Food Consumption Patterns: Findings from the Malaysian Adult Nutrition Survey(MANS)

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ABSTRACT

This study reports the food consumption patterns of adults aged 18 to 59 years in the Malaysian Adults Nutrition Survey (MANS) carried out between October 2002 and December 2003. A total of 6,742 subjects comprising 3,274 men and 3,468 women representing the northern, central , southern and east coast of Peninsular Malaysia as well as Sabah and Sarawak were interviewed. A semi-quantitative food frequency questionnaire (FFQ) which consisted of 126 food items was used to evaluate the food consumption pattern (habitual food intake) of the respondents during the previous one- year period. The results demonstrate that *nasi putih* (cooked rice) was consumed by 97% of the population twice daily (average 2½ plates per day). Other food items consumed daily were marine fish, (one medium fish per day), green leafy vegetables (one cup per day) and sweetened condensed milk (three teaspoons per day. The mean frequencies for daily intake of rice, leafy vegetables, marine fish, local *kuih*, anchovy(*ikan bilis*) and biscuits were significantly higher among the rural compared to the urban adults. In contrast, more urban dwellers consumed chicken and eggs more frequently than their rural counterparts. More men than women consumed chicken and eggs more frequently. Malaysian adults showed a satisfactory habit of drinking plain water, with 99% drinking at least six glasses of plain water daily. Other beverages such as tea (47%), coffee (28%), chocolate-based drinks (23%) and cordial syrup

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(11%) were also consumed on daily basis, however, in a smaller proportion of the population. There were differences in the prevalence of daily consumption of foods when comparing urban and rural population, and also between men and women. The prevalence of daily consumption of marine fish among rural and urban adults was 51% and 34% respectively. For sweetened condensed milk, men and women consumed 43% and 28% respectively; however, more women drank full cream milk than men. Between the age groups, 21% of adults below 20 years old consumed chicken at least once a day, while this pattern of intake was not shown in the older age groups. Our findings show that adults, aged 50 to 59 years old, had the highest prevalence of daily consumption of full cream milk with 24% while those aged 18 to 19 years old had the lowest prevalence of daily consumption at 15%. The food consumption pattern of Malaysian adults appears to be satisfactory. However, some changes in food habits are recommended especially in substituting the less wholesome sweetened condensed milk with the more nutritious full cream or skimmed milk.

INTRODUCTION

Food consumption data provide estimation on the quantity of each prepared food consumed by individuals. Food consumption data vary considerably from country to country and even within a country due to variations in ethnicity, geographical areas, age and sex. The World Health Organization (WHO) recommends that individual countries should estimate their own food consumption pattern. This is because data collected from the food consumption pattern can be used for a variety of purposes such as examining the dietary pattern, assessing adequacy of nutrient intake, evaluating the intake and exposure of various contaminants and additives through food as well as establishing policies in agriculture, food production, trade and health.

Food frequency questionnaire (FFQ) has been widely used to evaluate habitual food intake of population-based epidemiological studies. It is usually the preferred method because it is cheap, easy to administer and requires minimal effort from the subjects (Subar, 2004). In food consumption surveys, FFQ can provide estimates on the frequency and quantity of foods consumed by individuals. In food consumption surveys, for example, in countries such as Singapore (Health Promotion Board, 2004), Vietnam (Khoi, Khan & Mai, 2002) and New Zealand (Quigley & Watts, 1997), FFQ had been used to assess food intake in their national surveys.

In food consumption surveys, various types of dietary assessment methods can be used, for example, the 24 hour dietary-recall, 3-day dietary record, food checklist and FFQ. The evaluation technique selected and used for any national consumption survey usually depends on the objective of the survey. Food frequency questionnaire is a useful method to evaluate mean population intake or to categorise intake of individuals based on their food consumption (Kelemen *et al.*, 2003; Kubena, 2000). It has also been used to assess dietary intake of individuals or population in the prevention of diseases. More significantly, according to some earlier studies (Fu *et al.*, 1998; Kim *et al.*, 2003), FFQ

could evaluate the habitual energy and nutrient intake to determine the relationship between changes in food habits and chronic diseases.

This paper reports the food consumption patterns of the Malaysian population using the food frequency questionnaire, as part of the results of the Malaysian Adult Nutrition Survey (MANS) conducted by the Family Health and Development Division, Ministry of Health Malaysia in collaboration with several universities and research institutes. The main objective of the study is to determine the food consumption pattern of Malaysian adults. These data will serve as invaluable baseline data for comparison with other and subsequent MANS.

