Malaysian Dietary Guidelines for Children and Adolescents

National Coordinating Committee on Food and Nutrition
Ministry of Health Malaysia  2013
<table>
<thead>
<tr>
<th>Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message by Minister of Health Malaysia</td>
<td>i</td>
</tr>
<tr>
<td>Foreword by Director-General of Health Malaysia</td>
<td>ii</td>
</tr>
<tr>
<td>Preface by Deputy Director-General of Health (Public Health) Malaysia</td>
<td>iii</td>
</tr>
<tr>
<td>Preface by Chairman of Technical Working Group on Nutritional Guidelines</td>
<td>iv</td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>v</td>
</tr>
<tr>
<td>Technical Working Group on Nutritional Guidelines</td>
<td>vi</td>
</tr>
<tr>
<td>List of Authors</td>
<td>viii</td>
</tr>
<tr>
<td>Editorial Board</td>
<td>xii</td>
</tr>
<tr>
<td>Pre-test Working Group</td>
<td>xiii</td>
</tr>
<tr>
<td>List of Tables, Figures and Appendices</td>
<td>xiv</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>xvii</td>
</tr>
<tr>
<td>Key Message 1</td>
<td>Practise exclusive breastfeeding from birth until 6 months and continue to breastfeed until 2 years of age</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Key Message 2</td>
<td>Give appropriate complementary foods to children between the age of 6 months to 2 years</td>
</tr>
<tr>
<td>Key Message 3</td>
<td>Eat a variety of foods within your recommended intake</td>
</tr>
<tr>
<td>Key Message 4</td>
<td>Attain healthy weight for optimum growth</td>
</tr>
<tr>
<td>Key Message 5</td>
<td>Be physically active everyday</td>
</tr>
<tr>
<td>Key Message 6</td>
<td>Eat adequate amount of rice, cereals or tubers</td>
</tr>
<tr>
<td>Key Message</td>
<td>Message</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>Key Message 7</td>
<td>Eat fruit and vegetables everyday</td>
</tr>
<tr>
<td>Key Message 8</td>
<td>Consume moderate amounts of fish, meat, poultry, egg, legumes and nuts</td>
</tr>
<tr>
<td>Key Message 9</td>
<td>Consume milk and milk products everyday</td>
</tr>
<tr>
<td>Key Message 10</td>
<td>Include appropriate amounts and types of fats in the diets</td>
</tr>
<tr>
<td>Key Message 11</td>
<td>Limit intake of salt and sauce</td>
</tr>
<tr>
<td>Key Message 12</td>
<td>Consume foods and beverages low in sugar</td>
</tr>
<tr>
<td>Key Message 13</td>
<td>237</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Drink plenty of water daily</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Key Message 14</td>
<td>251</td>
</tr>
<tr>
<td>Consume safe and clean foods and beverages</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Key Message 15</td>
<td>265</td>
</tr>
<tr>
<td>Educate children on the use of nutrition information on food labels</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Participants of Consensus Meeting on the Malaysian Dietary Guidelines for Children and Adolescents, 14 – 15 May 2012</td>
<td>281</td>
</tr>
</tbody>
</table>
Many countries in the world are still battling with problems of malnutrition amongst children. About ten million children die before reaching the age of five each year throughout the world, and more than a third of these deaths are associated with malnutrition. At the same time, adolescents are faced with body image problems and health risk behaviours such as tobacco or drug abuse that may lead to poor nutritional status. In Malaysia, even though the National Health and Morbidity Survey III (2006) findings indicated that children under 5 years had better nutritional status compared to those in neighbouring countries, there is evidence that the nutritional status of infants is still sub-optimal. The rate of exclusive breastfeeding was found to be less than optimal, whereby infants were hurriedly being introduced to alternative feeding by desperate mothers seeking to juggle between family and careers. In addition, complementary feeding is still being inappropriately timed. Whilst many factors contribute to malnutrition amongst children and adolescents, parental lack of knowledge may be one of the reasons. Furthermore, there is evidence that the availability of accurate and practical dietary information can produce improved nutrition and health outcomes amongst children and adolescents. Therefore, this guideline is developed with the noble objective of empower parents and caregivers to provide healthier food choices for their children to ensure their optimal nutritional status. It will also assist policy makers and health professionals in providing nutrition education to the desired target group. I would like to commend the Technical Working Group (TWG) on Nutritional Guidelines established under the National Coordinating Committee on Food and Nutrition for their diligent efforts in successfully completing this book. I have every confidence that this book will serve its purpose well.

DATO’ SRI LIOW TIONG LAI
MINISTER OF HEALTH MALAYSIA
It is an irrefutable fact that nutrition plays a significant role in the early years of life. Most healthy habits formed during childhood are often carried on throughout life, and this is one of the most important preventive steps that one can take to fend off lifestyle diseases such as obesity, diabetes mellitus and heart disease.

As is common in most developing nations, dietary patterns amongst Malaysians have steadily evolved as a result of socioeconomic change. Families nowadays commonly eat on the go. The average time devoted to meal preparation has declined as a result of busy lifestyles. Eating for convenience has become a popular trend, and it is undeniable that children and adolescents have also been swept along with this trend. Added to this burden is the fact that children are naturally picky eaters, which makes the task of inculcating healthy eating habits even more challenging. The incidence of overweight amongst school children in Malaysia has increased from 11.0% in 2002 to 12.8% in 2008, whilst obesity prevalence among school children has increased from 9.7% in 2002 to 13.7% in 2008 as reported in the Nutritional Status and Dietary Habits of Primary School Children in Malaysia (2007-2008). Adolescents are vulnerable to physical and emotional changes brought about by puberty and are commonly reported to engage in high-risk health behaviours such as eating disorders, substance abuse and premarital sexual relations which may lead to unwanted pregnancies. These behaviours also have a direct bearing on their nutritional status and health due to the extra burden placed on their mental and physical needs.

Therefore, there is a serious need to address the above concerns. Good dietary habits play a role in strengthening mental and physical capacities which may help children and adolescents cope better with the numerous challenges in their lives.

I believe that the Malaysian Dietary Guidelines for Children and Adolescents will be put to good use in planning suitable dietary interventions in settings involving children and adolescents including crèches, health clinics, hospitals, kindergartens, schools and juvenile rehabilitation centres.

I would like to thank and compliment the Technical Working Group (TWG) on Nutritional Guidelines who have worked with utmost dedication and care to ensure that these guidelines are completed on time.

DATUK DR. NOOR HISHAM ABDULLAH
DIRECTOR GENERAL OF HEALTH, MALAYSIA
Preface by

DEPUTY DIRECTOR-GENERAL OF HEALTH (PUBLIC HEALTH) MALAYSIA

Lifelong dietary habits are formed during childhood and adolescence. Therefore, it is crucial that the nutritional status of this target group is well-monitored and that proper measures are taken to ensure good nutrition becomes a norm amongst them. This will augur well for the long-term social and economic development of our country.

However, in an environment that promotes commercials of fast foods, soft drinks and other junk foods, coupled with busy lifestyles, healthy eating becomes a challenge for most people. It would be tragic if such unhealthy eating habits are passed on to the next generation, as that would only serve to perpetuate the trend.

The National Health and Morbidity Survey, 2006 suggests that 23.4% of school children aged 7 to 12 years and 21.4% adolescents aged 13 to 18 years are obese. Meanwhile, a study conducted in 2008 by Universiti Kebangsaan Malaysia found that 32.1% of school children skip breakfast. These are some of the nutritional problems amongst children and adolescents that need to be addressed. Thus, various strategies have been outlined under the National Nutrition Policy and the National Plan of Action for Nutrition of Malaysia to improve their nutritional status. One of the strategies is providing accurate and practical dietary information to parents and caregivers of children and adolescents.

This Malaysian Dietary Guidelines for Children and Adolescents is a well-timed effort by the Technical Working Group (TWG) on Nutritional Guidelines, established under the National Coordinating Committee on Food and Nutrition. It is a significant publication, coming at a time when there is a heightened level of concern over the likelihood of a rise in non-communicable diseases such as obesity and diabetes mellitus amongst the Malaysian population.

Therefore, it is hoped that the Malaysian Dietary Guidelines for Children and Adolescents will be used as a stepping stone in the planning of more concrete and effective measures to tackle the nutritional problems affecting children and adolescents, not only in the short term but also projected for the likely scenario in the distant future. Government agencies, social organisations and even food manufacturers should be educated on these dietary guidelines to enable them to plan and implement suitable measures. It is also my fervent hope that health professionals, in their capacity to educate and disseminate health information to the public, would work hard to ensure that these dietary guidelines are regularly advocated to parents, caregivers and teachers through all possible communication media.

I would like to congratulate and convey my best wishes to all members of the TWG on Nutritional Guidelines who have worked hard to complete this publication.

DATUK DR. LOKMAN HAKIM SULAIMAN
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CHAIRMAN OF TECHNICAL WORKING GROUP ON NUTRITIONAL GUIDELINES

The nutritional needs of children and adolescents are different from those of adults because children are growing and developing. Hence, it is important to understand the gap between current dietary practices and the recommended diets. Some of the recommendations are related to the quantity and quality of the food eaten and encourage consumption of the right types of foods in the right amounts to meet the body’s nutrient needs and to reduce the risk of chronic disease.

The Malaysian Dietary Guidelines for Children and Adolescents comprise 15 key messages and 67 key recommendations for healthy children and adolescents from birth to 18 years of age. Scientific basis for the messages and discussion on issues related to infants, children and adolescents are also provided. This Guideline is primarily intended for health professionals. However, other documents may be produced in a format that is more suitable for children, adolescents and their caregivers.

This guideline is developed by the Technical Working Group (TWG) on Nutritional Guidelines which comprises 29 members, plus numerous scientific experts. The TWG on Nutritional Guidelines is responsible for reviewing and analysing current dietary and nutritional information and incorporating them into scientific-based recommendations. We welcome feedback, comments and suggestions from the end users in order to help us improve the development for future guidelines. We are hopeful that the recommendations will serve as a reference to help educate and guide Malaysian children and adolescents towards improving their dietary habits and lifestyle.

I would like to thank members of the TWG on Nutritional Guidelines, the contributors, the pre-test working group, the editorial committee, the Consensus Workshop participants and the TWG Secretariat for the input and commitment towards the publication of this valuable document.

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ACKNOWLEDGEMENT

The Technical Working Group on Nutritional Guidelines under the auspices of the National Coordinating Committee on Food and Nutrition has established this guideline through a series of workshop and several meetings. The members of the Technical Working Group are represented by various government agencies, the academia, professional bodies as well as non-government organisations (NGOs). Their invaluable contributions and commitments have led to the success and completion of this guideline.

Warmest appreciation and gratitude go to the:

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- All the authors, reviewers and participants of the consensus workshops and all individuals that have directly and indirectly contributed to the completion of this document.
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The working group developed the guidelines in accordance with the National Plan of Action for Nutrition of Malaysia under the auspices of the National Coordinating Committee on Food and Nutrition (NCCFN).

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<table>
<thead>
<tr>
<th><strong>Consume Foods and Beverages Low in Sugar</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Roslee Rajikan</td>
</tr>
<tr>
<td>Universiti Kebangsaan Malaysia</td>
</tr>
<tr>
<td>Dr. Faizah Kamaruddin</td>
</tr>
<tr>
<td>Ministry of Health Malaysia</td>
</tr>
<tr>
<td>Dr. Barakatun Nisak Mohd Yusof</td>
</tr>
<tr>
<td>Universiti Putra Malaysia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Consume Safe and Clean Foods and Beverages</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Norrani Eksan</td>
</tr>
<tr>
<td>Selangor State Health Department</td>
</tr>
<tr>
<td>Dr. Azmani Wahab</td>
</tr>
<tr>
<td>Dungun District Health Office</td>
</tr>
<tr>
<td>Dr. Rozanim Kamarudin</td>
</tr>
<tr>
<td>Ministry of Health Malaysia</td>
</tr>
<tr>
<td>Ms. Linza Md Yassin</td>
</tr>
<tr>
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</tr>
<tr>
<td>Dr. Maarof Abd Ghani</td>
</tr>
<tr>
<td>Universiti Kebangsaan Malaysia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Drink Plenty of Water Daily</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Mohd. Nasir Mohd. Taib</td>
</tr>
<tr>
<td>Universiti Putra Malaysia</td>
</tr>
<tr>
<td>Dr. Loh Su Peng</td>
</tr>
<tr>
<td>Universiti Putra Malaysia</td>
</tr>
<tr>
<td>Dr. Rozanim Kamarudin</td>
</tr>
<tr>
<td>Ministry of Health Malaysia</td>
</tr>
<tr>
<td>Mr. Mohd. Rizal Md. Razali</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>National Sports Institute of Malaysia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Educate Children on the Use of Nutrition Information on Food Labels</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Tee E Siong</td>
</tr>
<tr>
<td>Nutrition Society of Malaysia</td>
</tr>
<tr>
<td>Ms. Har Rasyidah Mohd Irani</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
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</tr>
<tr>
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</tr>
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</tr>
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</tr>
<tr>
<td>Ministry of Health Malaysia</td>
</tr>
</tbody>
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## List of Tables, Figures and Appendices

### KEY MESSAGE 1

- **Appendix 1**: Method of storing and thawing expressed breast milk
- **Appendix 2**: Acceptable medical reasons for breast milk substitution in babies aged below 6 months

### KEY MESSAGE 2

- **Table 2.1**: The total daily energy requirement from complementary foods
- **Table 2.2**: Frequencies of complementary foods according to age
- **Appendix 1**: Recommended daily food intake according to age

### KEY MESSAGE 3

- **Table 3.1**: Recommended caloric intake of children and adolescents by age and sex
- **Table 3.2a**: Number of serving sizes based on daily caloric needs by age group (3 to 9 years)
- **Table 3.2b**: Number of serving sizes based on daily caloric needs by age group (10 to 18 years)
- **Table 3.3**: Food varieties according to food groups
- **Figure 3.1**: Malaysian Food Pyramid (2010). Daily serving size (1500 to 2500 kcal per day)

### Sample menus for children aged 3 to 18 years

- **Appendix 1**: Sample menu for children aged 3 years (1000 kcal)
- **Appendix 2**: Sample menu for children aged 4 to 6 years (1300 kcal)
- **Appendix 3**: Sample menu for children aged 7 to 9 years (1800 kcal)
- **Appendix 4**: Sample menu for children aged 10 to 12 years (boys) (2200 kcal)
- **Appendix 5**: Sample menu for children aged 13 to 18 years (boys) (2700 kcal)
- **Appendix 6**: Sample menu for children aged 10 to 18 years (girls) (2000 kcal)
KEY MESSAGE 4
Table 4.1 Interpretation of Z-scores for BMI-for-age
Figure 4.1 Prevalence of overweight and obesity in children age 6 to 12 years in Peninsular Malaysia (2002 and 2008)
Appendix 1 BMI cut-off point from birth to 2 years old (boys)
Appendix 2 BMI cut-off point from 2 to 5 years old (boys)
Appendix 3 BMI cut-off point from birth to 2 years old (girls)
Appendix 4 BMI cut-off point from 2 to 5 years old (girls)
Appendix 5 BMI cut-off point for 5 to 19 years old in boys (Z-scores)
Appendix 6 BMI cut-off point for 5 to 19 years old in girls (Z-scores)

KEY MESSAGE 5
Figure 5.1 Physical Activity Pyramid
Appendix 1 Examples of moderate and vigorous activities defined by level of intensity
Appendix 2 Examples of muscle strengthening and bone strengthening activities defined by level of intensity
Appendix 3 Examples of structured and unstructured physical activities

KEY MESSAGE 6
Table 6.1 Number of servings according to age

KEY MESSAGE 7
- -

KEY MESSAGE 8
Table 8.1 Essential and non-essential amino acids
Table 8.2 Recommended Nutrient Intakes (RNIs) for Malaysia 2005: Daily recommended intakes of protein for individuals

KEY MESSAGE 9
Appendix 1 Other countries' recommendation on milk and milk products for children and adolescents
KEY MESSAGE 10

Appendix 1  Energy distribution of some common fried foods: Contribution of energy content from fat, carbohydrate and protein

Appendix 2  Energy distribution of some common high-fat foods: Contribution of energy content from fat, carbohydrate and protein

Appendix 3  Energy distribution of some common high-fat kuih: Contribution of energy content from fat, carbohydrate and protein

KEY MESSAGE 11

Table 11.1  Recommended sodium and salt limit for children

Table 11.2  High-salt food in Malaysian children's diet and healthy alternatives

Appendix 1  Sources and content of sodium in selected foods

KEY MESSAGE 12

Table 12.1  Average intake of selected foods and beverages that are usually high in sugar among Malaysian adults

Table 12.2  Sugar content in selected local beverages and snacks

Table 12.3  Sugar content in selected local kuih

Figure 12.1  Prevalence of caries by age group

Appendix 1  Sugar intake recommendation

KEY MESSAGE 13

Table 13.1  Physiological effects of body weight loss as sweat

Table 13.2  Calculation of water requirement for boys according to Malaysian RNI

Table 13.3  Calculation of water requirement for girls according to Malaysian RNI

Table 13.4  Drinking schedule for those (6 to 18 years old) active in sports and with regular training
### KEY MESSAGE 14

<table>
<thead>
<tr>
<th>Table 14.1</th>
<th>Contributing factors for food poisoning in 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 14.1</td>
<td>Trends of Cholera, Typhoid/Paratyphoid, Hepatitis A and Dysentery in Malaysia, 1999 – 2009</td>
</tr>
<tr>
<td>Figure 14.2</td>
<td>Incidence of food poisoning in Malaysia, 2000 – 2010</td>
</tr>
<tr>
<td>Appendix 1</td>
<td>General requirements for labelling of food</td>
</tr>
</tbody>
</table>

### KEY MESSAGE 15

<table>
<thead>
<tr>
<th>Figure 15.1</th>
<th>Nutrition Information Panel (NIP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix 1</td>
<td>Tips on using the Nutrition Information Panel (NIP)</td>
</tr>
<tr>
<td>Appendix 2</td>
<td>Example of some instructions/activities that can be used to educate children in reading the Nutrition Information Panel by parents, caregivers or teachers</td>
</tr>
</tbody>
</table>
Executive summary

Nutritional needs differ at different stages of life. For the newborn, there is no better food than breast milk. Older children need a proper balance of foods to ensure good growth and development, whilst for adolescents, dietary habits and food preferences which affect energy consumption and nutrient intake are generally developed during this period. However, for both children and adults, some principles are equally applicable including the need to ensure that food is handled well and safe to eat and to enjoy a wide variety of nutritious foods.

The National Nutrition Policy formulated in 2005 by the Ministry of Health Malaysia is aimed to ensure that everyone has access to nutrition information and education as well as resources and opportunities to make informed decisions on healthy food choices. The Malaysian Dietary Guidelines for Children and Adolescents is consistent with this principle.

The National Guideline for the Feeding of Infants and Young Children was first published in 2008. In light of this, some scientific basis on infant and young child feeding in the Malaysian Dietary Guidelines for Children and Adolescents has been updated in line with the principles in the previous guideline. Both guidelines can be used as references to address infants the feeding and dietary patterns of young children and adolescents (0 to 18 years).

The recommendations in the Malaysian Dietary Guidelines for Children and Adolescents are for healthy Malaysian children and adolescents and may not satisfy the specific nutritional needs of children and adolescents with particular health conditions. This book describes the scientific rationale for the guidelines and is intended for health professionals. Other documents that are more user-friendly and suitable for children, adolescents and their caregivers will be produced. The guideline is also useful for health professionals, academicians and policy makers in developing education and communication materials ad designing and implementing nutrition related programmes, including national food policies, nutrition education and information.
These guidelines were developed by a team of experts from various disciplines namely nutrition, public health, paediatric health, oral health and psychology with community involvement through pre-testing of the proposed key recommendations. The development of the guidelines began in early 2011 and the final draft was tabled at a Consensus Workshop attended by all relevant stakeholders in May 2012. In summary, the Malaysian Dietary Guidelines for Children and Adolescents recommend:

- Exclusive breastfeeding for babies below 6 months and continue to breastfeed until 2 years of age.
- Appropriate complementary foods to children between the aged of 6 months to 2 years.
- Eating a variety of foods within your recommended intake.
- Attaining healthy weight for optimum growth.
- Being physically active everyday.
- Eating adequate amounts of rice, cereals or tubers.
- Eating fruits and vegetables every day.
- Consuming moderate amounts of fish, meat, poultry, egg, legumes and nuts.
- Consuming milk and milk products everyday.
- Including appropriate amounts and types of fats in the diet.
- Limiting the intake of salt and sauce.
- Consuming foods and beverages low in sugar.
- Drinking plenty of water daily.
- Consuming safe and clean foods and beverages.
- Educating children on the use of nutrition information on food label.
Key Message 1

Practise Exclusive Breastfeeding from Birth until 6 Months and Continue to Breastfeed until 2 Years of Age
1.0 TERMINOLOGY

Complementary feeding
Complementary feeding is defined as the process that begins when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk. Any foods or nutritive liquids, besides breast milk, that are given to young children during this period are defined as complementary foods. These foods may be prepared specifically for children or may consist of family foods served to other household members which are modified to make them more easily consumed by infants and young children and provide sufficient amounts of nutrients (WHO, 2000; PAHO/WHO, 2003).

Exclusive breastfeeding
Exclusive breastfeeding is defined as feeding an infant nothing except breast milk from his or her mother or a wet nurse, or with expressed breast milk. Infant does not receives other fluids including water or solids, with the exception of drops or syrups consisting of vitamins, mineral supplements or medicine (WHO, 2008).

Expressed breast milk
Expressed breast milk is defined as milk expressed from the breast using manual manipulation or using a breast pump.

Predominant breastfeeding
In predominant breastfeeding, breast milk (including expressed milk or from a wet nurse) is the predominant source of nourishment, but the infant also receives other fluids. These include liquids (such as water and water-based drinks and fruit juice), ritual fluids and ORS and drops or syrups (vitamins, minerals, medicines). Non-human milk and food-based fluids are not allowed (WHO, 2008).

2.0 INTRODUCTION

Adequate nutrition is critical to child health and development. It is well recognised that the period from birth to 2 years of age is a ‘critical window’ for the promotion of optimal growth, health and behavioural development. Longitudinal studies have consistently shown that this is the peak age at which children are at risk of growth faltering, deficiencies of certain micronutrients and common childhood illnesses such as diarrhoea. After a child reaches 2 years of age, it is very difficult to reverse stunting that has occurred earlier (Martorell, Khan & Schroeder, 1994). The immediate consequences of poor nutrition during these formative years include significant morbidity and
mortality and delayed mental and motor development. In the long term, early nutritional deficiencies are linked to impairments in intellectual performance, work capacity, reproductive outcomes and overall health during adolescence and adulthood.

The World Health Organization (WHO) and United Nations Children's Education Fund (UNICEF) recommended that infants be exclusively breastfed for the first 6 months of life with the subsequent introduction of complementary foods at the age of 6 months (WHO, 1989). Among the most important breastfeeding practices are the initiation of breastfeeding within one hour of birth and frequent and on-demand feeding (including night feeds). Infants should also be breastfed more frequently during illness and recovery. At the age of 6 months, appropriate nutritionally adequate and safe complementary foods must be introduced. Breastfeeding should still be continued until the child is aged 2 years and above, along with the feeding of nutritious complementary foods (WHO, 2001a).

The government has fully recognised the significance of breastfeeding and infant nutrition over the past decades. Since the formulation of the National Breastfeeding Policy in 1993, the government has made a strong commitment towards promoting breastfeeding practices and protecting consumers from aggressive marketing of breast milk substitutes. The government has also played a vital role in safeguarding the practice of exclusive breastfeeding by providing appropriate health services, and accurate and complete information on breastfeeding. Concrete measures have also been taken to create a conducive environment which reinforces breastfeeding, such as granting longer maternity leave and providing facilities in public area as well as workplace for breastfeeding.

In this regard, one of the major strategies undertaken by the Ministry of Health Malaysia was the implementation of the Baby Friendly Hospital Initiative since 1992. Up to 2010, there were a total of 133 baby friendly hospitals in the country. Out of these, 123 are government hospitals, 2 are hospitals under the Ministry of Higher Education Malaysia, 2 are hospitals under the Ministry of Defence and 6 are private hospitals (MOH, 2010).

### 3.0 SCIENTIFIC BASIS

#### 3.1 Benefits of breastfeeding to the child

Breastfeeding brings clear short term benefits for child health by reducing morbidity and mortality from infectious diseases. Extensive research using improved epidemiologic methods and modern laboratory techniques have documented diverse and compelling advantages for infants, mothers, families and society from breastfeeding and the use of human milk for infant
feeding (Kramer et al., 2001). These advantages include health, nutritional, immunologic, developmental, psychological, social, economic and environmental benefits.

The review of Jackson and Nazar (2006) on the immune response and long-term health effects has indicated that there is evidence of long term benefits of breastfeeding that may influence autoimmunity. Breastfeeding may significantly alter the immune system of the infant. This can be seen by the effect of breastfeeding on the size of the thymus gland, the antibody response to vaccination and increased tolerance to breast milk leukocyte antigens.

3.2 Benefits of breastfeeding for mothers

Important health benefits of breastfeeding have also been described for mothers. The benefits include decreased postpartum bleeding and more rapid uterine involution attributable to increased concentrations of oxytocin, decreased menstrual blood loss and increased child spacing attributable to lactational amenorrhea. Breastfeeding mothers also have a lower risk of breast cancer and ovarian cancer and possibly a decreased risk of hip fractures and osteoporosis in the postmenopausal period (Ip et al., 2007; AAP, 2005; Labbok, 2001).

Mothers who breastfeed are more likely to return to pre-pregnancy body weight thus reducing the risk for obesity. Studies have found significant postpartum weight loss in exclusively breastfeeding mothers compared to formula feeding mothers (Janney, Zhang & Sowers, 1997). A recent study found that the percentage of body fat loss was significant across time in exclusively breastfeeding mothers and not in mixed feeding mothers, suggesting a protective effect of exclusive breastfeeding against cardiovascular diseases and other chronic health conditions (Hatsu, McDougald & Anderson, 2008).

3.3 Breastfeeding and socio-economic impact

In addition to specific health advantages for infants and mothers, breastfeeding also confers economic, family and environmental benefits. These benefits include the potential for decreased annual health care costs, decreased employee absenteeism and associated loss of family income, more time for attention to siblings and other family matters as a result of decreased infant illness, decreased environmental burden for disposal of formula cans and bottles and decreased energy demands for production and transport of artificial feeding products (Cohen, Mrtek & Mrtek, 1995; Levine & Huffman, 1990).

3.4 Basis for recommendations

The National Breastfeeding Policy for Malaysia was formulated in 1993 and revised in 2005 in accordance with World Health Assembly Resolution 54.2 (WHO, 2001b), whereby exclusive breastfeeding was recommended for the first 6 months of life and continued breastfeeding was recommended up to 2 years. In an effort to promote normal initiation and establishment of breastfeeding, WHO/ UNICEF (WHO, 1989) jointly published the ten steps guideline for successful breastfeeding. Step Four of this guideline recommends health professionals to help mothers initiate breastfeeding within one hour of birth.

Ideally, all newborns must be placed naked in a prone position on their mothers’ bare chests immediately following birth for at least an hour to encourage mothers to recognise when their babies are ready to breastfeed (Uvnas-Moberg, 1998; Winberg, 2005).
The intimate contact within the first hour of life facilitates maternal-infant behaviour. Close body contact between the infant and his mother helps regulate the newborn’s temperature, energy conservation, acid-base balance, adjustment of respiration, as well as crying and nursing behaviours. This research also indicated that infants are protected from harmful bacteria because latching will lead to the colonization of friendly bacteria on the baby’s skin and gut from the mother’s skin contact between the mother germ (contact between the mother’s and baby’s skin) mother’s and baby’s skin (Uvnas-Moberg, 1994; Winberg, 2005).

Early initiation of breastfeeding ensures that the newborn receives colostrum. Colostrums contain abundant antibodies and lymphocytes to protect the baby from infection. This is the first immunisation for a newborn and many studies have supported this important benefit. A recent study of more than 10,000 newborns in Ghana reported that if all infants started breastfeeding within one hour of delivery, it would reduce neonatal death by 22%. The figure would rise to 41% if newborn babies of 2 to 28 days were counted. The study estimates that out of the four million infants who die in the developing world each year in the first month of life, almost one million infants could be saved (Edmond et al., 2006).

In addition to specific advantages to the infants, mothers may also obtain the beneficial effect from early latching. Maternal oxytocin release stimulated by infant suckling enhances the flow of milk. It prevents blocked ducts and engorgement (Hill & Humenick, 1994; Shiau & Anderson, 1997). Other benefits of early initiation to mothers have also been observed. Maternal oxytocin antagonises the flight-or fight effect, decreasing maternal anxiety, increasing calmness and social responsiveness. Thus, indirectly oxytocin enhances parenting behaviours (Uvnas-Moberg, 1994; Winberg, 2005).

It is important to ensure correct breastfeeding techniques during counselling session with mothers and ante-natal education. The fundamental components to successful breastfeeding is to position the infant correctly and comfortably. Proper positioning of mother and infant during breastfeeding, correct latching and suckling enhances the mother’s confidence thereby leading to successful breastfeeding (Anisfeld & Lipper, 1983; Hales, 1977). The mother should be allowed to be comfortable and hold her baby in any position she prefers such as cradling, cross cradling, football hold and lying on one side. The comfort of both mother and infant ensures the achievement of successful latching. After latching on, breastfeeding begins with the nipple, surrounding areola and underlying breast tissue are brought deeply into the mouth of the infant, whose lips and cheeks form a seal. The amount of milk transfer is dependent on the above initial component. With correct latching and suckling, baby gets enough milk and gain weight well (De Carvalho et al., 1983; Dewey et al., 2003). Proper positioning of the breastfeeding mother-infant dyad, correct latching and suckling enhances a mother’s confidence, leading to successful breastfeeding, thereby reducing the breastfeeding problems experienced by mothers for example cracked nipples, mastitis and blocked ducts (Hill & Humenick, 1994; Shiau & Anderson, 1994). Incorrect positioning, latching and suckling results in pain and stress and thus reduces the chances of breastfeeding success.

3.5 Breastfeeding challenges
Despite government efforts to improve breastfeeding rates in Malaysia, many mothers
choose to give breast milk substitutes to their babies, with or without continued breastfeeding. Some of these mothers reported facing several challenges to continue to breastfeed their babies. Mothers usually experience breastfeeding obstacles after discharge from the hospital. The most common challenge is the perception that mothers may not provide adequate amount of milk to their babies. This perception could be held by the mother herself and/or people around her. One of the possible reasons behind this perception might be due to the breastfeeding frequency that is higher than that in the formula fed baby. Research by Arora et al., (2000) on the major factors influencing breastfeeding rates has shown that perception of not enough milk supply was an important factor (35.1%) to the failure of exclusive breastfeeding. Other contributing factors reported were the father’s attitude towards breastfeeding (36.5%) and the perception of that a working mother would be unable to continue exclusive breastfeeding once she returns to work when a mother starts working (29.4%).

Other common problems encountered by mothers are breast engorgement due to incomplete milk emptying, improper latching on that leads to painful cracked nipples and fussy or sleepy infants. These challenges conspire to create a crisis of confidence in the continuation of exclusive breastfeeding. Without any support, help and encouragement from family members, namely the husband, parents and parents in law, exclusive breastfeeding will not be achievable.

In the study done by Chen (1978), the main reasons attributed to the cessation of breastfeeding were inadequate lactation (67%), return to work (15%) and infants hospitalisation (5%). The reasons for giving additional formula milk were convenience (26%), mothers’ physical weakness (23%) and poor lactation (20%).

Other significant obstacles to breastfeeding reported by mothers included non-supportive family members, lack of emotional support from husbands, too much housework and lack of interest in breastfeeding. Mothers require extra counseling sessions to enable them to identify strategies for achieving and sustaining exclusive breastfeeding. The availability of trained peer counselors in the community might be an effective approach to help mothers identify and overcome their challenges and concerns.

4.0 CURRENT STATUS

In Malaysia, nationally representative data on the rates of exclusive breastfeeding was virtually unavailable before the 1990s. The Second National Health and Morbidity Survey, NHMS II (1996) was the first national survey that used the indicators recommended by WHO for assessing breastfeeding practice (WHO, 1991) and provided baseline data for the country. Although the prevalence of ever breastfeeding was high at 95%, only 29% of infants below 4 months of age were exclusively breastfed (IPH, 1997).

The Third National Health and Morbidity Survey, NHMS III (2006) indicated that the overall prevalence of exclusive breastfeeding below 4 months was 19.3%, whilst exclusive breastfeeding below 6 months was 14.5% and predominant breastfeeding was 19.7% (IPH, 2008). There was a significant decline of 9.7% in the prevalence of exclusive breastfeeding and an increase of 9.7% in the prevalence of predominant breastfeeding when compared to the findings of the NHMS II.
In the NHMS III report, the percentage of infant who were exclusively breastfed fell rapidly after the age of 2 months and, at the same time, the percentage of infants consuming infant formula began to rise. There was no available information on the factors that may be related to this finding but other studies elsewhere suggested that mothers returning to work negatively affects breastfeeding rates (Bitler & Currie, 2004).

National Guidelines for the Feeding of Infants and Young Children (from birth until 3 years) were developed in 2008. Education on infant feeding practices has been integrated into public health programmes and communicated through written materials, postnatal talks and seminar/ training courses for childcare and day-care centre caregivers. This chapter is a scientific update version of the National Guidelines for the Feeding of Infants and Young Children (from birth until 3 year) and reviews the key recommendations to help enhance the mothers’ understanding and achieve the goal of this key message.
5.0 KEY RECOMMENDATIONS

Key recommendation 1
Be mentally prepared during pregnancy for exclusive breastfeeding.

How to achieve
1. Get information on exclusive breastfeeding from trained healthcare professionals during antenatal visits.
2. Learn the correct breastfeeding techniques.
3. Get additional information on breastfeeding from breastfeeding counsellors, peer support group, any reading materials in order to strengthen knowledge and motivation.

Key recommendation 2
Start breastfeeding within one hour of birth.

How to achieve
1. Ask to place your baby naked on your chest without clothing within one hour after birth.
2. Maintain skin-to-skin contact for at least one hour.
3. Let your baby learn to latch and start breastfeeding during skin to skin contact.
4. Ask nurses or doctors to help you start breastfeeding by employing the correct techniques.

Key recommendation 3
Breastfeed frequently and on demand.

How to achieve
1. Be available to your baby so that he can be fed on demand.
2. Breastfeed when baby shows signs of hunger (e.g. sucking on a fist, looking around, searching for breast and crying) or when mother’s breasts feel full.
3. Wake your baby up for breastfeeding if baby sleeps too long (more than 2 hours) or when mother’s breasts feel full.
4. Breastfeed your baby on demand, day and night, at least 8 to 12 times everyday.
5. Feed baby on the first breast until baby is satisfied (e.g. baby relaxes, stops searching for breast and falls asleep). Offer the second breast if baby is still hungry and if the first breast does not feel full.
6. Do not give pacifiers or artificial teats to breastfed babies except upon doctor’s advice.
**Key recommendation 4**  
Breastfeed with correct techniques.

**How to achieve**
1. Make sure you are in a comfortable position either sitting or lying down.
2. Make sure your baby is well-positioned for breastfeeding:
   a. Baby’s head and body are in a straight line.
   b. Baby is held close to your body.
   c. Baby’s whole body and head is well supported and facing your breast.
3. Make sure your baby is well latched on to the breast. Signs of good attachment are:
   a. Baby’s mouth is wide open.
   b. Baby’s lower lip is turned outward.
   c. Baby’s chin touches breast.
   d. More areola, especially the lower part, is inside baby’s mouth.
4. Learn to recognise signs of correct breastfeeding techniques:
   a. Baby suckles slowly and deeply with pauses.
   b. Baby’s cheeks appear full and round during suckling.
   c. You can hear your baby swallowing.
   d. Baby releases breast when full.

**Key recommendation 5**  
Avoid giving liquids or food other than breast milk to breastfed babies below 6 months.

**How to achieve**
1. Do not start your baby on complementary foods before the age of 6 months to prevent early termination of breastfeeding. Gets advice from breastfeeding counsellors or health care professionals before introducing other fluids including plain water, infant formula, juices or complementary foods to babies below 6 months of age.
2. Learn signs of a breastfed baby’s satiation, including:
   a. Baby passes urine 6 to 8 times a day.
   b. Urine colour which is clear to light yellow.
   d. Passing motion 3 to 8 times a day and perhaps less frequently as baby grows older.
**Key recommendation 6**
Continue to give breast milk even when mother returns to work.

**How to achieve**
1. Take as much maternity leave as possible to continue breastfeeding, if you are a working mother.
2. Practise expressing breast milk by hand or use a breast pump during confinement or maternity leave.
3. Store expressed breast milk properly. Expressed breast milk can be kept for 3 to 5 days in the refrigerator (refer to Appendix 1 - Method of storing and thawing expressed breast milk).
4. Train your baby to drink breast milk using a cup during maternity leave.
5. Make arrangements to have your baby near your workplace, if possible.
6. Continue to breastfeed frequently, especially at night to ensure milk production is sustained.
7. Arrange a work schedule that will allow time to express breast milk.

**Key recommendation 7**
Get enough rest, nutritious food and drinks to maintain health while breastfeeding.

**How to achieve**
1. Reorganise housework and have enough sleep.
2. Consume a well-balanced diet with additional 1 serving of milk and 1 serving of rice or other cereals daily.
3. Drink at least 8 glasses of water everyday.
4. Avoid excessive alcohol and caffeinated drinks.

**Key recommendation 8**
Obtain full support to breastfeed from husband, family members and community.

**How to achieve**
1. Get husband and close family members to:
   a. be involved in the preparation during pregnancy such as accompanying during pregnancy check-ups (antenatal visits) and after delivery (postnatal) follow-up.
   b. help to arrange housework and take care of other children.
   c. ensure that breastfeeding mothers are provided with nutritious foods.
   d. be caring and understanding towards the breastfeeding mother.
e. seek help from trained health care professionals in breastfeeding or breastfeeding support groups whenever mother faces breastfeeding difficulties.

2. Urge employers and the community to provide a supportive environment by having childcare centres or breastfeeding areas at the workplace or shopping complex.

**Key recommendation 9**

Use cup feeding as an alternative to breastfeeding.

