working includes unemployed, and old age
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 13.2: Prevalence of low potassium intake (less than 3,500 mg/day) by sociodemographic characteristics (n=886)

Sociodemographic Characteristics	Unweighted Count	Estimated Population	Prevalence (%)	95% CI	
				Lower	Upper
MALAYSIA	871	24,536,343	98.7	97.18	99.42
Location					
Urban	432	18,769,051	98.6	96.61	99.45
Rural	439	5,767,292	99.0	95.78	99.77
Sex					
Male	371	11,657,282	98.1	95.08	99.31
Female	500	8,487,851	99.3	98.22	99.76
Ethnicity					
Malay[a]	435	12,264,338	98.6	95.03	99.62
Chinese	125	5,123,205	96.5	91.67	98.54
Indian	37	1,474,690	97.1	83.37	99.56
Other Bumiputera	204	-	-	-	-
Others	70	-	-	-	-
Marital Status					
Single[b]	262	8,660,338	98.7	96.47	99.50
Married or cohabiting	607	15,854,976	98.7	96.43	99.56
Education Level					
No Formal Education	94	1,599,698	98.9	95.33	99.77
Primary School	132	2,225,667	98.2	91.50	99.63
Secondary School	553	16,550,214	98.8	96.49	99.59
Tertiary Education	88	4,078,858	98.5	94.07	99.65
Occupation					
Government Employee	67	-	-	-	-
Private Employee	202	8,399,943	97.8	93.24	99.28
Self Employed	150	3,678,138	98.9	96.86	99.65
Not Working[c]	439	10,629,288	99.2	97.77	99.70
Household Income Group					
B40	619	14,687,137	98.6	95.96	99.54
M40	181	5,811,516	99.8	98.47	99.97
T20	62	6,202,188	96.6	90.52	98.84

a - Malay includes Orang Asli
b - Not working includes unemployed, and old age
c - Not working includes unpaid worker, homemaker, retiree, student, unemployed, health problem and old age

Table 13.3: Mean daily sodium, salt and potassium intake and sodium-to-potassium ration (n=886)

Indicators	Unweighted Count	Estimated Population	Estimate (mean)	95% CI	
				Lower	Upper
Sodium Intake (mg/day)	886	N/A	2,892	2,758	3,026
Salt intake (g/day)	886	N/A	7.346	7.0	7.7
Potassium Intake (mg/day)	886	N/A	1,141	1,097	1,186
Sodium-to-Potassium Ratio	886	N/A	2.81	2.64	2.98

N/A - Not Applicable

Table 13.4: High-sodium foods most commonly consumed in a month by Malaysian adults with high urinary sodium (more than 2,000mg/day) (n=614)

No	Food items	Unweighted count	Estimated population	Population consumed (%)	95% CI		Mean intake (servings/ month)	95% CI	
					Lower	Upper		Lower	Upper
1	Fried chicken with/ without spices	484	N/A	80.83	75.36	85.32	11.78	9.56	14.00
2	Fried vegetables	490	N/A	78.02	71.40	83.46	13.27	11.18	15.36
3	Fried rice	449	N/A	73.83	68.12	78.83	7.79	6.64	8.95
4	*Nasi lemak*	361	N/A	68.85	63.68	73.59	4.35	3.57	5.12
5	White bread	387	N/A	63.29	56.45	69.64	10.18	8.43	11.94
6	Instant noodles	379	N/A	61.90	55.31	68.07	4.60	3.91	5.29
7	Fried savoury *kuih*	343	N/A	57.17	50.63	63.47	11.83	8.74	14.92
8	Omelette *(Telur dadar)*	359	N/A	56.73	49.41	63.76	4.23	3.60	4.87
9	Chicken curry	318	N/A	52.65	46.25	58.97	4.85	4.05	5.65
10	Chicken soup/ *singgang*/ steamed	359	N/A	52.05	45.77	58.26	7.23	5.89	8.57
11	*Roti canai/ paratha*	302	N/A	49.61	42.96	56.27	5.51	4.48	6.54
12	Fried meehoon	328	N/A	48.38	42.13	54.69	4.64	2.71	6.58
13	Processed meat/ nugget/ sausages/ beef patty	267	N/A	46.60	39.61	53.72	4.58	3.43	5.72
14	Tomato/ chilli sauce	290	N/A	46.33	40.18	52.60	9.77	7.64	11.89
15	Fried noodle	343	N/A	46.32	39.42	53.36	3.81	3.19	4.43
16	Chicken rice	248	N/A	45.56	39.17	52.09	3.12	2.57	3.67
17	*Ayam masak kicap*	305	N/A	45.46	38.60	52.49	7.16	5.67	8.66
18	Fried kuetiau	243	N/A	43.46	37.49	49.62	3.02	2.38	3.66
19	*Sambal belacan*	233	N/A	40.80	34.28	47.66	10.48	7.69	13.27
20	Beef/ chicken burger	201	N/A	39.42	32.62	46.66	2.59	2.04	3.14
21	Fried anchovies	257	N/A	38.75	32.59	45.29	2.48	1.79	3.18
22	Fish surimi products	217	N/A	38.24	31.05	45.98	4.98	3.65	6.31
23	Fish soup	281	N/A	37.65	31.56	44.14	5.72	4.59	6.85
24	*Ayam masak sambal*	180	N/A	35.44	29.49	41.87	6.19	4.90	7.47
25	Shrimp paste (*belacan*)	207	N/A	35.38	28.89	42.47	9.21	6.45	11.96
26	*Keropok lekor*	179	N/A	34.83	28.83	41.35	5.76	4.16	7.36
27	Canned fish (sardines/ tuna)	222	N/A	34.64	29.24	40.47	2.90	2.23	3.56