MATERIAL AND METHODS

Sampling design and sampling size

The methods and conduct of the MANS have been described elsewhere (Ministry of Health Report of Seminar on Findings of MANS, 2007). Briefly, this study was commissioned by the Family Health and Development Division, Ministry of Health Malaysia. Fieldwork was carried out between October 2002 and December 2003. A stratified random sampling with proportional allocation was adopted for this study. Geographically, the survey covered the whole of Malaysia, both the urban and rural areas. The sampling frame was obtained from the Department of Statistics' National Household Sampling Frame (NHSF). Allocation of sample size was assisted by the Department of Statistics. Respondents must be Malaysian and between 18 to 59 years old. Based on this inclusion criteria, a total of 7349 subjects was identified as eligible respondents in this survey but only 6742 subjects comprising 3,274 men and

3,468 women completed the full survey, giving a response rate of 92%. These subjects had been used in the analysis which represents an estimated weighted adult population of 14,178,135. Permission to conduct the study was obtained from the Legal Adviser, Ministry of Health.

Food frequency questionnaire

The FFQ was used to determine the food consumption pattern of the adults. FFQs which had been developed and calibrated for use among the Malay (Noor Azia, 2002) and Chinese Malaysian adults (Chong & Norimah, 2002) were adapted. The adapted FFQ was pre-tested, improved and finally used in this survey. The FFQ consisted of 126 food items which were listed into 15 food groups. The FFQ was administered by interview on a one-to-one basis where subjects were asked on the frequency of intake of each food item either 'per day, per week, per month, per year or never' on the food items listed. Subjects were also requested to respond to the number of servings consumed each time they eat the food. The frequency of intake was based on the habitual intake of the past year. There were five options for frequency of intake categories. This option would reflect the frequency of intake responded by the subjects as number of times per day, number of times per week, number of times per month, number of times per year and never. Each subject was required to provide only one option. However, for food items which were consumed on a seasonal basis, for example, during the fruit seasons or festive seasons, the subject would respond to the frequency of intake at that time (for example consuming rambutan three times a week for a month only) but were requested the duration of intake. Each food item listed was given a standard serving size based on the

Album Saiz Sajian Makanan Malaysia and also the list of food item weight in household measures (Food Portion Sizes of Malaysian Foods Album, 2002/2003). The serving size was based on the medium size. Some of the serving sizes used were piece, one whole fruit, match box size, cups and spoons and others. Additional information on the socio-demographic background of the subjects was also collected.

Conversion of food frequency to amount of food intake

The conversion of food frequency to the amount of food intake was carried out using the following formula:

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

(Wessex Institute of Public Health, 1995)

The conversion factor used to estimate food intake was based on frequency of intake

Frequency of intake	Frequency	Conversion factor
Per day	1X	1
	2X	2
	3X	3
Per week	1X	0.14 (1/7)
	2X	0.29 (2/7)
	3X	0.43 (3/7)
Per month	1X	0.03 (1/30)
	2X	0.07 (2/30)
	3X	0.10 (3/30)

Data analysis

This survey was based on a complex, multi-stage sample design. Data analysis was done using SPSS version 13.0. Data analysis for this survey had taken into account the sample weights and the complex survey design. Weighting of sample data had enabled us to produce estimates of statistics that would have been obtained if the entire sampling frame had been surveyed. Appropriate sample weights were needed to estimate means, standard error, confidence interval and other statistics. Sample weights were used to produce correct population estimates because each respondent does not have the same chance of being selected. The sample weights compensated for unequal probabilities of selection, adjustment for non-response and post stratification for stratum, age and sex.

RESULTS

Demography

Table 1 shows the demographic charac-teristics of the subjects recruited into the survey. The main results had been reported in another paper (Ministry of Health Report of Seminar on Findings of MANS, 2007). Briefly, subjects were recruited from all over Malaysia with the majority coming from the central zone of Peninsular Malaysia and the least from Sabah. There were almost equal proportions of men and women as well as urban and rural subjects. The majority of the subjects were Malays, married, had upper secondary school education and were in the low household income category. With regard to age, the majority were below 40 years of age.

Prevalence and mean frequency of the top 10 daily consumed foods

Table 2 shows the prevalence and mean frequency of the top ten daily consumed foods among Malaysians. Generally 97% of the Malaysian population consumed rice twice a day and on average, 2½ plates of rice