**How to achieve**

1. Thaw expressed breast milk in quantities that are required for each feed by placing it in the refrigerator the night before use or gently re-warm the container under warm running water or in a bowl of warm water.

2. Gently swirl the bottle or container of breast milk to mix the content well.

3. Extract the thawed breast milk into a cup (spoon or dropper also can be used for younger baby) for feeding.

4. Take note of the following when cup feeding your baby:
   a. Baby will take time to get used to expressed breast milk and feeding from a cup. You will need to be patient, especially during the first introduction.
   b. Cradle the baby on the lap. Hold the baby in upright position with your hand placed behind his neck. Make sure the baby is positioned comfortably.
   c. Place a small cup on the baby’s lips and tilt the milk gently until it reaches the baby’s lips. Let the baby lick the milk with his tongue.
   d. Make sure the baby is swallowing the milk and avoid pouring the milk into the baby’s mouth.
   e. Feed the baby according to his need. Stop feeding the baby when he begins to show signs that he is full (such as turning his head away or stop licking).
   f. Burp the baby. All babies need to be burped for all types of feeding methods except direct breastfeeding.
**ADDITIONAL RECOMMENDATION**

**Babies who cannot be breastfed**
Generally, all babies below the age of 6 months should be given only breast milk unless medically indicated (refer to Appendix 2 - Acceptable medical reasons for supplementation to the babies aged below 6 months old). For the use of specialised infant formulas for specific medical conditions, consult a health care professional. Infant formulas marketed in Malaysia are required to be fortified with certain nutrients such as iron at a minimum level of 0.15 mg/100 kcal. (MOH, 1985).

**Giving expressed breast milk**
Expressed breast milk is usually given to breastfed babies when the mother returns to work or whenever the mother is not around. Mothers and caregivers should learn the correct and safe method of storing, preparing, thawing and giving expressed breast milk. It is best given via a cup or spoon if possible.

After giving expressed breast milk, hold the baby in a sitting position or a position in which the baby’s head is higher than his body. To prevent the baby vomiting or choking on milk, do not place baby in the cradle, bouncer or in bed less than 30 minutes after feeding. If the baby falls asleep, let the baby sleep in a sideways position.
REFERENCES


APPENDICES

Appendix 1. Method of storing and thawing expressed breast milk

Storing expressed breast milk

- Choose a suitable container made of glass or plastic that can be kept covered. Clean it by washing in hot soapy water and rinsing in hot clear water. If the mother is hand expressing, she can express directly into the container.
- If storing several containers, each container should be labeled with the date and time. Always use the oldest stored milk first, that is first in first out.
- The baby should consume expressed milk as soon as possible after expression. Feeding of fresh milk (rather than frozen) is encouraged.
- Milk should not be stored above 37˚C.

Thawing

- Frozen breast milk may be thawed slowly in a refrigerator and used within 24 hours.
- It can be defrosted by standing in a bowl of warm water. Once the milk is thawed, it should be used within 1 hour.
- Do not boil milk or heat it on a stove, over a direct fire or in a microwave oven. Heating it in a microwave oven will destroy some of the protective properties (antibodies) in breast milk. The overheated milk and bottle can burn baby’s mouth.
- Warm only the amount of milk that will be used at one feeding. Milk cannot be stored once it has been warmed.
- The fat in the breast milk may separate out in small globules. Gently shake it to mix the creamy fat with the rest of the liquid.
- Feed the milk to the baby with a cup. A spoon may be used for small amounts.

Breast milk storage

<table>
<thead>
<tr>
<th>Method of storage</th>
<th>Healthy baby</th>
<th>Ill baby</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh Milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room temperature 25ºC – 37ºC</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Air conditioned room 15ºC - 25ºC</td>
<td>8 hours</td>
<td>-</td>
</tr>
<tr>
<td>Less than 15ºC</td>
<td>24 hours</td>
<td>-</td>
</tr>
<tr>
<td>Refrigerator (2ºC - 4ºC)</td>
<td>&lt; 8 days</td>
<td>48 hours</td>
</tr>
</tbody>
</table>

- Place the container of milk in the coldest part of the refrigerator or freezer. Many refrigerators do not keep a constant temperature. Thus, a mother may prefer to use milk within 3 to 5 days or freeze milk that will not be used within 5 days.
Appendix 2. Acceptable medical reasons for breast milk substitution in babies aged below 6 months

**Infant conditions**

a) Infants who should not receive breast milk or any other milk except specialised formula:
   - Classic galactosemia: A special galactose-free formula is needed.
   - Maple syrup urine disease: A special formula free of leucine, isoleucine and valine is needed.
   - Phenylketonuria: A special phenylalanine-free formula is needed (some breastfeeding is possible, under careful monitoring).

b) Infants for whom breast milk remains the best feeding options but who may need other foods in addition to breast milk for a limited period:
   - Very low birth weight infants (those born weighing less than 1500 g).
   - Very preterm infants; those born less than 32 weeks gestational age.
   - Newborn infants who are at risk of hypoglycaemia by virtue of impaired metabolic adaptation or increased glucose demand (such as those who are preterm, small for gestational age or who have experienced significant intrapartum hypoxic/ischaemic stress, those who are ill and those whose mothers are diabetic) if their blood sugar fails to respond to optimal breastfeeding or breast milk feeding.
   - Infants younger than six months who, in spite of frequent and effective suckling and in the absence of illness, show persistent growth faltering (as demonstrated by a fatal or downward growth curve).

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### Breast milk storage

<table>
<thead>
<tr>
<th>Method of storage</th>
<th>Healthy baby</th>
<th>Ill baby</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frozen milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freezer compartment inside refrigerator</td>
<td>2 weeks</td>
<td>2 weeks</td>
</tr>
<tr>
<td>(1 door fridge)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freezer part of a refrigerator-freezer</td>
<td>3 months</td>
<td>3 months</td>
</tr>
<tr>
<td>(2 doors fridge)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separate deep freeze</td>
<td>6 months</td>
<td>3 months</td>
</tr>
<tr>
<td>Thawed in a refrigerator (do not refreeze)</td>
<td>24 hours</td>
<td>12 hours</td>
</tr>
</tbody>
</table>

Source: MOH (2009)
Maternal conditions

Mothers who are affected by any of the conditions mentioned below should receive treatment according to standard guidelines.

a) Mothers who may need to avoid breastfeeding:
   - HIV infection: If replacement feeding is acceptable, feasible, affordable, sustainable and safe (AFASS).

b) Mothers who may need to avoid breastfeeding temporarily:
   - Suffering from an illness that prevents a mother from caring for her infant, for example sepsis.
   - Herpes simplex virus type 1 (HSV-1): Direct contact between lesions on the mother’s breasts and the infant’s mouth should be avoided until all active lesions have resolved.
   - Maternal medication:
     - Sedating psychotherapeutic drugs, anti-epileptic drugs and opioids and their combinations may cause side effects such as drowsiness and respiratory depression and are better avoided if safer alternatives are available.
     - Radioactive iodine-131 is better avoided if safer alternatives are available- a mother can resume breastfeeding about two months after receiving this substance.
     - Excessive use of topical iodine or iodophors (e.g. povidone-iodine), especially on open wound mucous membranes, can result in thyroid suppression or electrolyte abnormalities in the breastfed infant and should be avoided.
     - Cytotoxic chemotherapy requires that a mother stops breastfeeding during therapy.
c) **Mothers who can continue breastfeeding despite contraindications**,  

- Breast abscess: Breastfeeding should continue on the unaffected breast; feeding from the affected breast can resume once the abscess has been drained and antibiotic treatment has started.
- Hepatitis B: Infants should be given hepatitis B vaccine, within the first 48 hours or as soon as possible thereafter.
- Hepatitis C
- Mastitis: If breastfeeding is very painful, milk must be removed by expression to prevent progression of the condition.
- Tuberculosis: Mother and baby should be managed according to national tuberculosis guidelines.
- Substance use:  
  - Maternal use of nicotine, alcohol, ecstasy, amphetamines, cocaine and related stimulants has been demonstrated to have harmful effects on breastfed babies.
  - Alcohol, opioids, benzodiazepines and cannabis can cause sedation in both the mother and the baby.
- Mothers should be encouraged not to use these substances and given opportunities and support to abstain.

*Source: MOH (2009); WHO (2009)*
Key Message 2

Give Appropriate Complementary Foods to Children Between the Age of 6 Months to 2 Years
1.0 TERMINOLOGY

**Breast milk substitutes**
Any food marketed, or otherwise presented, as a partial or total replacement of breast milk.

**Complementary food**
Any nutrient-containing food or liquid other than breast milk, infant formula or follow-up formula given to infants from age 6 to 24 months.

**Finger food**
Any food that is self-held and can be eaten independently, such as soft biscuits, rusks and bite-sized fruits.

**Follow-up formula**
Any food intended for use as a liquid part of the weaning diet for an infant from the aged of 6 months onwards, and for young children. It is a product prepared from the milk of cows or other animals or other constituents of animal and plant origin, which have been proven to be suitable for infants from the age of 6 months onwards and for young children.

**Infant formula**
Any food described or sold as an alternative for human milk for the feeding of infants. It is product prepared from the milk of cows or other animals, or other edible constituents of animals, including fish, or from plants suitable for infant feeding. This includes ready-to-feed formula.

**Infant or baby**
A child up to 12 months of age.

**Mixed feeding**
The act of feeding infants with breast milk in combination with breast milk substitutes.

**Nutritious snack**
Any nutrient dense food in small portions, eaten between main meals. It is usually self-fed, convenient and easy to prepare, such as fresh fruits and mini sandwiches. It should not replace main meals.

**Young child**
A child aged 12 months up to 3 years (36 months).
2.0 INTRODUCTION

It is well recognised that the period from birth to 2 years of age is critical for the promotion of optimal growth, brain development, as well as health and behavioural development. This is the peak age for growth failure, deficiencies of certain micronutrients and common childhood illnesses such as diarrhoea. Poor infant feeding practices, coupled with high rates of infectious diseases, are the principal proximate causes of malnutrition during the first 2 years of life (WHO, 2005). Approximately 6% of deaths of children under 5 years in developing countries could be prevented through improvements in complementary foods and feeding practices (Jones et al., 2003). For this reason, it is essential to ensure that caregivers are provided with appropriate guidance on optimal feeding of infants and young children.

The Malaysian National Breastfeeding Policy was formulated in 1993 and revised in 2005 in accordance with World Health Assembly Resolution 54.2 (2001). The revised policy recommended exclusive breastfeeding of babies for the first 6 months of life and continued breastfeeding up to 2 years. Complementary foods should be introduced at the age of 6 months. The WHO Global Consultation on Complementary Feeding observed that the nutrient needs of full-term, normal birth weight infants can be met by human milk alone for the first 6 months without any adverse effect on infant growth, if the mother is well nourished (WHO, 2003).

However, when infants reach the age of 6 months onwards, breast milk or infant formula alone becomes insufficient to meet the growing children's requirements of energy and several nutrients, particularly protein, iron, zinc and some fat-soluble vitamins (A and D). Furthermore, most infants are developmentally ready for other foods at about 6 months. This marks a transition period from exclusive breastfeeding to family foods to ensure that their nutritional needs are met complementary foods should be timely, adequately, appropriately, safely and properly given.

3.0 SCIENTIFIC BASIS

3.1 Basis of recommendations

3.1.1 Rationale of timely introduction of complementary feeding at the age of 6 months

A longer duration of breastfeeding is linked to other benefits, including reduced risk of chronic illnesses and obesity, as well as improved cognitive outcomes. However, after 6 months of age, it is increasingly difficult for breastfed infants to meet their nutrient needs from breast milk alone
(WHO, 2003). Therefore, adequate complementary foods are required to achieve the nutrient demand, in order to support growth and development. According to the United Nations Sixty-sixth session of the General Assembly in 2011, promotion of adequate breastfeeding and complementary feeding is a cost-effective and low-cost population-wide intervention that can reduce risk factors for non-communicable diseases (UN, 2012).

The WHO Global Consultation on Complementary Feeding concluded that the potential health benefits of waiting until 6 months to introduce other foods outweigh any potential risks. Infant growth is generally not improved by complementary feeding before 6 months even under optimal conditions (i.e. nutritious, microbiologically safe foods) and tend to displace breast milk (Cohen, Mrtek & Mrtek, 1995; Dewey et al., 1999; WHO, 2003). The early introduction of complementary foods, in fact, shortens the duration of breastfeeding (Zeitlin & Ahmed, 1995) and interferes with the uptake of important nutrients found in breast milk, such as iron and zinc. There are unlikely to be any risks associated with delaying introduction of solids to 6 months in all infants (SACN, 2003).

A randomised study in the United States of America found that there was no growth advantage in starting solids earlier or at 6 months (SACN, 2003). In addition, several studies carried out in developing countries, as well as in some industrialised countries, showed that the early introduction of complementary foods (below 6 months of age) increases infant morbidity and mortality, by reducing ingestion of protective factors present in breast milk and by increasing the likelihood of food contamination (Dewey et al., 1999). However, if complementary food is not introduced by 10 months of age, it may increase the risk of feeding difficulties later. Therefore, it is important to give age-appropriate foods in the correct consistency and by the correct method, for developmental and nutritional reasons (Agostoni et al., 2008).

The European Society for Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) Committee considers that gastrointestinal and renal functions are sufficiently mature by 4 months of age to enable term infants to process complementary foods. There is a range of ages at which infants attain the necessary motor skills to cope safely with complementary feedings. Nevertheless, the committee considers that exclusive breastfeeding for around 6 months is a desirable goal and also most effective to prevent allergic diseases (Agostoni et al., 2008). Naylor and Morrow (2001) reported that most of the infants gradually develop the ability to chew and show an interest in food other than milk at 6 months of age.

3.2 Energy and nutrients needed from complementary feeding

Breast milk intake continues to make a substantial contribution to the energy and nutrient intakes of infants and young children in developing countries after the age of 6 months (Dewey & Brown, 2003). The energy requirement of healthy infants in Malaysia is according to Recommended Nutrient Intakes (RNI) for Malaysia (NCCFN, 2005). Energy needs from complementary foods are estimated by subtracting average milk energy intake from total energy requirements at each age. The calculated total daily energy requirement from complementary foods is shown in Table 2.1.
Infants with low intake of breast milk or consuming low-energy dense complementary foods (0.6 kcal/g) may require a higher meal frequency. However, over-consumption of energy-dense complementary foods may induce excessive weight gain in infancy leading to obesity in school age and childhood (Agostoni et al., 2008). Besides, it may lead to excessive displacement of breast milk. Thus, not all children will need the same recommended number of meals. Caregivers should be attentive to children’s hunger cues when judging how often and how much to feed children.

Infants need a variety of foods to ensure that all nutrient needs are met. The types and amounts of food are as in Appendix 1. Micronutrient needs are high during the first 2 years of life in order to support the rapid rate of growth and development during this period. Dewey, Cohen & Rollins (2004) reported that diets predominantly from unfortified plant-based foods, such as rice, could not meet the protein and micronutrient needs of infants, especially iron, zinc, calcium and vitamin B₁₂. It was also reported that fruits and vegetables rich in vitamin A and vitamin C should be eaten daily. In order to meet the infants’ need for such nutrients, animal-source foods such as meat, poultry, fish and eggs (WHO, 2005) need to be given daily.

For infants who are unable to consume animal-source foods in sufficient amounts, adequate quality protein can be obtained by consuming fortified foods or a combination of grains and legumes. Thus, for these infants, both grains and legumes should be included in the daily diet, preferably within the same meal. In the South Asia region, babies aged between 6 and 23 months need to consume 80 g (≈3 to 4 tablespoons) lentils daily, with or without consumed animal-source foods, in order to meet estimated energy needs (WHO, 2005). The American Academy of Paediatrics also recommends that infants with a strong family history of allergies should not receive cow’s milk until 1 year of age, eggs until 2 years and peanuts, nuts, fish and shellfish until 3 years of age (AAP, 2000).

Additionally, the Malaysian Oral Health Survey of preschool children carried out in 2005 indicated that, the prevalence of dental caries was at 75.5% (MOH, 2007). Therefore, nutrition education and the encouragement of practices that limit sugar intake should start from a young age. The ESPGHAN Committee recommended avoiding consumption of juices or other

### Table 2.1. The total daily energy requirement from complementary foods

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Daily energy needs (kcal/ day)¹</th>
<th>Average milk energy intake (kcal/ day)²</th>
<th>Energy from complementary food (kcal/ day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 to 8</td>
<td>615</td>
<td>413</td>
<td>202</td>
</tr>
<tr>
<td>9 to 11</td>
<td>686</td>
<td>379</td>
<td>307</td>
</tr>
<tr>
<td>12 to 24</td>
<td>945</td>
<td>346</td>
<td>599</td>
</tr>
</tbody>
</table>

Source:
¹Average from RNI (NCCFN, 2005)
²WHO (2003)
sugar-containing drinks in bottles, and discouraging children from developing the habit of sleeping with a bottle (Agostoni et al., 2008). The committee also recommended that additional salt should not be added to foods during infancy to reduce the risk of cardiovascular diseases in later life.

Although, some studies suggested that infants under the age of 12 months may need some added sodium for proper growth and development, it does not apply to all infants because these studies focused on pre-term infants (Al-Dahhan et al., 1984) and animal (Fine et al., 1987). In exclusively breastfed infants below 6 months of age, sodium intake of approximately 160 mg per day from breast milk is adequate. Infants who are formula-fed will consume around 185 mg of sodium per day (NHMRC, 2003). According to the Malaysian Food Regulations 1985 (MOH, 1985), the sodium content of infant formulas should not exceed 60 mg/100 kcal. In countries such as Australia and New Zealand, the maximum amount of sodium allowed is 100 mg per 100 g in flours, pasta and ready-to-eat foods, 300 mg for biscuits and 350 mg for teething rusks (NHMRC, 2003).

By 12 months of age, the renal system is fully mature, hence the sodium tolerance of children above the age of 1 year is not expected to differ from that of adults (Fomon, 1993). Therefore, their intake of sodium should be proportionately adjusted downward based on the energy requirements of children relative to those of adults (WHO, 2012).

Food preferences seem to emerge early in life, although the nature of the progression of these preferences to adulthood is not clear (Worthington-Roberts & Williams, 2000). Infants appear to have an innate preference for the taste of salt, which develops around 4 months of age (Beauchamp, Cowart & Moran, 1986; Beauchamp et al., 1994). However, this may be reduced by limiting subsequent exposure to salty food among infants and children (Cowart & Beauchamp, 1990; Harris & Booth, 1987). These preferences are influenced by parents’ food preferences, parental role model practices, family approaches to food purchasing and cooking, media exposure and parent–child interaction regarding food (Campbell & Crawford, 2001).

Therefore, offering complementary foods without added sugars and salt may be advisable, not only for short-term health, but also to set infant’s threshold for sweet and salty tastes at lower levels later in life (Agostoni et al., 2008).

### 3.3 Food texture

The neuromuscular development of infants indicates the minimum age at which they can ingest particular types of foods (WHO, 1998). Semi-solid or pureed foods are needed at first, until the ability to munch (jaw movements) or chew (use of teeth) appears. Generally, healthy infants aged 6 to 8 months old will gradually be able to tolerate pureed, mashed and semi-solid foods. By the age of 8 months, most infants can hold and eat finger foods. At 9 to 11 months, infants begin to develop chewing skills and are able to consume coarsely chopped foods. At 12 months, infants learn to swallow with easy lip closure and begin to develop biting skill. Most children at this age can eat the same type of food consumed by the rest of the family (WHO, 2005).

Gradually, the food texture and methods of preparation can be changed as the infants get older, adapting to their development and abilities. When foods of inappropriate texture are offered, children may be unable to consume large amounts or may take longer to eat the food.
Infants are at risk of choking on food due to their poor chewing and swallowing abilities, as well as their narrow airways, compared to older children. Therefore, the United States Food and Drug Administration recommends that infants should not be given cubes or chunks of food larger than 0.5 cm (USFDA, 2005).

3.4 Practise responsive feeding

Responsive feeding is defined as feeding infants directly and assisting young children, appropriate for their age and developmental needs, to ensure that they consume adequate amounts of complementary food. Improving complementary feeding requires attention to foods as well as to the feeding behaviour of caregivers. It has been hypothesised that a more active style of feeding may improve dietary intake (WHO, 2005). According to Benton (2004), forcing a child to eat a particular food will decrease the liking for that food. Restricting access to particular foods increases rather than decreases preference for those foods. By contrast, repeated exposure to initially disliked foods may break down resistance.

Appropriate feeding behaviours can be divided into four types:

i. Adaptation of the feeding method to the psychomotor abilities of the child (spoon handling ability, ability to munch or chew, use of finger foods);

ii. The active involvement of the feeder, including encouragement to eat, offering additional foods and providing second helpings;

iii. Response of the feeder, including relationship close bond between child and feeder, timing of feeding and positive or aversive style of interacting;

iv. The feeding situation, including the organisation, frequency and regularity of the feeding situation, whether the child is supervised and protected while eating and by whom (WHO, 1998).

3.5 Safe preparation and storage of complementary foods

Introduction of complementary foods will increase the risk of infants contracting food borne diseases. The peak incidence of diarrhoeal disease is during the second half year of the infant’s first year (Bern et al., 1992). Numerous studies have indicated that a great proportion of diarrhoea and other food borne diseases are due to unhygienic preparation of foods in the household. A poor food intake, aggravated by the loss of nutrients from vomiting, diarrhoea, malabsorption and fever over an extended period of time, will lead to nutritional deficiencies. This leads to serious consequences for the growth and immune system of infants and children (Motarjemi, 2000).

Feeding bottles are particularly important route for the transmission of pathogens because they are difficult to keep clean. Therefore, it is very important that all the equipment used to feed and to prepare feeds for infants (for example, bottles, teats, lids) has been thoroughly cleaned and sterilized before use. It will remove harmful bacteria that could grow in the feed and make infants ill (WHO & FAO, 2007). In addition, the Ministry of Health Malaysia (MOH) has banned the sale of baby bottles containing Biphosphenol A (BPA) since March 1, 2012, as a precaution measure, if any special situation should arise where feeding bottles are necessary. There has been no specific evidence to show that polycarbonate baby bottles containing BPA are safe for high-risk groups, including babies and children. Therefore, parents must be advised to choose BPA-free bottles, if bottles are required, to frequently
check and replace any bottles with scratches on the inner walls and to replace bottles every 6 months, even if there is no visible damage.

3.6 Feeding during and after illness
During illness such as diarrhoea and fever, the need for fluids is three times greater than usual. Therefore, it is essential that extra fluids be provided in addition to water obtained from the normal diet. Sick children appear to prefer breast milk to other foods (Brown et al., 1990). Thus, it is advisable to continue frequent breastfeeding during illness.

Even though the child’s appetite may be reduced during illness, continued consumption of foods is recommended to maintain nutrient intake and enhance recovery (WHO, 2005). After illness, the child needs greater nutrient intake to make up for nutrient losses during the illness and allow for catch-up growth. Extra food is needed until the child has regained any weight lost and is growing well again.

4.0 CURRENT STATUS
In Malaysia, the infant feeding practice is still sub-optimal. The Third National Health and Morbidity Survey (NHMS III) showed that in 2006, while the ever breastfeeding rate is almost universal, the rate of exclusive breastfeeding below 6 months was only 14.5% (IPH, 2008). In terms of complementary feeding, only 41.5% infants received timely complementary feeding (i.e. between the ages of 6 to 10 months) and complementary food was given to infants as early as 2 months of age. Furthermore, only 55.9% of children aged 9 to 23 months received at least 3 meals a day. A clinic-based report showed that in 2009, 14.4% infants were exclusively breastfed. This figure has increased to 16.2% in 2010 and 23.3% in 2011. In terms of complementary feeding, data from 2010 show that 64.6% of infants had received timely complementary feeding at 6 months and this increased to 77.6% in 2011 (MOH, unpublished data).

Available data have showed that infant feeding practices in Malaysia are still sub-optimal. In order to improve current feeding practices, the National Guidelines for the Feeding of Infants and Young Children (from birth until 3 years old) were developed in 2008. Education on the feeding practices of infants and young children has been integrated into public health programmes including written materials, postnatal talks and seminar/training courses for childcare and day care centre caregivers. This chapter is a scientific update of the National Guidelines for Feeding of Infants and Young Children (from birth until 3 years old) and reviews of the key recommendations to help healthcare providers, caregivers and parents to have a better understanding of infant feeding and achieve the goal of this key message.
5.0 KEY RECOMMENDATIONS

Key recommendation 1
Start baby on complementary food from 6 months of age.

How to achieve
1. Start with a few teaspoons of complementary food and gradually increase the amount.
2. Breastfeeding on demand should be continued until baby is 2 years of age.
3. Add expressed breast milk to complementary foods (e.g. breast milk mixed with rice porridge).

Key recommendation 2
Feed children with enough food to meet their energy needs.

How to achieve
1. Give children a variety of cereals (e.g. porridge, rice, bread) and tubers (e.g. potatoes, sweet potatoes).
2. Generally, baby aged 6 to 8 months should be given ½ cup of thick rice porridge at each main meal. This should be increased gradually to 1 cup between the ages of 9 to 11 months.
3. Children 1 to 2 years should be given ½ cup of rice at main meals.
4. Add about ½ teaspoon of oil, butter or margarine in each main meal every day (up to a maximum of 2 teaspoons per day).
5. Prepare home-cooked complementary food without adding salt, sugar, or soya sauce (kicap).
6. If you give children commercially prepared cereals, read the food label including the nutrition information panel and choose those fortified with iron. Avoid products with added sugar or salt.
7. Avoid adding salt and sauces when preparing food for toddlers.

Key recommendation 3
Increase the feeding frequency of complementary foods according to age.

How to achieve
1. Give complementary foods to children at the following frequencies according to their age as per Table 2.2.
Key recommendation 4
Change food texture and preparation methods gradually as the baby gets older.

How to achieve
1. Ideally, give infants and young children freshly prepared food.
2. Serve blended, mashed and soft foods to children at the age of 6 to 8 months.
3. Serve chopped foods to children at the age of 9 to 11 months. Healthy finger foods such as fruits can also be given.
4. Give children family foods at the age of 12 months.
5. Avoid giving chunks of hard food larger than 0.5 cm (½ of your thumb nail) and supervise children during mealtimes to avoid choking.

Key recommendation 5
Give a variety of food and gradually increase the quantity to ensure that all nutrient needs are met.

How to achieve
1. Give children foods from animal sources such as meat, poultry, fish or eggs every day, as they are the main sources of protein, iron and zinc. However, avoid giving egg white to babies aged below 1 year.
2. Continue to practice breastfeeding in between meals. For breastfed children above 6 months old who are non-breastfed should be given all types of dairy milk, except low-fat milk, skimmed milk, sweetened condensed milk and creamer. Soya milk should not replace dairy milk unless advised by health care professionals. However, avoid adding sugar to milk and choose flavoured milk that has little or no sugar.

Table 2.2. Frequencies of complementary foods according to age

<table>
<thead>
<tr>
<th>Age</th>
<th>Meal frequency/ day</th>
<th>Nutritious snacks/ day</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 to 8 months</td>
<td>2 to 3 times</td>
<td>1 to 2 times</td>
</tr>
<tr>
<td>9 to 11 months</td>
<td>3 to 4 times</td>
<td>1 to 2 times</td>
</tr>
<tr>
<td>1 to 2 years</td>
<td>4 to 5 times</td>
<td>1 to 2 times</td>
</tr>
</tbody>
</table>
3. If milk and foods from animal sources are not consumed in adequate amounts, give children both cereals and legumes [e.g. mung beans (kacang hijau), red beans or dhal] in the same meal.

4. Give different-coloured fruits and dark green leafy vegetables (e.g. spinach and mustard greens) every day. Fresh fruits can be served as healthier and nutrient-dense snacks.

5. Provide fruit juice, but not more than ¾ glass (180 ml) a day, to prevent children from feeling full, as it may decrease the intake of other nutritious food.

6. Give fresh foods and avoid processed foods high in sugar or salt.

7. Avoid giving children drinks with low nutrient value such as tea, coffee, sweetened condensed milk, syrup, cordials and carbonated drinks.

**Key recommendation 6**
Consider your child’s stage of development and ability when feeding.

**How to achieve**
1. Feed babies directly when they are still young. When they grow older and are able to feed himself, provide assistance at meal times.
2. Avoid giving complementary foods using the feeding bottle.
3. Be patient and take time to feed children. They should be encouraged and not forced to eat.
4. Be aware of signs of hunger and satiety. Stop feeding children when they are full.
5. Create a fun environment and interact lovingly with children during meal times.
6. Teach good and proper oral hygiene habits such as brushing teeth daily.

**Key recommendation 7**
Give sick children extra fluids and offer small but frequent meals.

**How to achieve**
1. Continue and practise frequent breastfeeding.
2. Offer children their favourite foods when they have no appetite.
3. Encourage children to eat a variety of soft and appetising food.
4. During recovery, give extra food and encourage children to eat more at each meal.
REFERENCES


# APPENDICES

## Appendix 1. Recommended daily food intake according to age

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Amount of food per day according to age groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6 to 8 months</td>
</tr>
<tr>
<td>Cereals, cereals-based products and tubers</td>
<td>1 ½ cup porridge</td>
</tr>
<tr>
<td>Vegetables</td>
<td>2 tablespoons cooked vegetables</td>
</tr>
<tr>
<td>Fruits</td>
<td>¼ slice of papaya OR small size banana (1 pisang mas: 33 g )</td>
</tr>
<tr>
<td>Meat, poultry, fish and legume</td>
<td>2 teaspoons of any type of meat or ¼ fish</td>
</tr>
<tr>
<td>Milk</td>
<td>Breastfeeding on demand</td>
</tr>
<tr>
<td>Fats, oils</td>
<td>1 teaspoon added oil</td>
</tr>
</tbody>
</table>

Equivalent of household measurements:

- 1 cup = 200 ml
- 1 teaspoon = 5 g
Key Message 3

Eat A Variety of Foods Within Your Recommended Intake
1.0 TERMINOLOGY

**Adequate diet**
An adequate diet provides enough energy, nutrients and fibre to maintain an individual’s health. A diet that is adequate for one individual may not be adequate for another.

**Balanced diet**
A balanced diet consists of a combination of foods that provide the proper balance of nutrients. The body needs several types of foods in varying amounts to maintain health. The right balance of nutrients needed to maintain health can be achieved by eating the proper balance of all healthy foods including fruits, vegetables and meats.

**Food group**
The different types of food can be classified into five food groups. These food groups consist of foods of similar nutrient content and functions.

**Food pyramid**
A food pyramid is a visual tool that is used as a guide in designing a healthy diet. It is developed as a guide to provide a framework for the types and amounts of food that can be eaten in combination to provide a healthy diet. A food pyramid consists of levels that represent various food groups. Indicated beside each food group is the recommended number of servings per day from each group. From the bottom to the top of the food pyramid, the size of each food group becomes smaller indicating that an individual should eat more of the foods at the base of the pyramid and less of the foods at the top of the pyramid.

**Healthy diet**
A healthy diet provides adequate and balanced combinations of energy and nutrients.

**Moderation**
Eating in moderation refers to consuming the proper amounts of foods to maintain a healthy weight and to optimize the body’s metabolic process.

**Recommended Nutrient Intake (RNI)**
Recommended nutrient intake is the daily intake which meets the nutrient requirements of almost all (97%) apparently healthy individuals, in an age and sex-specific population group. The range of intakes encompassed by the RNI and the upper tolerable nutrient intake should be considered sufficient to prevent deficiency, maintain optimal health while avoiding toxicity (NCCFN, 2005).
Serving size
In the dietary guidelines, a serving size is the amount of food recommended for consumption in a day. The portion size is in household measures such as cup, plate, bowl, tablespoon and tea spoon. A serving size defined in the food pyramid may not equal a serving size defined in a food label.

Variety
Variety refers to eating many different types of foods each day and to ensure better selection of nutritious foods. By selecting a variety of foods, the chances of consuming the multitude of nutrients the body needs are optimised.

2.0 INTRODUCTION
A healthy diet is important as a source of nutrients, to reduce the risk of diseases and in the management of certain diseases. Healthy and balanced eating habits provide energy and nutrients required by the body. The Malaysian Dietary Guidelines (MDG), (NCCFN, 1999) recommended three important considerations when planning healthy meals, specifically, eating a balanced diet and a wide variety of foods in moderation. The same principles apply in the recommendation for children. These recommendations have also been suggested by other Dietary Guidelines from various countries such as USA (USDHHS & USDA, 2005), Australia (NHMRC, 2003) and Singapore (HPB, 2003). The American Heart Association also recommended that those aged 2 years and older should consume a diet that primarily consists of fruits and vegetables, whole grains, low-fat and non-fat dairy products, beans, fish and lean meat (AHA, 2006).

It is very important that children and adolescents are provided with appropriate foods that incorporate the good principles of nutrition such as having a variety of foods, balanced intake of nutrients and eating in moderation. Different foods provide different combinations of energy and nutrients. The recommended way to meet the daily requirements of energy and nutrients is to eat a varied diet that combines cereals, fruits and vegetables, meat, fish, poultry, legumes and dairy products. Water is also important as it is essential for many body functions, for example regulating the body temperature and digestion. A nutritious diet reduces the risk of nutrient deficiencies and excesses. A food pyramid may act as a guide to provide a framework for the types and amounts of food that can be eaten in combination to provide a nutritious and healthy diet. The levels in the food pyramid from the bottom to the top indicate that a child should eat more of the foods at the base of the pyramid and less of the foods at the top of the pyramid which are represented by various food groups.
In 2011, the USDA introduced ‘MyPlate’ (the USDA Plate) concept to replace its food pyramid structure. While the basic nutritional guidelines for the Americans remain similar, there are a few differences. The differences are (i) less emphasis on grains, (ii) not using serving size, (iii) not mentioning fats and oils and (iv) replacing the ‘meat’ group with protein (USDA, 2011).

In line with the Malaysian Dietary Guidelines (MDG) for adults, the dietary guidelines for children and adolescents is also based on the pyramid. The plate icon or the plate concept may be used by nutritionists, dietitians and other related health professionals as an educational tool to teach parents/teachers/caregivers to transfer information from the food pyramid to the plate. It also helps parents and children to understand the food groups described in the food pyramid. The use of a food plate acts as a simple and useful guide when consuming a meal.

The MDG for Children and Adolescents recommends the consumption of all the food groups in the food pyramid guidelines for children aged 3 to 18 years. However in fewer numbers of servings based on their energy requirement. This is in line with the dietary guidelines for children of other countries [Australia, (2003); Singapore, (2010) and USA (2010)]. A study on the nutritional status and food habits of about 12,000 primary school children in Malaysia reported that 3 in 10 children (Ismail et al, 2009) skipped breakfast a few days a week. Among 90% of the children who snacked frequently, their snack was a combination of healthy foods such as fruits and also unhealthy snacks such as extruded snacks, sweets or French fries. In another study among adolescents, about 20% skipped at least one meal a day; with 12.6% missing breakfast (Moy, Gan & Siti Zaleha, 2006). The MDG for Children and Adolescents is developed taking into consideration the recent evidence on the changes in dietary practices and dietary habits of Malaysian children.

3.0 SCIENTIFIC BASIS

Protein, carbohydrates and fat provide energy to the body, while vitamins and minerals are important for proper functioning of the body. In addition to the essential nutrients, foods also contain non-nutrients that can influence body functions. These include fibre and phytochemicals (found in plants), many of which are protective against disease. Some of these compounds act as antioxidants, which protect the body’s cells from being damaged.

In the Malaysian Food Pyramid (Figure 3.1), each horizontal section contains depictions of different food groups based on the daily energy needs of children and adolescents. The Malaysian RNI (NCCFN, 2005) recommended that total
Carbohydrates should contribute 55 to 70%, total fat 20 to 30% and protein 10 to 15% of the total daily energy intake for the general population including children. Thus, carbohydrates form a major percentage of the energy needs and are placed at the base of the pyramid. Children aged between 3 to 18 years require adequate energy for growth and development. The total calories that children and adolescents need each day varies depending on a number of factors, including age, sex, weight and level of physical activity. Providing sufficient energy intake from foods and beverages is important in achieving growth and attaining energy balance.

As rice is the staple food of Malaysia, it constitutes the basic constituent of most meals. The MDG recommends planning meals with rice or other grains as the dominant portion of meals. The principal nutritional objective is to promote an optimal intake of carbohydrate and fibre rich foods.

The basis for most healthy meals should be to include unrefined or minimally processed cereals and grains (whole grain or wholemeal) where possible and to choose fortified cereals and grains when available and affordable. A study by Zalilah et al., (2006) among underweight, normal...
Carbohydrate intake was between 51 to 53% of total daily energy intake. In another study among lower primary schoolchildren, carbohydrate intake contributed 54% of energy in both boys and girls. (Fatihah et al., 2010).

Children and adolescents should consume foods naturally high in dietary fibre. The consumption of dietary fibre in childhood is associated with important health benefits, especially with respect to promote normal bowel movement. Dietary fibre also may help to reduce the risks of cardiovascular disease, some types of cancers and adult-onset diabetes. According to the American Dietary Guidelines 2010, the recommended intake of fibre is 14 g per 1000 calories per day (USDA & USDHHS, 2010). Based on this recommendation, the range of fibre intake of children should be from 18 to 39 g per day. Unprocessed cereals (grains) and legumes and other foods that are a natural source of dietary fibre should contribute an average intake of at least 25 g per day (WCRF/AICR, 2007).

A study on fibre intake reported that the mean intake among adults in Kuala Lumpur was 13.22 g per day (Suzana, Azhar & Fatimah, 2004). There is a lack of studies on fibre intake among children in Malaysia. Nonetheless, it is suggested that the dietary guidelines for children should include recommendations for unprocessed cereals (grains) and legumes. Increasing the serving size for fruits and vegetable groups will also increase fibre intake among children.

Fruits and vegetables are major contributors of a number of nutrients including folate, magnesium, potassium, dietary fibre and vitamins A, C and K. Eating more fruits and vegetables also helps to increase the intake of antioxidants and phytochemicals to improve immunity and bowel movement. Studies have shown that high intakes of fruits and vegetables have a protective effect against cardiovascular disease (Liu et al., 2000) and diabetes (Fung et al., 2002). The WHO Technical Report Series 916 (WHO, 2003) recommends intake of 400 to 500 g of fresh fruits and vegetables a day to reduce risk of coronary heart disease, stroke and high blood pressure.