No	Food items	Unweighted count	Estimated population	Population consumed (%)	95% CI		Mean intake (servings/ month)	95% CI	
					Lower	Upper		Lower	Upper
28	Fried potato	147	N/A	33.78	26.94	41.38	2.44	1.69	3.18
29	Light soy sauce	195	N/A	33.65	28.28	39.48	15.82	11.44	20.21
30	Fried prawn	174	N/A	31.18	25.11	37.98	3.27	2.63	3.92
31	Stir Fry vegetables with oyster Sauce	189	N/A	30.36	24.32	37.17	9.39	7.42	11.36
32	Grilled/ baked/ roast chicken	191	N/A	28.70	23.48	34.55	5.49	3.79	7.20
33	Snacks/ crackers	157	N/A	28.02	22.45	34.35	4.42	3.03	5.80
34	Noodle soup	179	N/A	27.82	23.15	33.02	3.21	2.44	3.97
35	*Udang sambal*	121	N/A	27.48	21.38	34.56	3.22	2.09	4.34
36	Flavoured rice	154	N/A	27.27	22.37	32.78	2.76	2.06	3.46
37	*Ikan kering/ masin*	211	N/A	27.09	21.52	33.49	2.60	2.00	3.21
38	Fish/ prawn/ crab/ squid crackers	163	N/A	26.27	21.68	31.43	3.24	2.37	4.12
39	Anchovies *sambal*	175	N/A	24.82	20.18	30.13	1.67	1.22	2.12
40	Fried instant noodles	150	N/A	24.73	19.79	30.42	3.22	2.43	4.00
41	*Ikan masak sambal*	123	N/A	24.22	17.63	32.30	4.23	3.06	5.39
42	*Sambal kicap*	137	N/A	22.57	17.15	29.09	8.35	5.74	10.97
43	Vegetables cooked in coconut milk	150	N/A	22.04	17.23	27.73	2.91	2.06	3.76
44	Dark soy sauce	181	N/A	21.56	16.92	27.06	16.25	7.38	25.12
45	Chicken satay	133	N/A	21.16	16.86	26.20	1.67	1.31	2.04
46	Pasta	100	N/A	21.09	16.21	26.97	3.59	1.95	5.24
47	Hot and spicy fried chicken	71	N/A	19.84	14.72	26.20	4.32	2.69	5.94
48	Beef soup/ *singgang*/ simmered/ steam	123	N/A	19.24	14.31	25.37	1.82	1.37	2.28
49	Salted egg	136	N/A	19.16	14.71	24.58	0.60	0.49	0.71
50	Curry mee	98	N/A	18.88	14.21	24.63	2.47	1.67	3.27

N/A - Not Applicable

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