Table 1. Socio-demographic characteristics of subjects of MANS

Characteristics	Proportion (%)	95% Confidence Interval		Total Sample	Estimated Population
		Lower	Upper		
Zone					
South	20.96	20.08	21.87	1,329	2,972,294
Central	38.01	37.06	38.97	2,321	5,388,794
East Coast	11.40	10.91	11.92	943	1,616,847
North	13.31	12.82	13.82	893	1,886,983
Sabah	7.91	7.44	8.41	737	1,121,712
Sarawak	8.40	7.93	8.91	705	1,191,505
Strata					
Urban	59.54	58.16	60.90	3,701	8,441,210
Rural	40.46	39.10	41.84	3,227	5,736,925
Sex					
Men	50.85	49.35	52.36	3,343	7,210,108
Women	49.15	47.64	50.65	3,585	6,968,028
Marital Status					
Unmarried	31.18	29.62	32.78	1,857	4,417,000
Married	64.75	63.15	66.31	4,829	9,172,330
Divorced	1.50	1.17	1.93	85	212,824
Widow	2.57	2.13	3.11	151	364,469
Educational Level					
Primary school	19.06	18.03	20.13	1,435	2,697,449
Lower secondary school	20.35	19.25	21.50	1,482	2,880,629
Upper secondary school	34.63	33.24	36.04	2,304	4,901,071
Matriculation/Form 6	5.56	4.93	6.27	360	786,855
College/University	15.52	14.31	16.82	975	2,196,924
Others	4.88	4.27	5.58	363	691,410
Household Income					
Less than RM1500	50.50	49.03	51.97	3,613	7,160,146
RM1500 - RM3500	35.00	33.62	36.41	2,363	4,962,569
More than RM3500	14.50	13.48	15.58	952	2,055,420
Age group (years)					
18-19	10.22	9.02	11.56	427	1,448,992
20-24	15.86	14.76	17.02	1,042	2,248,568
25-29	14.11	13.21	15.06	1,005	2,000,458
30-34	13.24	12.38	14.15	944	1,877,264
35-39	12.54	11.75	13.38	1,046	1,778,124
40-44	11.05	10.28	11.86	894	1,566,059
45-49	9.43	8.68	10.24	652	1,336,499
50-54	7.40	6.71	8.16	506	1,049,598
55-59	6.15	5.45	6.94	412	872,574

Table 2. Prevalence and mean frequency of top 10 daily consumed foods

Types of foods	Prevalence who answered daily consumption (%)	Mean frequency per day	Total amount consumed daily
Rice	97.15	2.00	2½ plates
Marine Fish	40.78	1.61	1½ medium
Green leafy vegetables	39.89	1.47	1 cup
Sweetened condensed milk	35.33	1.57	3 teaspoons
Powdered milk	17.13	1.41	3 teaspoons
Bread	17.11	1.24	3 slices
Biscuit	16.30	1.25	5 pieces
Local Kuih	16.30	1.25	2 pieces
Chicken Egg	12.06	1.15	1 whole medium
Ikan bilis	11.94	1.24	2 tablespoons

Table 3. Prevalence and mean frequency of top 10 weekly consumed foods

Types of foods	Prevalence who answered weekly consumption (%)	Mean frequency per weekly	Total amount consumed weekly
Bean vegetable	72.65	1.99	1 cup
Chicken egg	72.09	2.50	3 whole medium
Chicken meat	69.09	2.38	3 pieces
Cabbage	66.28	1.79	1 cup
Local kuih	63.45	2.19	4 pieces
Wheat noodles	59.27	2.13	1 bowl
Rice based noodles	58.01	2.01	1 bowl
Bread	56.92	2.47	6 slices
Green leafy vegetables	54.43	2.72	2 cups
Tubers	53.95	1.82	1 cup

per day. This result is expected as rice is the staple food of Malaysians. The other nine food items eaten daily but by a smaller proportion of the population ranged from marine fish, green leafy vegetables to *ikan bilis.* All these latter food items were consumed at least once a day, in amounts ranging from one and half medium fish to 2 tablespoons of *ikan bilis*. The mean frequencies and prevalence of food items eaten daily by the population as well as by strata, sex and age groups are shown in Figure 2 through Figure 5.

Prevalence and mean frequency of the top 10 weekly consumed foods

As Malaysia has an abundance of varieties of foods, the results showed that the majority of Malaysians consume food items more regularly at weekly intervals. Table 3 shows the prevalence and mean frequency of the top 10 weekly consumed foods by Malaysians. The food items range from the cereal group such as wheat noodles, rice based noodles to bread and tubers, vegetables and meat groups. There were a few food items such as green leafy vegetables, bread and chicken egg which appeared both in the daily and weekly consumed foods; however, these foods were eaten by more individuals weekly. Mean frequencies ranged between 1.79 to 2.73 times per week.

Most frequently consumed beverage (daily) by the Malaysian population

Figure 1a shows the most frequently consumed beverages (daily) by the population. Plain water was the most frequently consumed beverage and a majority of the population drank it at least six times daily (assuming intake of a glass each time). Other beverages in descending order such as tea, coffee, chocolate-flavoured drink, and cordial were consumed between 1.8 times to 1.4 times a day (assuming intake of a cup each time). Soft drinks consumption was not in the most frequently consumed list daily. However, this did not imply that the population did not consume soft drinks. A similar pattern was also demonstrated in the types of beverages consumed and their frequencies either in the urban or rural area (Figure 1b).