Suhaili (2007) reported that among primary school children in Serdang, 90% did not meet the recommended intake of fruits and vegetables. A study on primary school children in Selangor showed moderate knowledge and practice and good attitude towards consumption of fruits and vegetables (Salihah et al., 2009). Other studies on intake of fruits and vegetables (Zalilah & Tham, 2002) among children (Norimah & Lau, 2000; Zalilah et al., 2005) showed that intakes were notably lower than the recommended amounts. Studies among preschoolers and school age children reported that while fruits were preferred by children and were provided as snacks by parents, vegetables were least liked by them (Norimah & Lau, 2000; Ismail et al., 2009).

The food items on the third level of the pyramid are milk and dairy products, fish, poultry, meat and legumes. These foods are mainly composed of proteins which are vital for growth and the maintenance of body functions. These foods also contribute B vitamins (e.g. niacin, thiamine, riboflavin and B6), vitamin E, iron, zinc and magnesium to the diet. Foods in this group...
should contribute 10 to 15% of total energy intake per day.

Milk and milk products provide rich sources of protein, riboflavin, calcium, vitamin D (for products fortified with vitamin D) and potassium. Studies have shown that intake of milk and milk products improve bone health, especially in children and adolescents (HPB, 2010; USDA & USDHHS, 2010). It is especially important to establish the habit of drinking milk in young children, as those who consume milk at an early age are more likely to do so as adults. However, several studies in the country have shown that the diets of children and adolescents do not meet current national dietary recommendations (Lim & Norimah, 2007). For children who are lactose intolerant, low-lactose and lactose-free milk products are available.

Considering the nutritional value of the food groups in the third level, it is important to include them in the daily diet. Inadequate or excessive intake of these foods should be avoided as they have significant implications on an individual’s health. Excessive intake could increase the risk of hypercholesterolaemia and coronary heart disease while an inadequate intake could lead to protein deficiency and anaemia (WHO, 2003). Thus, taking into consideration health implications, it is recommended that foods in this group be consumed in moderate amounts.

Fat, oils, sugars and salts are in placed at the peak of the pyramid. Currently the limited study carried out among children and adolescents in Malaysia showed fat intake contributing between 27 to 33% of total energy (Hazwanie, Poh & Norimah, 2011; Fatihah et al., 2010; Zalilah et al., 2006). United States recommended between 30 to 35% of energy from fat for children and adolescents (NIH, 2001). Excessive intake of fat can cause obesity among the children and adolescents. Obesity is a risk factor for high blood pressure, diabetes and cardiovascular disease during their adult life. The presence and tracking of high blood pressure in children and adolescents occur due to unhealthy lifestyle, including excessive intake of salt (Aboderin et al., 2002).

Excessive added sugars in daily diet of the children and adolescent have also been implicated in the development of various health problems including obesity (Berkeys et al., 2004), hypertension, dyslipidaemia (Dhingra et al., 2007) and dental caries (Rennie & Livingstone, 2007). Studies have also shown the association between regular consumption of sugary drinks in particular sugar sweetened carbonated drinks with obesity development and poor dietary quality in school children (Malik, Schulze & Hu, 2006).

The food pyramid also provides the number of servings for each food group. The recommended numbers of servings are different for individuals of different age groups and sex. The recommended number of servings is an average amount that individuals should choose to consume each day. The number of servings calculated for the dietary guideline is based on 60% carbohydrate, of which 50% is complex carbohydrate and 10% refined sugar, 15% protein and 25% fat (NCCFN, 2005). When the total caloric intake has been calculated according to the percentage of carbohydrate, protein and fat, the total calories will then be converted to an exchange list for carbohydrates, protein and fat followed by conversion into serving sizes. For children, the number of servings for the macronutrient intake are calculated based on their age groups, sex and energy requirements.
4.0 CURRENT STATUS

The assessment of food intake among children are difficult to do as the data reported can be unreliable or misleading, thus these studies have to be interpreted with caution. Many studies on food habits have been reported among young (below 6 years) and older children (7 to 12 years), (Ismail et al., 2009; Moy, Gan & Siti Zaleha, 2006; Norimah & Lau, 2000). However, only a few of them reported energy and nutrient intake. A study among adolescents in Sabah reported mean energy intake between 1468 to 1709 kcal per day in boys and girls (Foo et al., 2006). Another study among adolescents in Peninsular Malaysia, demonstrated a higher mean energy intake of 1903 kcal among girls while 2133 kcal in boys. Macronutrient contributions to the total energy intake were 52% for carbohydrate, 33% fat and 15% protein (Zalilah et al., 2006).

Soo, Wan Abdul Manan & Lee (2011) who carried out a study among Chinese primary school children in Kota Bharu aged 10 to 12 years old showed that protein, fat and total calorie intake were significantly higher among the overweight compared with the normal children. In another study of children in the same age group, however in the Klang Valley, reported mean energy intake of 2046 kcal in boys and 1944 kcal among girls (Hazwanie, Poh & Norimah, 2011). Macronutrients contribution to the total energy intake were identical in both sexes; 59% carbohydrate, 14% protein and 27% fat.

In a few studies reporting the food intake among 7 to 9 year olds in Peninsular Malaysia, Fatihah et al., (2010) reported that carbohydrate, protein and fat intake contributed 54%, 16% and 30% to the total energy intake respectively. Mean energy intake for boys was 1618 kcal while 1513 kcal per day for girls. Meanwhile, among the same age group children in Klang Valley, carbohydrate contribution to total energy intake was higher among boys than girls (59% vs. 56%) while fat contribution was lower among boys than girls (27% vs. 29%). Mean energy intake was not significantly higher in boys (2025 kcal) than girls (1916 kcal) (Hazwanie, Poh & Norimah, 2011).

At present, published data on the food intake of children 3 to 6 years are lacking, however food habits of children in preschools have been reported (Norimah & Lau, 2000; Mohd Nasir et al., 2012). In the recent study among 4 to 6 year olds, majority of the pre-school children consumed breakfast, lunch and dinner every day, however, some 17%, 13% and 18% skipped these meals respectively. Food groups of concern were fruits and vegetables, whereby 26% and 32% of preschoolers consumed these food groups only twice a week, with 12% not eating vegetables at all. Fast food consumption was satisfactory with the majority eating once or twice monthly, with fried chicken as the most commonly consumed. A third of the preschoolers ate snack foods once to twice a week. Majority (56%) preferred foods which were deep fried over healthier cooking preparations such as boiling (29%). This preference for deep fried foods over boiled foods among the preschoolers (Mohd Nasir et al., 2012) was similar to those reported a decade ago (Norimah & Lau, 2000).
5.0 **KEY RECOMMENDATIONS**

**Key recommendation 1**
Choose and ensure that the daily diet consists of foods based on the Malaysian Food Pyramid.

**How to achieve**
1. Choose foods from the five food groups based on the Malaysian Food Pyramid to get all nutrients needed by the body.
2. Vary your food choices within each food group during main meals.
3. Reduce fats, oils, salt, sugar and flavour enhancers such as monosodium glutamate (MSG), sauces (e.g. soya sauce) and flavouring cubes in cooking.

**Key recommendation 2**
Choose and ensure the number of servings consumed are based on caloric needs.

**How to achieve**
1. Determine the caloric needs based on age group and sex as shown in Table 3.1

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Boys (kcal)</th>
<th>Girls (kcal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 years</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>4 to 6 years</td>
<td>1300</td>
<td>1300</td>
</tr>
<tr>
<td>7 to 9 years</td>
<td>1800</td>
<td>1600</td>
</tr>
<tr>
<td>10 to 12 years</td>
<td>2200</td>
<td>2000</td>
</tr>
<tr>
<td>13 to 15 years</td>
<td>2700</td>
<td>2200</td>
</tr>
<tr>
<td>16 to 18 years</td>
<td>2800</td>
<td>2000</td>
</tr>
</tbody>
</table>

Source: NCCFN (2005); Values are rounded up to the nearest tens.
2. Consume the number of servings based on caloric needs as shown in Table 3.2a and 3.2b.

### Table 3.2a. Number of serving sizes based on daily caloric needs by age group (3 to 9 years)

<table>
<thead>
<tr>
<th>Food groups</th>
<th>1000 (3 years)</th>
<th>1300 (4 to 6 years)</th>
<th>1600 (7 to 9 years)</th>
<th>1800 (7 to 9 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals/ grains</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Fruits</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Vegetables</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Meat/ poultry</td>
<td>½</td>
<td>½</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fish</td>
<td>½</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Legumes</td>
<td>½</td>
<td>½</td>
<td>½</td>
<td>1</td>
</tr>
<tr>
<td>Milk and dairy products</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

* Based on 14 g protein per serving
# Based on 30 g carbohydrate per serving
Fat and sugar caloric values have been incorporated into the total caloric intake per day.

### Table 3.2b. Number of serving sizes based on daily caloric needs by age group (10 to 18 years)

<table>
<thead>
<tr>
<th>Food groups</th>
<th>2000 (10 to 12 years)</th>
<th>2200 (10 to 12 years)</th>
<th>2500 (13 to 15 years)</th>
<th>2700 (13 to 15 years)</th>
<th>2800 (16 to 18 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals/ grains</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Fruits</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Vegetables</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Meat/ poultry</td>
<td>1</td>
<td>1½</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Fish</td>
<td>1</td>
<td>1½</td>
<td>1½</td>
<td>1½</td>
<td>1½</td>
</tr>
<tr>
<td>Legumes</td>
<td>1</td>
<td>1½</td>
<td>1</td>
<td>1½</td>
<td>1½</td>
</tr>
<tr>
<td>Milk and dairy products</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

* Based on 14 g protein per serving
# Based on 30 g carbohydrate per serving
Fat and sugar caloric values have been incorporated into the total caloric intake per day.
3. Ensure variety in each food group and vary the food choices in the same group as they are interchangeable. The foods and their serving sizes below have similar nutrient content (Table 3.3).

Table 3.3. Food varieties according to food groups

<table>
<thead>
<tr>
<th>One serving of cereals and cereal products and tubers (30 g carbohydrate per serving)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bee Hoon, soaked</td>
</tr>
<tr>
<td>Biscuits, cream crackers</td>
</tr>
<tr>
<td>Bread, white</td>
</tr>
<tr>
<td>Bread, whole meal</td>
</tr>
<tr>
<td>Laksa, soaked</td>
</tr>
<tr>
<td>Mee or kuay teow, wet</td>
</tr>
<tr>
<td>Potato</td>
</tr>
<tr>
<td>Putu mayam</td>
</tr>
<tr>
<td>Rice, white, cooked</td>
</tr>
<tr>
<td>Rice porridge, plain</td>
</tr>
<tr>
<td>Sweet potato, yam and tapioca</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>One serving of fruits (15 g carbohydrate per serving)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple/ chinese pear/ mango/ ciku</td>
</tr>
<tr>
<td>Banana, berangan (medium size)</td>
</tr>
<tr>
<td>Banana, emas</td>
</tr>
<tr>
<td>Durian</td>
</tr>
<tr>
<td>Grapes</td>
</tr>
<tr>
<td>Guava/ pear</td>
</tr>
<tr>
<td>Mandarin orange, (small to medium)</td>
</tr>
<tr>
<td>Papaya/ pineapple/ watermelon</td>
</tr>
<tr>
<td>Prunes</td>
</tr>
<tr>
<td>Raisins</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>One serving of vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark green leafy-vegetables, cooked</td>
</tr>
<tr>
<td>Fruit vegetables, cooked</td>
</tr>
<tr>
<td>Ulam, raw</td>
</tr>
</tbody>
</table>
### Table 3.3: Food varieties according to food groups

#### One serving of fish, poultry and meat
(14 g protein per servings)

<table>
<thead>
<tr>
<th>Food variety</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchovies (head removed)</td>
<td>2/3 cup</td>
</tr>
<tr>
<td>Beef, lean (7.5 cm x 9 cm x 0.5 cm)</td>
<td>2 pieces</td>
</tr>
<tr>
<td>Chicken, drumstick</td>
<td>1 piece</td>
</tr>
<tr>
<td>Cockles</td>
<td>1 cup</td>
</tr>
<tr>
<td>Eggs</td>
<td>2 whole</td>
</tr>
<tr>
<td>Ikan kembung</td>
<td>1 medium</td>
</tr>
<tr>
<td>Ikan selar</td>
<td>1 whole</td>
</tr>
<tr>
<td>Ikan tenggiri</td>
<td>1 piece</td>
</tr>
<tr>
<td>Chicken liver</td>
<td>2 pieces</td>
</tr>
<tr>
<td>Telur puyuh (Quail egg)</td>
<td>12 whole</td>
</tr>
<tr>
<td>Squid</td>
<td>2 medium</td>
</tr>
</tbody>
</table>

#### One serving of legumes
(7 g protein per servings)

<table>
<thead>
<tr>
<th>Food variety</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chickpea/dhal</td>
<td>1 cup</td>
</tr>
<tr>
<td>Green/Mung bean and canned baked bean</td>
<td>1 1/2 cups</td>
</tr>
<tr>
<td>Tempeh/tau-kua/tauhu</td>
<td>2 pieces</td>
</tr>
<tr>
<td>Unsweetened soy bean milk</td>
<td>1 1/2 glass</td>
</tr>
</tbody>
</table>

#### One serving of milk and dairy products
(7 g protein per servings)

<table>
<thead>
<tr>
<th>Food variety</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheese</td>
<td>1 slice</td>
</tr>
<tr>
<td>Milk, low fat</td>
<td>1 glass</td>
</tr>
<tr>
<td>Milk, evaporated</td>
<td>2/3 cup</td>
</tr>
<tr>
<td>Milk, powdered (heaped)</td>
<td>4 dessertspoon</td>
</tr>
<tr>
<td>Yoghurt</td>
<td>1 cup</td>
</tr>
</tbody>
</table>

**Standard measurements used in this dietary guideline are as follows:**

- 1 cup = 200 ml.
- 1 glass = 250 ml.
- 1 dessertspoon = 10 ml.
- 1 tablespoon = 15 ml.
- 1 teaspoon = 5 ml.
ADDITIONAL RECOMMENDATIONS

Taking supplements
Eating a variety of foods daily as guided by the food pyramid should provide all the nutrients needed by the body. Therefore, supplements are not necessary for most children and adolescents. Nutrient supplements cannot be used as a substitute for fresh food and supplements of some nutrients taken regularly in large amounts are known to be harmful. However supplements may be needed to meet specific nutrient requirements such as during convalescence (recovery and illness) and in pregnant and lactating adolescents. Nutrient supplements should only be taken on the advice of nutritionists, dietitians and other medical professionals.
REFERENCES


### Appendix 1. Sample menu for children aged 3 years (1000 kcal)

<table>
<thead>
<tr>
<th>Menu</th>
<th>Serving size</th>
<th>Weight</th>
<th>Calorie (Kcal)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breakfast</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakfast cereal</td>
<td>½ small bowl</td>
<td>20 g</td>
<td>60</td>
</tr>
<tr>
<td>Raisins</td>
<td>1 teaspoon</td>
<td>10 g</td>
<td>30</td>
</tr>
<tr>
<td>Fresh milk</td>
<td>½ glass</td>
<td>130 ml</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>170</td>
</tr>
<tr>
<td><strong>Morning tea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biscuits, cream cracker</td>
<td>3 piece</td>
<td>10 g</td>
<td>45</td>
</tr>
<tr>
<td>Chocolate flavoured milk</td>
<td>½ glass</td>
<td>125 ml</td>
<td>65</td>
</tr>
<tr>
<td>Banana, <em>emas</em></td>
<td>1 whole</td>
<td>35 g</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>145</td>
</tr>
<tr>
<td><strong>Lunch</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice, white</td>
<td>½ cup</td>
<td>50 g</td>
<td>70</td>
</tr>
<tr>
<td>Vegetables, stir fried</td>
<td>½ cup</td>
<td>30 g</td>
<td>25</td>
</tr>
<tr>
<td>Chicken, soup</td>
<td>½ piece</td>
<td>40 g</td>
<td>30</td>
</tr>
<tr>
<td>Apple</td>
<td>1 whole</td>
<td>115 g</td>
<td>65</td>
</tr>
<tr>
<td>Plain water</td>
<td>1 glass</td>
<td>250 ml</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>190</td>
</tr>
<tr>
<td><strong>Afternoon tea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuts, cashew</td>
<td>1 teaspoon</td>
<td>10 g</td>
<td>65</td>
</tr>
<tr>
<td>Fuit flavoured yogurt</td>
<td>1 small cup</td>
<td>110 g</td>
<td>70</td>
</tr>
<tr>
<td>Watermelon</td>
<td>½ slice</td>
<td>130 g</td>
<td>35</td>
</tr>
<tr>
<td>Plain water</td>
<td>1 glass</td>
<td>250 ml</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>170</td>
</tr>
<tr>
<td><strong>Dinner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice, white</td>
<td>½ cup</td>
<td>50 g</td>
<td>70</td>
</tr>
<tr>
<td>Vegetables, stir fried</td>
<td>½ cup</td>
<td>30 g</td>
<td>25</td>
</tr>
<tr>
<td>Threadfin bream, cooked in soya sauce</td>
<td>½ piece</td>
<td>40 g</td>
<td>75</td>
</tr>
<tr>
<td>Plain water</td>
<td>1 glass</td>
<td>250 ml</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>170</td>
</tr>
<tr>
<td><strong>Supper</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh milk</td>
<td>1 glass</td>
<td>250 ml</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>160</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1005</td>
</tr>
</tbody>
</table>
### Appendix 2. Sample menu for children aged 4 to 6 years (1300 kcal)

<table>
<thead>
<tr>
<th>Time</th>
<th>Menu</th>
<th>Serving size</th>
<th>Weight</th>
<th>Calorie (Kcal)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breakfast</strong></td>
<td>Bread, white</td>
<td>2 slices</td>
<td>60 g</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Jam</td>
<td>1 teaspoon</td>
<td>10 g</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Full cream milk</td>
<td>1 glass</td>
<td>250 g</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>330</strong></td>
</tr>
<tr>
<td><strong>Morning tea</strong></td>
<td>Biscuits, marie</td>
<td>3 slices</td>
<td>20 g</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Appe juice (without sugar)</td>
<td>1 glass</td>
<td>250 ml</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>150</strong></td>
</tr>
<tr>
<td><strong>Lunch</strong></td>
<td>Rice, white</td>
<td>¾ cup</td>
<td>75 g</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Indian mackerel, cooked in soy bean paste</td>
<td>1 piece</td>
<td>80 g</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>Mixed vegetables, fried</td>
<td>1 cup</td>
<td>60 g</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Watermelon</td>
<td>1 slice</td>
<td>250 g</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Plain water</td>
<td>1 glass</td>
<td>250 ml</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>350</strong></td>
</tr>
<tr>
<td><strong>Afternoon tea</strong></td>
<td><em>Kuih Kasturi</em></td>
<td>1 piece</td>
<td>40 g</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Plain water</td>
<td>1 glass</td>
<td>250 ml</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td><strong>Dinner</strong></td>
<td>Rice, white</td>
<td>¾ cup</td>
<td>75 g</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Chicken, <em>masak kunyit</em></td>
<td>½ cup</td>
<td>50 g</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Mixed vegetable, soup</td>
<td>1 small bowl</td>
<td>50 g</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Plain water</td>
<td>1 glass</td>
<td>250 ml</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>240</strong></td>
</tr>
<tr>
<td><strong>Supper</strong></td>
<td>Fresh milk</td>
<td>1 glass</td>
<td>250 ml</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
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### Appendix 3. Sample menu for children aged 7 to 9 years (1800 kcal)

<table>
<thead>
<tr>
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<th>Serving size</th>
<th>Weight</th>
<th>Calorie (Kcal)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breakfast</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandwich, sardine</td>
<td>1 slice</td>
<td>65 g</td>
<td>160</td>
</tr>
<tr>
<td>Salad</td>
<td>1 cup</td>
<td>30 g</td>
<td>10</td>
</tr>
<tr>
<td>Apple juice (without sugar)</td>
<td>1 glass</td>
<td>250</td>
<td>60</td>
</tr>
<tr>
<td><strong>Morning tea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Kuih cara berlauk</em></td>
<td>2 pieces</td>
<td>30 g</td>
<td>70</td>
</tr>
<tr>
<td>Tea</td>
<td>1 cup</td>
<td>200</td>
<td>20</td>
</tr>
<tr>
<td><strong>Lunch</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice, white</td>
<td>1 cup</td>
<td>100 g</td>
<td>130</td>
</tr>
<tr>
<td>Chicken, <em>kurma</em></td>
<td>1 piece</td>
<td>120 g</td>
<td>250</td>
</tr>
<tr>
<td>Kailan, cooked in oyster sauce</td>
<td>½ cup</td>
<td>60 g</td>
<td>90</td>
</tr>
<tr>
<td>Guava</td>
<td>½ whole</td>
<td>150</td>
<td>70</td>
</tr>
<tr>
<td>Plain water</td>
<td>1 glass</td>
<td>250</td>
<td>0</td>
</tr>
<tr>
<td><strong>Afternoon tea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bun, coconut</td>
<td>1 whole</td>
<td>60 g</td>
<td>165</td>
</tr>
<tr>
<td>Full cream milk</td>
<td>1 glass</td>
<td>250 ml</td>
<td>160</td>
</tr>
<tr>
<td><strong>Dinner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice, white</td>
<td>1 cup</td>
<td>100 g</td>
<td>130</td>
</tr>
<tr>
<td>Threadfin bream, cooked in soy sauce</td>
<td>1 whole</td>
<td>75 g</td>
<td>150</td>
</tr>
<tr>
<td>Brinjal, stir fried</td>
<td>½ cup</td>
<td>60 g</td>
<td>50</td>
</tr>
<tr>
<td>Fried tempe</td>
<td>1 piece</td>
<td>40 g</td>
<td>70</td>
</tr>
<tr>
<td>Plain water</td>
<td>1 glass</td>
<td>250</td>
<td>0</td>
</tr>
<tr>
<td><strong>Supper</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biscuits, cream cracker</td>
<td>3 pieces</td>
<td>10 g</td>
<td>45</td>
</tr>
<tr>
<td>Fresh milk</td>
<td>1 glass</td>
<td>250 ml</td>
<td>160</td>
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Total: 1790 kcal
### Appendix 4. Sample menu for children aged 10 to 12 years (boys) (2200 kcal)

<table>
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<tr>
<th>Time</th>
<th>Menu</th>
<th>Serving size</th>
<th>Weight</th>
<th>Calorie (Kcal)</th>
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<tbody>
<tr>
<td><strong>Breakfast</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fried mee</td>
<td>1 cup</td>
<td>170 g</td>
<td>280</td>
</tr>
<tr>
<td></td>
<td>Boiled egg, fried in chilli</td>
<td>½ whole</td>
<td>30 g</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Tea</td>
<td>1 cup</td>
<td>200 ml</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>380</td>
</tr>
<tr>
<td><strong>Morning tea</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Curry puff</td>
<td>1 piece</td>
<td>50 g</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Apam gula hangus</td>
<td>1 piece</td>
<td>30 g</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>Plain water</td>
<td>1 glass</td>
<td>250</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>245</td>
</tr>
<tr>
<td><strong>Lunch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rice, white</td>
<td>1 ½ cup</td>
<td>150 g</td>
<td>190</td>
</tr>
<tr>
<td></td>
<td>Black pomferet, fried in chilli</td>
<td>1 piece</td>
<td>95 g</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>Mustard, stir fried</td>
<td>½ cup</td>
<td>60 g</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Mixed vegetables, soup</td>
<td>1 small bowl</td>
<td>150 g</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Guava</td>
<td>½ whole</td>
<td>150 g</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Plain water</td>
<td>1 glass</td>
<td>250</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>520</td>
</tr>
<tr>
<td><strong>Afternoon tea</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fruit flavoured yogurt</td>
<td>2 small cup</td>
<td>230 ml</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>Green pea, coated</td>
<td>1 small pack</td>
<td>40 g</td>
<td>190</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>330</td>
</tr>
<tr>
<td><strong>Dinner</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rice, white</td>
<td>1 ½ cup</td>
<td>150 g</td>
<td>190</td>
</tr>
<tr>
<td></td>
<td>Chicken, masak sambal</td>
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<td>100 g</td>
<td>210</td>
</tr>
<tr>
<td></td>
<td>Mixed vegetables, fried</td>
<td>½ cup</td>
<td>60 g</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Orange</td>
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<td>160 g</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Plain water</td>
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<td></td>
<td>520</td>
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<tr>
<td><strong>Supper</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biscuits, cream cracker</td>
<td>6 pieces</td>
<td>20 g</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Chocolate flavoured milk</td>
<td>1 glass</td>
<td>250 ml</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>200</td>
</tr>
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<td></td>
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<td>Calorie (Kcal)</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------</td>
<td>--------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Breakfast</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakfast cereal</td>
<td>½ bowl</td>
<td>40 g</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>Low fat milk</td>
<td>½ cup</td>
<td>200 ml</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Bread, white</td>
<td>1 slice</td>
<td>30 g</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Jam</td>
<td>1 teaspoon</td>
<td>10 g</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Orange juice</td>
<td>1 glass</td>
<td>250</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morning tea</td>
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<td></td>
<td>390</td>
<td></td>
</tr>
<tr>
<td>Dumpling, chicken</td>
<td>1 whole</td>
<td>60 g</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Full cream milk</td>
<td>1 glass</td>
<td>250 ml</td>
<td>160</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td></td>
<td></td>
<td>310</td>
<td></td>
</tr>
<tr>
<td>Rice, briyani</td>
<td>1 ½ cup</td>
<td>150 g</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Chicken, cooked in chilli</td>
<td>1 piece</td>
<td>70 g</td>
<td>200</td>
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</tr>
<tr>
<td>Vegetables, dhal</td>
<td>½ cup</td>
<td>60 g</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Acar timun</td>
<td>½ cup</td>
<td>30 g</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Plain water</td>
<td>1 glass</td>
<td>250 ml</td>
<td>0</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Afternoon tea</td>
<td></td>
<td></td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Fried, bee hoon</td>
<td>1 ½ senduk</td>
<td>200 g</td>
<td>330</td>
<td></td>
</tr>
<tr>
<td>Egg, fried (sunny side up)</td>
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<td>100</td>
<td></td>
</tr>
<tr>
<td>Tea (with sugar)</td>
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<td>200 ml</td>
<td>20</td>
<td></td>
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<tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Dinner</td>
<td></td>
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</tr>
<tr>
<td>White, rice</td>
<td>2 cup</td>
<td>200 g</td>
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<td></td>
</tr>
<tr>
<td>Beef, curry</td>
<td>2 pieces</td>
<td>100 g</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Anchovies, fried in chilli</td>
<td>½ cup</td>
<td>30 g</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Spinach, fried</td>
<td>½ cup</td>
<td>60 g</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Guava</td>
<td>½ whole</td>
<td>150 g</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Plain water</td>
<td>1 glass</td>
<td>250 ml</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supper</td>
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<td></td>
<td>635</td>
<td></td>
</tr>
<tr>
<td>Biscuits, Marie</td>
<td>6 pieces</td>
<td>40 g</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>Chocolate flavoured milk</td>
<td>1 glass</td>
<td>250 ml</td>
<td>110</td>
<td></td>
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<td></td>
<td></td>
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Appendix 6. Sample menu for children aged 10 to 18 years (girls) (2000 kcal)

<table>
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<th>Serving size</th>
<th>Weight</th>
<th>Calorie (Kcal)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breakfast</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandwich, sardine</td>
<td>2 slices</td>
<td>120 g</td>
<td>280</td>
</tr>
<tr>
<td>Fresh milk</td>
<td>1 glass</td>
<td>250 ml</td>
<td>160</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>440</td>
</tr>
<tr>
<td><strong>Morning tea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kuih kasui</td>
<td>2 pieces</td>
<td>80 g</td>
<td>140</td>
</tr>
<tr>
<td>Tea</td>
<td>1 cup</td>
<td>200 ml</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>160</td>
</tr>
<tr>
<td><strong>Lunch</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice, chicken</td>
<td>1 plate</td>
<td>325 g</td>
<td>330</td>
</tr>
<tr>
<td>Papaya</td>
<td>1 slice</td>
<td>210 g</td>
<td>70</td>
</tr>
<tr>
<td>Plain water</td>
<td>1 glass</td>
<td>250 ml</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>400</td>
</tr>
<tr>
<td><strong>Afternoon tea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mung bean porridge with coconut milk</td>
<td>1 ½ bowl</td>
<td>230 g</td>
<td>240</td>
</tr>
<tr>
<td>Bread, white</td>
<td>1 slice</td>
<td>30 g</td>
<td>70</td>
</tr>
<tr>
<td>Plain water</td>
<td>1 glass</td>
<td>250 ml</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>310</td>
</tr>
<tr>
<td><strong>Dinner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice, white</td>
<td>1 cup</td>
<td>100 g</td>
<td>130</td>
</tr>
<tr>
<td>Red snapper, cooked in tamarind</td>
<td>1 slice</td>
<td>70 g</td>
<td>150</td>
</tr>
<tr>
<td>Kailan, fried</td>
<td>½ cup</td>
<td>60 g</td>
<td>60</td>
</tr>
<tr>
<td>Watermelon</td>
<td>1 slice</td>
<td>250 g</td>
<td>70</td>
</tr>
<tr>
<td>Plain water</td>
<td>1 glass</td>
<td>250 g</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>410</td>
</tr>
<tr>
<td><strong>Supper</strong></td>
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</tr>
<tr>
<td>Chocolate flavoured milk</td>
<td>1 glass</td>
<td>250 ml</td>
<td>110</td>
</tr>
<tr>
<td>Bun, coconut</td>
<td>1 whole</td>
<td>60 g</td>
<td>165</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td>275</td>
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</table>
Key Message 4

Attain Healthy Weight for Optimum Growth
1.0 TERMINOLOGY

Body image
Body image is a term which may refer to a person's perception of his or her own physical appearance, or the interpretation of the body by the brain. Body image is often measured by asking the subject to rate their current and ideal body shape using a series of pictures/figures. The difference between these two values is the measure of body dissatisfaction.

Development
Development refers to the increased ability of the body to function physically and intellectually. Physical and intellectual developments proceed at different rates in different individuals.

Eating disorders
Eating disorders refer to a group of conditions defined by abnormal eating habits that may involve either insufficient or excessive food intake to the detriment of an individual's physical and mental health.

Energy requirement
The energy requirement of children and adolescents is the amount of dietary energy needed to maintain health, growth and an appropriate level of physical activity.

Growth
Growth refers to the acquisition of tissue and the consequent increase in body size.

Normal body weight
In children below 5 years old, BMI-for-age above -2SD line to below +1SD line is considered normal weight based on the growth chart from WHO, 2006. In children above 5 to 19 years old, BMI-for-age above -2SD line to +1SD line is considered normal weight based on the growth chart from WHO, 2007.

Obese
In children below 5 years old, BMI-for-age (according to sex) above +3SD are considered obese based on WHO Child Growth Standard (WHO, 2006). In children above 5 to 19 years old, BMI-for-age at above +2SD is considered obese based on the growth chart from WHO, 2007.
Overweight
In children below 5 years old, weight-for-age above +2SD is considered overweight based on WHO Child Growth Standard (WHO, 2006). In children above 5 to 19 years old, BMI-for-age at above +1 SD is considered overweight based on growth chart from WHO, 2007.

Underweight
In children below 5 years old, BMI-for-age less than -2SD and below is considered wasting based on growth chart from WHO, 2006. In children above 5 to 19 years old, BMI-for-age at less than -2SD and below is considered thinness based on the growth chart from WHO, 2007.

2.0 INTRODUCTION
Weight gain and increase in body size are part of the growing process in childhood and adolescence. There is increasing evidence of the importance of optimum growth and adequate nutrition in childhood to cognitive development (Emond et al., 2007) and bone mass in adulthood (Bonjour et al., 1991; Davies, Evans & Gregory, 2005).

Ensuring optimum growth and development can be achieved through maintaining a positive energy balance and adequate intake of nutrients such as protein, fats, carbohydrate, vitamins and minerals. During periods of rapid growth, deprivation of adequate energy intake, whether intentionally through inappropriate dieting behaviours or due to impoverishment will restrict weight gain and height attainment.

The recommended dietary energy requirements in children and adolescents are defined to maintain health, promote optimal growth and maturation and support a desirable level of physical activity. Dietary energy recommendations must also be compatible with health, prevention of underweight and obesity and for adequate social and psychological development.

Parents and caregivers play an important role in determining the food habits of young children while peer group norms and media advertising are important determinants of food habits amongst adolescents. In recent years, there has been an increasing concern on issues such as childhood obesity and issues arising from unhealthy body image. Childhood obesity can persist into adulthood with its associated health risks. Unhealthy body image can also lead to poor dieting habits and eating disorders (Striegel-Moore & Smolak, 2001).
Social trends in a progressive society in Malaysia have also influenced the food habits of children and adolescents (Khor, Cobić & Skrzypiec, 2002). In urban societies within Malaysia where both parents are working, one of the major trends observed is the increasing number of meals bought and consumed outside the home and the frequency of eating in fast food outlets. Frequent eating out that is associated with intake of energy-dense foods is one of the important contributing factors of the rising obesity trends in our society.

3.0 SCIENTIFIC BASIS

3.1 General growth patterns

Normal growth is the progression of changes in height, weight and head circumference that are compatible with established standards for a given population. The progression of growth is interpreted within the context of the genetic potential for a particular child (Lifshitz & Cervantes, 1996).

Understanding the normal patterns of growth enables the early detection of deviations which may be pathological (such as poor weight gain due to a metabolic disorder) or due to socioeconomic factors.

During early childhood, the rate of increase in weight and length is essentially linear. During adolescence, however, growth accelerates over a period of 1 to 3 years and then decelerates rapidly until growth in height ceases at about 16 years of age in girls and 18 years in boys. At the age of 11 years, girls would have attained approximately 12% of their adult stature and 36% adult weight, while the respective levels for boys are approximately 20 and 50%. Growth during adolescence is accompanied by an increased proportion of body fat for girls and likewise for lean body mass and blood volume in boys (AAP, 2009).

During adolescence there is a marked increase in the rate of gain in both weight and height—referred to as the adolescent growth spurt. The spurt in height begins on average at 10 to 11 years in girls and at 12 to 13 years in boys, although there is wide variation in this. During the adolescent growth spurt, boys gain an average of 20 cm in height and 20 kg in weight and girls around 16 cm and 16 kg respectively. The peak velocity for weight gain tends to occur about three months after that for height. In girls, the onset of menstruation generally occurs after the peak in height velocity; in boys, the development of secondary sexual characteristics is less closely related to the adolescent growth spurt (AAP, 2009).

**Basal metabolic rate**

Basal metabolism is the energy expended for cellular and tissue processes that maintain life. It is measured under standard conditions of thermo neutrality, immobility and fasting. The Basal Metabolic Rate (BMR) relative to weight increases from birth to two years and then gradually declines through adolescence (Holliday, 1971).

The effect of age on BMR is a function of changes in body composition through childhood and adolescence. The BMR is strongly correlated with body’s Fat Free Mass (FFM) that comprises the bulk of the active metabolic tissue. Marked sex differences in intensity and duration of the adolescent growth spurt and in the proportion of FFM are key determinants of the energy and nutrient needs of boys and girls.
Table 4.1. Interpretation of Z-scores for BMI-for-age

<table>
<thead>
<tr>
<th>Z-score</th>
<th>0 to &lt;5 years WHO, 2006¹</th>
<th>5 to 19 years WHO, 2007²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above +3 SD</td>
<td>Severely overweight</td>
<td>Severely obese</td>
</tr>
<tr>
<td>Above +2 SD</td>
<td>Overweight</td>
<td>Obese</td>
</tr>
<tr>
<td>Above +1 SD</td>
<td>At risk of overweight</td>
<td>Overweight</td>
</tr>
<tr>
<td>O (median) to +1SD</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Between median to -2SD</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Between -2SD and -3SD</td>
<td>Thinness</td>
<td>Thinness</td>
</tr>
<tr>
<td>Below -3SD</td>
<td>Severe thinness</td>
<td>Severe thinness</td>
</tr>
</tbody>
</table>

Source: ¹WHO(2006); ²WHO(2007)

3.2 Assessment of body weight and growth rate

**Body mass index for age**

For children and adolescents, height and body composition is continually changing. For children aged 0 to below 5 years, it is recommended that the WHO, 2006 growth standard chart for BMI-for-age for boys and girls be used (Appendix 1 to Appendix 4). For children aged 5 to 19 years, the WHO growth reference (de Onis et al., 2007) is recommended for use in boys (Appendix 5) and in girls (Appendix 6). The cut-off points for overweight and obesity for older children (at age 19 years) are similar to the adult cut-off points based on this recent WHO, 2007 growth charts (Table 4.1).

The extent to which serial data for a child can deviate from a given Z-score or percentile range before concern is warranted depends on several factors. These are age of the child, the child's position in the Z-score or percentile range, the length of time for which the rate of growth deviates from the norm and the coexistence of any medical condition. In general, the more pronounced the change in growth rate, the younger the child and the more extreme the percentile, the greater is the concern.

3.3 Maintaining body weight status and health consequences in children and adolescents

3.3.1. Underweight and failure-to-thrive

The most serious consequences of an inappropriate food intake in infancy and early childhood are underweight and failure-to-thrive. In Malaysia, underweight and failure-to-thrive persist prevalent especially amongst children living in poor conditions (Khor, 2003) where the aetiology of the problem rests in a complex mix of social and economic factors. Failure-to-thrive is also a common result of child neglect in some communities.

3.3.2. Overweight and obesity in children

Children and adolescents require adequate energy intake for proper growth but too many calories and too little physical activity can lead to obesity. Persistent obesity in childhood is associated with other lifestyle related diseases that may persist in adulthood. These include cardiovascular diseases, type-2
diabetes mellitus (now occurring in children), osteoarthritis, breast and alimentary cancers, skin disorders, aggravation of rheumatic diseases, asthma and other respiratory diseases. Childhood obesity increases the risk of childhood hyperinsulinaemia, hypertension and dyslipidaemia (Ludwig, 2007). Moderately higher adiposity during adolescence has been associated with premature death in younger and middle-aged adults in the U.S. (van Dam et al., 2006).