DISCUSSION

This report discusses the food consumption patterns of Malaysian adults as part of the comprehensive Malaysian Adults Nutrition Survey (MANS) carried out between October 2002 and December 2003. Foods and beverages frequently consumed daily by the population were determined and the consumption patterns of food items consumed daily and weekly by a majority of the population were established. These data will provide an invaluable baseline data for comparison with other and subsequent MANS surveys.

Generally, several food items were consumed daily and weekly by Malaysians. This finding was encouraging as it was in line with the recommendation of the Malaysian Dietary Guidelines (NCCFN, 1999), which advised that the Malaysian population should consume a variety of foods. A diet can be considered as having 'variety' when the diet contains foods in all the food groups in the Malaysian Food Pyramid. Similar recommendations were also suggested in Singapore (Singapore Dietary Guidelines, 2003). Only rice was consumed every day by a majority (97%) of the population. Cooked rice (*nasi putih*) was consumed on average twice daily amounting to 2½ plates of rice per day. Since this is the first time a Nutrition Survey is carried out in
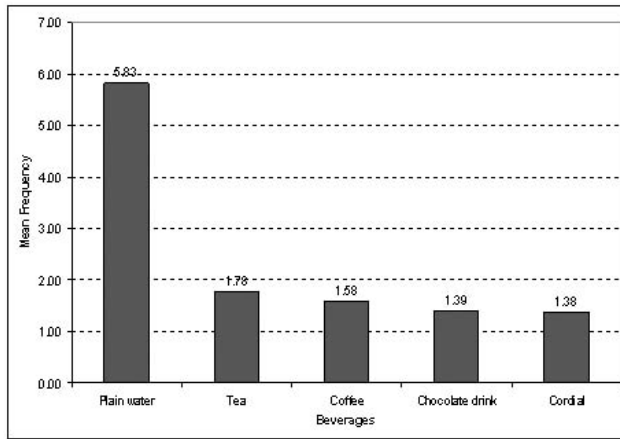
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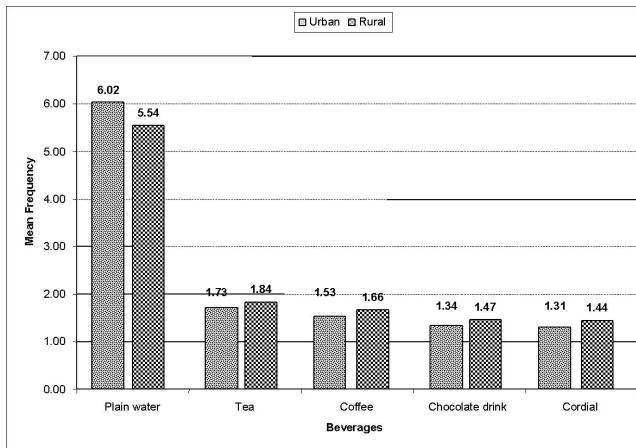**Figure1a**. Mean frequency of beverages consumed daily by population