Evidence shows that childhood obesity is associated with major cardiovascular risk factors (Serdula et al., 1993). Obese children and adolescents often suffer from poor self-esteem (Strauss, 2000), adopt unhealthy behaviours and may encounter social isolation and discrimination (Strauss & Pollack, 2003). Overweight children are likely to be obese as adults. Evidence from a systematic review showed that children with overweight or obese parents have a higher risk of obesity. Campbell et al., (2001) reported that 79% of 10 to 14 year old children with at least one obese parent were obese, regardless of whether the parental obesity is of genetic or environmental origin.

3.4 Dietary habits and weight gain
Eating patterns are changing among Malaysian children. These include increased number of meals eaten in schools and outside the home, larger portion sizes, shifts in beverage consumption from milk-based drinks to sweetened drinks and changing meal patterns and frequency, with declining breakfast consumption and increase in snacking (Ismail et al., 2003).

3.4.1 Management of overweight and obesity in children
Young children under the age of 7 years who are overweight or obese with no other health concerns, should maintain weight or gain weight slowly rather than lose weight, thus allowing the child to add height rather than weight. This will lead BMI-for-age to drop over time into a healthier range. However, older children above 7 years who are obese may benefit from weight loss. Weight loss should be slow and steady from 0.5 kg a week to 2 kg a month depending on the child’s ability and environmental support received.

For weight maintenance and weight loss, inculcating healthy eating habits and encouraging physical activity and lifestyle changes are better than restricting diet. Parental involvement is important for successful weight management of the child. Consultation with a health care professional about weight management strategies is important to ensure appropriate management of other health conditions.

3.5 Body image and eating disorders
Body image refers to the internal perception of one’s own physical or outer appearance (Thompson et al., 1999). Body dissatisfaction and dieting behaviour are important predictors for the development of eating disorders. This coupled with the observation that eating disorders are likely to become increasingly prevalent in Asia suggests that preventive measures such as public education, early detection and treatment should be instituted to avert a growing problem.
Eating disorders

Anorexia nervosa, bulimia and binge-eating disorder are the three most recognised eating disorders. Anorexia nervosa sufferers have a feeling of being fat when emaciated and has a morbid fear of weight gain in their relentless pursuit to be thin (APA, 2000). Bulimia nervosa is defined by an overvaluation of weight shape and the behavioural symptoms of recurrent binge eating accompanied by purging and fasting (Striegel-Moore & Smolak, 2001). The Eating Disorders Not Otherwise Specified (EDNOS) category reflects the many cases of eating disorder that can be quite severe but do not meet the diagnostic criteria for anorexia nervosa and bulimia nervosa.

The peak age of onset for eating disorders is during adolescence and young adulthood but pre-adolescent children have been found to exhibit some characteristics of eating disorders and concerns about body weight. In a review published in 2004, comparing rates of eating disorders amongst Western and non-Western countries, it was reported that eating disorders were more common amongst Western countries. Prevalence rates in Western countries for anorexia nervosa ranged from less than 1 to 6% in subjects while prevalence rates in non-Western countries was between less than 1 to 3% (Makino, Tsuboi & Dennerstein, 2004). Nevertheless eating disorders is an increasing problem that is common amongst young women in Asia including China, India, Malaysia, Philippines and Indonesia. Community studies in Hong Kong indicated that 3 to 10% of young women had disordered eating of a degree that warrants concern (Lee & Lee, 2000).

The major concern in eating disorders is the lack of food intake and deprivation of energy, vitamins and minerals, which leads to malnutrition. Children who self-impose energy restriction have a retarded growth rate and delayed puberty. Treatment of anorexia nervosa and bulimia a long term complex process which is best provide by the psychiatrist and dietitian with training and experience in this area.

3.6 Maintaining healthy weight in children and adolescents

Weight maintenance is achieved when calorie intake (food intake) is balanced with physical activity. The recommended dietary energy requirements in children and adolescents are defined to maintain health, promote optimal growth and maturation and support a desirable level of physical activity (AAP, 2009).

There are no optimal proportions of carbohydrate, protein and fat in the diet for weight maintenance (IOM, 2002). However, to promote a healthy diet and meet nutrient needs, the Recommended Nutrient Intake (RNI) for Malaysia (NCCFN, 2005) has recommended intake of 55 to 70% energy from carbohydrates, 10 to 15% energy from proteins and limit energy from fats between 20 to 30%.

Consuming high calorie or energy dense foods or meals may contribute to excessive calorie intake. Children should be encouraged to reduce their consumption of sweetened beverages and eat fewer high-fat snacks. Programmes designed to reduce the amount of time engaged in sedentary activity such as television watching, for example have been successful in reducing weight gain and improving fitness.
For underweight children, a detailed medical and diet history including a review of the weight and height is essential to establish the pattern of growth and the underlying cause of failure to thrive or the problem will simply recur. While nutrition education of the mother is essential to develop good eating behaviours for the whole family including the underweight child. A balanced diet should be given in small frequent meals to increase the total food intake. Healthy, calorie-dense meals and snacks provide enough additional calories to meet the demands of growth (AAP, 2009).

4.0 CURRENT STATUS

Two cross-sectional surveys conducted in 2002 (Ismail et al., 2003) based on WHO (WHO, 2007) classification and a recent survey in 2008 (Ismail et al., 2009) on children aged 6 to 12 years in Peninsular Malaysia revealed an increase prevalence in overweight from 11.0 to 12.8% and obesity from 9.7 to 13.7%, respectively (Figure 4.1).

In Malaysia, there is evidence of body image problems amongst children and adolescents. Females aged 8 to 9 years have been found to desire a thinner body size and showed body size dissatisfaction (Zalilah & Zaitun, 2005). In a study on females aged 13 to 16 years by Pon, Mimalini & Mohd Nasir, (2004) overweight females had higher body image misrepresentation and tended to skip meals, compared to those with a normal body weight. As for young adults aged 19 to 30 years, Khor, Cobiac & Skrzypiec, (2002) found significant correlations between negative feelings pertaining to the physical self and uninhibited eating behaviour. Khor et al., (2009) also reported a high proportion of adolescent male and females (80%) have concerns about their body image. Overweight males and females experienced significantly higher levels of anxiety and pre-occupation with body weight and shape, compared to the normal weight subjects.

A recent study among a sample of 529 Malaysian high school students (103 Malays, 344 Chinese and 82 Indians) found that Chinese girls were more dissatisfied with their bodies than Chinese boys, but no gender difference was found for Malay and Indian participants (Mellor et al., 2009).
5.0 KEY RECOMMENDATIONS

Key recommendation 1
Monitor the growth of children and adolescents using appropriate growth standards or charts to ensure healthy growth.

How to achieve
1. Measure weight and height, calculate Body Mass Index (BMI) and determine weight status using BMI-for-Age monthly.
3. Discuss the growth of children with health care professionals (nutritionists, dietitians, doctors, nurses) or teachers.
4. Bring your child to the clinic according to the appointment date for growth monitoring.
5. Keep your child’s growth chart and constantly monitor his or her growth. Seek medical advice if there is any concern with his or her growth.

Key recommendation 2
Children and adolescents should consume adequate amount of calories and nutrients needed for healthy growth.

How to achieve
1. Eat according to calorie recommendations by age, sex and physical activity level.
2. Eat a variety of foods from all food groups in appropriate amounts to obtain adequate nutrients.

Key recommendation 3
For children and adolescents who are overweight or obese, reduce weight gradually by adopting a healthy diet and increase physical activity.

How to achieve
A. Encourage overweight and obese children to practise healthy eating.
   1. Eat according to calorie recommendations by age, sex and physical activity level.
   2. When hungry, eat only to satisfy needs but do not overeat.
   3. Eat 3 main meals per day, plus 1 or 2 nutritious snacks between meals. Avoid skipping meals as it will lead to eating bigger meals or snacks later.
   4. Replace calorie-dense foods with healthier options.
   5. Eat smaller serving sizes of high calorie foods.
6. Replace sugar sweetened beverages with plain water or low fat milk.
7. Avoid using special diets such as meal replacements, slimming tea or pills to reduce weight as they can cause side effects.

B. Encourage overweight and obese children to increase physical activity.
1. Reduce sedentary activities such as watching television and video, playing computer games and other sedentary activities.
2. Perform 60 minutes of physical activity daily.
3. Motivate children to be physically active everyday.
4. Inculcate interest in physical activity with peers in order to develop confidence and increase self-esteem.

Key recommendation 4
If the child is underweight or having growth failure, increase calorie intake as recommended.

How to achieve
1. Provide small but frequent meals throughout the day.
2. Choose foods with higher calorie and protein content.
3. Provide complete balanced nutritional supplements and drinks to ensure additional calorie and nutrient intake.
4. Consult with a health care professional to ensure appropriate management of weight and other health problems.

Key recommendation 5
Instill a healthy body image in children and adolescents.

How to achieve
1. Look out for signs of distorted body image perception among children and adolescents for instance, if they are extremely concerned about their weight, eating, dieting or dislike certain parts of the body.
2. Emphasise the positive appearance and character of children and adolescents.
3. Explain normal variation in body sizes and shapes among children and adolescents.
4. Discuss how the media can use a variety of techniques to create unrealistic body images.
5. Encourage realistic goals and aim for gradual change in body weight. If the child or adolescent is overweight, do not criticise his or her appearance.
6. Seek medical advice if your child is having weight control issues.
REFERENCES


APPENDICES

Appendix 1. BMI cut-off point from birth to 2 years old (boys)

Appendix 1

BMI-for-age (Boys)
Birth to 2 years (z-score)

Sumber: WHO Child Growth Standard, 2009
## Appendix 2. BMI cut-off point from 2 to 5 years old (boys)

<table>
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<th>Age (Month and Year)</th>
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<th>Possible Risk of Overweight</th>
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<th>Obesity</th>
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**BMI-for-age (Boys)**

**Appendix 2.** BMI cut-off point from 2 to 5 years old (boys)
Appendix 3: BMI cut-off point from birth to 2 years old (girls)
Appendix 4. BMI cut-off point from 2 to 5 years old (girls)
### Appendix 5. BMI cut-off point for 5 to 19 years old in boys (Z-scores)

<table>
<thead>
<tr>
<th>Age</th>
<th>-3SD</th>
<th>-2SD</th>
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</table>

**Source:** WHO (2007)

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<tr>
<th>z-score (SD)</th>
<th>Interpretation</th>
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<tr>
<td>&gt;2</td>
<td>Obesity</td>
</tr>
<tr>
<td>&gt;1 to ≤ 2</td>
<td>Overweight</td>
</tr>
<tr>
<td>≥ - 2 to ≤ 1</td>
<td>Normal</td>
</tr>
<tr>
<td>≥ - 3 to &lt; -2</td>
<td>Thinness</td>
</tr>
<tr>
<td>&lt; -3</td>
<td>Severely thinness</td>
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</table>
Appendix 6. BMI cut-off point for 5 to 19 years old in girls (Z-scores)

<table>
<thead>
<tr>
<th>Age</th>
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<th>-2SD</th>
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*Source: WHO (2007)*

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Key Message 5

Be Physically Active Everyday
1.0 TERMINOLOGY

**Duration**
Duration represents the temporal length of an activity, often quantified in minutes.

**Frequency**
Frequency represents the number of times a person engages in an activity over a predetermined period.

**Intensity**
Intensity refers to the degree of overload an activity imposes on physiological systems compared to resting states.

The intensity of physical activity can be described as light, moderate and vigorous. These terms correlate to the absolute amount of energy expenditure or oxygen consumption associated with specific types of activity. Oxygen consumption is expressed in metabolic equivalents (METs), which are multiples of the resting rates of oxygen consumption during physical activity (Ainsworth et al., 2011). In general, light-intensity activity is physical activity carried out at 1.0 to less than 3.0 METs; moderate-intensity activity is defined as 3.0 to 6.0 METs; and more than 6.0 METs is categorized as vigorous-intensity activity.

**Physical activity**
Physical activity is defined as any bodily movement produced by skeletal muscles that result in energy expenditure. Physical activity is a complex behaviour that involves many aspects. It can be described by four parameters: type, frequency, duration and intensity. It is closely related to, but distinct from, exercise and physical fitness. Exercise, on the other hand, means any planned, structured and repetitive bodily movements that are performed to improve physical fitness.

Among adults and older children, physical activity can be divided into three main components:

- **Occupational work**: Activities undertaken during the course of work or at school
- **Household and other chores**: Activities undertaken as part of day-to-day living
- **Leisure-time physical activity.** Activities undertaken in the individual’s discretionary or free time. Activities are selected on the basis of personal needs and interest. They include exercise and sports;

- **Exercise.** A planned and structured subset of leisure-time physical activity that is usually undertaken for the purpose of improving or maintaining physical fitness.

- **Sports.** Its definition varies around the world. It implies a form of physical activity that involves competition and also embraces general exercise and a specific occupation.

Among infants and young children, physical activity is usually grouped into these two types (NASPE, 2002):

- **Structured physical activity.** Developmentally appropriate physical activity that is guided by the caregiver.

- **Unstructured physical activity.** Child-initiated physical activity that occurs as the child explores his or her environment.

**Physical inactivity**

Physical inactivity or sedentary behaviour, as it is otherwise known, can be defined as ‘a state when body movement is minimal and energy expenditure approximates resting metabolic rate’. However, physical inactivity represents more than an absence of activity. It refers also to participation in physically passive behaviours such as television viewing, reading, playing or working at the computer, playing computer or video games, talking with friends on the telephone, sitting in a car/ bus or eating.

**Physical fitness**

In the context of this paper, the term physical fitness focuses on the health related aspects of fitness. Physical fitness is characterised by (i) an ability to perform daily activities with vigour, and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits, and (ii) demonstrations of traits and capacities that are associated with low risk of premature development of diseases associated with physical inactivity. The five components of physical fitness are: cardiorespiratory endurance, muscular endurance, muscular strength, body composition and flexibility (Caspersen, Powell & Christenson, 1985), which can all be assessed, quantified and measured to provide an indication of an individual’s physical fitness level.
2.0 INTRODUCTION

Regular physical activity is important for promoting health and fitness in children and adolescents; especially for those who are inactive, to become more active and those who are already active to increase their level of cardio respiratory fitness further.

Physical activity is important for the health and well-being of people of all ages. It has long been recognised as an important factor in enhancing health and reducing the risk of various chronic diseases. Youth who are regularly active also have a better chance of a healthy adulthood. Children and adolescents do not usually develop chronic diseases, such as heart disease, hypertension, type-2 diabetes, or osteoporosis; however, risk factors for these diseases can begin to develop early in life (DHHS, 2008).

Data from 79 developing countries and a number of industrialised countries suggests that about 43 million children under 5 years old are overweight or obese world-wide (WHO, 2010). In the U.S., the prevalence of overweight children (aged 5 to 14 years) has doubled in the last 30 years, from 15 to 32% (Ogden et al., 2010). Among Malaysian children aged 6 to 12 years old, the prevalence of overweight and obesity based on WHO (2007) BMI-for-age reference; increased from 20.7% in 2001/ 2002 to 26.5% in 2008/ 2009 (Ismail et al., 2009). Obesity itself (weight-for-height z-score above 2SD) was found in 5.3% among children below 10 years of age (Mohd Azahadi et al., 2008).

Evidence shows that associated with increases in childhood obesity, physical activity among children has declined. A study in the U.S. showed that while 42% of 6 to 11 year old children achieved 60 minutes per day of physical activity, only 8% of adolescents achieved this goal (Troiano et al., 2007). In Malaysia, Dan, Mohd Nasir and Zalliah (2007) reported a lack of physical activity among adolescents, with boys being more active than girls and Malays being more active than the Chinese. Wilson (2008) reported high involvement in sedentary activities among children and adolescents in Selangor, and that those in the older age groups had less physical activity than their younger counterparts.

Because epidemiologic data show that chronic and degenerative diseases of adulthood begin in childhood, there has been concern that a lack of physical activity during childhood that persists into sedentariness during adulthood may be one of the major causes leading to increased health problems in later life. The bottom line is that physical activity reaps health benefits that far outweigh the risks of adverse events (DHHS, 2008), hence it is vital to emphasise the importance of physical activity and to provide achievable strategies in order to encourage children and adolescents specifically and the nation in general, to become more physically active.
3.0 SCIENTIFIC BASIS

3.1 Physical activity and chronic disease prevention

3.1.1 Obesity, its related diseases and weight management

Obese children and adolescents are at risk for health problems during their youth and as adults. For example, obese children and adolescents are more likely to have risk factors associated with cardiovascular disease (such as high blood pressure, high cholesterol and type-2 diabetes) than are other children and adolescents (Freedman et al., 2007).

Obese children and adolescents are more likely to become obese as adults. Whitaker et al., (1997) found that approximately 80% of children who were overweight at age 10 to 15 years were obese adults at age 25 years. Freedman et al., (2007) also found that 25% of obese adults were overweight as children. They noted that if overweight began before 8 years of age, obesity in adulthood was more likely to be more severe.

Early signs of chronic disease and risk factors for chronic disease, such as elevated cholesterol and hypertension, which tend to be associated with a middle-aged population, have been reported in children. Several studies have documented that the presence of chronic disease risk factors in children is associated with low aerobic fitness and low levels of physical activity (Froberg & Anderson, 2005; Anderssen et al., 2007).

Physical inactivity has been shown to be a significant predictor and cause of obesity in children, independent of nutritional habits with sedentary activities such as television viewing having replaced recreational pursuits that involve more physical activity (Jago et al., 2005) and is further emphasized when combined with consumption of unhealthy food (Utter et al., 2003). This becomes problematic since children with the lowest physical activity/fitness levels and highest percentage of body fat are most likely to develop other risk factors for cardiovascular disease, including elevated blood pressure and serum cholesterol levels (Anderssen et al., 2007). It is encouraging that weight and blood pressure can be lowered in children when physical activity is an integral part of the treatment regimen (Strong et al., 2005).

Several cardiovascular disease risk factors tend to ‘track’ over time whereby if you have them as a child, you are more likely to retain them as an adult. For example, a follow-up of the Harvard growth study of 1922 to 1935 showed that being overweight during adolescence was a greater predictor of chronic disease development than being overweight as an adult (Must et al., 1992). Likewise, aerobic fitness and physical activity behaviours tend to track into adulthood where it was found that very inactive young adults had the lowest aerobic fitness scores when they were youngsters. In Finland, a longitudinal study showed that children who were the most sedentary had the least favourable cardiovascular disease risk profile when they became young adults (Raitakari et al., 1994).

Children today are more sedentary as they ride in car or bus to school, have less physical exercise, watch more television, play more sedentary games such as computer games, and do not have as much freedom to play outside on their own. Consequently, there is mounting evidence that our young children are becoming less physically active and more overweight and obese. Physical inactivity has contributed to an increase of 100% in the prevalence of childhood obesity in the United States since 1980 (CDC, 2008).
The National Health and Nutrition Examination Study (NHANES, 2007 - 2008) found that the prevalence of overweight American adolescents aged 12 to 19 was 19.3% for males and 16.8% for females. About 10% of adolescents ages 12 to 19 have total cholesterol levels exceeding 200 mg/dL (Ogden et al., 2010).

Observation and experimental evidence supports the hypothesis that maintaining high amounts and intensities of physical activity starting in childhood and continuing into adult years will enable people to maintain a favourable risk profile and lower rates of morbidity and mortality from cardiovascular disease and diabetes later in life. Collectively, the research suggests that moderate to vigorous-intensity physical activity for at least 60 minutes per day would help children and youth maintain a healthy cardiorespiratory and metabolic risk profile (Janssen & Leblanc, 2009).

3.1.2 Bone, joint and muscle health and performance

Regular participation in physical activity has been well established as an integral part of a healthy lifestyle in adults. It has been recognised that most diseases affected by exercise are a result of life-long processes, usually surfacing clinically in the older adult years. Kohrt (2007) has reported that many studies show positive effects of either a physically active lifestyle or exercise interventions on intermediate markers of bone health such as bone mineral content (BMC) and bone mineral density (BMD).

Although current science is not conclusive, it appears that, as with adults, the total amount of physical activity is more important for achieving health benefits than is any one component (frequency, intensity or duration) or a specific mix of activities (aerobic, muscle-strengthening, bone-strengthening). Nonetheless, bone-strengthening activities remain especially important for children and young adolescents because the greatest gains in bone mass occur during the years just before and during puberty. In addition, almost 90% of peak bone mass is acquired by the end of adolescence (DHHS, 2008). Experimental studies involving programmes of 10 to 60 minutes duration of moderate to high-strain activity (impact, weight bearing) for 2 to 3 or more days per week have been shown to have beneficial effects on skeletal health.

Physical activity is positively related to cardiorespiratory fitness in children and youth, and both pre-adolescents and adolescents can achieve improvements in cardio-respiratory fitness with exercise training. In both children and youth, participation in muscle-strengthening activities 2 or 3 times per week significantly improves muscular strength. For this age group, muscle-strengthening activities can be unstructured and part of play, such as playing on playground equipment, climbing trees or pushing and pulling activities (Janssen & Leblanc, 2009).

Kohrt (2007) concluded that there is moderate to strong evidence that physical activity plays an essential role in the maintenance of bone health and muscles, although information is lacking to define the type and dose of activity required to optimise the benefits.

3.1.3 Mental and neurological health

Babyak et al., (2000) indicate that physical activity improves mood and reduces symptoms of depression and anxiety, while aerobic exercise intervention showed significant improvements in depression comparable to individuals receiving
psychotropic treatment and individuals in the aerobic exercise condition had significantly lower relapse than those in the medication group. O’Connor (2007) stated that the size of literature is large for studies providing high-quality evidence about the role of physical activity in relation to anxiety, depression, alcohol use and smoking.

3.1.4 Asthma
Comparisons of population-based and convenience samples of youth with asthma provide inconsistent results. Physical activity levels are higher (Chen, Dales & Krewski, 2001), lower (Kitsantas & Zimmerman, 2000) or were no different in asthmatic compared with non-asthmatic youth. Gilliland et al., (2003) reported that the risk of developing asthma may be associated with overweight in boys and girls. Several studies show that a controlled aerobic programme (2 to 3 sessions/week for at least 6 weeks) result in improved aerobic and anaerobic fitness in youth with asthma (Counil et al., 2003).

3.1.5 Academic performance
Several cross-sectional observations showed a positive association between academic performance, which included grade point average, scores on standardized tests and grades in specific courses and physical activity and physical fitness (Field, Diego & Sanders, 2001; Kim et al., 2003).

Physical activity was also found to have a positive influence on concentration and memory (Tomporowski, 2003) and on classroom behaviour (Shephard, 1997). Mechanistic studies of cognitive function also suggest a positive effect of physical activity on intellectual performance (Cotman & Berchtold, 2002).

3.2 Physical activity recommendations for children and adolescents
The World Health Organization recommends that children and youth aged 5 to 17 years should accumulate at least 60 minutes of moderate to vigorous-intensity physical activity daily (WHO, 2010). The Physical Activity Guidelines for Americans also recommends 60 minutes or more of physical activity in their key guidelines for children and adolescents aged 6 to 17 years (DHHS, 2008). Similarly, in the United Kingdom, the Department of Health (2004) advocates that children and young people should achieve a total of at least 60 minutes of at least moderate-intensity physical activity each day.

Activities that strengthen muscle and bone are also emphasised, and the WHO, (2010); DHHS, (2008); DHC, (2009) recommended that these types of activities should be carried out at least 3 times a week. Activities that produce high physical stresses on the bones, such as running, jumping rope, basketball, tennis and hopscotch, help to improve bone health (DHHS, 2008; Department of Health, 2004). Activities that make muscles do more work than usual, also called ‘overload’, help to strengthen muscles (DHHS, 2008). These activities can be unstructured and part of play, such as climbing trees, carrying, playing rough and tumble (Department of Health, 2004); or structured, such as lifting weights or working with resistance bands (DHHS, 2008).

Participation in a variety of physical activities that are enjoyable and safe and that support natural development should be encouraged (WHO, 2010). Preschool children should participate in physical activities that are appropriate for their developmental level and physical health status (California DHS, 2002). Free play or unstructured physical activity, should be encouraged
and structured sports programmes should emphasise participation and enjoyment rather than competition and winning (California DHS, 2002). Children’s activities are characteristically intermittent, that is involving alternating bouts of moderate to vigorous activity with periods of rest and recovery. Hence, children’s activities should be in periods lasting 10 to 15 minutes or more that includes moderate to vigorous activity (California DHS, 2002). Patterns of physical activity changes as a child grow into adolescent years, when they are more likely to sustain longer periods of activity and play organised games and sports. However, adolescents still commonly do intermittent activity, and even very short bouts of moderate or vigorous-intensity activities should count towards total activity time (DHHS, 2008). Children should be discouraged from extended periods of inactivity. Sedentary behaviours, such as watching television or videos, playing video games and leisure surfing of the internet, should be kept to a total of no more than 1 hour per day (California DHS, 2002). On the other hand, the DHAA (2004a; 2004b) recommended no more than 2 hours a day on television viewing and computer games for Australian children. Sedentary time should be replaced with active time; for example, rather than just watching sporting events on television, children and adolescents should participate in age-appropriate sports or games (DHHS, 2008; DHC, 2009).

3.3 Physical activity recommendations for specific groups

3.3.1 Inactive children
Physical inactivity is a strong contributor to overweight. Reducing sedentary behaviours to less than two hours per day is important to increase physical activity and health. An incremental approach to the 60 minute goal is recommended. Increasing activity by 10% per week appears to be acceptable and achievable. Attempting to achieve too much too rapidly is often counterproductive and may lead to injury. At home, in day care and in preschool, children should be regularly encouraged to be active and to explore. The amount of time that they are restrained from being active should be minimised (NASPE, 2004).

3.3.2 Disabled children
Disabled children and adolescents lead more restrictive lives and they tend to face an increased risk of becoming unfit and obese, as well as anti social behaviour and mental health problems. Disabled children should be encouraged to play and be involved in physical activity together with other children in preschool settings, local playgrounds, school and extended school settings, holiday clubs and at sports and leisure centres. Many disabled children and those with complex health requirements have to be content with frequent hospital visits and play can not only increase a child’s ability to cope with medical procedures but it can hasten recovery (NICE, 1997).

3.3.3 Asthma and other medical conditions
Strong et al., (2005) have tabulated the effects of physical activity for asthma children and adolescents that are encouraged to do aerobic fitness with varieties of activities for 2 to 3 days/ week for at least 6 weeks and intensity according to the aerobic programmes. While for hypertensive children/ adolescents, aerobic types of physical activity for at least 12 to 32 weeks, 3 day/ week with 30 min/ session and intensity to improve aerobic fitness was found to have a positive beneficial effect on blood pressure control.
3.3.4 Overweight and obese children

For overweight and obese children, they are encouraged to embark on variety of aerobic activity for at least 3 to 5 day/week with moderate to vigorous intensity and duration from 30 to 40 min/day (Strong et al., 2005). Obese and overweight children and adolescents should also engage in muscle-strengthening and bone-strengthening activities three times a week (CDC, 2008).

3.4 Physical activity in children and adolescents – the role of schools, families, and communities

3.4.1 The role of the school

A comprehensive school physical activity programmes should include quality physical education, school-based physical activity opportunities, school staff wellness and involvement and family and community participation (NASPE, 2008). Physical education should be enjoyable, meet the needs of all students and keep the students active for more than 50% of the class time (NASPE, 2008). It has been suggested that elementary and high school students should receive 150 minutes and 225 minutes of physical education per week, respectively (NASPE, 2004).

Schools can also incorporate physical activity during classroom time as part of planned lessons, intramural sports programmes and interscholastic sports. Whilst recess provides an opportunity for students to participate in free time physical activity and practice skills developed in physical education classes. Schools are encouraged to provide students with space, facilities and equipment that can make participation in physical activity enjoyable and safe. All elementary school children should be provided with at least one daily period of recess for a minimum of 20 minutes (NASPE, 2006). Schools are also encouraged to offer the use of facilities outside of school hours.

3.4.2 The role of the family

Parents and families have a strong influence on children’s level of physical activity and thus play an important role in helping them to be active. Children whose parents are active were 5.8 times more likely to be active than children of sedentary parents (Hood et al., 2000). Parents should model positive physical activity by leading an active lifestyle themselves, create active family time into daily family’s routine, make use of public parks and recreation areas, and replacing inactivity with activity whenever possible. The time spent on screen time (watching TV, using computer, movies/ DVDs, video games) should be monitored and limited to 2 hours a day (AAP, 2001). It is also suggested to engage in physical activity (e.g. push-ups, running in place or crunches) during commercial breaks and turning off the television during mealtime and homework time.

Furthermore, parents can help their children to be active by exposing them to a variety of activities including recreation, team sports and individual sports. Instead of giving video games, parents can buy toys that promote physical activity like balls, kites, jump ropes and bicycle. Parents should be positive about the activities that their children engage in and always encourage their interest in new activities. In addition, parents can encourage their children to play outside in safe places and to be active with their friends.

3.4.3 The role of the community

Communities can promote active lifestyles by improving access to places for people to be physically active such as building new places for
physical activity or turn abandoned or vacant lots into parks, multipurpose courts or playgrounds. It is also essential to identify and promote safe routes for walking and bicycling to school and recreational facilities. Building schools closer to home, greater neighbourhood densities, less exposure to busy roads en route to school and school crossing guards can encourage children to walk. Closer proximity to school also provides the opportunity for use of school grounds for physical activity in afterschool hours.

Community-wide campaigns are also essential to spread physical activity messages to youth and families through television, radio, newspapers and billboards. Continuous public education such as through health fairs, walk or run events and physical activity counselling will increase awareness and encourage the community to be active.

4.0 CURRENT STATUS

In Malaysia, several surveys have been conducted that evaluated the physical activity level and/or physical activity pattern of its adult population. However, there are no known reported national surveys that evaluated the physical activity of Malaysian children and adolescents. The adult surveys included the National Health and Morbidity Survey (NHMS II) conducted in year 1996, the Malaysian Adults Nutrition Survey (MANS) conducted in years 2002/2003 and the NHMS III conducted in year 2006. All three surveys reported low participation in physical activity, whereby the NHMS II reported only 11.6% of the population were doing regular physical activity or adequate exercise (MOH, 1999); while MANS reported 14.4% had adequate exercise, with more men (19.5%) than women (9.1%) having adequate exercise (Poh et al., 2010). The NHMS III similarly reported that 43.7% of Malaysian adults were physically inactive (Mohd Azahadi et al., 2008).

Among children, only three published reports on physical activity were found. Dan, Mohd Nasir & Zallilah, (2007) reported that 35.3% of adolescents aged 13 years old in Kuantan had low physical activity, while 61.5% had moderate and only 3.0% had high physical activity levels based on the Physical Activity Questionnaire for Older Children (PAQ-C). A more recent study reported objective measures of physical activity using pedometers among children and adolescents aged between 9 to 18 years old in urban Selangor (Wilson, 2008). It found that activity levels were low for the younger age group (9 to 12 years) with only 43% males and 34% females meeting the international guidelines for the minimum number of steps/day (males 15,000; females 12,000); while in the older age group (13 to 18 years), only 12% females and 55% males achieved the ‘expected minimum’ steps/day (males 12,000; females 10,000).

A review of ten studies conducted by university students was undertaken for the Ministry of Health (MOH, 2011). All the studies included physical activity assessment among adolescents in Malaysia and applied the cross-sectional study design. One of these studies reported that the percentage of adolescents who had ‘ever-exercised’ in the week prior to the study was a
respectable 75%. Another study in Putrajaya found more than half of the students had moderate physical activity levels (52.8%), 42.8% reported low physical activity levels and only 4.4% reported high physical activity levels.

Generally, boys were more active than girls (MOH, 2011). A study in Petaling District, Selangor, reported a prevalence of physical inactivity at 50.1% for girls and 39.6% for boys (Kee et al., 2011). Another study in Kuala Lumpur reported a similar trend, where 45.6% of girls were inactive versus 23.1% of boys. Only one study reported their results by ethnicity. The study conducted in Kuala Lumpur found that the prevalence of physical inactivity was highest among the Chinese (44.7%), followed by Malays (34.9%) and Indians (26.9%).

In view of the low levels of physical activity among Malaysians in general, and among children and adolescents in particular, it is therefore important to include and highlight physical activity in the Malaysian Dietary Guidelines (MDG) (Figure 5.1) for children and adolescents as a measure to promote physical activity amongst our young population.

**Figure 5.1. Physical Activity Pyramid**

- Be physically active every day in as many ways as you can.
  - Example: Walking, climbing stairs, be active during PE class, doing household chores.
- Accumulate at least 60 minutes of moderate intensity physical activity daily.
  - Example: playing actively outdoors, running and chasing, cycling, swimming, football, badminton.
- Participate, at least 3 times a week, in activities that increase muscle and bone strength.
  - Example: Monkey bars, jumping jacks, push-up, chin-up, crab walk, working with resistance bands, jumping, skipping, hopscotch, jumping rope, gymnastics.
- Limit physical inactivity and sedentary habits.
  - Example: Watching TV, playing video games, surfing internet, playing computer.
- Source: NCCFN (2010)
5.0 KEY RECOMMENDATIONS

**Key recommendation 1**
Be physically active everyday in as many ways as you can.

**How to achieve**
Always incorporate more physical activities in your daily life. Parents should try not to restrict their children from being naturally active.

Do these activities whenever possible so as to be more active:

1. Walk or cycle to school.
2. Engage in some physical activity during school, especially during recess time.
3. Participate actively during physical education classes.
4. Help with household chores, such as sweeping, washing your own school shoes and mopping the floor.
5. Choose to walk up the stairs, instead of taking the lift or escalator.
6. Whenever you have free time, engage in outdoor activities with your family and friends.

**Key recommendation 2**
Accumulate at least 60 minutes of moderate-intensity physical activity daily.

**How to achieve**
Activities for children and young people should match their age, maturity, developmental or skill level and health status. Children often do activities in short bursts; hence, accumulation of physical activity over the day is a practical approach.

1. Allow young children to play as much as possible in a safe outdoor environment.
2. Emphasise participation and enjoyment, rather than competition and winning, when conducting structured sports programmes for pre-schoolers.
3. Encourage children and adolescents to engage in moderate-intensity activities, such as playing badminton, riding a bicycle, rollerblading, brisk walking or a game of catch and throw.
4. Encourage children and adolescents to engage in vigorous-intensity activities suitable for their age, such as running and chasing (e.g. police and thief), football, basketball, tennis, swimming, riding a bicycle (fast), jumping rope, martial arts (e.g. taekwondo, karate) or vigorous dancing.
5. Accompany children for longer walks, visits to park or swimming pool and bike rides during weekends.

For a more comprehensive list of moderate and vigorous intensity activities, refer to Appendix 1.

Key recommendation 3
Participate at least 3 times a week, in activities that increase muscle and bone strength.

How to achieve
1. Engage in moderate-intensity physical activities that help to strengthen muscles. Suitable activities for muscle-strengthening by age group are as follows:
   a. Children below 7 years: Playing at playground, adult supervised exercises (e.g. squats, chin-ups, crab walk, jumping jacks).
   b. Primary school-aged children and adolescents: Climbing trees/walls, playing at playground (e.g. monkey bars), push-ups, pull-ups, sit-ups, tug-o-war or working with resistance bands.

2. Engage in moderate physical activities that help to strengthen bones. Suitable activities for bone-strengthening by age group are as follows:
   a. Children below 7 years: Jumping, hopping, skipping or running.
   b. Primary school aged children and adolescents: Hopscotch (teng teng or jengket-jengket), jumping rope, running, gymnastics, basketball, volleyball or tennis.

For a more comprehensive list of muscle and bone strengthening activities, refer to Appendix 2.

Key recommendation 4
Limit physical inactivity and sedentary habits.

How to achieve
Children should be discouraged from extended periods of inactivity and should not be sedentary for more than 60 minutes at a time.
1. Limit screen time to not more than two hours a day. For example: Watching television, playing video games and using the computer or surfing the internet.
2. If children are into electronic games, encourage them to play active video games (e.g. basketball video exergames) rather than sedentary ones.
ADDITIONAL RECOMMENDATIONS

Children who are inactive
Children who are inactive should be regularly encouraged to be active. In order to achieve the goal of 60 minutes per day of moderate-intensity physical activity, an incremental approach is recommended. Increasing physical activity by 10% per week is an achievable target. Young children on the other hand, should be encouraged to explore their environment in order to stay active.

Children with physical disability
Children with physical disabilities should be encouraged to play and be involved in physical activity wherever possible. This includes in settings such as at community playgrounds, preschools and schools. Parents and teachers should help the child identify ways to overcome barriers to physical activity, such as lack of access, transportation and information. Many physical activities can be adapted so that everyone can participate. For example, sports that can be played in a wheelchair include tennis, basketball, track, dance, riding horses or swimming.

Children with special needs
Children with special needs are children with the same needs and desires as their peers. The difference is that the special needs children require adaptation and extra support. Consult with a medical doctor or health professionals before starting an exercise routine with your child, in order to understand the risk (if any) and to be familiar with proper safety precautions.

Asthma or other medical conditions
Children with asthma can and should be physically active. Parents and school teachers should encourage children with asthma to participate in physical activity. It is important for each child with asthma to recognise his own asthma triggers (e.g. dust, chemical sprays, heavy exercise) and to avoid or control these triggers. An asthma management plan should be developed for each child by the child himself, parent/guardian and health care provider. Lastly, the child should have convenient access to asthma medications.

Overweight and obesity
Children who are overweight or obese should embark on a physical activity program which comprise of moderate to vigorous-intensity physical activity for 30 to 40 minutes per day and for at least 3 to 5 days a week. Barriers to physical activity should be considered and programmes can be designed to help children create realistic goals (e.g. exercise for 10 minutes) that they can build on over time (e.g. increase to 15 minutes).
School-based physical activity
Schools are in a uniquely favourable position to increase physical activity and fitness among their students. Schools should provide physical and social environments that encourage and enable physical activity in a safe setting. School personnel are encouraged to establish policies that promote enjoyable, lifelong physical activity; including (i) a comprehensive, preferably daily, physical education for children from preschool to secondary school; (ii) commitment of adequate resources, including funding, personnel, safe equipment, and facilities; (iii) appropriately trained physical education specialists; (iv) physical activity instruction and programmes that meet the needs and interests of all students, including those with illness, developmental disability, obesity, sedentary lifestyles or a disinterest in team or competitive sports. Schools should also provide extra-curricular physical activity programmes that address the needs and interests of all students. Teachers can also help to identify and reduce barriers to regular physical activity, including doubts about the need for more activity, the fear of injury, the availability of safe settings and the lure of more sedentary pursuits.