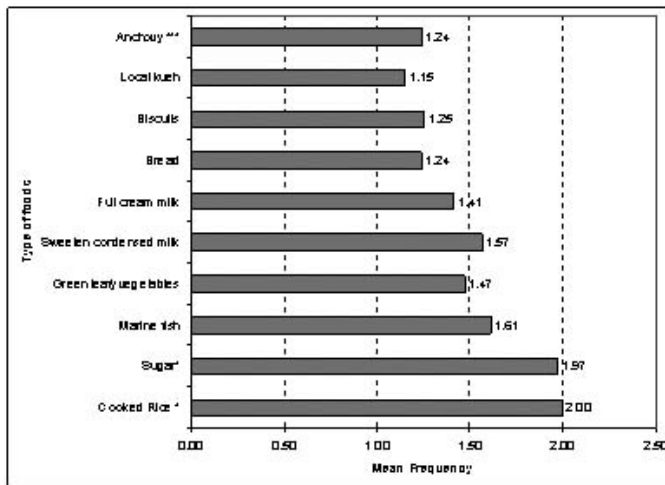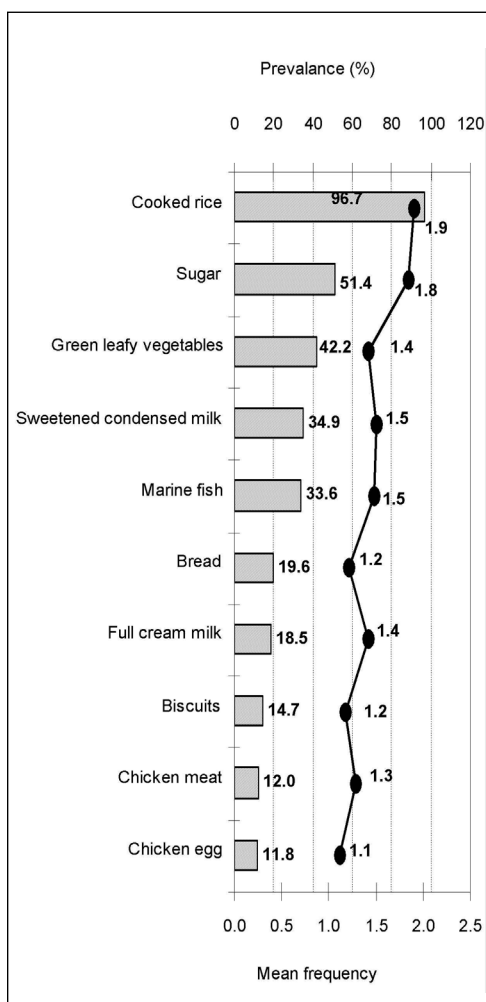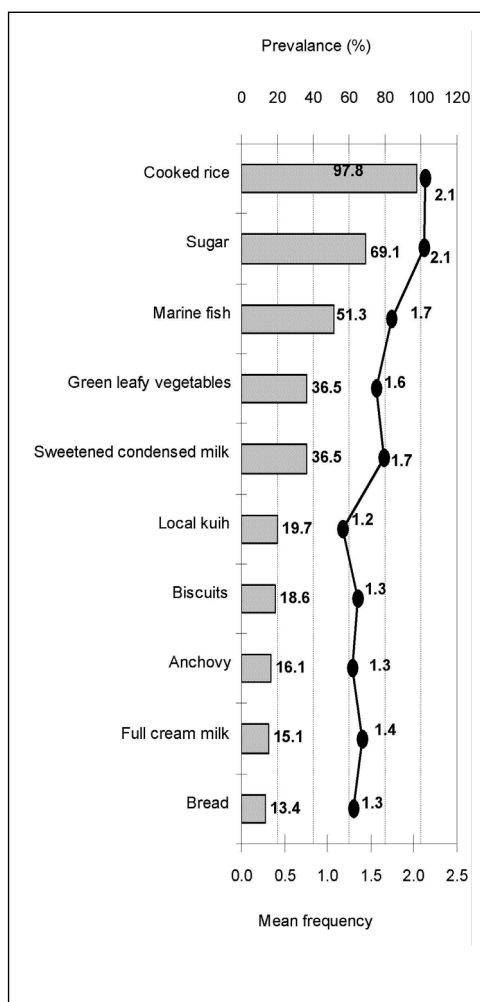**Figure1b.** Mean frequency of beverages consumed daily by stratum

Figure 2. Mean frequency of food items eaten daily by the population
* consumed by more than 50% of the population

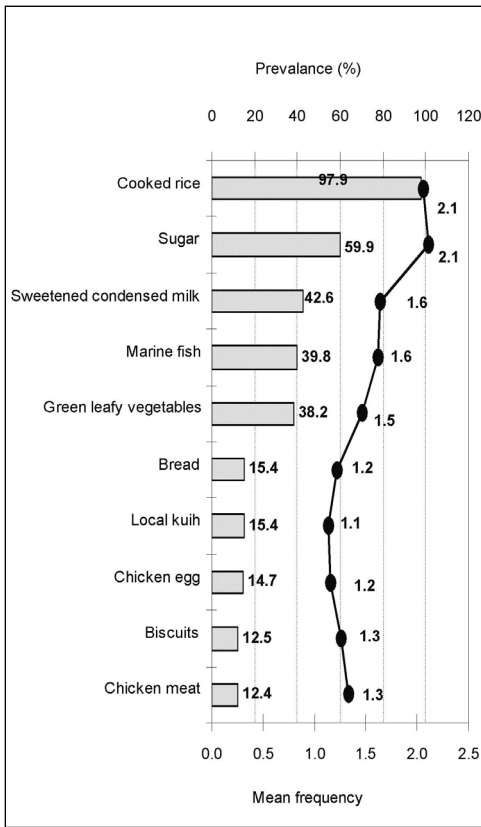**Figure 3a.** Mean frequency and prevalence of food items eaten daily by the urban population