Community-based physical activity
Community setting and the way they are designed can promote or inhibit physical activity in children and adults. A safe environment that facilitates walking in a community setting (e.g. good sidewalks, reasonable distances between destinations) determines if a child can be physically active in his environment. Parks and playgrounds provide opportunities for children to run and play and helps increase unstructured physical activity.
REFERENCES


APPENDICES

Appendix 1. Examples of moderate and vigorous activities defined by level of intensity

For the second level of the physical activity pyramid, examples of moderate and vigorous activities defined by level of intensity are as follows:

<table>
<thead>
<tr>
<th>Moderate activity</th>
<th>Vigorous activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3.0 to 6.0 METs</strong>&lt;br&gt; (3.5 to 7 kcal/min)</td>
<td><strong>Greater than 6.0 METs</strong>&lt;br&gt; (more than 7 kcal/min)</td>
</tr>
</tbody>
</table>

**Aerobic exercise (transport):**
- Climbing stairs at a light effort
- Walking at a moderate or hard effort
- Walking carrying a load
- Race walking at a light or moderate effort
- Cycling at a light effort

**Aerobic exercise (transport):**
- Climbing stairs at a moderate or hard effort
- Race walking at a hard effort
- Cycling at a moderate or hard effort

**Aerobic exercise (play/sports):**
- Aerobics at a light effort
- Archery
- Athletics- jumping at a light or moderate effort
- Athletics – throwing
- Badminton
- Ballet at a light or moderate effort
- Baseball at a light or moderate effort
- Cricket at a moderate or hard effort
- Dancing (general) at a light or moderate effort
- Fishing
- Golf
- Gymnastics
- Hide and seek, poison ball
- Hockey at a light effort
- Hopscotch at a light or moderate effort
- Horseback riding at a moderate effort
- Ice skating at a light effort
- Juggling
- Kayaking at a light or moderate effort
- Playing active video games (e.g. dance mat, arcade games) at a moderate effort

**Aerobic exercise (play/sports):**
- Aerobics at a moderate or hard effort
- Athletics- hurdles steeplechase
- Athletics- jumping at a hard effort
- Ballet at a hard effort
- Baseball at a hard effort
- Basketball
- Dancing (general) at a hard effort
- Handball
- Football
- Hockey at a moderate or hard effort
- Hopscotch with a hard effort
- Horseback riding at a hard effort
- Ice skating at a moderate or hard effort
- Kayaking at a hard effort
- Martial arts (karate/ judo/ kick boxing)
- Netball
- Playing active video games (e.g. dance mat, arcade games) at a hard effort
- Riding a scooter/ rollerblading/ roller skating at a moderate or hard effort
- Rock climbing at a moderate or hard effort
- Rugby
## Appendix 1

### Moderate activity

<table>
<thead>
<tr>
<th>3.0 to 6.0 METs</th>
<th>Greater than 6.0 METs</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3.5 to 7 kcal/min)</td>
<td>(more than 7 kcal/min)</td>
</tr>
</tbody>
</table>

- Playing the drums/ trombone
- Playing frisbee at a moderate or hard effort
- Playing with animals or young children at a moderate or hard effort (walk/ run)
- Playing with playground equipment (e.g. monkey bars)
- Riding a scooter/ rollerblading/ roller skating at a light effort
- Riding a skateboard
- Rock climbing at a light effort
- Squash with a light effort
- Swimming
- Table tennis
- Tennis (court) at a light effort
- Tenpin bowling
- Unstructured indoor or outdoor play (walk/ run)
- Volleyball (court)

### Vigorous activity

- Running/ jogging
- Skipping/ jump rope
- Squash with a moderate or hard effort
- Tennis (court) at a moderate or hard effort
- Trampoline
- Volleyball (beach)

### Aerobic exercise (chores):

- Carrying small children
- Carrying very heavy items (e.g. moving furniture)
- Child care (dressing)
- Dusting
- Gardening
- Making the bed, tidying/ cleaning room
- Mopping
- Mowing lawn
- Pulling up weeds, raking leaves
- Scrubbing floors
- Shovelling/digging
- Sweeping
- Vacuuming
- Washing car/ windows
- Wheel barrowing

*Source: Ridley, Ainsworth & Olds (2008)*
Appendix 2. Examples of muscle strengthening and bone strengthening activities defined by level of intensity

For the third level of the physical activity pyramid, examples of muscle-strengthening and bone-strengthening activities defined by level of intensity are as follows:

<table>
<thead>
<tr>
<th>Muscle-strengthening activities</th>
<th>Bone-strengthening activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting weights</td>
<td>Basketball</td>
</tr>
<tr>
<td>Climbing trees/walls</td>
<td>Hopping, skipping, jumping</td>
</tr>
<tr>
<td>Playing on playground equipments (e.g. monkey bars)</td>
<td>Jumping rope</td>
</tr>
<tr>
<td>Push-ups, pull-ups, sit-ups</td>
<td>Running</td>
</tr>
<tr>
<td>Tug of war</td>
<td>Hopscotch</td>
</tr>
<tr>
<td>Working with resistance bands</td>
<td>Gymnastics</td>
</tr>
<tr>
<td></td>
<td>Volleyball</td>
</tr>
<tr>
<td></td>
<td>Tennis</td>
</tr>
</tbody>
</table>

Source: Ridley, Ainsworth & Olds (2008)
Appendix 3. Examples of structured and unstructured physical activities

Some examples of structured and unstructured physical activities as additional recommendations for children are as follows:

<table>
<thead>
<tr>
<th>Structured Physical Activity¹</th>
<th>Unstructured Physical Activity²</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Playing instruments</td>
<td>• Playing at school playground</td>
</tr>
<tr>
<td>• Playing in a marching band</td>
<td>• Moving about, swinging, or climbing</td>
</tr>
<tr>
<td>• Playing guitar or drums in a rock band</td>
<td>• Walking</td>
</tr>
<tr>
<td>• Twirling a baton in a marching band</td>
<td>• Helping around the house</td>
</tr>
<tr>
<td>• Singing and dancing as a co-curricular activity in school</td>
<td>• Taking the stairs</td>
</tr>
<tr>
<td>• Playing a musical instrument while actively running in a marching band</td>
<td>• Tidy up room</td>
</tr>
<tr>
<td>• Badminton</td>
<td>• Skateboarding</td>
</tr>
<tr>
<td>• Football</td>
<td>• Roller-skating or in-line skating</td>
</tr>
<tr>
<td>• Swimming</td>
<td>• Running</td>
</tr>
<tr>
<td>• Basketball</td>
<td>• Skipping</td>
</tr>
<tr>
<td>• Netball</td>
<td>• Jumping rope</td>
</tr>
<tr>
<td>• Futsal</td>
<td>• Performing jumping jacks</td>
</tr>
<tr>
<td>• Volleyball</td>
<td>• Bike riding</td>
</tr>
<tr>
<td>• Table tennis</td>
<td></td>
</tr>
<tr>
<td>• Karate, taekwondo, silat or other martial arts</td>
<td></td>
</tr>
</tbody>
</table>

¹Activities done in a structured or organized environment (such as playing in a league, sports club, private facility)
²Activities done in free play
Malaysian Dietary Guidelines for Children and Adolescents
Key Message 6

Eat Adequate Amount of Rice, Cereals or Tubers
1.0 TERMINOLOGY

Breads
Breads refers to leavened and unleavened wholemeal, white, mixed-grain, rye and fruit breads, as well as roti canai, capati, rosai, pita bread, bun, pizza, roti arab, rolls, bagels, muffins and crispbreads.

Cereals
Cereals refer to the entire class of cereal foods, including whole or partially processed cereal grains. It includes rice, breads, breakfast cereals, noodles, pasta, oats, corn and barley. Others are plain cereal products such as flour, semolina, bran and wheatgerm. It excludes cereal-based products with a significant amount of added fat and sugar.

Noodles and pasta
Noodles and pasta includes a wide range of Asian and Italian products based on sheets of dough made from flour usually wheat or rice flour, water and sometimes with egg added. Examples are mee, bee hoon, kuey teow, laksa, egg noodles, udon, spaghetti and macaroni. The term excludes some instant noodles and flavoured pasta mixes with significant amounts of added fat and salt.

Rice
Rice refers to rough rice, brown rice, milled white rice, large broken rice, small broken rice, parboiled rice, rice hulls, rice bran and rice flour.

Tubers
Tubers refer to fleshy underground swelling of stem or root strands that normally contain varying amount of starch.

Whole grain
Whole grain refers to cereal foods that consist of the intact, ground, cracked or flaked caryopsis which incorporate all the components of the natural grain, including the bran and germ. Foods that contain at least 51% by weight of any combination of whole grains have generally been termed as “whole grain” (Jacobs et al., 2000). These include brown rice, dark breads, whole grain ready-to-eat cereals, cooked cereal, popcorn, wheat germ and bran (Liu, 2003). However, in most studies, foods have also defined as whole grain if at least 25% is whole grain or bran by weight (Jacobs et al., 2000).

When the bran and germ of the grain, which contain the major amount of nutrients and dietary fibre, have been removed and only the starchy inner part of the grain remains, the grain is now termed as refined-grain products.
Wholemeal bread

Wholemeal bread is a mixture of wholemeal wheat flour and wheat flour containing not less than 60% of wholemeal wheat flour and water (MOH, 1985).

2.0 INTRODUCTION

Cereal-based products are the most important sources of food and serve as the major source of energy and protein to human diet since ancient times. Eight types of cereals, namely wheat, maize, rice, barley, sorghum, oats, rye and millet – provide more than 56% of the energy and 50% of the protein consumed by the world population (Cordain, 1999).

Cereals contain all the macronutrients (carbohydrates, fats and proteins) needed for support and maintenance. They are an excellent source of minerals and vitamins, the micronutrients required for adequate health. Dietary guidelines all over the world are recommending the inclusion of whole grains because of the increasing evidence that whole grains and wholegrain-based products have the ability to enhance health beyond the simple provision of energy and nutrients. The different chemical components present in whole grains (dietary fibre, inulin, β-glucan, resistant starch, carotenoids, phenolics, tocotrienols and tocopherols) have many health enhancing properties and may play the role in the prevention of chronic diseases (Borneo & Leon, 2012).

Cereals would be an excellent choice to provide more than 55% of total energy for optimal health as recommended by Food and Agriculture Organization (FAO, 2002). For over 3 billion people particularly those who live in developing countries, rice is the main source of calories, providing approximately 700 calories/ person/ day (FAO, 2004). It is important to note that nutrients such as fibre, thiamine, niacin, vitamin B6, iron, phosphorus, magnesium and potassium would only present significantly in rice if it is consumed together with its bran (Bird et al., 2000). For the last 3000 to 4000 years, the world’s population has relied upon whole grains as a main proportion of the diet. It is only in the last 100 years that a majority of the population has started consuming refined grain products (Slavin, 2006). This is because most cereals are consumed after milling – a process which removes the outer layers of the grain (bran and germ) to preserve the starch-rich white endosperm. As such, milling takes out the key nutrients from cereals, since those outer layers of the grain are rich in vitamins, minerals, fibre, phytochemicals and many others. Because of this milling process, most people are unable to benefit from the enormous health-enhancing properties of cereals. Under-milling has been employed to retain
B vitamins in milled rice, but the shelf-life of under-milled grain products is shorter than that of milled rice.

It is becoming evident that whole grain is important for health beyond the simple provision of major nutrients and energy. An increasing amount of evidence shows that consumption of whole grains and whole grain-based products is associated with a reduction in the risk of developing many diseases, including cardiovascular diseases (Lutsey et al., 2007), strokes (Kurth, 2006), hypertension (Kochar, Gaziano & Djousse, 2012; Lee, Puddey & Hodgson, 2008), metabolic syndrome and type-2 diabetes (Anderson & Pasupuleti, 2008) and different types of cancer (Wakai et al., 2006; Haas et al., 2009). Studies have also shown that whole grain consumption can aid in weight management (van der Vijver et al., 2009) and asthma (Tabak et al., 2006).

Ecologically, a high-carbohydrate diet based on cereals makes good use of the world’s resources, since grain crops require relatively low input resources per unit of food energy produced. Today, roughly half of the world’s cropland is devoted to growing cereals. If we combine their direct intake (e.g. as cooked rice or bread) with their indirect consumption, in the form of foods like meat and milk (about 40% of all grain is currently fed to livestock), then cereals account for approximately two-thirds of all human calorie intake (Dyson, 1999).

Roots and tuber crops are consumed as staple food in many countries in the world; however, their contribution to the population’s energy supply varies within a large range depending on the country. Many species and varieties are consumed but three species, namely cassava, Irish potato and sweet potato, make up more than 90% of roots and tuber crops used for direct human consumption. While Malaysian consumption data is lacking, it is estimated that in South East Asia, sweet potatoes, Irish potatoes, cassava and other roots and tubers represent 48%, 31%, 18% and 3% of the total directly consumed root and tuber crops respectively. About 35% of total root and tuber crops and 85% of sweet potatoes used as human staple food are consumed in South East Asia (FAO, 1990).

Among the staples, rice has the highest protein digestibility. Potato protein has a higher biological value than cereal proteins, but the net protein utilisation is lower than that of rice. Utilisable protein is comparable in brown rice, wheat, maize, rye, oats and potato but is lower in sorghum and higher in millet. Rice also has higher energy digestibility. Protein quality of roots and tubers is often higher than those of rice, particularly for amino acid lysine. Roots and tubers have lower fat and higher fibre content which results in slightly lower energy content than cereals.
3.0 SCIENTIFIC BASIS

Childhood is a dynamic period with numerous physiological and psychosocial changes. Children's food choices and intakes can be influenced by several factors. These include growing independence, increased involvement in social life, need for peer acceptance, dissatisfaction with body image and influence from the media. During adolescent years, children's eating behaviours show a greater tendency to skip meals, increased consumption of meals outside the home and ready-to-eat foods, increased snacking and greater interest in dieting. It is well accepted that dietary habits developed during childhood can carry into adulthood. Furthermore, intake of specific nutrients during a younger age can influence the future risk of chronic diseases, as risk factors such as elevated cholesterol or blood pressure seems to develop at an early age. Therefore, it is recommended that children establish good dietary practices at an early age to avoid development of these conditions in later life.

In Malaysia, as with many other rising income countries, rapid economic development has brought about changes in the populations dietary intakes and lifestyle. Consequently, these changes have contributed significantly to the increasing prevalence of obesity and diet-related chronic diseases, both in the adult and children populations. Various studies among the adolescents have shown that the prevalence of overweight and obesity ranges from 5 to 26%, depending on, the age, ethnicity, gender and locality as well as the methods used to define overweight and obesity. Overweight children are also heavier than they have been in the past. Nutrition and health surveys reveal that Malaysians are already affected by health problems previously more prevalent in Western countries. The increasing prevalence, once thought to be an urban phenomenon, has spread to the rural population at a similarly alarming rate (Ismail et al., 2002).

Focusing our attention on cereal intake, which is the major source of dietary carbohydrate, there are indications that the amount of carbohydrate in children's diets has been increasing. This was an inevitable consequence of the recommendations to decrease dietary fat. Unfortunately, as they are shifting away from fat, the type of carbohydrate that children are eating also appears to have changed. In the U.S. it was noted in the Bogalusa Heart Study that children who occupied the lowest percentiles of fat consumption had increased their intake of simple carbohydrates (Nicklas, Myers & Berenson, 1995).

The contribution of snacks to the total caloric intake has always been important in children of all ages. Among Malaysian children, the most frequently consumed snacks are, in descending order, extruded snacks, ice-cream, biscuits, bread, chocolate, sweets, fruits and kuih-muih (Ismail et al, 2003). In the U.S., it was reported that bread consumption at breakfast has declined, particularly for whole grain bread and has been replaced by ready-to-eat cereals, particularly highly refined breakfast cereals (Nicklas, O'Neil & Berenson, 1998). Approximately two-third of Malaysian children take breakfast every day, with bread, fried rice and noodles being the most popular foods consumed. On the other hand, a good 32.1% of the children skipped breakfast occasionally, including 7.5% who never have breakfast. It is also important to note that, among school children surveyed, 9.6% of boys and 9.8% of girls were underweight, indicating inadequate energy intake (Ruzita et al., 2008).
3.1 Gastrointestinal health
Dietary fibre is one of the important nutrients associated with bowel health. It has been found to be associated with a reduction of chronic constipation, diverticulitis and some types of irritable bowel symptoms (Kantor et al., 2001). Besides dietary fibre, whole grains are also rich sources of fermentable carbohydrates including resistant starch and oligosaccharides. The oligosaccharides, with a low (2–20) degree of polymerisation, can have similar effects as soluble dietary fibre in the human gut and they have consistently been shown to alter human faecal flora. These undigested carbohydrates that reach the colon are fermented by the intestinal microflora to produce short-chain fatty acids such as acetic, butyric and propionic acids. Short-chain fatty acid butyrate, for instance is a preferred fuel for the colonic mucosa cells to proliferate to produce mucus for lubrication.

Data from a recent dietary survey suggested that the energy-based interpolation of the dietary fibre reference intake for children and adolescents from the existing physiological data of adults (14 g/1000 kcal) is practicable to calculate the reference values per day. While dietary fibre itself does not yield energy in the diet, it comes from energy-yielding foods, for example, grain, fruits and vegetables. Therefore, such an energy-based approach is more realistic when the reference values were used to prepare food-based dietary guidelines (Alexy, Kersting & Sichert-Hellert, 2006).

3.2 Metabolic syndrome and Type-2 Diabetes
In 2005, the Centers for Disease Control and Prevention (CDC) reported that 1 in 3 children born in 2000 would develop type-2 diabetes (DHHS, 2007). Type-2 diabetes is most prevalent among overweight and obese adolescents, which puts them at risk of developing heart disease and other diabetes related complications before the age of 35 years (Hedley et al., 2004). These alarming statistical figures will result in enormous personal, societal and economic costs for many years to come.

Epidemiological studies consistently show that the risk for type-2 diabetes mellitus is decreased with the consumption of whole grains (Van Dam et al., 2002). Dietary fibre, magnesium and vitamin E in whole grains are important components in insulin metabolism. Relatively high intakes of these nutrients from whole grains may prevent hyperinsulinaemia. Dietary fibre seems to be the most important component in cereal grains in controlling blood glucose level. It has been associated in improving postprandial serum glucose and insulin sensitivity, subsequently decreasing the risk of diabetes. This inverse relationship between high fibre intake and a lower risk of type-2 diabetes has been shown.
in both epidemiological (Fung et al., 2002) and cohort studies (Schulze et al., 2007).

In a randomised cross-over study, intake of purified insoluble cereal fibre for three days has increased insulin sensitivity (Weickert et al., 2006). Intake of these fibres has been shown to stimulate the acute secretion of glucose-dependent insulinotropic polypeptide and insulin, reducing the glucose response to a meal in the following day (Weickert et al., 2005). Subjects who consumed a whole grain diet also showed improved insulin sensitivity (Pereira et al., 2002).

In a randomised clinical trial, 27 healthy subjects showed a significant reduction in glucose levels as well as LDL-cholesterol after consuming approximately 30.5 g fibre/day for a period of three months (Aller et al., 2004). In both healthy and type-2 diabetic patients, consumption of brown rice lowered blood glucose response compared to milled rice (Panlasigui & Thompson, 2006).

It has been suggested that dietary fibre improves glycaemic response and insulin concentration by slowing the digestion and absorption of food as well as by regulating several metabolic hormones. These mechanisms are thought to be brought about by soluble fibre (Ohara, Tabuchi & Onai, 2000). The soluble fibre also slows down the absorption and digestion of carbohydrates which lead to a reduced demand for insulin (Khor, 1997). Nevertheless, the synergistic effect of several whole grain components, such as phytochemicals, vitamin E, magnesium, or others, may be involved in the reduction of the risk for type-2 diabetes mellitus.

### 3.3 Weight management

Studies suggested that there is an association between whole grain intake and the regulation of body weight (Pereira et al., 2002). In the Coronary Artery Risk Development in Young Adults Study, whole grains were inversely associated with Body Mass Index (BMI) and waist hip ratio at baseline and 7 years later (Pereira et al., 1998). Although the differences were modest, the risk for weight gain and the development of overweight or obesity could be substantially decreased. The intake of whole grains also appears to prevent weight gain among middle-aged women (Liu et al., 2003). In the Nurses’ Health Study, the subjects who consumed more whole grains consistently weighed less than the women counterparts who had lower consumption of whole grains.

In feeding experiments, it has been shown that subjects would tend to eat to a constant weight of food. This is important since in real life people rarely eat foods of a different energy density but similar weight or portion size (Mazlan, Horgan & Stubbs, 2006). Whole grain foods have high volume, low-energy density and relatively lower palatability may promote satiation. It has shown that whole grains may enhance satiety (delayed return of hunger following a meal) for up to several hours following a meal. Obesity is associated with low fibre intake. Grains rich in viscous soluble fibre tend to increase intraluminal viscosity, prolong gastric emptying time and slow nutrient absorption in the small intestine. Although total energy intake and overall nutrient density appear to be the most important factors affecting weight regulation, a high-fibre, low-fat diet is recommended for maintenance of body weight and prevention of obesity.

Studies among adolescents investigating the association of fibre and whole grain intakes with the development of body composition found an independent prospective association with lower body mass index (Steffen, 2003). An increase in consumption of ready-to-eat-cereals as a source
of carbohydrates was shown to be an effective strategy to help obese children lose weight, particularly when accompanied by nutrition education (Rosado et al., 2008).

**4.0 CURRENT STATUS**

Data on cereals and fibre intake among Malaysian children is not readily available as most studies focus on energy and protein intake. Dietary fibre intake is difficult to estimate because it is not included in food or nutrient databases and is generally not listed on Nutrition Information Panel (NIP). In a survey on food habits of Malaysian school children, it was found that about 90% of them ate lunch and dinner at home. Most are not eating balanced meal with only 28% eating rice with meat and vegetables during lunch and 21.1% during dinner (Ismail et al., 2003). Most children (86.6%) bought food and drinks from their school canteen, mainly nasi lemak, fried mee and chicken rice.

In the Western population, studies showed that, on average, preschoolers do not eat high-fibre foods but consume large amounts of low-fiber items (Kranz et al., 2005). Dietary assessment studies of adolescent males, conducted in Western countries, reported intakes of dietary fibre below recommended amounts (Decarli et al., 2000; Nicklas, Myers & Berenson, 1995). This is parallel to the fact that consumption of whole grains among US children and adolescents was less than 1 serving/ day (Harnack, Walters & Jacobs, 2003), with the most current data showing that mean whole grain intake was 0.59 and 0.63 servings/ day among children 6 to 12 years and adolescents 13 to 18 years, respectively (Zanovec et al., 2010).
5.0 KEY RECOMMENDATIONS

Key recommendation 1
Ensure an adequate intake of cereals and cereal based foods according to age.

How to achieve
1. Consume a variety of cereals (including rice) and cereal based food for main meals.
2. Gradually increase the number of servings according to age:

<table>
<thead>
<tr>
<th>Age</th>
<th>No of servings</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 6 years</td>
<td>3</td>
</tr>
<tr>
<td>7 to 9 years</td>
<td>4 to 5</td>
</tr>
<tr>
<td>10 to 12 years</td>
<td>6 to 7</td>
</tr>
<tr>
<td>13 to 15 years</td>
<td>7 to 8</td>
</tr>
<tr>
<td>16 to 18 years</td>
<td>6 to 9</td>
</tr>
</tbody>
</table>

Note: Males need more servings than females

3. Tubers may be consumed as an alternative to rice and other cereal products.

Key recommendation 2
Ensure that at least half of daily cereal intake includes whole grain.

How to achieve
1. Introduce whole grain foods in children’s diet beginning at 9 to 12 months old.
2. Choose whole grain alternatives for bread, biscuits and cereal products.
3. Cook white rice mixed with brown rice/unpolished rice.
4. Mix whole wheat flour with plain flour when baking.
5. Read food labels and choose cereals products labelled with whole grain, wholemeal or whole wheat.
Key recommendation 3
Prepare and choose healthier tubers and cereal products.

How to achieve
1. Choose or prepare healthier food made from tubers and cereals such as boiled sweet potatoes, tapioca, yams, steamed corn kernels, rice puddings and others.
2. Choose or prepare cereal based meals which are high in fibre, low in sugar and salt.
3. Choose cereal based snacks low in fat, sugar and salt.
4. If you choose breakfast cereal, select those with high fibre, low sugar content and add fresh or dried fruits, seeds and nuts to enhance the flavour.
6.0 ROLE OF PARENTS, CAREGIVERS AND TEACHERS

Healthy eating and physical activity habits begin in early childhood and track into later life. Parents can have a strong influence on their children’s dietary intake, activity and behaviours. They have the ability to control the availability of, and exposure to, food and activity opportunities for their children. More importantly, every parent should act as role models and provide their children with support and structure to practise healthy lifestyles. Parents need to educate themselves on healthy eating habits and content-specific acts of parenting, such as rules about dietary intake or physical activities. Studies have found that parental support and encouragement for physical activity and healthy eating are associated with adolescents’ physical activity and dietary intake (Neumark-Sztainer et al., 2003).

Using these guidelines, initiatives should be taken to implement changes in the quantity and nutritional quality of foods and beverages available to students within the school food environment. The emphasis on the changes is to reduce the risk of overweight, obesity and type-2 diabetes. The school food environment includes meals sold at school canteens, vending machines and after-school snacks provided by parents and caregivers. The intervention strategies should target the reduction of high-fat foods, high-fat/ calories snacks and desserts, and beverages with added sugar, while increasing fruits and vegetables, as well as fibre-rich foods including grain-based foods and legumes. Canteens can offer at least three different choices of high-fibre grain-based foods and/ or legumes (≥2 g fiber/ serving) daily.

Steps should also be taken to improve children’s dietary intake outside of the school environment through messages about healthy eating. Projects that can be carried out may include: canteen-based educational events, taste tests to introduce new food items and nutrition education provided in the classroom and through Parent-Teacher’s Association (PTA) newsletters. A meta-analysis of seven school-based interventions reported improvements in children’s dietary intake (Howerton et al., 2007). Taste preference is a well-documented mediating factor of food choice. Therefore, efforts to incorporate the most acceptable whole grain and legume containing foods in the diet can increase consumption and foster behaviour change. Subsequently we can build on these initial changes to promote consumption of the less familiar whole grain and legume foods.
REFERENCES


Key Message 7
Eat Fruit and Vegetables Everyday
1.0 TERMINOLOGY

Fruit
The term fruit is generally used to describe the sweet, fleshy edible portion of a plant that arises from the base of the flower and surrounds the seeds. Most fruits are eaten fresh and raw when they are ripe which give them a sweet taste. In some cases, fruits are consumed before they ripen, usually with a spicy or savoury sauce or dip. Some ripe and unripe fruits are used in cooking or added into salads which can offer a tasty alternative. Fruits can also be consumed as canned fruits, dried fruits and fruit juice, preferably without added sugar and preservatives.

Vegetables
Vegetables are the edible parts of plants which include leaves, roots, stalks, bulbs and flowers but do not include tubers (potato, tapioca and yam). Commonly consumed vegetables are fresh, green leafy vegetables (such as spinach and lettuce), coloured vegetables (such as red spinach), fruit vegetables (also known as gourd or melons, such as pumpkin, loofah and cucumber), bean vegetables (such as long beans), cruciferous vegetables (such as cabbages and broccoli), ulam-ulam (such as pegaga (pennywort) and ulam raja) and edible plant stems (such as celery and asparagus). Vegetables are also available as canned or frozen vegetables. Some vegetables are eaten raw while others are cooked to make them more palatable and digestible, sometimes in combination with other food groups (such as egg, meat, fish or legumes).

2.0 INTRODUCTION

Fruits and vegetables in human nutrition can be traced back to ancient history. The early humans spent much time gathering wild fruits and vegetables besides hunting animals for their sustenance. Despite the dependence on only two food groups (plants and meat), these early humans were considered healthy and did not show any sign of being afflicted with nutrition related chronic diseases. As civilisations evolved and agriculture became predominant, a variety of fruits and vegetables were cultivated for both their nutritional and aesthetic values.

Good nutrition is imperative for all children to achieve optimal physical and mental development. Fruits and vegetables are a cornerstone of a healthy diet for growing children. Inadequate consumption of fruits and vegetables contributes considerably to poor diet quality of children. Fruits and vegetables are generally low in calories, nutrient-dense and contain non-nutrient
Malaysian Dietary Guidelines
for Children and Adolescents

substances that are considered to be important components of healthy diets
(Newby, 2009).

Fruits and vegetables have been recognised as a good source of vitamins and
minerals collectively referred to as micronutrients which serve an array of
important functions in the body (WCRF/ AICR, 2007). The darker or more
colourful a fruit or vegetable is, the higher the content of vitamins, minerals
and antioxidants (Isabelle et al., 2010a; Isabelle et al., 2010b; Lorach et al., 2008).
The widespread and debilitating nutritional disorders, including birth defects,
mental and physical retardation, weakened immune systems, blindness
and even death, are caused by diets lacking in micronutrients. Low fruit and
vegetable intake is a major contributing factor to micronutrient deficiencies.
Vitamin A, for instance, maintains eye health and boosts the body's immunity
against infectious diseases while potassium promotes good nerve and
muscle functioning. Folate, a B-vitamin also known as folic acid, found in
fruits and vegetables can significantly reduce the risk of neural tube birth
defects in newborns and contribute to the prevention of heart disease. Other
micronutrients in fruits and vegetables, such as vitamin C and vitamin E, serve
as powerful antioxidants that can protect cells from cancer-causing agents.
In addition, vitamin C increases the body's absorption of calcium, an essential
mineral for strong bones and teeth and iron from other foods (FAO, 2003).

The rise in childhood obesity globally over the past decade has been dramatic.
There are an estimated 35 million overweight/ obese children in developing
countries, compared with 8 million in developed countries (WHO, 2003). These
children are significantly more likely to be overweight or obese compared to
those who consume fruit and vegetables more frequently. Obesity puts children
at risk for early cardiovascular disease, diabetes, bone and joint problems,
sleep apnea and psychological problems (Krebs et al., 2007). Since fruits and
vegetables are relatively low in energy, they can be helpful in achieving and
maintaining a healthy weight and would be beneficial in the light of the
growing obesity epidemic.

Despite the well-known health benefits of eating fruits and vegetables, children's
intake is generally below the recommended amounts. Affirmative actions are
greatly needed to increase children's consumption of fruits and vegetables. For
example, as food preference is a key determinant of consumption in children,
establishing preference for fruits and vegetables early in life is important to get
children to accept a variety of fruits and vegetables later in life (Hetherington
et al., 2011).
3.0 SCIENTIFIC BASIS

Heart disease, cancer and diabetes are the leading causes of death in Malaysia, totaling to about 25% of deaths in the year 2008 (Department of Statistics Malaysia, 2010). Daily consumption of fruits and vegetables in sufficient amounts could help prevent major diseases such as cardiovascular diseases and certain cancers (Lock et al., 2005; WHO, 2003). There are many mechanisms by which fruits and vegetables confer protective effects against such diseases. Fruits and vegetables contain phytochemicals, antioxidants and vitamins such as bioflavonoids, carotenoids, vitamin E and C, in which these components can reduce the risk of cancer, coronary heart disease, stroke and high blood pressure. Vegetables are likely to be beneficial in the management of type-2 diabetes due to their fibre content, low energy density and possible hypoglycaemic activity. Fruits and vegetables may also play a role in weight management as the intake may promote satiety and reduce the consumption of foods high in refined carbohydrates, fat, saturated fat and cholesterol (Wang et al., 2011).

3.1 Weight status

Increased consumption of fruits and vegetables has been shown to reduce short-term energy intake in children (Leahy, Birch & Rolls, 2008) and decrease body weight in overweight and obese children and their parents in family-based behavioural weight control programmes (Epstein et al., 2001; Epstein et al., 2008). In a longitudinal study, low vegetable intake was associated with higher body mass index (BMI) in women whose vegetable consumption was tracked from adolescence into adulthood (te Velde et al., 2007).

Fruits and vegetables contain a high proportion of water, fibre and are low in calories and energy density. As water has the ability to reduce energy density (Grunwald et al., 2001) and fibre provides non-energy containing mass, it is plausible that components of fruits and vegetables may prevent weight gain and facilitate weight loss, within the context of a reduced calorie diet. It is likely that the water and fibre content of fruits and vegetables enhance satiety and consequently weight management, particularly when consumed in whole form (Rolls, Ello-Martin & Tohill, 2004). A review on dietary fiber interventions showed that high fibre diets (additional > 10 to 12 g/ day) in 20 out of 22 studies resulted in weight loss of 1.3 to 1.9 kg over 3.8 months (Howarth, Saltzman & Roberts, 2001). Therefore, replacing high energy dense foods with high fibre foods that are lower in energy density, such as fruits and vegetables, can be an important part of a weight management strategy for children.

3.2 Bowel movement

Worldwide, the prevalence of constipation in the general population is varied, ranging from 0.7 to 29.6% in children (Suzanne, Marc & Carlo, 2011). Low consumption of dietary fiber, fruits and vegetables can disrupt bowel movements, particularly in children (Tam et al., 2011; Wald et al., 2009; Van den Berg et al., 2006). In addition, low intake of plant foods contributed to significantly lower intakes of micronutrients including vitamin C, folate and magnesium in constipated children as compared to their non-constipated counterparts with adequate intake of plant foods (Lee et al., 2008). The high fibre and water content in fruits and vegetables, whether in fresh, dried or juice form, can increase bowel movements (Murakami et al., 2007). Although prune juice and orange juice have been widely promoted as a solution for constipation (Winney, 1998), the evidence so far has been based on expert opinion rather than scientific studies (Merilyn & Tina, 2003).
3.3 Cancer
A sufficient intake of fruits and vegetables during childhood may possibly have a long-term protective effect on cancer risk in adults. A longitudinal study by Maynard et al., (2003) reported that childhood fruit consumption protected against cancer in adulthood. Furthermore, a review of 200 epidemiological studies on the association between consumption of fruits and vegetables and risk of cancer also revealed a significant inverse association (Van’t Veer et al., 2000).

Michels et al., (2006) investigated the association between fruit and vegetable consumption and the prevalence and incidence of adenomas of the distal colon and rectum among 34,467 women in the Nurses’ Health Study who had undergone colonoscopy or sigmoidoscopy during follow-up between 1980 and 1998. It was found that frequent consumption of fruits was inversely related to the risk of being diagnosed with polyps, whereas little association was found for vegetable consumption. In a review of prospective cohort and case-control studies on cancer protective effects of fruit and vegetable consumption, there was a significant protective effect of fruits and moderate effect of vegetables on the risk of lung cancer (Wakai et al., 2011).

The protective effects of fruits and vegetables against risk of cancer are probably mediated through micronutrients, phytochemicals and fibre in fruits and vegetables. While phytochemicals and micronutrients may prevent and interrupt the development of cancer cells, fibre may prevent carcinogens from becoming active (Stan et al., 2008).

3.4 Cardiovascular diseases
While cardiovascular disease (CVD) is typically not diagnosed until adulthood, atheromatous lesions have been discovered in children and young adults (Strong, Zieske & Malcom, 2001). The presence of atherosclerosis in youth has been linked to CVD risk factors such as obesity, abnormal plasma lipoprotein levels, elevated blood pressure and insulin resistance (Zieske, Malcom & Strong, 2002; Dwyer, Stone & Yang, 2000; Hedley et al., 2004).

A review of eight prospective cohort studies that examined the relationship between consumption of fruits and vegetables with cardiovascular diseases indicated an inverse association between intake of vegetables and risk of CVD (Hu, 2003). In another review of relationship between dietary factors and coronary heart diseases, Mente et al., (2009) identified a significant effect of vegetables and a moderate effect of fruits on risk of coronary heart disease. Higher intake of fruits and vegetables was also associated with a reduced risk of ischaemic heart disease mortality in the European Prospective Investigation into Cancer and Nutrition (EPIC)-Heart study (Crowe et al., 2011).

Fruits and vegetables have high concentrations of bioactive compounds including antioxidants which are associated with reduced risk of CVD. Antioxidants have a rate-limiting role in lipid peroxidation (Griendling & FitzGerald, 2003) in which lipid peroxidation is associated with atherogenesis (Diaz et al., 1997). Besides antioxidants, fruits and vegetables also contain a variety of phytochemicals, micronutrients and fibre that are beneficial for cardiovascular health (WHO, 2003).

3.5 Diabetes
Diabetes is a strong independent risk factor for cardiovascular disease and often these conditions exist together, sharing common modifiable risk factors (Carter et al., 2010). Much of the
research on fruits and vegetables and risk of type-2 diabetes supported that eating 3 or more servings of whole fruits each day was associated with a lower risk of developing diabetes. Eating 1 or more serving of green leafy vegetables was also linked to lower diabetes risk (Bazzano et al., 2008). In another recent study, Odegaard et al., (2011) reported that dietary pattern with higher intake of vegetables, fruits, and soya foods was inversely associated with risk of incident type-2 diabetes in 43,176 Chinese men and women in Singapore, followed up from 1993 through 2004.

Several studies have revealed that fruits and vegetables are important components of dietary patterns associated with a decreased risk of type-2 diabetes (Van Dam et al., 2002; Montonen et al., 2005; Hodge et al., 2007). Although the mechanism for this association is uncertain, it is plausible that a combination of antioxidants and phytochemicals in fruits and vegetables might reduce the markers of oxidative stress in people with type-2 diabetes. Evidence also suggests that green leafy vegetables might contribute to lower risk of type-2 diabetes due to their magnesium content (Fernando & Martha, 2005). In addition, vegetables are likely to be beneficial in the dietary control of type 2 diabetes because of their high fibre content, low energy density carbohydrate and possible hypoglycaemic activity (Riccardi, Rivellese & Giacco, 2008; Kennedy, Chokkalingam & Farshchi, 2005).

At present, there is no firm conclusion as to whether increasing intake of fruits and vegetables in childhood can decrease the risk of type-2 diabetes later in life. Thus, the relationship between intake of fruits and vegetables in childhood and risk of type-2 diabetes should be investigated further (Carter et al., 2010).

4. CURRENT STATUS

The FAO Food Balance Sheet for Malaysia from 1961 to 2009 indicated that over the years, per capita consumption of fruits and vegetables increased from 78.7 to 93.0 kg/capita/year (FAOSTAT, 1961-2009). Despite the increase, the amount is still lower compared to other countries and did not achieve the recommended intake of 400 g/day. The Malaysian NCD Surveillance (MOH, 2006) reported that approximately 70% of Malaysian adults did not meet the recommended intake of fruits and vegetables. In contrast, the Malaysian Adult Nutrition Survey 2003 (MOH, 2008) showed that Malaysian adults consumed an average of 6 servings of fruits and vegetables daily. The various dietary methods used in these surveys could result in under- or over-reporting of fruits and vegetables intake which eventually contribute to these different findings.

Children’s intake of fruits and vegetables is greatly influenced by family environment such as parental modelling and monitoring, availability and accessibility of fruits and vegetables, structure and location of family meals, television viewing and parenting or feeding style (Gross, Pollock & Braun, 2010; Blisset, 2011). To date, studies on fruit and vegetable consumption among Malaysian children are lacking. However, as the consumption of fruits and vegetables among Malaysian adults is inadequate, it can also be assumed that Malaysian children are not meeting the recommended intake of fruits and vegetables. Available data on intake of fruits and vegetables of indigenous (Zalilah & Tham, 2002; Wan Norlida et al., 2007) and non-indigenous children (Norimah & Lau, 2000; Zalilah et al., 2005) showed that the intakes were notably lower than the recommended amounts. Studies among preschoolers and school age children reported that while fruits are preferred by children and are provided as snacks by parents, vegetables are least liked by them (Norimah & Lau, 2000; Ismail et al., 2009).
5. KEY RECOMMENDATIONS

Key recommendation 1
Eat a variety of fruits and vegetables everyday.

How to achieve
1. Eat fresh fruits and vegetables.
2. Choose dark green leafy vegetables everyday.
3. Eat different coloured fruits and vegetables.
4. Choose a variety of fruits and vegetables as snacks such as bananas, guava, cucumber slices, tomatoes or carrot sticks.
5. If you choose dried fruits, select unsweetened or unsalted variety.
6. If you choose canned fruits, serve without syrup.
7. Prepare fresh fruit and vegetable juices without added sugar and preservatives.
8. Choose fresh, frozen or canned vegetables and serve as a dish, salad, ulam or as an ingredient in a dish.

Key recommendation 2
Eat adequate amount of fruits and vegetables everyday.

How to achieve
1. For children below 7 years old, give 2 servings of vegetables and 2 servings of fruit daily.
2. For children and adolescents aged 7 to 18 years, eat at least 3 servings of vegetables and 2 servings of fruits daily.
3. Choose fresh fruits over fruit juices. Fruit juices should not replace more than 1 serving of fruit.
4. Serve fruits and vegetables creatively to encourage consumption.
ADDITIONAL RECOMMENDATIONS

Prevention of choking in young children
For children aged below 7 years, fruits and vegetables can pose as a choking hazard if they are not prepared or served appropriately to children. To prevent choking, fruits and vegetables should be cut into small pieces and seeds should be removed from fruits. Children should also be monitored by adults when they are served with fruits and vegetables that could potentially cause choking.

Preparation of fruits and vegetables
To ensure children get the many nutrients from fruits and vegetables, proper selection, storage and preparation are required. Choose only high quality fruits and vegetables and avoid those that are bruised, over-ripe and shriveled. Refrigerate perishable fruits and vegetables to maintain quality and safety while some others (e.g. potatoes, melons, apples, mangoes, bananas, papayas) may require room temperature for quality and ripening process. Wash fruits and vegetables (with skin and without skin) before use with cool tap water to remove dirt, pesticide residues, insects and harmful microbes. Cooking fruits and vegetables will make certain nutrients more available. However, to reduce the loss of nutrients, cut the produce into large pieces. It is advisable to minimize the time, temperature and amount of water used when cooking fruits and vegetables as to retain their nutrients.
6. ROLE OF PARENTS, CAREGIVERS AND TEACHERS

Parents and caregivers play an important role in promoting the consumption of fruits and vegetables among children as they provide early eating experience and create food environments for children to develop healthy eating behaviours that will track into adulthood. Parents and caregivers can influence children’s intake of fruits and vegetables by making fruits and vegetables available and accessible at home, modeling fruit and vegetable consumption, encouraging children to eat more fruits and vegetables, involving children in meal planning and preparation and exposing children to the tastes of fruits and vegetables early in infancy and repeatedly. It is also important for parents and caregivers to provide a variety of fruits and vegetables in various forms (cooked, fresh, dried or juice) to children from young so as to increase their preference and acceptance.

In the school environment, teachers play an important role in promoting fruit and vegetable consumption to children. Besides being a role model to children, teachers can exert influence on curriculum and co-curricular activities as well as school canteen management. Fruits and vegetables should be included in the menu for school events such as parent-teacher association meetings, prize-giving, teachers’ day celebration and sports day, whether for children, teaching staff or parents. Food demonstration and tasting, display of colourful pictures of fruits and vegetables in classrooms, school vegetable garden and supermarket tours are several classroom and co-curricular activities that can enhance teaching and learning related to fruits and vegetables. Teachers can also assist canteen operators to include fruits and vegetables in the menu served to children and carry out regular inspections of the food sold in the canteen to ensure that fruits and vegetables are included in the menu.
REFERENCES


Key Message 8

Consume Moderate Amounts of Fish, Meat, Poultry, Egg, Legumes and Nuts
1.0 TERMINOLOGY

Fish
Fish includes all fresh or processed marine and freshwater fish. It does not include shellfish and fish eggs.

Legumes
Legumes grow in a pod such as the whole range of beans, peas and lentils, including baked beans, kidney beans, soya beans, red, green, yellow and brown lentils, black-eyed peas or garden peas.

Meat
Meat includes all or part of the muscle component of any cattle, sheep, goat, buffalo, deer, pig or rabbit carcass. It excludes organs and glands such as liver, kidney, brain and heart.

Nuts and Seeds
Nut is a general term for the large, dry, oily seeds or fruit of some plants. Example of nuts is peanuts, almonds, cashews, walnuts and pistachios. Seeds are obtained from fruit or flower and normally removed before the main parts of the fruit or flower are consumed. Seeds include sunflower seeds.

Poultry
Poultry refers to chicken, duck, goose, turkey, ostrich, quail and other ‘bird like’ foods (flesh and organs) except its eggs.

Shellfish
Shellfish are exoskeleton-bearing aquatic invertebrates and species commonly used as food. These include molluscs (such as clams, mussels, oysters and scallops) and crustaceans (such as shrimp, prawn, lobster and crab). It can be obtained either from marine or freshwater.

Textured vegetable protein
Textured vegetable protein is also called mock meat. These are not meat-derived foods but are made from a mixture of soya, gluten, flour and artificial flavourings mainly to replicate the taste, texture and appearance of real meats.

Vegetarian
Vegetarian are people who do not consume meat due to personal lifestyle choice or for religious reasons. There are four types of vegetarianism (ADA, 2009):
• Lacto-ovo vegetarians: People who avoid meat, but consume dairy foods (such as milk), eggs and plant foods.
• Lacto-vegetarians: People who avoid meat and eggs, but consume dairy foods and plant foods.
• Ovo-vegetarians: People who avoid meat and dairy foods, but consume eggs and plant foods.
• Vegans: People who consume only plant base foods.

2.0 INTRODUCTION

Fish, meat, poultry, egg, legumes and nuts are mainly composed of protein. These are the main sources of protein from the daily diet. Protein from animal sources such as fish, meat, poultry and egg are consider high in quality as it contains all the essential amino acids.

The quality of protein in fish is equivalent to those in meat and poultry. Fish also contain high amount of vitamin B<sub>12</sub>, iodine and polyunsaturated fatty acids (PUFA), namely omega-3 and omega-6 fatty acids. Marine fish such as salmon, trout and sardine are high in PUFA but these are rarely consumed fish by Malaysians. Local freshwater fish such as ikan patin, ikan keli and eel (belut) do contain moderate amount of PUFA (Suriah et al., 1995). These fish are also cheaper and easily available compared to marine fish. If consumed frequently, these types of fish may help in increasing the level of PUFA in blood, which has been shown to enhance brain performance especially in infants and children. Along with omega-3 fatty acids, omega-6 fatty acids play a crucial role in brain function as well as normal growth and development in children. Food sources of omega-6 fatty acids include soya bean oil, sunflower oil and corn oil. Ikan bilis is a good source of calcium as it is consumed with its bones. Processed fish-based food, such as keropok lekor are also good sources of calcium as they are prepared by grinding the flesh together with the edible bones. These foods are also easily consumed by children due to the simplicity in appearance.

Meat and poultry are also a good source of protein. However, the consumption of these foods should be in moderate amounts, as they also contain high level of saturated fats. It has been reported that excessive intake of red meat is associated with chronic diseases such as cardiovascular disease (CVD) and cancer (Keszei et al., 2012). Egg especially the white portion is rich in protein and essential amino acids while the yellow portion (egg yolk) contains high amounts of fat. Through research and innovation, egg yolks today are fortified with PUFA and selenium (Fisinin, Papazyan & Surai, 2008). However, as this portion may also contain high level of cholesterol, moderate consumption of whole egg is recommended.
Although legumes and nuts do not contain all of the essential amino acids, these foods may supply all the essential amino acids if eaten in right combination. In addition, plant-based food are good source of vitamins, minerals and phytochemicals such as flavonoids.

## 3.0 Scientific Basis

Proteins are macromolecules made from smaller sub-units called amino acids joined together via special chemical bonds known as peptide bonds. To make all the proteins required by the body, twenty different amino acids are needed. The nine essential amino acids are those that must consume in your diet because your body cannot make them or cannot make them in required amounts. The remaining eleven amino acids are nutritionally non-essential because the body can make them from other compounds (Table 8.1).

Proteins can be categorised based on their amino acid mixtures. Those containing adequate, balanced amounts of all essential amino acids are said to be complete protein sources, whereas those supplying low amounts of one or more of the essential amino acids are incomplete protein sources. In general, meat, poultry, eggs and dairy products are complete protein sources, whereas plant products are incomplete protein sources (McGuire & Beerman, 2011). Meanwhile, incorporating protein- and iron-rich foods into children’s diet will improve their health, because protein and iron are required for the metabolism of energy and oxygen transport in red blood cells. Protein foods that are a good source of iron include liver, red meat, seafood and legumes.

<table>
<thead>
<tr>
<th>Essential</th>
<th>Non-essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Histidine</td>
<td>Alanine</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>Arginine</td>
</tr>
<tr>
<td>Leucine</td>
<td>Asparagine</td>
</tr>
<tr>
<td>Lysine</td>
<td>Aspartic acid</td>
</tr>
<tr>
<td>Methionine</td>
<td>Cysteine</td>
</tr>
<tr>
<td>Phenylalanine</td>
<td>Glutamic acid</td>
</tr>
<tr>
<td>Threonine</td>
<td>Glutamine</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>Glycine</td>
</tr>
<tr>
<td>Valine</td>
<td>Proline</td>
</tr>
<tr>
<td></td>
<td>Serine</td>
</tr>
<tr>
<td></td>
<td>Tyrosine</td>
</tr>
</tbody>
</table>

Source: IOM (2005)
Proteins vary in their digestibility. The protein from meats, fish and poultry is highly digestible (90% or more); this compares with a digestibility of 78% in beans and 86% in whole wheat (Schlenker & Long, 2007).

3.1 Recommended protein intake
Protein requirements are influenced by growth, food protein quality, health status and the availability of carbohydrate as an energy source. Total protein needs increase slightly with age (Table 8.2), but when the child’s body weight is considered, the protein requirement actually declines slightly. The Acceptable Macronutrient Distribution Range (AMDR) for protein is 10 to 35% of total calories (IOM, 2002).

3.2 Clinical implications

Low-protein diets

a) Protein deficiency
Protein Energy Malnutrition (PEM) is defined as a lack in supply of sufficient energy or protein to meet the body’s metabolic demands. Children with PEM have poor growth with wasting (low weight-for-height) and stunting (low height-for-age). Immune function is impaired in PEM and likely contributes to the chronic respiratory infections and diarrhoea in many poorly nourished children.

b) Anaemia
Besides being rich in protein, red meat, egg and cockles are also good sources of iron. If a child does not get enough iron over a prolonged period, he can develop iron deficiency anaemia. Lack of iron in the body interferes with the development and structure of haemoglobin in the blood cell. This is a condition that limits the ability of the blood to carry oxygen throughout the body and remove carbon dioxide efficiently. Iron deficiency anaemia can interfere with brain development, affecting a child’s motor skills, attention and ability to learn (Hamid Jan et al., 2010).

c) High-protein diets
There are risks with protein intakes exceeding the upper limit of the AMDR (greater than 35% of total calories). Animal protein is rich in sulfur-containing amino acids that increase calcium loss in the urine and deplete bone mineral if not compensated with optimum calcium intakes. High intake of animal sources also leads to large amounts of saturated fat being consumed. Clinicians are also raising concerns about the effects of excessive protein intakes on kidney function.

<table>
<thead>
<tr>
<th>Age and gender</th>
<th>Protein RNI (g per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td></td>
</tr>
<tr>
<td>1 to 3 years</td>
<td>17</td>
</tr>
<tr>
<td>4 to 6 years</td>
<td>23</td>
</tr>
<tr>
<td>7 to 9 years</td>
<td>32</td>
</tr>
<tr>
<td>10 to 12 years</td>
<td>45</td>
</tr>
<tr>
<td>13 to 15 years</td>
<td>63</td>
</tr>
<tr>
<td>16 to 18 years</td>
<td>64</td>
</tr>
<tr>
<td>Boy</td>
<td></td>
</tr>
<tr>
<td>10 to 12 years</td>
<td>45</td>
</tr>
<tr>
<td>13 to 15 years</td>
<td>63</td>
</tr>
<tr>
<td>16 to 18 years</td>
<td>64</td>
</tr>
<tr>
<td>Girl</td>
<td></td>
</tr>
<tr>
<td>10 to 12 years</td>
<td>46</td>
</tr>
<tr>
<td>13 to 15 years</td>
<td>55</td>
</tr>
<tr>
<td>16 to 18 years</td>
<td>54</td>
</tr>
</tbody>
</table>

Source: NCCFN (2005)
d) Food allergy
A food allergy is defined as an adverse reaction to foods that involve an immune response. It is also called food-hypersensitivity reaction, usually in response to large molecules of food protein. The food allergies most common among young children are allergies to cow’s milk, soya, nuts, egg white, wheat and citrus (Whitney & Rofles, 2011). Special attention should be given when feeding children who are prone to food allergies.

4.0 CURRENT STATUS
Protein is essential for children and adolescents as it is needed to build tissues and promote healthy growth. Foods that are high in protein include fish, meat, poultry, eggs, legumes and nuts. A study that was carried out in a rural fishing community in Sabah showed that the protein intake of adolescents aged 12 to 19 years had achieved 98% of the RNI level. Fish was reported as one of the principal sources of protein in the study (Foo et al., 2006). According to an earlier report by these investigators, those adolescents consumed approximately 23% of their total iron intake from animal-origin products such as fish and seafood (12%), meat and chicken (6%) and eggs (5%) (Foo et al., 2004).

In the study by Zalilah et al., (2006) involving adolescents in the age range of 11 to 15 years, the subjects were reported to obtain 14 to 16% of their daily energy from proteins. This level is considered adequate according to the Malaysian recommended value of between 10 and 15% (NCCFN, 2005). However, the mean total protein intake for normal-weight girls and boys had achieved 127% of the RNI level (Zalilah et al., 2006). A review by Norimah, Poh & Ismail (2007) regarding food habits and dietary intake of Malaysian adolescents between the ages of 10 and 17 years, from year 2001 to 2006, had reported that protein intake among this age group was adequate. However, only boys had fulfilled the requirement for iron intake. Girls met only 44 to 46% of RNI for iron intake table.
5.0 KEY RECOMMENDATIONS

Key recommendation 1
Eat fish daily.

How to achieve
1. Consume a serving of fish daily and choose a variety of fish.
2. Freshwater fish may be consumed, alternating with marine fish.
3. Serve sardine and tuna occasionally as a dish or fillings (e.g. sandwich, pie or buns).
4. Choose anchovy without the heads and entrails as one of the fish source in porridge/dishes.
5. Shellfish should be consumed less frequently compared to fish.
6. Frozen fish can be consumed as a substitute for fresh fish; however, frozen processed fish products such as fish ball, fish nugget and fish cake are not encouraged due to the high content of salt and preservatives.
7. Consumption of salted, dried or pickled fish is not encouraged due to the high salt content.

Key recommendation 2
Consume meat, poultry and egg moderately.

How to achieve
1. Choose or prepare either meat, poultry or egg dishes daily to the recommended amount (Refer to Key Message 3).
2. Fresh or frozen poultry or meat should be consumed instead of the processed form, such as chicken ball, meat ball, nugget or burger patties, due to the high content of salt and preservatives.
3. Consumption of salted egg is not encouraged due to the high salt content.

Key recommendation 3
Practise healthier cooking methods for fish, meat, poultry and egg dishes.

How to achieve
1. Choose lower fat cooking methods such as poaching, steaming, boiling, braising, grilling or roasting.
2. Avoid consumption of over-grilled meat, poultry and fish.
3. Limit deep frying methods in preparing fish, meat, poultry and egg dishes to reduce fat and calories.
4. Use herbs, spices or lime to add flavour in fish, meat and poultry dishes, while reducing the use of salt or sauces (e.g. oyster sauce, fish sauce or tomato sauce).

5. For children, prepare meat and poultry dishes by shredding, chopping and mincing. Slow cooking methods such as stewing or braising are also recommended.

6. For children, fish bones should be removed. Fish fillets or cutlets are suitable as the bones have been removed.

**Key recommendation 4**
Choose meat and poultry that are low in fat and cholesterol.

**How to achieve**
1. Choose lean cuts of meat. Trim off the visible fat as much as possible before cooking.
2. Choose skinless chicken parts or remove the skin before cooking. Skinless chicken breasts are the leanest parts.
3. Minimise consumption of processed meat sources such as burgers patties, sausages or nuggets to not more than once a week. Choose lower fat and salt products by referring to the Nutrition Information Panel (NIP) of the food label.

**Key recommendation 5**
Consume legumes daily.

**How to achieve**
1. Add legumes (peas, beans or dhal) to soups, porridge and dishes.
2. Choose a variety of legume products such as tempe and bean curds to prepare meals.
3. Be creative in preparing various legume dishes to encourage consumption.

**Key recommendation 6**
Include nuts and seeds in weekly diet.

**How to achieve**
1. Add nuts and seeds (sesame seeds) as ingredients in dishes.
2. Choose unsweetened and unsalted nuts as well as seeds (e.g. sunflower seeds or pumpkin seeds) as snacks.
ADDITIONAL RECOMMENDATION

Vegetarian diets

The prevalence of vegetarianism among Malaysian adolescence is reported at 1.2% (Lew & Barlow, 2005). No data is available on the prevalence of vegetarianism among children in Malaysia. Although the prevalence among adolescents is not high, attention should be given in providing the best advice with regard to dietary intake in this group.

To achieve optimum vegetarian nutrition, eating adequately from a variety of plant-based food groups is recommended, particularly emphasising legumes, nuts, seeds and their products to ensure sufficient and complete protein intake. Although iron content is high in vegetarian diet, it is not readily absorbed by the body due to the fact that the iron is from plant-based food.

Thus, choosing iron-rich food or food that can increase iron absorption is essential. Fresh fruits, fruit juice or vegetables rich in vitamin C should be eaten with each meal to enhance absorption of iron. Consumption of tea with meals should be avoided as it will lower iron absorption.

Lacto-ovo vegetarians can meet their daily nutrient requirement by taking dairy products and eggs. It is important to plan meals that can provide sufficient energy, vitamin $B_{12}$, protein and iron. In addition, intake of textured vegetable meat/ artificial meat, mock meat/ fish and vegetarian meat/ fish have to be limited as these are high in fat, salt and flavor-enhancers.

Vegans are advised to consult nutritionists or dietitians to obtain professional advice on achieving protein requirement from their diet.
REFERENCES


Key Message 9

Consume Milk and Milk Products Everyday
1.0 TERMINOLOGY

Condensed milk or sweetened condensed milk
Condensed milk or sweetened condensed milk is the product obtained by evaporating from milk, a portion of its water or by recombining milk constituents and adding sugar to the remainder. It shall contain not less than 8% of milk fat and 28% of total milk solids (MOH, 1985).

Evaporated milk or unsweetened condensed milk
Evaporated milk or unsweetened condensed milk is the product obtained by evaporating from milk, a portion of its water or by recombining milk constituents and part evaporation. It shall contain not less than 8% of milk fat and 28% of total milk solids (MOH, 1985).

Filled milk
Filled milk shall be a product which in general composition, appearance, characteristic and intended use is similar to milk but the milk fat has been replaced wholly or partly by an equivalent amount of edible vegetable oil or edible vegetable fat. It shall contain not less than 3.25% of fat and 9% of non-fat milk solids (MOH, 1985).

Flavoured milk
Flavoured milk is milk or recombined milk to which permitted flavouring substance has been added and may contain sugar or salt or both. It shall have been heat-treated such as pasteurisation or UHT. It shall contain not less than 2% of milk fat and 8% of non-fat milk solids (MOH, 1985).

Fresh milk
Fresh milk is directly sourced from cow, buffalo, goat and sheep. Fresh milk is usually heat treated before consumption. In the farm, it is usually boiled. At the commercial scale, fresh milk is pasteurised. Fresh milk generally contains about 3% of milk fat.
Full cream milk powder or dried full cream milk
Full cream milk powder or dried full cream milk is milk or recombined milk from which the water has been removed. Full cream milk powder contains more than 26% of milk fat (MOH, 1985).

Low fat milk
Low fat milk is milk which contains not more than 1.5 g of fat per 100 ml of milk (MOH, 1985).

Milk
Milk refers to cow, buffalo, goat and sheep milk [fresh, pasteurised, sterilised and ultra-high temperature (UHT milk) and milk powder (full cream, skimmed, malted and filled milk powder)] (MOH, 1985).

Milk products
Milk products include products prepared from milk, such as butter, ghee (butter oil), cheeses, cultured or fermented milk and ice cream (MOH, 1985).

Pasteurised milk
Pasteurised milk is similar to fresh milk except that it has been heat treated.

Skimmed/ non-fat milk
Skimmed/ non-fat milk is milk from which milk fat has been removed. It shall not contain more than 0.5% of milk fat and not less than 8.5% of non-fat milk solids (MOH, 1985). It is useful for those who want to limit their intake of energy, fat and cholesterol.

Ultra-high temperature (UHT) milk
Ultra-high temperature (UHT) milk is milk which has been subjected to heat treatment by being retained at a temperature of not less than 135°C for at least two seconds to render it commercially sterile and immediately packed in sterile containers (MOH, 1985).
2.0 INTRODUCTION

Milk and milk products contribute many essential nutrients needed for survival and growth in children. Besides providing calories for energy, milk is a nutrient-dense food and a good source of a wide range of nutrients. Milk and milk products are a good source of essential nutrients including calcium, potassium, phosphorus, protein, vitamins A, D, and B₁₂, riboflavin and niacin (Tee et al., 1997; USDA, 2008). Hence, children should be encouraged to consume the recommended daily servings of milk and milk products. It is important to establish a habit of drinking milk in young children, as those who consume milk at an early age are more likely to do so as adults (NCCFN, 2010; USDA & USDHHS, 2010).

Several studies in Malaysia reported that the diets of children and adolescents do not meet current national dietary recommendations for milk and milk products (Lim & Norimah, 2007; Liu, 2003; Norhisham, 2007). As children grow older, they tend to decrease milk consumption and increase intake of less nutritious beverages (e.g. carbonated soda and fruit drinks) (Nicklas, 2003). Such a trend would be undesirable in view of the good nutritional content provided by milk. These guidelines therefore recommended daily consumption of milk and dairy products.

3.0 SCIENTIFIC BASIS

3.1 Rationale on the importance of milk for children

Scientific evidence indicates that the consumption of milk and milk products can contribute to significant health benefits. Various dietary guidelines recognise that adequate intake of milk and milk products are linked to improved bone health, especially in children (HPB, 2010; NHMRC, 2003; USDA & USDHHS, 2010).

Milk and milk products make important contributions to children’s diets. These foods provide nutrients that are needed for the growth and development of children. Growth requirements combined with physical activity play a role in determining a child’s nutritional needs. Genetic background, gender, body size and shape are other factors. The nutrients needed by children are the same as those needed by adults, but the amounts vary.

Protein plays a key role in growth of children as it builds, maintains and repairs body tissues. It is therefore important to encourage children to eat 2 to 3 servings of protein-rich foods every day, for example meat, fish or poultry. Milk and other dairy products are also good sources of protein for children. These foods are at the same level three of the food pyramid as meat, fish and poultry. Milk is also a good source of a variety of vitamins and minerals which are vital for supporting growth and development of children.

A mineral of particular significance in milk and dairy products is calcium. It is of particular importance for building strong bones and teeth. Sufficient calcium must be provided commencing from childhood in order to ensure strong bone density. Adequate calcium-rich foods, including milk and dark-green leafy vegetables, must be provided from childhood to reduce risk of osteoporosis in later life (Gregory, Judith & Lois, 2001).

Total calcium retention for weight is relatively low in toddlers compared with other age groups. An intake of 500 mg per day is recommended
between 1 and 3 years of age, increases to 600 mg/ day for 4 to 6 years and 700 mg/ day for 7 to 9 years. Recommended intake for calcium reaches up to 1000 mg/ day for adolescents aged 10 to 18 years (NCCFN, 2005). Thus, the optimal intake increases as the onset of puberty approaches. It is therefore vital that the development of dietary practices in children will be associated with adequate calcium intake in later life (Frank et al., 2006).

Black et al., (2002) showed that the non-milk drinker had a low calcium intake although most children consumed small amounts of some dairy products, such as cheese, yogurt and ice cream. The study also showed that children with a history of long-term avoidance of cow milk had very low dietary calcium intakes and poor bone health in comparison with milk-drinking children. They also confirmed earlier observations that children who do not drink milk have a shorter stature than those who consume milk regularly. They found that milk avoiders had smaller skeletons, significantly lower bone area and bone mineral contents.

According to Huncharek, Muscat & Kupelnick (2008), an adequate intake of milk and milk products beginning in childhood improves bone health in adolescence. This study examined data from 106 children initially aged 3 to 5 years who participated in the Framingham Children’s study. At the end of 12 years study, adolescents (15 to 17 years) who consumed 2 or more servings of milk and milk products a day as children had significantly higher bone mineral content, bone area and bone mineral density than those who consumed less than 2 servings a day.

The consumption of milk and milk products also do not adversely affect body weight or body composition in children and adolescents. Spence, Cifelli & Miller (2011) reviewed 36 observational studies that examined the relationship between either milk or milk product consumption or calcium intake on body weight and body composition in children and adolescents. The results from nearly all of the studies demonstrated either a beneficial or neutral relationship between the consumption of dairy and/ or calcium and body weight and body composition in children and adolescents. Murphy et al., (2008) have also demonstrated that children and adolescents who drink either flavoured or plain milk consume more nutrients and have a lower or comparable Body Mass Index (BMI) than non-milk drinkers.

3.2 School Milk Programme
School Milk Programme (SMP) has been implemented in many countries. The implementation of the programme varies among different countries and there are usually three categories of milk distribution – free, subsidised and full-cost. In Malaysia, SMP was introduced in 1985 by the government through the Ministry of Education as a welfare program. Eligible school children were from hard core poor and poor families. It was anticipated that SMP could play a very important role in inculcating and maintaining the milk drinking habit until adulthood and beyond (Aminah & Sharifudin, 2008).

A study by Chen (1989) in 1985 to 1986 to evaluate the impact of a school milk programme on the nutritional status of a total of 2,766 children aged 6 to 9 years from 12 primary schools in Ulu Selangor showed that there was a reduction in the prevalence of protein-energy malnutrition in terms of underweight (15.3 to 8.6%), stunting (16.3 to 8.3%) and wasting (2.6 to 1.7%) from the start of the school feeding
programme to two years later. As there were no major developmental changes in Ulu Selangor during that period, it is likely that the reduction in the prevalence of protein-energy malnutrition and the improvement of the attendance rate among the children were due to the impact of the school milk feeding programme (Chen, 1989).

There has been no other detailed study on the impact of the SMP in the country. Nevertheless, recognising the value of the programme, it has been continued to be implemented over the years as a free or subsidised programme, depending on the target group. There have been intermittent problems in the implementation of the programme, especially in relation to poor storage of milk packets. This has resulted in isolated cases of food poisoning among some children. In 2011, the programme was rebranded as ‘1 Malaysia School Milk Programme’ (FSQD, 2011).

Evaluation of SMP by USDA (2004) reported that the SMP significantly increased students’ intake of energy, calcium, riboflavin, protein, magnesium and vitamin B₆. Another research showed that children who went for a packet of milk at lunch were more likely to get the calcium they needed than children who drank other beverages, such as juices (USDA, 2004). Studies have also shown that lunch-time milk drinkers received more of the nutrients that are typically low in children’s diets, such as vitamin A and zinc (Robinson, Gold & Kipetzky, 2005).

3.3 Pasteurised milk
Pasteurised milk is the milk that has been efficiently heat treated for a certain period of time and then immediately and rapidly reduced to 4°C or less and maintained at that temperature with protection from contamination (MOH, 1985).

Pasteurisation of milk is the most effective means of reducing the risk of microbiological hazards (Oliver et al., 2009; USDHHS, PHS & FDA, 2009). There is no meaningful change in the nutritional quality of milk as a result of pasteurisation (LeJuene & Rajala-Schultz, 2009). Moreover, unlike raw milk, most pasteurised milk commercially sold is fortified with vitamin D, a nutrient which enhances the intestinal absorption of calcium and phosphorus and plays a beneficial role in bone health (IOM, 1997).

There is a perception that raw milk is more nutritious and healthful than pasteurised milk. Although proponents of raw milk and raw milk products believe that these products possess enhanced nutritional qualities, taste and health benefits, science-based data do not substantiate these beliefs (Oliver et al., 2009; USFDA & USDHHS, 2009). In addition, consuming raw milk and raw milk products has serious health consequences and is responsible for life-threatening disease outbreaks from harmful bacteria such as *E. coli*, *Salmonella*, *Campylobacter* and *L. Monocytogenes* (Oliver et al., 2009; USFDA & USDHHS, 2009).

3.4 Flavoured milk
The nutrient content in flavoured milk is the same as unflavoured milk. The main difference between flavoured and unflavoured milk is the added sugar in the former resulting in the slight increase in calories. This does not seem to be a serious negative factor since several scientific studies have shown that children who drink flavoured milk consumed more milk overall and met more of their nutrient needs. Children who consumed flavoured milk tended to have higher calcium intakes (Frary, Johnson & Wang, 2004; Johnson, Frary & Wang, 2002). Study conducted by Johnson, Frary & Wang (2002) showed that the additional sugar in flavoured milk did not
increase sugar intake of flavoured milk drinkers overall, likely because flavoured milk frequently displaces other low-nutrient sugared beverages. A study in Connecticut found that removal of flavoured milk from a school district resulted in a decrease in milk consumption by 37 to 63%, depending on the grade level (Patterson & Saidel, 2009) and may have a consequent deterioration in diet quality (Murphy et al., 2008).

Sugar has been said to be able to contribute to the risk of dental caries. However, there are several factors (e.g. amount of time sugar remains on the teeth) that influence the degree of caries risk for a food or beverage. Levine (2001) concluded that there is no scientific evidence indicating that flavoured milk consumption was the cause of tooth decay. The AAPD (2009) also stated that chocolate milk does not contribute to tooth decay in children.

3.5 Recommendations for milk and milk products

Dietary guidelines of many countries have highlighted the importance of milk and milk products specifically for children (Health New Zealand, 2008; HPB, 2010; NHMRC, 2003; USDA & USDHHS, 2010). These guidelines recommend 2 to 4 servings of milk and milk products per day to help meet calcium and other key nutrient needs (refer to Appendix 1). Several studies had shown that children who drink milk have higher intakes of specific nutrients and better overall nutritional status than non-milk drinkers (Ballew, Keuster & Gillespie, 2000; Bowman, 2002; Volek et al., 2003).

3.6 Justification on the recommended servings (2 to 3 servings)

Most types of milks, either full cream milk, low fat milk or skimmed milk have approximately 300 mg of calcium per 250 ml (Tee et al., 1997; USDHHS & USDA, 2005). Based on the Recommended Nutrient Intakes (RNI) for Malaysia, a child aged between 1 and 3 needs 500 mg of calcium daily. This need steadily increases as the child grows, right up 1000 mg of calcium daily for a child aged between 10 and 12 years (NCCFN, 2005). Therefore, children and adolescents can get most of their daily calcium from 2 to 3 servings of milk, as well as calcium from other source of foods for the optimal bone development.

Garin (2008) also emphasised the importance of milk in a toddler’s diet, as it provides calcium and vitamin D to help build strong bones. Toddlers should have 500 mg of calcium. The calcium requirement is easily met if a child gets the recommended 2 servings of dairy foods every day, but this amount provides only half of the vitamin D requirement.

Many foods contain calcium, but milk and other milk products are the best sources. Milk and milk products such as yoghurt, cheese and buttermilk contain a form of calcium that a body can absorb easily. Calcium in foods high in calcium chelating agents, for example oxalic acid (such as spinach, sweet potatoes and beans) or phytic acid (such as unleavened bread, raw beans, seeds and nuts) may be poorly absorbed (NICHD, 2006).

4.0 CURRENT STATUS

There is no national nutrition survey on dietary intake of children in the country. There is therefore no national data on milk or milk products consumption for children. However, there were several small scale studies, amongst school children in different parts of the country.

In a study of 896 students aged 13 to 17 years to investigate current calcium intake and nutritional status in adolescent girls, 71.4%...
of the subjects were found to consume milk. The mean intake was 1.62 glasses per day. Milk commonly consumed was full cream, followed by low fat milk, condensed milk and skimmed milk. The results also showed that 4.6% of the students consumed yoghurt twice daily (Liu, 2003). In another study of 1003 male adolescents aged 13 to 17 years old, it was found that 75.5% drank milk and full cream milk was the favourite milk chosen. The reported mean intake was 1.56 glasses per day. For milk products, it was reported that 84.9% consume milk products such as cheese, ice cream, pudding, custard and butter (Choong, 2004).

In a study of 239 primary school girls, aged 7 to 9 years in Kuala Lumpur, milk consumption habits were determined using a questionnaire. The results showed that the mean intake was 1.78 glasses per day. Most of the subjects (54%) drank flavoured milk followed by fresh milk (38.6%), low fat milk (22.8%), full cream milk (20.0%), skimmed milk (14.9%), milk shake (10.7%) and condensed milk (9.3%). For milk products, 57.7% and 84.1% of subjects consumed cheese and yoghurt respectively (Lim & Norimah, 2007). Similar findings were obtained in another study of 235 primary school boys, aged 7 to 9 years in Kuala Lumpur, where the mean serving intake was 1.69 glasses per day (Norhisham, 2007). The most consumed types of milk were flavoured milk (49.8%), fresh milk (35.0%) and low fat milk (30.0%). Consumption of yoghurt and cheese among subjects were 69.8% and 60.0% respectively.

A study by Zainun, Zulaika & Shohaimi (2009), involving 218 boys and girls between 10 to 11 years in Selangor and Putrajaya, found that there were significant differences in calcium intake among the three races (Malay, Chinese and Indian). Estimated daily calcium intake was 372.5 mg for Malay, 221.0 mg for Chinese and 82.9 mg for Indians.
5.0 KEY RECOMMENDATIONS

Key recommendation 1
Consume 2 to 3 servings of milk and milk products everyday.

How to achieve
1. Drink milk such as fresh milk, sterilised milk, ultra-high temperature (UHT) milk, pasteurised milk or milk prepared from milk powder every day. Sweetened condensed milk and sweetened condensed filled milk are not considered as milk and should be discouraged.
2. Add milk to breakfast cereal.
3. Drink milk as a snack to replace other sweetened beverages.
4. Choose a variety of milk based drinks such as yoghurt, yoghurt drinks and cultured milk with lower sugar content.
5. Choose a variety of milk based foods such as butter with lower salt content and cheese.
6. Consume milk and milk products in addition to a variety of other foods every day. Milk should not replace main meals.
7. Encourage parents to pack UHT milk for children to consume at school.

Key recommendation 2
Use milk and milk products creatively.

How to achieve
1. Serve milk in ways that children like best such as milk shake, adding chocolate powder or fruits.
2. Chill milk to encourage children to drink milk.
3. Use milk in various recipes for example in cookies, puddings, custard and curd.
4. Substitute coconut milk (santan) with milk in preparing dishes.
5. Replace sweetened condensed milk, sweetened creamer and sweetened condensed filled milk with liquid or powdered milk in tea or ais kacang.
Key recommendation 3
Choose milk and milk products appropriate to physiological needs.

How to achieve
1. Get all family members to drink milk every day according to their needs.
2. Children and adolescents should consume adequate quantities of milk and milk products every day.
3. Pregnant and lactating adolescent girls should drink milk every day to help meet increased nutrient needs.
4. Choose lower fat milk and milk product for children who are overweight.

Key recommendation 4
Encourage milk consumption through education and promotion.

How to achieve
1. Promote milk intake in pre-school and school such as designating a particular day as ‘Milk Drinking Day’.
2. Encourage school canteen operators to sell milk and milk products.
3. Encourage provision of milk-vending machines in schools.
4. Teach children that milk is a nutritious beverage.
5. Parents, caregivers and teachers should be role models and drink milk themselves.
6. Strengthen and expand the implementation of the school milk programme.
ADDITIONAL RECOMMENDATION

Children and adolescents with lactose intolerance

Lactose intolerance refers to symptoms such as flatulence, bloating, abdominal pain, and diarrhoea that occur after intake of too much lactose relative to the body’s ability to break it down by the intestinal enzyme lactase (McBean & Miller, 1998). In Asian children, there is an age-related decline in lactase activity, also called lactase non-persistence, which generally starts after 2 to 3 years of age, possibly leading to lactose intolerance (Jackson & Savaiano, 2001). However, the exact extent of lactose-intolerance among Malaysian children is not documented.