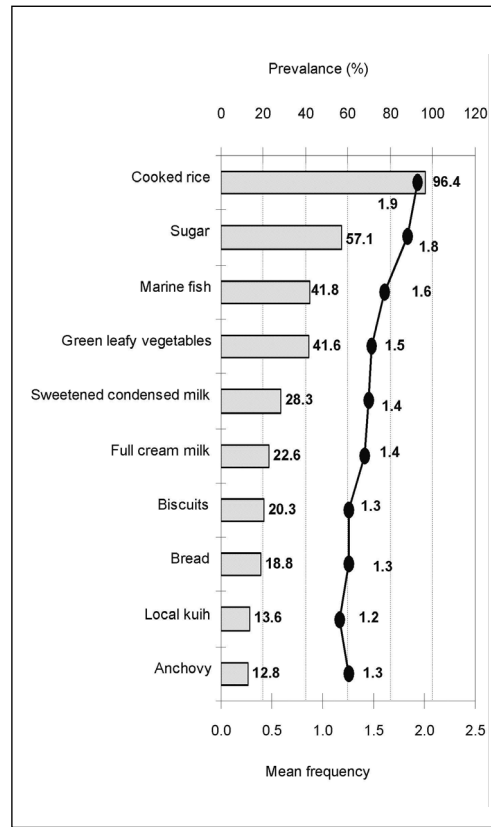**Figure 3b.** Mean frequency and prevalence of food items eaten daily by the rural population

Malaysia, this information is useful for future comparisons. In Korea (Sook, 2003) and Vietnam (Le, Le & Ngyen, 2003), food consumption trends had shown a decrease in rice intake. Similarly, albeit for trends in food availability, Tee (1999) reported that there was a steady decline in calories from cereals from 1960s to the late 1990s in Malaysia.

The other food item consumed daily was sugar (4 teaspoons per day) and

consumed by 59% of population everyday (Figure 2), usually added to beverages such as tea, coffee and chocolate-based drinks. There has been no available report quantifying sugar consumption among Malaysians until MANS. Previous reports were based on food balance sheet data of Malaysia which showed available sugars was estimated to be 86g/day (FAO, 1985; 2002). Other food items eaten daily were fish, particularly marine fish (one and half

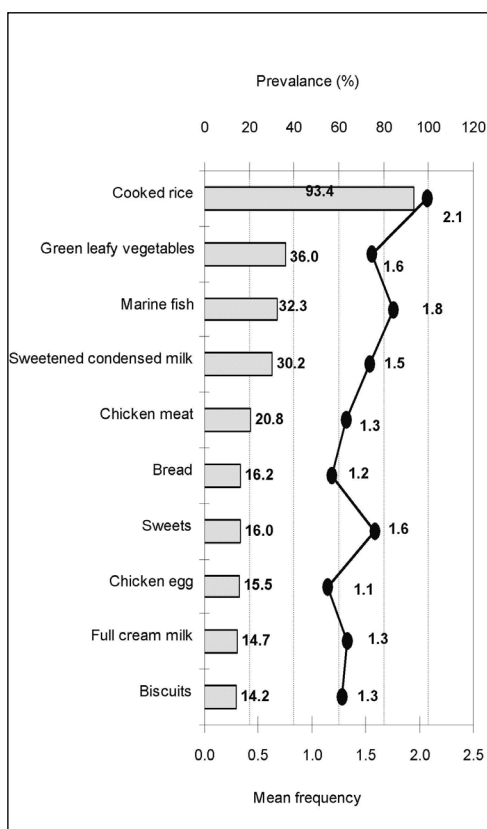**Figure 4a.** Mean frequency and prevalence of food items consumed daily by men

Figure 4b. Mean frequency and prevalence of food items consumed daily by women

medium fish), green leafy vegetables (1 cup) and sweetened condensed milk (3 teaspoons per day). Examples of marine fish consumed were *kembung, tenggiri* and *ikan merah* while green leafy vegetables eaten were spinach, *sawi* and *kangkung*. It should be recognised that Malaysians consumed almost similar foods by strata, sex, and even age groups. (Figures 3a-3b, Figures 4a-4b, Figures 5a-5e). The top four food items frequently consumed were comparable.

Between the rural and urban populations, the frequency of intake of common food items such as rice, sugar, leafy vegetables, marine fish, sweetened condensed milk, *local kueh*, anchovy and biscuits were higher in the rural than among the urban subjects. In contrast urban dwellers were more frequent eaters of chicken and eggs. The same results were found among men, whereby men consumed chicken and eggs more frequently than women. Similar results in Singapore show that men consumed eggs more frequently than women (Yeo, 1998).

There could be several possible reasons for this dietary pattern. The availability with regard to variety and the affordability (price) of these food items (chicken and eggs) might be a reason as to why chicken and egg

Figure 5a. Mean frequency and prevalence of food items consumed daily for age group 18-19
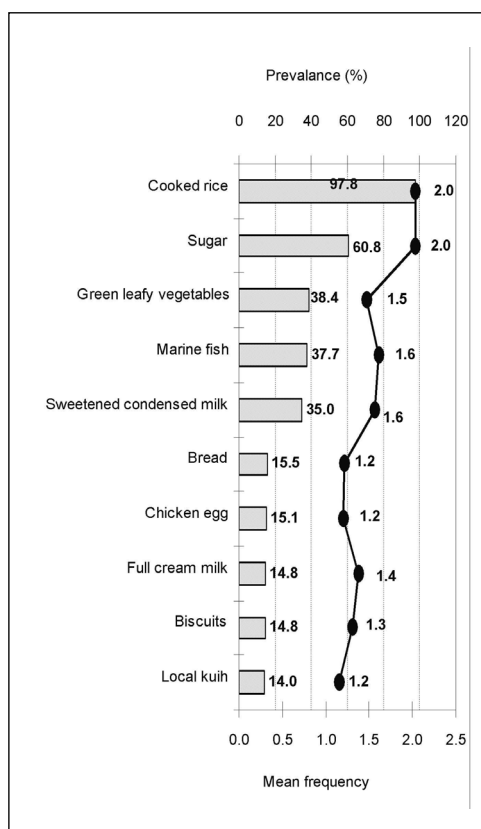
Figure 5b. Mean frequency and prevalence of food items consumed daily for age group 20-29

products were consumed more frequently in the urban areas and among men. Urbanisation and industrialisation had brought about a shift towards a 'westernised' dietary pattern and food consumption in Malaysia (Tee, 1999). In the urban areas, the lifestyle of the population is usually more hectic in comparison to their rural counterparts. As such, urban people (as well as men) depend more on cooked, processed, ready to eat and fast foods for consumption. The rapid expansion of the meat and poultry industry had also influenced food consumption of meat in Korea (Sook, 2003). For example,

fast food restaurants, 24-hour coffee shops and convenience stores which are more abundant in the urban areas provide accessibility to ready-to-eat chicken and egg dishes. Furthermore, the price is considered affordable by the urban residents.

In this survey, women were shown to be frequent drinkers of full cream milk compared to men who preferred sweetened condensed milk. In a small food consumption survey in Singapore, although 37% of the population did not have a habit of drinking milk, they generally preferred full cream milk over sweetened condensed milk (Yeo, 1998). In Korea (Sook, 2003), milk
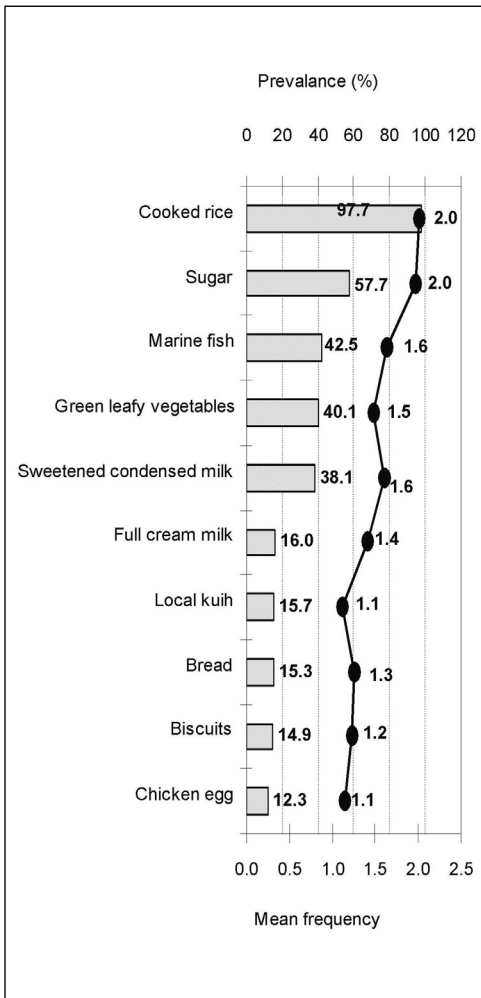
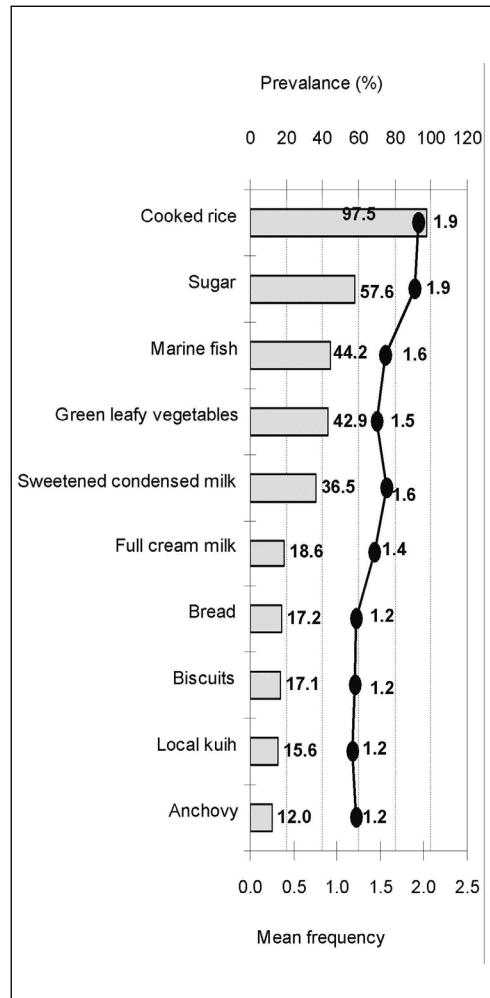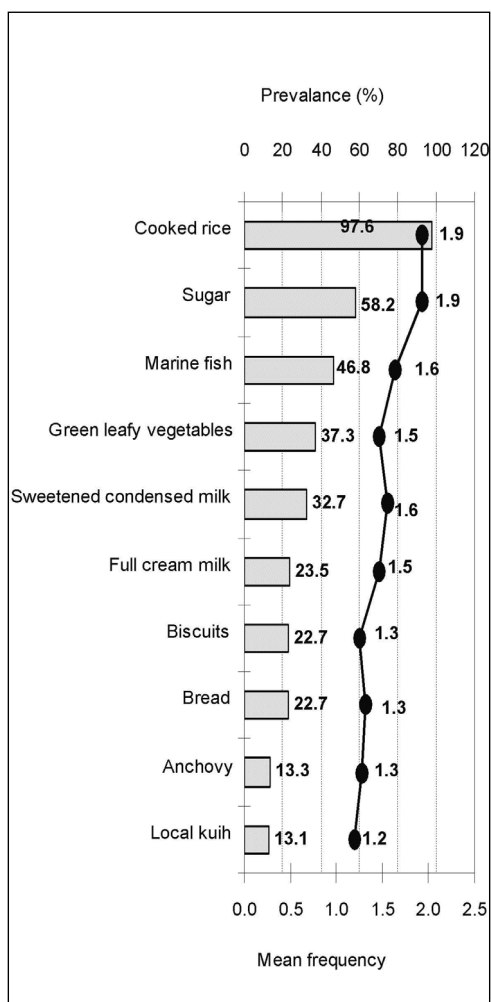**Figure 5c.** Mean frequency and prevalence of food items consumed for age group 30-39