Small amounts of milk or dairy foods can often be tolerated by people with lactose intolerance, but lactose-free dairy products are available now. Lactose intolerant people often avoid milk products, although this may not be necessary (NHMRC, 2003). Some ways to make intake of milk and other dairy products more tolerable are to consume them during a meal, to choose fermented dairy products (e.g. yoghurt or cheese) rather than milk, or to consume the milk in small quantities (approximately ½ cup) at intervals throughout the day (McBean & Miller, 1998).
6.0 ROLE OF PARENTS, CAREGIVERS AND TEACHERS

As parents, caregivers or teachers, first and foremost, they should be role models to children. Children are more likely to drink milk, if their role models do so. Encourage the children to choose milk every day. Milk can be served at any meals (NDC, 2009).

For children who do not like to drink milk or drink less milk, it is important for parents or caregivers or teachers to find creative ways to help the child build an affinity for drinking milk every day. For example, milk can be served as milk shakes, smoothies or curd/yoghurt (dadih) or it can be added in various recipes such as in cookies, pudding, custard and so on. Flavoured milk was preferred by children rather than plain milk, therefore promoting milk with flavours may help to attract children to consume more milk (Babolian & Ab Karim, 2010).

There are also numerous ways in which milk drinking can be promoted in schools. Teachers should play a role in promoting the importance of milk in children’s nutrition. The school administration may designate a particular day as ‘Milk Drinking Day’. The goal of this event would be to promote the distribution of milk in schools thereby encouraging students to make milk drinking a habit (Griffin, 2004). Furthermore, they should encourage school canteen operators to sell milk and milk products.
REFERENCES


FSQD (Food Safety and Quality Division) (2011). Garis panduan pengendalian bekalan susu sekolah (Guidelines for the management of milk supplies to schools). Ministry of Health Malaysia, Putrajaya.


Malaysian Dietary Guidelines
for Children and Adolescents


## APPENDICES

### Appendix 1. Other countries’ recommendation on milk and milk products for children and adolescents

<table>
<thead>
<tr>
<th>Countries / Organisations</th>
<th>Year</th>
<th>Age group (years)</th>
<th>No of servings per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States of America ¹</td>
<td>2010</td>
<td>2 to 3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 to 8</td>
<td>2 ½</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 to 18</td>
<td>3</td>
</tr>
<tr>
<td>New Zealand ²</td>
<td>2008</td>
<td>2 to 12</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13 to 18</td>
<td>3</td>
</tr>
<tr>
<td>Singapore ³ (milk only)</td>
<td>2008</td>
<td>1 to 2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 to 6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 to 18</td>
<td>1 to 2</td>
</tr>
<tr>
<td>Canada ⁴</td>
<td>2007</td>
<td>2 to 8</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 to 18</td>
<td>3 to 4</td>
</tr>
<tr>
<td>Australia ⁵</td>
<td>2003</td>
<td>4 to 11</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 to 18</td>
<td>3</td>
</tr>
</tbody>
</table>

**Source:**

¹ USDA & USDHHS (2010)  
² Health New Zealand (2008)  
³ HPB (2010)  
⁴ Health Canada (2007)  
⁵ NHMRC (2003)
Key Message 10

Include Appropriate Amounts and Types of Fats in the Diets
1.0 TERMINOLOGY

Fatty acid
A fatty acid is one of the main basic components of dietary fats and is present in many different carbon chain lengths and number of double bonds. Three molecules of fatty acids bound to a glycerol backbone produce a triglyceride which is commonly known as fat or oil depending on whether it is a solid or liquid at ambient temperature. The types of fatty acids in oils and fats determine their physical and chemical characteristics. Based on the number of their double bonds, fatty acids can be divided in three major groups; saturated, monounsaturated and polyunsaturated fatty acids. All natural oils and fats contain all the three fatty acid groups.

Hydrogenation
Hydrogenation is a process intended to give highly liquid vegetable oils, which are generally rich in polyunsaturated fatty acids (PUFA), a semi-solid or solid texture. In the process, hydrogen is forced into the vegetable oil to change the shape of the molecules, producing an oil called hydrogenated fat that mimic the texture of a saturated fat. Some margarines and shortenings contain hydrogenated or hardened fat and these are used in making bakery products, cookies and crackers.

Monounsaturated fat
Monounsaturated fatty acids (MUFA) contain one double bond in the molecule of the fatty acids. Oils that are rich in MUFA are naturally more liquid at room temperature compared to saturated oils. Olive oil contains about 75% while tea seed oil commonly contains over 80% MUFAs. Canola and Cashew oils both contain about 58% monounsaturated fat. Although tallow and lard are basically saturated fats, they contain about 50% and 40% MUFAs, respectively. Other rich sources of MUFAs include palm oil, groundnut oil (peanut oil), sesame seed oil, macadamia nut oil, grapeseed oil, safflower oil, sunflower oil and avocado oil. MUFAs are also found along with saturated fats in natural foods, including red meat, whole milk products, nuts and high-fat fruits, such as olives and avocados.

Omega-3 fatty acids
Omega-3 fatty acids are a family of polyunsaturated fatty acids (PUFA) that confer high liquidity and fluidity to the oil. Omega-3 fatty acids differ from the more common plant-source PUFAs, in the position of its first double bond, which starts at the 3rd carbon when counted from the methyl (or omega) end of the fatty acid molecule. The most common omega-3 fatty acids are eicosapentaenoic acids (EPA) and docosahexaenoic acid (DHA) and to a lesser
extent, alpha linolenic acid (ALA). EPA and DHA fatty acids have been found to be highly associated with the membrane of the cells in the central nervous system (CNS). Omega-3 rich food are generally derived from marine sources, in particular deep-sea cold water fish such as cod, salmon and tuna which are less common in Malaysian waters. Omega-3 fatty acid is also present in some plants but in a very small amount. Most of the commercially available vegetable cooking oils including margarines, contain no omega-3 or in trace amounts, unless they have been enriched or mixed with marine oils rich in omega-3 fatty acids.

**Partially hydrogenated fats**

In partial hydrogenation, only a portion of the unsaturated fatty acids in the oils were hydrogenated so that the texture of the solid product will not be as hard as fully hydrogenated oils. While fully hydrogenated oil completely saturates the unsaturated fatty acids in the oils, partial hydrogenation leaves some of the double bonds on the unsaturated fatty acids intact. Some of these unsaturated fatty acids, however, are transformed into *trans* fatty acids (TFA).

**Polyunsaturated fatty acids**

Polyunsaturated fatty acids (PUFA) are fatty acids that contain more than one double bond in their molecules, which includes omega-6 and omega-3 fatty acids. Omega-6 PUFA can commonly be found in various plant derived cooking oils that provide most of the PUFA metabolically important for the body, including alpha linoleic fatty acid which is an ‘essential fatty acid’. Multiple double bonds in the fatty acid molecules make these types of oils highly liquid and most PUFA-rich oils remain liquid even in a sub-zero temperature. Some examples of PUFA-rich oils are soya oil, corn oil and sunflower seed oil. PUFA-rich oils however, are less stable than SFA-rich and MUFA-rich oils at elevated temperatures and are easily degraded or peroxidised when used in the high temperatures of deep-frying operations.

**Saturated fatty acids**

Saturated fatty acids (SFA) are fatty acids that contain no double bond in their molecules. Saturated fat denotes an oil or fat that contains mainly saturated fatty acids in the triglyceride molecules. The higher the levels of SFAs in an oil, the higher the temperature required for it to be melted; hence most SFA-rich oils are somewhat solid at room temperature and categorised as fat rather than oil. Examples of saturated fat include lard, tallow, coconut oils and butter. Although solid at room temperature, margarine does not strictly fall under the saturated fat classification, since some margarines contain more unsaturated fatty acids than saturated fatty acids.
**Trans fat**

*Trans* fat is a type of fat that contains an unsaturated fatty acid with a *trans* isomer. *Trans* fatty acids (TFAs) are not readily found in most vegetable oils or animal oils, although they can be naturally present in ruminant fats (e.g. in dairy product such as milk and cheese from cows, sheep and goats). The term *trans* fat mainly refers to trans fatty acids derived from partially hydrogenated oils which can be commonly found in industrially-produced food products. The natural *trans* fatty acids that are found in dairy products, however, cannot be grouped together with the synthetically-produced *trans* fatty acids since they differ in their chemical and physical properties, hence producing different effect on health.

### 2.0 INTRODUCTION

Fat is a very important nutrient in children’s diet as it provides the essential fatty acids, that serves as the most concentrated source of energy for rapid growth and development, acts as a vehicle for the absorption and transportation of the fat-soluble vitamins (A, D, E and K), involved in membrane structure and synthesis, and acts as substrates for the synthesis of local hormones called eicosanoids which are important in body metabolism. During infancy, dietary fat requirements are highest at 35 to 40% of total energy. This is reflected in mother’s milk and infant formula which provide 40 to 50% of energy as fat. Particular attention should also be paid to the quality of dietary fat, especially the availability of the long-chain PUFAs- EPA and DHA-which play an important role in the development of visual acuity, neurological and cognitive function.

Restriction of energy intake from fat for children aged up to 2 years old may adversely affect the growth and development of children. On the other hand, excessive intake of fat during childhood may lead to the development of childhood obesity and other health complications in later years. A balanced diet, which includes appropriate amounts and types of fats, ensure optimal growth and development. A balanced intake of saturated, monounsaturated and polyunsaturated fats is important in maintaining an optimal lipid profile. Dietary saturated fats should be consumed moderately whereas *trans* fatty acids should be avoided in the diet.

An imbalance in energy and nutrient intake during childhood can create an unwelcome burden for the individual in adult years. Educating children on
healthy food selection at a young age is a crucial step in shaping a rational dietary intake habit when they grow-up. As fat is the main component of foods that receive the highest acceptance from all age groups, understanding the correct levels of intake for the different type of fats available should begin at a younger age. For school-aged children and adolescents, families, schools and peers are the critical links in providing the foundation for that understanding. While parents are the most important role models for children (Fowler-Brown & Kahwati, 2004), schools provide the guidelines and disciplinary environment. Peers and groups, on the other hand, are able to encourage healthier behaviours when correct understanding is fully inculcated.

When choosing fats, the choices consist of three types of fatty acids: saturated, monounsaturated and polyunsaturated fatty acids. Almost all sources of fats contain these three major fatty acids, but in different proportions. Selecting and preparing foods with the proper ratio of these fatty acids is as important as the amount of fats consumed by an individual. While both excessive intake and under-intake of fats may be unhealthy for children, imbalance in providing the required type of fatty acids may prove detrimental to their physical and mental development. A high intake of saturated and trans fatty acids may lead to high blood cholesterol concentrations. On the other hand, although a high-PUFA diet may counteract the effect of saturated fats, long-term intake of a high-PUFA diet may lead to greater susceptibility to free radical attacks.

In recent years, the long chain omega-3 PUFA, EPA and DHA fatty acids have received a lot of attention due to their beneficial effect on health, in particular on children’s cognitive development. Humans, however, cannot synthesise omega-3 fatty acids. In the human body, alpha-linolenic acid (ALA) is metabolised to the long-chain EPA and DHA. The conversion from ALA to EPA and DHA is very inefficient and it would be prudent to fulfill the daily omega-3 fatty acid needs from EPA/ DHA-rich animal sources such as marine fish, e.g. cod, salmon and tuna, and to a lesser degree, from common fishes found in Malaysian waters. Most of the commercial vegetable cooking oils, including margarines, contain no omega-3 or only in trace amounts unless they have been enriched with omega-3 rich oil. However, many processed foods, in particular formula milk, have been enriched with omega-3 fatty acids. The food industry has also introduced eggs rich in omega-3 fatty acids as an affordable alternative to deep-sea cold water fish.
3.0 SCIENTIFIC BASIS

Coronary heart disease, metabolic syndrome and cancer are the three major causes of death in Malaysia. Obesity among children and adolescents has also become a major concern, as it will inflict extra financial and social burden on the nation if the epidemic is not properly managed. Long-term dietary behaviour, in particular the amount and types of oils/fats consumed, has long been established as one of the major contributing factors to the development of these diseases.

Appropriate fat intake, in terms of intake and types of oils, from an early age may crucially determine an adult individual’s health outcome in the later years. Recent statistics show that the morbidity and mortality rate from degenerative diseases are fast increasing among young adults. In a study carried out in 2006, about 7% of adolescents between the age of 15 to 19, and 10% of young adults between the age of 20 to 29 were found to be obese (Rampal et al., 2007). As obesity increases the risk of developing most chronic degenerative diseases, in particular CHD, metabolic syndrome and cancer, it is not difficult to predict what will be the outcome of these increasing statistics in the next 10 to 20 years.

Fats and fatty acids have always been associated as significant risk factors for all major chronic diseases. As Malaysia is one of the leading edible oil producing nations, it is not surprising that the availability of fats/oil per capita has increased two fold from 49.4 g/day in 1961 to 84.3 g/day in 2003 (MOH, 2006). It is estimated that the average Malaysian takes between 10 and 20 g of extra fat/day, which contributes about 10% of their daily consumption. Fat intake is projected to steadily increase by the year 2020, unless some measures are taken to manage its intake among children and the general population.

3.1 Rationale of the 25 to 30% of fat energy intake for children

Human milk provides 50 to 60% of its energy as lipids, in which about 5% of the energy come from essential fatty acids with 1% of the energy in the form of long-chain polyunsaturated omega-3 fatty acids (EPA + DHA) (FAO, 1994). For neonates and infants, both quantity and quality of dietary fat are of paramount importance for the child’s optimal nutrition. Omega-3 fatty acids, principally in the form of DHA, are vital for the development of the brain, cognitive function and eicosanoid metabolism in the neonate and infant. As noted in the Recommended Nutrient Intakes for Malaysia (NCCFN, 2005), the dietary fat levels for infants are as follows:

- 0 to 5 months: 31 to 37 g/day
- 6 to 11 months: 21 to 28 g/day

Young healthy growing children need adequate amounts of fats and energy to sustain their daily metabolism. The United States recommends between 30 and 35% of energy from fat for their children and adolescents. For children 2 to 3 years of age, total fat intake is suggested to be between 30 and 35% of calories, while for children and adolescents 4 and 18 years of age, fat intake between 25 and 35% of calories is recommended (NIH 2001). IOM dietary reference intake 2002 suggested that children between 1 and 3 years old require between 30 and 40% energy from fat, whereas children between the age of 4 and 9 need between 25 and 35%. The WHO/FAO Expert Consultation (WHO, 2003), however, suggested a much broader range, between 15 and 30%, to ensure an achievable level in countries where the higher minimum level recommended was not practical due to limited availability. In these guidelines, it is recommended that Malaysian children and adolescents should consume between 25 and 30% energy from fat, which is in line with the
Malaysian Dietary Guidelines (NCCFN, 2010) that has suggested 20 to 30% energy from fats for the general population.

Children and adolescents are in the fast-growing stage, and restrictions on the energy intake from any major macronutrients may interrupt their rapid growth and development. Despite the national concerns regarding increased prevalence of obesity among children and adolescents, a reduction in fat intake until it is lower than the individual’s body requirement may restrict growth and development. The narrow range of 25 to 30% energy is suggested to encourage closer supervision among parents, caregivers and teachers on the intake of fat by the children, as lower intake may confer as much unfavourable effect as excessive intake.

4.0 CURRENT STATUS

Currently there is no available data on fat intake among children and adolescents in Malaysia, although a small study on 91 preschoolers (age 4 to 6) in Subang Jaya, Selangor, suggested that most of the kids preferred fried foods, either deep-fried or stir-fried, rather than the healthier steamed or roasted foods (Abdul Karim & Kheng, 2000). However, data from the Malaysian Adult Nutrition Survey (MOH, 2008) indicates that mean fat intake of the population is about 50 g (Minalini et al., 2008). This level is somewhat lower than the levels of 57 to 86 g/day recommended for male children between the age of 10 to 18. However, the level are only slightly higher than the minimum level (46 to 69 g/day) recommended for girl of similar age (NCCFN, 2005).

On the type of fats taken, a local study on Malaysian adults (Ng, 2010) and another on pregnant and lactating women (Ho et al., 2011) indicate that overall daily intakes of polyunsaturated fatty acids [e.g. the omega-6 linoleic acid (LA) and the omega-3 fatty acids alpha-linolenic acid (ALA) + eicosapentaenoic acid (EPA) + docosahexaenoic acid (DHA)] are inadequate compared to the recommended nutrient intake of these nutrients for Malaysians (NCCFN, 2005). Although there is no local data available for the younger Malaysian age groups, it is expected that the unsatisfactory scenario for PUFA intake by adult Malaysians would also apply to young children and adolescents. As the main cooking oil in Malaysia is palm oil-based, it is envisaged that the general population, including children and adolescents, consume more of the monounsaturated fatty acids (oleic and palmitoleic acids) and saturated fatty acids (palmitic acid), which make up more than 85% of the palm oil fatty acid profile. Based on a similar premise, Malaysians are less likely to consume a high amount of trans fats given the fact that palm oil is readily usable in many food applications without hydrogenation. However, children and adolescents are more exposed to the harmful effects of trans fats in the form of imported cookies and biscuits (Norhayati et al., 2011) as well as from their frequent visits to fast food outlets.

4.1 Increase MUFA and PUFA but limit SFA and trans intake

Several clinical trials have evaluated the effects of different fatty acids on LDL-cholesterol levels and found consistent positive correlations with lowering SFA or substituting MUFA and PUFA for SFA. Simply by replacing SFA with MUFA, LDL-cholesterol levels can be decreased by as much as 21.6% (Howell et al., 1997). Diets high in PUFAs lower total and LDL-cholesterol levels, while diets high in MUFAs mainly have a neutral effect although some reports indicate the beneficial effect of MUFA on lipid profiles. (Van Horn, Mccoin & Kris-Ethorton, 2008; NCEP, 2001). Malaysians
have little concern over MUFA intake since palm oil, which is the major cooking oil consumed by the population, contains more than 40% MUFA. Moreover, most of the processed foods industries by the food industry also incorporate palm oil as its main fat component. Nevertheless, there is a need to obtain PUFA from other sources, as palm oil (which contains between 10 and 12% PUFA) only supplies between 3 and 4% energy of PUFA and EFA which is barely sufficient for our daily requirements. It has been pointed out that for every 1% increase in PUFA, a 0.50 mg/dL decrease in LDL-cholesterol level is predicted and by replacing SFA with MUFA, LDL-cholesterol declines between 2.2 and 21.6% (Van Horn Mccoin & Kris-Ethorton, 2008). In a different analysis, it is suggested that for every 5% increase of energy from saturated fats, the risk of CHD increases by 17% or reciprocally, replacing 5% of the saturated fats with unsaturated fat reduces CHD risk by 42%. Even more substantial is that replacing 2% of trans fats with unhydrogenated unsaturated fat is able to reduce the risk of CHD by 53% (Hu et al., 1997; Hu et al., 1999; Hu & Willet, 2002). Identifying simple substitutions and attempting to reduce SFA and trans fat intakes may have a significant impact on the risk levels. The present recommendation suggests some of the ways these objectives can be achieved.

### 4.2 Selecting foods of reasonable fats content

Dining and food preparation make up the core daily activities of Malaysians. Malaysia is blessed with several different major ethnic groups who have diversified food choices. Despite popular belief that Malaysian foods have high fat content, in fact, most Malaysian foods contain moderate proportion of fats; between 10 and 20% of the energy content (Tee et al., 1997). Nevertheless, there are also a variety of foods which contain a high amounts of fats. Some popular local dishes, for example curry and fried noodles, incorporate a large amounts of fat which, when taken frequently, may tip the macronutrient balance of the individual’s diet. This has become a national problem, as most of the popular foods offered by food operators are rich in energy and fats. Children and adults alike need to be educated in recognising and avoiding this group of foods. Some of these foods can be modified in their preparation method to be part of a diet, while still providing substantial and aesthetic pleasure. Table in the appendices lists the energy content of some common high-fat foods in Malaysia-these foods should be consumed only occasionally.
5.0 KEY RECOMMENDATIONS

Key recommendation 1
Limit total daily fat intake to 25 and 30% of energy.

How to achieve

1. Limit intake of deep fried foods, to not more than once a day e.g. french fries, fried chicken or banana fritters (pisang goreng).
2. Limit intake of high-fat foods, e.g. fried kuey teow and fried rice, to not more than 2 to 3 times per week.
3. Limit intake of processed meat, e.g. burgers patties, sausages or nuggets to not more than once a week.
4. Modify recipes to reduce the oil content when preparing foods that are commonly cooked with excessive oil or fat.
5. Trim the visible fat from meat/ poultry before cooking.
6. Use steaming, stewing, grilling and baking, instead of frying, as a cooking method.
7. Reduce breading and battering in cooking as this absorbs oil. Wipe fried food with tissue paper to remove excess oil.

Key recommendation 2
Limit the intake of saturated fats (SFA).

How to achieve

1. Replace animal fats with vegetable oil when preparing food.
2. Remove the skin from poultry during food preparation.
3. Limit intake of foods rich in coconut milk or santan (e.g masak lemak, bubur kacang, nasi lemak, curry or kaya spread) to 2 to 3 times per week.
4. Limit intake of foods containing and prepared with, saturated fat, e.s. biscuits, traditional kuih such as dodol, briyani rice or crisps.
5. Limit intake of spreads (butter/ margarine/ peanut butter/ chocolate) to not more than 2 teaspoons per day.
**Key recommendation 3**
Increase the intake of polyunsaturated fatty acids (PUFA).

**How to achieve**

1. Cook food using a blended vegetable oil high in PUFA, e.g. Palm oil with soya oil, palm oil with corn oil, or palm oil with sunflower oil.
2. Encourage children to eat corn, nuts (e.g. cashew nuts, almonds, pistachios and chestnuts), legumes (e.g. chickpeas, soyabean or dhal), seeds (e.g. sunflower seeds or pumpkin seeds) as snacks to increase intake of PUFA.
3. Serve children sandwiches with sardine and tuna fillings.
4. Encourage consumption of fresh local fish containing PUFA, such as tenggiri, siakap, kembung, cencaru, bawal hitam, selar kuning and tongkol.

**Key recommendation 4**
Limit foods containing trans fatty acids (TFAs).

**How to achieve**

1. Use non-hydrogenated fats/oils when making pastries and cookies.
2. Avoid food products with the words ‘partially hydrogenated fat’ on the food label.

**Key recommendation 5**
Choose low-fat foods when eating out.

**How to achieve**

1. At school, children should avoid sausages, nuggets and burgers.
2. When buying street food, including at pasar malam, children should avoid deep-fried foods, e.g. keropok lekor, cakoi and foods high in oil e.g. fried noodles, kuih peneram, roti bom and murtabak.
3. Children should limit eating at fast food outlets when going out with friends to not more than once a week.
4. Children should request less fat and oil when ordering food.
6.0 ROLE OF PARENTS, CAREGIVERS AND TEACHERS

There is no specific set of protocol needed as ways to achieve the objective of the message. Parents, caregivers or teachers however, need to equip themselves with some basic concept of fats and its consumption. Ability to recognise which foods that are rich in fat content from those that are low readily provide a general guide for selection and preparation of healthier food for the children. Additional knowledge and understanding on the distinction between types of oils and fats that carry higher risk is as an added advantage. In addition, parents/guardians and caretakers may improve food preparation techniques to optimise the amount and type of fats in the diets of the children.

Teachers should encourage and educate school children on healthy food choices and to supervise canteen operators to prepare and serve a variety of healthy food without compromising the taste and appearance of the foods as to encourage children to make the right selection. In essence, with sufficient conceptual understanding of the role of fats in determining the future state of health of an individual, parents, caregivers and teachers may innovate many ways (besides what has already been suggested) to chart a healthier path for children and adults in the future.
REFERENCES


## APPENDICES

### Appendix 1. Energy distribution of some common fried foods: Contribution of energy content from fat, carbohydrate and protein

<table>
<thead>
<tr>
<th>Kod</th>
<th>Type of food</th>
<th>Serving size (g)</th>
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<th>CHO (g)</th>
<th>Pro (g)</th>
<th>Fat</th>
<th>g</th>
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*Source: Tee *et al.*, 1997*
Appendix 2. Energy distribution of some common high-fat foods:
Contribution of energy content from fat, carbohydrate and protein

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<th>Kod</th>
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<th>Pro (g)</th>
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</tbody>
</table>

* Indicate fast food items
Source: Tee et al., 1997
Appendix 3. Energy distribution of some common high-fat *kuih*: Contribution of energy content from fat, carbohydrate and protein

<table>
<thead>
<tr>
<th>Kod</th>
<th>Type of food</th>
<th>Serving size</th>
<th>Kcal</th>
<th>CHO</th>
<th>Pro</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>g</td>
<td>kcal</td>
<td>%kcal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>211001</td>
<td><em>Kuih Bidaran</em></td>
<td>69</td>
<td>224</td>
<td>30.2</td>
<td>3.6</td>
<td>9.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>325</td>
<td>43.7</td>
<td>5.2</td>
<td>14.4</td>
</tr>
<tr>
<td>211007</td>
<td><em>Kuih Bom</em></td>
<td>63</td>
<td>212</td>
<td>28.9</td>
<td>3.5</td>
<td>9.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>337</td>
<td>45.8</td>
<td>5.6</td>
<td>14.6</td>
</tr>
<tr>
<td>211017</td>
<td><em>Kuih Peneram</em></td>
<td>55</td>
<td>256</td>
<td>35.3</td>
<td>1.6</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>465</td>
<td>64.1</td>
<td>2.9</td>
<td>21.9</td>
</tr>
<tr>
<td>212006</td>
<td><em>Curry Puff</em></td>
<td>40</td>
<td>128</td>
<td>17.3</td>
<td>1.9</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>319</td>
<td>43.2</td>
<td>4.7</td>
<td>14.1</td>
</tr>
<tr>
<td>213016</td>
<td><em>Laddu</em></td>
<td>70</td>
<td>309</td>
<td>38.6</td>
<td>4.5</td>
<td>15.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>442</td>
<td>55.1</td>
<td>6.4</td>
<td>21.8</td>
</tr>
<tr>
<td>213021</td>
<td><em>Pakora</em></td>
<td>90</td>
<td>283</td>
<td>32.6</td>
<td>7.8</td>
<td>13.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>314</td>
<td>36.2</td>
<td>8.7</td>
<td>14.9</td>
</tr>
<tr>
<td>213022</td>
<td><em>Papadam</em></td>
<td>60</td>
<td>309</td>
<td>24.4</td>
<td>10.1</td>
<td>19.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>515</td>
<td>40.6</td>
<td>16.8</td>
<td>31.7</td>
</tr>
<tr>
<td>213028</td>
<td><em>Vadai</em></td>
<td>60</td>
<td>194</td>
<td>16.8</td>
<td>8.2</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>324</td>
<td>28.0</td>
<td>13.6</td>
<td>17.5</td>
</tr>
</tbody>
</table>

Source: Tee et al., 1997
Malaysian Dietary Guidelines
for Children and Adolescents
less SALT
Key Message 11
Limit Intake of Salt and Sauce
1.0 TERMINOLOGY

Iodised salt
It is a form of salt that has been fortified with iodine. It contains 20 to 30 ppm or 20 to 30 mg iodine per kg of salt (FAO, 1995).

Low-salt, very low-salt and salt-free food
Low-salt, very low-salt and salt-free food are defined as food with a sodium concentration not more than 0.12 g/100 g, 0.04 g/100 g and 0.005 g/100 g of food, respectively (MOH, 2006).

Salt and sodium
Salt is an inorganic compound consisting of sodium and chloride ions, i.e. NaCl. 1 g sodium is equivalent to 2.55 mg NaCl while 1 mmol sodium is equivalent to 23 mg sodium (NaCl consists of Na at 40%). Thus, 1 teaspoon or 5 g salt provides 2000 mg or 88 mmol sodium. In addition to NaCl, sodium may also be present in other forms, such as monosodium glutamate, sodium nitrate and sodium benzoate.

Salt substitutes
These are referred to as light salts, in which all or some of the sodium is replaced with another mineral, such as potassium or magnesium.

Sauce
A sauce is a liquid or sometimes semi-solid substance served on dishes as a relish (served as an accompaniment to food) or used as a flavourful seasoning in preparing other foods. This includes soya sauce (fermented soya bean), oyster sauce, tomato and chili sauces, fish sauce (made from fermented fish), prawn sauce (cencaluk), teriyaki sauce and Worchester sauce.

Table salt
It is a fine-grain salt that often contains an anti-caking ingredient, such as calcium silicate, to keep it free-flowing. It is available iodised or non-iodised. This type of salt is mainly used in cooking and at the table. In the market, there are several types of table salts including rock salt.
2.0 INTRODUCTION

Sodium is an essential mineral that is required daily in small amounts. Excessive intakes can increase the risk of adverse effects, particularly high blood pressure (IOM, 2004). Blood pressure can be tracked from childhood to predict hypertension in adulthood (Lawlor & Smith, 2005; Dekkers et al., 2002; Bao et al., 1995). The presence of high blood pressure in children and adolescents occurs due to unhealthy lifestyle, including excessive intake of salt (Aboderin et al., 2002). Higher blood pressure in childhood (in combination with other risk factors) causes target organ and anatomical changes that are associated with cardiovascular risk, including reduction in artery elasticity, increased ventricular size and mass, haemodynamic increase in cardiac output and peripheral resistance (Bao et al., 1995; Berenson et al., 1991; Aboderin et al., 2002). Hence, efforts to reduce blood pressure and prevent the age-related rise in blood pressure in childhood are prudent. This age group should not be neglected in terms of salt consumption recommendations when nutrition policies are being developed. However, data pertaining to the prevalence of hypertension and salt intake among infants, children and adolescents in Malaysia are scarce.

3.0 SCIENTIFIC BASIS

Studies of the association between sodium intake and blood pressure (BP) are more common in adults than in children. The sodium intake of children and adolescents is tied to their energy intake. A meta-analysis study on the effect of salt reduction in children and adolescents concluded that even a modest reduction in salt intake causes an immediate fall in the BP of children and, if continued, may well lessen the subsequent rise in BP with age and prevent the development of hypertension. Since children and some adolescents require less energy than adults do, their intake of sodium should be proportionately reduced (HPB, 2007). It should be borne in mind that, food preferences seem to emerge early in life, although the nature of the progression of these preferences to adulthood is not clear (Worthington-Roberts & Williams, 2000). However, this preference may be reduced by limiting subsequent exposure to salty food among infants and children (Beauchamp & Cowart, 1990; Harris & Booth, 1987). It seems that children’s food preferences are influenced by food exposure, parents’ food preferences, parental role modeling, family approaches to food purchasing and cooking, media exposure and parent–child interactions regarding food (Campbell & Crawford, 2001). Thus, it is essential to impart education on low-salt and low-sauce intake to the younger age groups, in order to prevent undesirable health consequences of high sodium intake on the health of children.
Adolescents are particularly prone to increased sodium intake because their energy needs increase greatly, resulting in an increase in food intake, including sodium. Their increase independence and disposable income encourage a greater intake of foods prepared outside the home, which may be more heavily salted than foods prepared at home. A higher intake of sodium could result in an increased excretion of calcium leading to low bone density and increased risk of osteoporosis in later life. The increased risk of calcium excretion may be more important in childhood and adolescence than in adulthood because of the need to develop the highest possible peak bone mass during adolescence. Peak bone mass is one of the determinants for the development of osteoporosis in later life (NHMRC, 2003).

3.1 Salt in relation to prevention of iodine deficiency

Iodine is essential in the production of thyroid hormones. These hormones are essential for life as they regulate key biochemical reaction, especially protein synthesis and enzymatic activities in target organs such as the brain, muscles, heart, pituitary gland and kidneys. Iodine deficiency disorders (IDD) occurs when the diet is low in iodine. IDD produces a spectrum of disorders: endemic goitre, hypothyroidism, brain damage, cretinism, congenital abnormalities, poor pregnancy outcomes and impaired cognitive and physical development (WHO, 2004).

In Malaysia, some of the causes of iodine deficiency include low content of iodine in soil and water, inadequate iodine in local foods and low consumption of marine seafood. The consumption of cassava, known to contain goitrogens, is an additional contributory factor (Kiyu, Zainab & Yahya, 1998). It usually occurs in populations living in remote areas where food sources from seawater are scarce. Several studies on IDD have been undertaken in Malaysia, many of which focused on different age groups living in remote areas. Prevalence of IDD among neonates in Sarawak was reported to be 7.5% (Kiyu et al., 1995). The overall national prevalence of IDD with urinary iodine (UI) < 100 μg/ L was 48.2%, higher among children residing in rural areas than in urban areas. The highest prevalence of UI<100 μg/ L was noted among the aborigines (Rusidah et al., 2010). A study conducted among the Orang Asli women of reproductive age in an urban fringe area in Hulu Langat District, 45 km away from Kuala Lumpur, had recorded goitre prevalence at 32.4% (Osman & Zaleha, 2005). In the rural areas of Pahang, the prevalence of goitre was up to 70% among adults (Osman, Ng & Khalid, 1993).

Salt is recommended as the preferred vehicle for iodine fortification because it is widely consumed in a constant amount, its sensorial characteristics are not affected by iodisation and the intervention can be implemented at a reasonable cost (WHO, 2004). IDD prevention and control programmes in Malaysia include distribution of iodised salt and iodisation of water supply. These approaches are currently restricted to populations living in areas of severe deficiency or who are difficult to reach, and to specific age groups such as pregnant women and children. It has been acknowledged that overall improvement of iodine status in certain areas can be attributed to the iodisation programme (Foo et al., 1996). According to the Food Regulations 1985, iodised salt should contain 20 to 30 ppm (20 to 30 mg) iodine per kg of salt (MOH, 1985).

As the IDD is still prevalent in several states in Malaysia, therefore, iodisation is still needed in
prevention and control of IDD in these states. Until an alternative vehicle for salt fortification is found, the current use of salt iodisation is still applicable. When implementing the salt iodisation programme, the Ministry of Health Malaysia should ensure that health promotion messages do not suggest that increased salt consumption is necessary to prevent iodine deficiency.

4.0 CURRENT STATUS

Little is known about the current intake of salt among Malaysian children and adolescents. Nevertheless, several cross-sectional studies among children and adolescents indicate the consumption of snacks and fast foods, which are usually high in fat and salt, is high. For example, a small-scale study among Chinese preschoolers reported that 41% of subjects consumed fast foods once to twice per week (Norimah & Lau, 2000). Half of Malaysian female adolescents consume fast food 2 to 3 times a month (Pon, Mirnalini & Mohd Nasir, 2004; Chin & Mohd Nasir, 2009). Furthermore, about half (41.3%) and a fifth (20.9%) of female adolescents have their meals at hawker centres, coffee shops or other food stalls 1 to 3 times a month and once a week, respectively (Chin & Mohd Nasir, 2009). Another study by Moy, Gan & Siti Zaleha (2006) and one by Foo et al., (2006) reported that keropok (chips made of shrimp/ fish and rice flour), a type of local high-salt snack, are among the common snacks consumed by a sample of Malaysian children and adolescents. This is probably influenced by a few factors including food availability and media influence. A content analysis of food advertisements targeting children by Karupaiah et al., (2008) reported that snacks (34.5%) and fast food (6.7%) were among the top of the list. Consumption of unhealthy snacks, Western fast food and foods outside the home are concerns among children and adolescents, as these dietary habits have been associated with high-calorie, -fat and -salt intake (Bowman et al., 2004). On the other hand, having more frequent meals with family members at home has been linked to healthier food intake, including fruits, vegetables, grains and calcium-rich foods (Videon & Manning, 2003; Neumark-Sztainer et al., 2003).

Worldwide, less data is available on sodium intake in infants and children than that of adults and these are mainly limited to the high-income nations of Europe. In the UK, the 1997 National Diet and Nutritional Survey (NDNS) of young people (Gregory et al., 2000) reported that children aged 4 to 18 years old consumed an average of 5.9 g of salt (2360 mg of sodium) per day, but this might be under estimated as added salt at the table was not considered, which is believed to be in the region of 800 mg. Results from the 2004 Canadian Community Health Survey (CCHS) revealed that children aged 1 to 3 averaged close to 2000 mg a day (Garriguet, 2007). In this age group, 77% of children exceeded the recommended daily tolerable upper level (UL) of 1500 mg/ day. The average daily sodium intake among 4 to 8 year olds was 2700 mg and 93% had consumed more than the UL of 1900 mg/ day. The mean daily sodium intake among U.S. children under 6 years of age is about 2115 mg or 1430 mg per 1000 kcal of energy. Children aged 6 years and above consume a mean of 3255 to 3585 mg or 1540 to 1610 mg per 1000 kcal of energy, with males consuming more than females (Smiciklas-Wright et al., 2003). The committee’s proposed sodium intake for infants, children and adolescents in Malaysia are based on those from the UK and Singapore Dietary Guidelines (Table 11.1).
### Table 11.1. Recommended sodium and salt limit for children

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>Sodium</th>
<th>Salt</th>
<th>Tolerable Upper Intake Level (UL)</th>
<th>Malaysian Recommended limit of salt added to food</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 6</td>
<td>≤ 1200</td>
<td>≤ 1200</td>
<td>1200</td>
<td>½ teaspoon of salt. Limit salty foods.</td>
</tr>
<tr>
<td>7 to 8</td>
<td>≤ 2000</td>
<td>≤ 2000</td>
<td>1200</td>
<td>1 teaspoon of salt. Reduced salty foods.</td>
</tr>
<tr>
<td>9 to 13</td>
<td>≤ 2000</td>
<td>≤ 2000</td>
<td>1500</td>
<td>1 teaspoon of salt. Reduced salty foods.</td>
</tr>
<tr>
<td>14 to 18</td>
<td>≤ 2000</td>
<td>≤ 2400</td>
<td>1500</td>
<td>1 teaspoon of salt. Reduced salty foods.</td>
</tr>
</tbody>
</table>

Source:
1. HPB (2007)
2. COMA (1991)
3. AIs may be used as a goal for individual intake. For healthy, breastfed infants, the AI is the mean intake. The AI for other life stages and gender groups is believed to cover the needs of all individuals in the group, but lack of data prevent this from being able to specify, with confidence, the percentage of the individuals covered by this intake.
4. UL is the maximum level of daily intake that is likely to pose no risk of adverse effects. Unless otherwise specified, the UL represents the total intake from food, water and supplements.
5.0 KEY RECOMMENDATIONS

Key recommendation 1
Choose and prepare foods with less salt and sauces (refer Table 11.2 and Appendix I).