Figure 5d. Mean frequency and prevalence of food items consumed daily for age group 40-49

consumption is still very low. This finding also indicates that women are probably more likely to be aware and more knowledgeable about the health benefits of milk. This is especially so as milk drinking is associated with a lower risk of osteoporosis (Chee *et al.*, 2002), thus the higher frequency of milk intake among women.

Irrespective of age groups, common food items frequently eaten daily were rice, sugar, fish, particularly marine fish and green leafy vegetables. Among the younger adults, particularly those below 20 years of age, chicken was consumed at least once a day, while this pattern of intake was not shown in the older age groups. Similar trends were also shown in Singapore (Health Promotion Board, 2004). Our findings show that full cream milk was consumed daily among the above 20-year-old groups; however the amount consumed was below the recommendations.

daily were tea, coffee, chocolate-based drinks and cordial. Soft drinks or carbonated drinks were not listed as the top five beverage consumed daily. Our study showed that people in the rural areas, in the east coast and Sarawak, women and the teenagers (<20 years) drank less plain water. Alternatively, these groups consumed more frequently beverages such as tea, coffee, chocolate-based drinks and cordials.

CONCLUSIONS

The majority of the Malaysian population consumed rice twice a day with an average intake of 2½ plates per day. Other food items eaten everyday included green leafy vegetables and marine fishes. Malaysians ate almost similar foods either by zones, strata, sex and even age groups; however, there was subtle differences especially by zones. Malaysians habitually consumed 6 glasses of plain water daily. Other beverages consumed were tea, coffee and chocolate-flavoured drinks and cordials.

There were many food items which were consumed daily and weekly by Malaysians. This finding was encouraging as it was in line with the recommendation of the Malaysian Dietary Guidelines (NCCFN, 1999), which advised that the Malaysian population should consume a variety of foods.

The Ministry of Health should continue its efforts to promote a healthy lifestyle and in creating awareness and providing nutrition education to the community. However, careful identification of simple effective nutrition strategies need to be identified and implemented. These strategies could then be utilised to improve nutrition knowledge and awareness as well as to motivate a change in nutrition behaviour.

Figure 5e. Mean frequency and prevalence of food items consumed for age group 50-59

Our results found that Malaysians had a satisfactory habit of drinking plain water. It was found that on average the population consumed at least six glasses of plain water daily. The recommended water intake is at least 6 to 8 glasses a day (NCCFN, 1999). It should be noted that the water intake recommendation include plain water, other beverages, water from fruits and vegetable as well as soups. Other beverages consumed

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