How to achieve
1. Eat home-cooked meals more frequently rather than eating out, as this offers more control over the use of salt and sauces.
2. Limit the intake of salty extruded snacks, e.g. potato chips, crackers and fish crackers.
3. Choose fresh fruits and foods low in salt as snacks, e.g. wholemeal crackers, buns and low-salt crackers.
4. Cut down on consumption of salty processed foods (e.g. sausages, nuggets, meat/chicken burgers, instant noodles, fish or prawn crackers), pickles and preserved fruits (e.g. jeruk or asam boi).
5. Read food labels for the sodium content of food. Choose products with claims of ‘low’ or ‘lower’ sodium/salt on the packaging.
6. Read the ingredients list on the food label and take note of all sources of sodium such as monosodium glutamate.
7. Avoid adding salt or sauces at the table.
8. Iodised salt is also salt. Until an alternative vehicle for salt fortification is found, the current use of salt iodisation is still applicable to protect against Iodine Deficiency Disorders (IDD) among high-risk groups.

<table>
<thead>
<tr>
<th>Limit</th>
<th>Choose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salty extruded snacks (e.g. potato chips, prawn crackers and fish crackers)</td>
<td>Fruits, wholemeal crackers, bun and low salt crackers</td>
</tr>
<tr>
<td>Processed meat (e.g. sausages, nuggets, meat/chicken burger), salted fish and salted egg</td>
<td>Home-made or low salt version of processed meat</td>
</tr>
<tr>
<td>Salted pickles or preserved with salt (e.g. jeruk or asam boi powder)</td>
<td>Low-salt and no MSG added version</td>
</tr>
<tr>
<td>Instant noodles with commercial flavour enhancer</td>
<td>Add fresh ingredients such as eggs, vegetables and meat to instant noodles and use only half the sachet of soup seasoning</td>
</tr>
<tr>
<td>Instant creamed soup</td>
<td>Low salt and no MSG version</td>
</tr>
<tr>
<td>Salted nuts</td>
<td>Unsalted nuts</td>
</tr>
</tbody>
</table>

Source: Tee et al., (2007)
Key recommendation 2
Instil preference for low-salt foods.

How to achieve
1. When preparing food for babies and toddlers, do not add salt, soya sauce or tomato sauces.
2. Cut down or halve the usage of salt and sauces in cooking.
3. Enhance the flavour of food by using natural herbs and condiments such as garlic, onion, white pepper, lemon juice and curry spices.
5. Request for low salt, less sauces and no MSG when eating out.
REFERENCES


### APPENDICES

**Appendix 1. Sources and content of sodium in selected foods**

<table>
<thead>
<tr>
<th>LOW &lt; 120 mg Sodium</th>
<th>MODERATE 120 - 480 mg Sodium</th>
<th>HIGH &gt; 480 mg Sodium</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cereal &amp; cereal products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice, plain, cooked (2 senduk)</td>
<td>Rice porridge, instant (1 packet)</td>
<td>Noodle, instant (&gt;¼ packet)</td>
</tr>
<tr>
<td><strong>Bihun, kuetiau, laksa, mi</strong> (&lt;2 cups)</td>
<td><strong>Noodle snack, flavoured</strong> (&gt;1 medium packet)</td>
<td></td>
</tr>
<tr>
<td><strong>Bread, white</strong> (1 slice)</td>
<td>Bread, wholemeal (1 slice)</td>
<td>Bread, white (2-4 slices)</td>
</tr>
<tr>
<td><strong>Bread, wholemeal</strong> (1 slice)</td>
<td><strong>Bread, wholemeal</strong> (2-3 slices)</td>
<td>Bread, wholemeal (2 slices)</td>
</tr>
<tr>
<td><strong>Biscuit, soda/ plain</strong> (&lt;3 pieces)</td>
<td>Biscuit, soda/ plain (3-12 pieces)</td>
<td>Biscuit, soda/ plain (&gt;12 pieces)</td>
</tr>
<tr>
<td><strong>Biscuit, cream crackers</strong> (&lt;7 pieces)</td>
<td><strong>Crackers, low-salt</strong> (&lt;12 pieces)</td>
<td></td>
</tr>
<tr>
<td><strong>Starchy roots, tubers &amp; products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potato (&lt;2 whole)</td>
<td>Potato chips (1 small packet)</td>
<td>Potato chips (&gt;½ big packet)</td>
</tr>
<tr>
<td><strong>Legumes &amp; legumes product</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soya bean, white (&lt;1 ½ cup)</td>
<td>Soya bean paste, fermented (Taucu) (1 tablespoon)</td>
<td>Soya sauce ‘thick’ (&gt;1 tablespoon)</td>
</tr>
<tr>
<td>Soya bean cake, fermented (Tempe)</td>
<td>Soya sauce ‘thin’ (&gt;¼ tablespoon)</td>
<td>Baked bean, canned (&gt;¼ cup)</td>
</tr>
<tr>
<td><strong>Nuts, seeds &amp; products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed nuts, without salt added (&lt;7 cups)</td>
<td>Peanut butter (3 tablespoons)</td>
<td>Mixed nuts, salt added (&gt;½ cup)</td>
</tr>
<tr>
<td>Watermelon seeds, dried, black (3 cups)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vegetable &amp; vegetable products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh vegetables</td>
<td>Seaweed, dried (Hai-tai) (½ cup)</td>
<td>Canned vegetables (&gt; ½ cup)</td>
</tr>
<tr>
<td></td>
<td>Pickled vegetables (&gt;½ cup)</td>
<td>Cabbage, Chinese, salted (Hum-choy) (&gt;1 tablespoon)</td>
</tr>
<tr>
<td></td>
<td>Black bean, canned (&gt; ½ cup)</td>
<td>Tomato soup, canned (&gt; ½ cup)</td>
</tr>
<tr>
<td></td>
<td>Peas, salted, fried (&gt;1 cup)</td>
<td></td>
</tr>
<tr>
<td>LOW &lt; 120 mg Sodium</td>
<td>MODERATE 120 - 480 mg Sodium</td>
<td>HIGH &gt; 480 mg Sodium</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td><strong>Fruits &amp; fruits products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh fruits</td>
<td>Durian, fermented (Tempoyak) (2 tablespoons)</td>
<td>Fruit, mixed, spicy pickled (&gt;1 tablespoon)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Meat and Poultry Products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicken, breast meat (&lt;1 cup)</td>
<td>Chicken, fried (1 piece)</td>
<td>Chicken, fried, fast food franchise (&gt;1 piece (140g))</td>
</tr>
<tr>
<td>Chicken, thigh (&lt;2 medium)</td>
<td>Chicken frankfurter (2 pieces)</td>
<td>Chicken curry, canned (&gt;1 can)</td>
</tr>
<tr>
<td></td>
<td>Beef, lean (&lt; ½ cup)</td>
<td>Beef burger, regular (1 whole)</td>
</tr>
<tr>
<td></td>
<td>Beef frankfurter (12.0 x 2.0cm) (2 pieces)</td>
<td>Beef burger with cheese (1 whole)</td>
</tr>
<tr>
<td></td>
<td>Beef curry, canned (&gt; ½ cup)</td>
<td>Beef rendang, canned (&gt; ½ cup)</td>
</tr>
<tr>
<td>Mutton, lean, raw (&lt;1 cup)</td>
<td>Mutton, lean raw (1 cup)</td>
<td>Mutton curry, canned (&gt; ½ cup)</td>
</tr>
<tr>
<td></td>
<td>Pork, raw (1 cup)</td>
<td></td>
</tr>
<tr>
<td><strong>Eggs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hen egg, whole (&lt;2 eggs)</td>
<td>Duck egg, salted, whole (1 egg)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fish ball (5 whole small, 2 cm)</td>
<td>Fish ball (2 ½, large)</td>
</tr>
<tr>
<td>Fresh fish (except stated in the moderate column)</td>
<td>Fish, dried, salted (1 piece, 25g)</td>
<td>Fish sauce (Budu) (&gt; ¼ tablespoon)</td>
</tr>
<tr>
<td></td>
<td>Carp, big, head (1 slice)</td>
<td>Anchovy, dried, without head and entrails (&gt; ¼ cup)</td>
</tr>
<tr>
<td></td>
<td>Carp, common (Lee Koh) (1 piece medium)</td>
<td>Sardine, canned (&gt;1 small can)</td>
</tr>
<tr>
<td></td>
<td>Mackerel, Spanish (1 slice)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Snapper, red (1 slice)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fish crackers, fried (5 pieces)</td>
<td></td>
</tr>
<tr>
<td>Fresh prawn</td>
<td>Prawn, salted, dried (1 tablespoon)</td>
<td>Shrimp, fermented (Cencaluk) (&gt; ½ tablespoon)</td>
</tr>
<tr>
<td></td>
<td>Prawn crackers (1 small packet)</td>
<td>Shrimp paste (Belacan) (&gt; ½ piece)</td>
</tr>
<tr>
<td></td>
<td>Prawn paste (Hay-Ko) (1 tablespoon)</td>
<td></td>
</tr>
<tr>
<td>Cuttlefish, fresh (&lt;2 whole, medium)</td>
<td>Cuttlefish, dried (1 whole, small)</td>
<td>Cuttlefish crackers (1 large packet)</td>
</tr>
</tbody>
</table>
### Lowe < 120 mg Sodium

1. **Milk & milk products**
   - Low sodium cheese, cheddar (<5 slices)
2. **Oils & fats**
   - Margarine, reduced salt (<2 tablespoons)
3. **Beverages**
   - Carbonated beverage, cream soda (<2 bottles of 500 ml)
4. **Condiments & spices**
   - All natural condiments (such as cloves, cinnamon, anise seeds, cumin seeds, *asam gelugor*, cardamom, chilli dried)

### Moderate 120 - 480 mg Sodium

1. **Milk & milk products**
   - Cheese, processed, cheddar (1 slice)
2. **Oils & fats**
   - Margarine (3 tablespoons)
3. **Beverages**
   - Carbonated beverage, sports drink (1 bottle of 1500 ml)
4. **Condiments & spices**
   - Chilli sauce (1 tablespoon)

### High > 480 mg Sodium

1. **Milk & milk products**
   - Cheese burger (1 whole)
2. **Oils & fats**
   - Butter (2 tablespoons)
3. **Beverages**
   - Carbonated beverage, sports drink (<1 ½ bottles of 500 ml)
4. **Condiments & spices**
   - Tomato ketchup (sauce) (1 tablespoon)

**Notes:**
1. Value without discretionary source of food; 1 tablespoon = 20 ml/ mg = 1 heaped dessertspoon
2. The amount in ( ) indicates upper limit value for respected category
3. The amount in ( ) indicates lower limit value for respected category

**Sources:**

Too much salt!
Key Message 12

Consume Foods and Beverages Low In Sugar
1.0 TERMINOLOGY

Extrinsic sugars
Extrinsic sugars are sugars that are usually added to foods. The terms refined, added and extrinsic sugars are sometimes used to denote sucrose and glucose used in the food industry and in the home. Physiologically, there is no difference between the sugars that occur naturally in food and the refined sugars that are added to the diet. Foods with high levels of added sugar often have low nutrient density but they are also high in energy. The term no added sugar means no sugars have been added during the manufacturing process; it does not mean that no sugar is present, since most foods contain sugars in some form.

Intrinsic sugars
Intrinsic sugars refer to naturally-occurring sugar that is an integral component of whole fruit, vegetable and milk products.

Simple carbohydrates
Simple carbohydrates (or simple sugars) refer to monosaccharides and disaccharides. Sucrose is found in sugar cane, honey and corn syrup. Lactose is found in milk products. Maltose is found in malt.

Sugars
The term sugars is conventionally used to describe monosaccharides and disaccharides, such as sucrose, dextrose, glucose, galactose and fructose. These can be found naturally in foods or can be added to foods during processing. Sugars is used to describe purified sucrose, as are the terms refined sugar and added sugar, although in some instances, partly-refined products such as corn syrup, molasses, caramel, brown sugar, honey, gula Melaka and gula kabung may also be regarded as added sugars. Added sugars also refers to sucrose or other refined sugars used in soft drinks or incorporated into foods, fruit drinks (juices) and other beverages.

2.0 INTRODUCTION

There are continuing debates and discussions in the scientific community on the role of sugars in health and diseases. Excessive sugar consumption has been associated with poor dietary quality (Yamada et al., 2008) and increased consumption of fast food (Hattersley et al., 2009). Excessive added sugars in
the daily diet of children and adolescents have also been implicated in the development of various health problems including obesity (Ludwig, Peterson & Gortmaker, 2001; Berkeys et al., 2004; Nicklas et al., 2003), hypertension, dyslipidaemia (Dhingra et al., 2007) and dental caries (Rennie & Livingstone, 2007). Sugary drinks, in particular sugar-sweetened carbonated drinks, have been implicated in the development of dental erosion especially if consumed between meals (Moynihan & Petersen, 2004). Other studies have also shown that regular consumption of this type of beverages is associated with obesity development and poor dietary quality in school children (Ludwig, Peterson & Gortmaker, 2001; Malik, Schulze & Hu, 2006). Nevertheless, the findings were not consistent and, therefore, further investigations are required to provide concrete justification.

WHO (2003) recommends that consumption of free sugars (monosaccarides and disaccarides added to food and naturally-occurring sugars such as honey, syrup and fruit juices) should be less than 10% of total energy intake (50 g sugars in a 2000 kcal diet) while younger children require no more than 30 g sugar per day (Sheiham, 2001). This recommendation has been made in view of preventing diet-related chronic diseases that have been increasing at a tremendous rate in the last few years.

3.0 SCIENTIFIC BASIS

The focus of scientific evidence on sugar in relation to health revolves around four main issues: (i) sugar is the main cause of dental caries and a low sugar intake could prevent tooth decay; (ii) sugar intakes in excess of recommendations could displace micronutrient-dense foods from the diet, resulting in a greater risk of vitamin and mineral deficiencies; (iii) sugar could promote the development of overweight and obesity in children and adolescents, either by contributing to excess energy intake specifically after consuming high-sugar foods/ beverages or by accentuating appetite leading to overconsumption; and finally (iv) sugar could be considered a possible cause of hyperactivity and other behaviour problems.

3.1 Dental caries

Dental caries is a continuing public health problem in Malaysia. As shown in Figure 12.1, the prevalence increases with age from 15 years up to 54 years after which a downward trend was observed.
Among 6-year-old children, there is a continuous declining trend of one or more carious teeth at the deciduous dentition, from 95.4% in 1970 to 88.6% in 1988 and 80.6% by 1997 (OHD, 2003; OHD, 1998; Dental Service Division, 1988; Dental Division, 1972). A similar trend was seen in 12- and 16-year-olds as well. Meanwhile, a smaller study in Kuala Lumpur found that 60% of 5-year-old preschoolers had experienced dental caries (Zahara, Fashihah & Nurul, 2010). Despite this seemingly declining trend, dental caries remains a significant health problem among Malaysian children and adolescents.

It has been suggested that sugar plays an essential role in the development of dental caries (Newbrun et al., 1980). Researchers have illustrated a dose response relation between the level of dental caries and the intake of sugars (Sheiham, 1987; Woodward & Walker, 1994; Miyazaki & Morimoto, 1996). A rise in the prevalence and severity of caries is seen as the intake of sugars increased from approximately 15 to 20 kg (40 to 55 g/day) up to 50 kg (136 g/day or 25 teaspoons) per person per year (WHO, 2003). Nevertheless, it is also important to note that poor oral hygiene and the absence of fluoride contribute to a higher incidence of dental caries (Cunningham, 1998; Gibson & Williams, 1999).

The frequency of sugar consumption has also been suggested to have greater detrimental effect, compared to the amount of sugar taken per day (Stecksen-Blicks & Borssen, 1999; Tinanoff & Palmer, 2000). WHO (2003) has recommended that the intake of free sugars should be limited to a maximum of 10% of energy intake, while the
frequency of consuming foods and/or drinks containing free sugars should be limited to a maximum of four times a day. The consumption of free sugars for preschoolers and younger children is recommended to be no more than 30 g per person per day while for adolescents the recommendation is 60 g per person per day (Sheiham, 2001).

3.2 Micronutrient deficiency
A diet high in sugar may affect the intake of micronutrients. Children in the Bogalusa Heart Study (Farris et al., 1998) in the United Kingdom were found to demonstrate a decreased trend in their nutrient intakes as total sugar intake increased. The most comprehensive findings on the effects of added sugar were observed in more than 14,000 people from the United States Department of Agriculture’s 1994 to 1996 continuing survey of food intake by individuals (Bowman, 1999; Steyn, Myburgh & Nel, 2003). The participants in the highest sugar intake group (>18% of total energy intake) had the lowest mean absolute intake of all micronutrients. This group also had the lowest proportion of people that met the recommended dietary allowances.

3.3 Overweight and obesity and its related chronic diseases
The rising trend in the prevalence of obesity in many countries (Giammattei et al., 2003), particularly in developing countries (Finer, 2003; de Onis & Blassner, 2000), has been attended by an increase in the proportion of fat from energy in the diet, an increase in sugar consumption, an increase in dietary energy density and a decrease in the intake of less digestible forms of carbohydrates (Mazlan et al., 2006). In Malaysia, obesity increased from 1% in 1990 to 6% in 1997 among 13- to 17-year-olds (Ismail & Vickneswary, 1999).

There is no clear evidence that consumption of sugar per se affects food intake and weight gain among children and adolescents. However, several studies have suggested that consumption of soft drinks and other sweetened beverages including fruit juices with added sugars could promote obesity development (Ludwig, Peterson & Gortmaker, 2001; Malik, Willet & Hu, 2009; Collison et al., 2010). A study in Saudi Arabia observed that a higher consumption of sugar-sweetened carbonated beverages was associated with a higher waist circumference and body mass index, especially among boys (Collison et al., 2010). Similarly, Ludwig, Peterson & Gortmaker (2001) had showed that large amounts of sweetened soft drink beverages were associated with increasing body mass index and the risk of obesity in more than 500 schoolchildren aged 11 to 12 years in Boston, even after adjustment for confounding variables. These observations were also reported in a cohort study of Australian schoolchildren (Sanigorski, Bell & Swinburn, 2007).

Not only that, children who consumed sugar-sweetened carbonated beverages regularly had poor dietary choices and higher energy intake (Collison et al., 2010). This is important in the present context as consuming excessive quantities of low-nutrient, energy-dense foods is a primary risk factor for obesity development (Spear, Barlow & Ervin, 2007).

In addition to sugar-sweetened carbonated beverages, there is also a growing concern over excessive fruit juice consumption and the risk of obesity in children and adolescents. Sanigorski, Bell & Swinburn (2007) have found a positive association between fruit juice consumption and increased weight among Australian children. Although fruit juice can provide some vitamins and nutrients, they often contain high amounts...
of sugar and calories and should, therefore, be consumed in moderation.

It is possible that high intake of sugar-sweetened beverages may increase the risk of obesity by contributing to the total energy and sugar intake. Collison et al., (2010) have shown that high consumption of sugar-sweetened beverages has been linked to higher energy and sugar intake among Saudi children. This could be due to the fact that sugar-sweetened beverages are increasingly served in very large portions, which may promote over-consumption. The excess sugar intake from the sweetened beverages may be stored as fat, leading to weight gain and increased adiposity (Minehira et al., 2003).

Similar findings have also been uncovered by Mazlan et al., (2006). In this intervention study, increasing intake of high-sugar snacks in the diet led to progressively higher daily energy intake. The increase in energy intake was mainly caused by the sugar incorporated into the snacks. The study had also noted that high-sugar snacks could easily promote over-consumption (Mazlan et al., 2006). A UK intervention study of children aged 7 to 11 years from primary schools found that a school based education program designed to reduce carbonated drink consumption led to a decrease in the percentage of overweight and obese children of 0.2%, compared to an increase of 7.5% in the control group after 12 months (James et al., 2004).

On the other hand, the study has also suggested that high levels of carbohydrate per se are protective against obesity because an increasing intake of sugars may displace the proportion of dietary fat from energy in the diet (Mazlan et al., 2006). Given the wide-scale changes in the composition of food products currently available to consumers, these are important issues. It is because consumers have been exposed to a large increase in the range of low-fat but energy-dense foods, rich in sugars or readily assimilated starches.

### 3.3.1 Obesity-related chronic diseases

Along with the obesity epidemic among children and adolescents in Malaysia, other chronic diseases related to obesity, such as type-2 diabetes, are also becoming apparent among these age groups, who are becoming exposed to the risk of developing these diseases at a younger age.

**Type-2 diabetes mellitus**

Evidence is still inconclusive on the association between sugar consumption per se and diabetes. Nonetheless, similar to the literature on overweight and obesity as discussed above, prospective studies have shown a positive association between sugar-sweetened beverages and the risk of type-2 diabetes mellitus. In a large cohort of women, it was found that those consuming more than one sugar-sweetened beverage per day had a greater risk of developing type-2 diabetes compared with those consuming less than one sugar-sweetened beverage per month (Schulze et al., 2004; Kvaavik, Meyer & Tverdal, 2004; Palmer et al., 2008). However, it is important to note that in these studies, the effect of sugar-sweetened beverages on type-2 diabetes development was only seen among those women who had higher body mass index.
In addition to sugar-sweetened beverages, there is also growing concern over excessive fruit juice consumption and the risk of type-2 diabetes mellitus among children and adolescents. Nonetheless, the evidence is still limited and is based on a study only conducted among women (Lydia et al., 2008). In this cohort, high intake of fruit juices was positively associated with incidence of type-2 diabetes mellitus, whereas intake of whole fruits and green leafy vegetables was negatively associated with reduced risk (Lydia et al., 2008).

3.4 Behaviour and cognitive function
Dietary sugars (especially sucrose) have been considered to be a possible cause of hyperactivity and other behavioural problems in children. The possible explanations for the association between sucrose and hyperactivity include a rise in blood sugar shortly after ingestion, reactive hypoglycaemia several hours after ingestion and an allergic response (Wolraich et al., 1994).

Nevertheless, the adverse effects of sucrose consumption and their impact on behaviour among children and adolescents have not been consistently proved. For example, a meta-analysis of 16 randomised controlled trials among hyperactive children found that reducing the sugar content of the diet did not reduce the degree of hyperactivity (Wolraich, Wilson & White, 1995). The lack of consistent data demonstrating the behavioural or cognitive effects of sugar should warrant further investigation. This is important as sucrose is a common component of children’s diets; hence, any possible relation between sugar and behaviour is a major health concern.

4.0 CURRENT STATUS
Currently there is limited data on sugar consumption by Malaysian children and adolescents. However, a study by Zahara, Fashihah & Nurul (2010) found that the majority of the preschoolers in Kuala Lumpur consumed sugary food and drinks more than 3 times a day. Quantitatively, the Malaysian Adult Nutrition Survey (MANS) 2003 reported that 59% of the population consumed sugar daily. Mean sugar intake was approximately 4 teaspoons per day (21 g) and it was usually added to beverages such as coffee, chocolate-based drinks and tea (MOH, 2008). On top of that, sweetened condensed milk, which contains significant amounts of added sugar, was also consumed regularly (approximately 30 g per day at an average frequency of 1.5 times per day). The MANS survey also indicated that consumption of sugar was higher in rural areas (69.1% of the rural population consumed sugar daily, at an average frequency of 2.1 times per day) as compared to the urban population (51.4% of the urban population consumed sugar daily, at an average frequency of 1.8 times per day).

Table 12.1 shows the average intake of food and beverages that are usually high in sugar. The amount of sugar from these foods and beverages is not quantified in the MANS 2003 study but it is believed to contribute substantially towards the intake of dietary energy. The sugar content of selected local food and beverages obtained from other reliable resources is tabulated in Table 12.2 and 12.3.
## Table 12.1. Average intake of selected foods and beverages that are usually high in sugar among Malaysian adults

<table>
<thead>
<tr>
<th>Type of food</th>
<th>Estimated mean intake (g or ml per day)</th>
<th>Household measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condensed milk</td>
<td>30</td>
<td>6 teaspoon (= 3 teaspoons of sugar)</td>
</tr>
<tr>
<td>Tea</td>
<td>247</td>
<td>1 ¼ cups</td>
</tr>
<tr>
<td>Coffee</td>
<td>171</td>
<td>¾ cup</td>
</tr>
<tr>
<td>Chocolate drinks</td>
<td>128</td>
<td>½ cup</td>
</tr>
<tr>
<td>Cordial syrup</td>
<td>102</td>
<td>½ glass</td>
</tr>
<tr>
<td>Carbonated drinks</td>
<td>57</td>
<td>1/5 can</td>
</tr>
<tr>
<td>Local kuih</td>
<td>22</td>
<td>¾ piece</td>
</tr>
<tr>
<td>ABC ice</td>
<td>26</td>
<td>1/8 bowl</td>
</tr>
<tr>
<td>Jam</td>
<td>6</td>
<td>½ teaspoon</td>
</tr>
<tr>
<td>Added Sugar</td>
<td>21</td>
<td>4 teaspoon</td>
</tr>
</tbody>
</table>

*Source: MOH (2006)*

## Table 12.2. Sugar content in selected local beverages and snacks

<table>
<thead>
<tr>
<th>Food (g per ml)</th>
<th>Sugar content (g)</th>
<th>Household measurement (teaspoon)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chocolate bar (19 g)</td>
<td>5 to 10</td>
<td>1 to 2</td>
</tr>
<tr>
<td>Cookies (29 g)</td>
<td>5 to 10</td>
<td>1 to 2</td>
</tr>
<tr>
<td>Cereals sweetened (29 g)</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Ice cream (60 g)</td>
<td>5 to 15</td>
<td>1 to 3</td>
</tr>
<tr>
<td>Energy drinks (250 ml)</td>
<td>20 to 40</td>
<td>4 to 8</td>
</tr>
<tr>
<td>Carbonated drinks (240 ml)</td>
<td>15 to 30</td>
<td>3 to 6</td>
</tr>
</tbody>
</table>

*Source: Sugar content obtained from Nutrition Information Panel (NIP) of selected foods labels in Malaysia (unpublished).*
Table 12.3. Sugar content in selected local *kuih*

<table>
<thead>
<tr>
<th>Local kuih</th>
<th>Weight (g) per piece</th>
<th>Sugar content (g) per piece</th>
<th>Teaspoon equivalent (1 tsp = 5 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bingka ubi kayu</td>
<td>70 to 90</td>
<td>18 to 25</td>
<td>4¼</td>
</tr>
<tr>
<td>Kuih koci</td>
<td>40 to 50</td>
<td>10 to 13</td>
<td>2¼</td>
</tr>
<tr>
<td>Kuih keria</td>
<td>55 to 65</td>
<td>10 to 13</td>
<td>2¼</td>
</tr>
<tr>
<td>Lepat pisang</td>
<td>65 to 75</td>
<td>10 to 13</td>
<td>2¼</td>
</tr>
<tr>
<td>Kuih kosui</td>
<td>70 to 80</td>
<td>10 to 13</td>
<td>2¼</td>
</tr>
<tr>
<td>Kuih seri muka</td>
<td>110 to 120</td>
<td>10 to 13</td>
<td>2</td>
</tr>
<tr>
<td>Onde-onde</td>
<td>25 to 45</td>
<td>8 to 10</td>
<td>2</td>
</tr>
<tr>
<td>Kuih kasturi</td>
<td>120 to 135</td>
<td>8 to 10</td>
<td>1¼</td>
</tr>
<tr>
<td>Doughnut (plain)</td>
<td>45 to 55</td>
<td>7 to 10</td>
<td>1¼</td>
</tr>
<tr>
<td>Puding jagung</td>
<td>70 to 80</td>
<td>7 to 10</td>
<td>1¼</td>
</tr>
<tr>
<td>Apam</td>
<td>40 to 50</td>
<td>6 to 8</td>
<td>1½</td>
</tr>
<tr>
<td>Kuih lapis</td>
<td>120 to 140</td>
<td>5 to 7</td>
<td>1¼</td>
</tr>
</tbody>
</table>

Source: NCCFN (1999)
5.0 KEY RECOMMENDATIONS

Key recommendation 1
Eat foods low in sugars.

How to achieve
1. Replace high-sugar cereals, snacks and desserts with better choices such as fresh fruits, steamed corn, chickpeas or groundnuts.
2. If you choose kuih, cakes and biscuits, select varieties with less sugars and without cream/ filling/ icing.
3. Reduce consumption of sugary desserts such as ice cream and cakes, while choosing fruits more often.
4. Avoid sugary foods in between meals and close to bedtime.
5. If consuming sugary snacks as desserts, limit them to smaller portions and not more than once a day.

Key recommendation 2
Drink beverages low in sugars.

How to achieve
1. Choose plain water or milk over sugar-sweetened beverages, such as carbonated drinks, packed drinks and cordials as well as juices with added sugar.
2. Avoid sugar-sweetened beverages in between meals and close to bedtime. Plain water is the best to quench your thirst.
3. Choose milk, soya milk and cultured milk lower in sugar.
4. Limit intake of table sugar or sweetened condensed milk or sweetened creamer to 1 teaspoon per cup of drink.

Key recommendation 3
Instil a preference for less sweet taste.

How to achieve
1. Avoid introducing sugary foods and drinks to children below the age of 1.
2. Modify food preparation methods to reduce the sugar content.
3. Provide nutritious and lower in sugar paced foods and drinks for school children.
4. Request for lower sugar drinks when eating out.
5. Refrain from giving sweets, candies, chocolates, cookies and ice-cream as rewards to children.
Key recommendation 4
Choose sugar-free or less sugary products.

How to achieve
1. Check food labels for sugar content. If sugar is listed at the beginning of the ingredient list, it indicates that sugar is the main component of the product.
2. On the ingredient list, look for other names for sugars such as glucose, sucrose, maltose, caramel and corn syrup.
3. Check the Nutrition Information Panel (NIP) on product labels for sugar content, if available. Choose products labeled as lower sugar or sugar-free.
ADDITIONAL RECOMMENDATION

Practise good and proper oral hygiene habits
Even though the prevalence of dental caries has declined over the years, it is still a significant health problem among Malaysian children and adolescents. While sugar consumption pattern (amount and frequency) has been shown to be associated with dental caries formation, poor oral hygiene and the absence of fluoride in toothpaste are also factors that contribute to the development of tooth decay.

Good and proper oral hygiene should start at the very beginning of a child’s life to prevent tooth decay. Indeed, good oral hygiene remains important as children grow into adolescence. Hence, establish and practise good hygiene habits by ensuring that children brush their teeth at least twice daily with the proper brushing technique. When using fluoridated toothpaste for young children, parents should ensure that it is made especially for children and administer only a pea-size amount.

Parents play an important role in both modeling and teaching good and proper oral hygiene. Parents should also bring their children for dental check-ups as soon as their children turn 1 and schedule regular dental visits for preventive care.
REFERENCES


## Appendix 1. Sugar intake recommendation

<table>
<thead>
<tr>
<th>Age</th>
<th>RNI calorie</th>
<th>Total sugar intake (10%)</th>
<th>Gram of added sugars per day</th>
<th>Teaspoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toddlers and preschoolers (2 to 6 years old)</td>
<td>1000 to 1200</td>
<td>&lt; 10%</td>
<td>&lt; 15 g</td>
<td>3</td>
</tr>
<tr>
<td>Children (7 to 10 years old)</td>
<td>1500 to 1600</td>
<td>&lt;10%</td>
<td>&lt; 20 g</td>
<td>4</td>
</tr>
<tr>
<td>Adolescent (11 to 18 years old)</td>
<td>1800 to 2000</td>
<td>&lt;10%</td>
<td>25 to 40 g</td>
<td>5 to 8</td>
</tr>
</tbody>
</table>

Added sugars should be less than 10% of total calorie intake. Added sugars are the sugars and syrups added to foods and beverages in processing or preparation, not the naturally occurring sugars in fresh fruits or fresh milk.

*Source: NCCFN (2005); WHO (2003); AHA (2009)*
Key Message 13

Drink Plenty of Water Daily
1.0 TERMINOLOGY

Beverage
A beverage refers to any one of various liquids suitable for drinking, excluding plain water. This may include tea, coffee, liquids, beer, milk or soft drinks. An alcoholic beverage is liquor containing more than 2 per cent v/v (2% by volume) of alcohol but does not include denatured spirit or any liquor or any preparation containing more than 2 per cent v/v of alcohol for which medicinal properties are claimed (MOH, 1985).

Dehydration
Dehydration is excessive loss of body water. There are a number of causes of dehydration including heat exposure, prolonged vigorous exercise, vomiting, diarrhoea, kidney disease and medications (diuretics).

Electrolyte
An electrolyte is a substance that will dissociate into ions in solution and acquire the capacity to conduct electricity. The electrolytes include sodium, potassium, chloride, calcium and phosphate.

Energy drink
An energy drink is a fluid that typically contains stimulants, such as caffeine and guarana, with varying amounts of carbohydrate, protein, amino acids, vitamins, sodium and other minerals.

Hydration
Hydration is a process of providing adequate amounts of liquid to body tissues.

Sports drink
A sports drink is a fluid that contains carbohydrate (6 to 8%), electrolytes (sodium and potassium), flavour and vitamins. A sports drink replaces water and electrolytes during physical activities.

Water
Water is a substance with the chemical formula H_2O: one molecule of water has two hydrogen atoms covalently bonded to a single oxygen atom. Water is a tasteless, odourless liquid at room temperature and pressure and appears colourless.
2.0 INTRODUCTION

Water is essential for life and it is the main constituent of cells, tissues and organs. It is part of building material, used as a solvent and reaction medium as well as being a carrier to transport nutrients to cells and removes wastes from cells. Water also acts as a thermoregulator, a lubricant and shock absorber during walking and running (Jéquier & Constant, 2010). Consequently, the optimal functioning of the body requires a good hydration level. The regulation of water balance is very precise and is essential for the maintenance of health and life. In infants and children, water as a percentage of body weight is higher than in adults (Manz, 2007). This is mainly due to a higher water content in the extracellular compartment, whereas the water content in the intracellular compartment is lower in infants than in older children and adults.

Hydration status is critical to the body’s process of temperature control. Body water loss through sweat is an important cooling mechanism in hot climates and in periods of physical activity. Sweat production is dependent upon environmental temperature and humidity, activity levels and type of clothing worn. It has been shown that to obtain effective rehydration after dehydration induced by sweat loss, it is necessary to replace the electrolytes as well as the water lost during the dehydration process. These electrolytes can be ingested either by consuming a drink to replace the water or by eating solid food together with water (Maughan, Leiper & Shirreffs, 1996). Alcohol, sport drinks and energy drinks should be avoided by children and adolescents. It is widely known that alcohol-containing drinks have diuretic effects whereas the purpose of sports drinks is to rehydrate the body and replace the electrolytes after intense sweating during exercise while energy drinks are normally used to stimulate the body. A recent statement by the American Academy of Pediatrics (Committee on Nutrition and the Council on Sports Medicine and Fitness, 2011) sustains that all these beverages are dangerous for children. The sports drinks should be recommended only for athletes who engage in sustained physical activity, but the energy drinks should not be recommended in children, adolescents and young adults.

3.0 SCIENTIFIC BASIS

Human water requirements are based on experimentally derived intake levels that are expected to meet nutritional adequacy for members of a healthy population; these are adequate intake levels determined for infants, adolescents, adults and elderly individuals (Sawka, Cheuvront & Carter, 2005). Numerous factors, such as high ambient temperatures and humidity levels, physical activity and exercise and heat stress in particular, influence water needs. Food
habits such as intake of salt, caffeine and alcohol are also factors affecting water requirements.

3.1 Physical performance

The role of water and hydration in physical activity, particularly in athletes and in the military, has been of considerable interest and is well-described (Murray, 2007). Continued exercise will cause fluid loss through sweat which results in a dehydrated condition. This will cause a progressive decline in pulmonary and systemic pressure, increases core temperature, decreases in skin blood flow and overall decline in cardiac output as stroke volume decreases beyond the compensatory increase in heart rate (Coyle, 2004). During challenging athletic events, it is not uncommon for athletes to lose 6 to 10% of body weight through sweat, thus leading to dehydration if fluids have not been replenished. Researchers found that dehydration affects sports performance as well as health conditions negatively even at a dehydration level of 2% of body mass loss as this amount is common among athletes (Sawka, Cheuvront & Carter, 2005). Dehydration will induce premature fatigue by increasing thermoregulatory stress, cardiovascular strain and negative changes in muscle metabolism and alterations in central nervous system functions (Sawka, Cheuvront & Carter, 2005).

The performance of prolonged exercise which is more than 60 minutes, in a warm environment can result in a substantial loss of body water, with the potential for adverse effect on performance capacity and an increase risk of heat illness. A body water loss of more than 10 to 15% of body mass, which is about 20 to 30% of total body water, can lead to death (Maughan, 2003) (Table 13.1).

During exercise, children may be at greater risk for voluntary dehydration. Children may not recognise the need to replace lost fluids and both children as well as coaches need specific guidelines for fluid intake (AAP, 2000). Additionally, children may require more time to acclimatise to an increase in environmental temperature than adults (Falk & Dotan, 2008; Bytomski & Squire, 2003). Meyer & Bar-Or (1994) reviewed six exercise studies in hot conditions that compared fluid loss of boys and girls to adults and calculated percentage dehydration, which would have been achieved after one hour if no fluids had been consumed. The magnitude of dehydration was similar in children and adults (ranging from 0.40 to 2.41%), leading these authors to conclude that “when correcting for body mass, children are generally similar to adults with regard to their water losses during exercise.”

<table>
<thead>
<tr>
<th>Percentage of body weight loss as sweat (%)</th>
<th>Physiological effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Impaired performance</td>
</tr>
<tr>
<td>4</td>
<td>Capacity for muscular work declines</td>
</tr>
<tr>
<td>5</td>
<td>Heat exhaustion</td>
</tr>
<tr>
<td>7</td>
<td>Hallucinations</td>
</tr>
<tr>
<td>10</td>
<td>Circulatory collapse and heat stroke</td>
</tr>
</tbody>
</table>

*Adapted from: Rehner, 1994*
Therefore, a drinking schedule is very important in order to avoid dehydration.

### 3.2 Cognitive performance

Water, or its lack (dehydration), can influence cognition. Mild levels of dehydration can produce disruptions in mood and cognitive functioning. This may be of special concern in the very young, very old, those in hot climates and those engaging in vigorous exercise. Mild dehydration produces alterations in a number of important aspects of cognitive function such as concentration, alertness and short-term memory in children (10 to 12 years), young adults (18 to 25 years) and the oldest adults (50 to 82 years) (Suhr et al., 2004). As with physical functioning, mild-to-moderate levels of dehydration can impair performance on tasks such as short-term memory, perceptual discrimination, arithmetic ability, visuomotor tracking, and psychomotor skills (Cian et al., 2001; D’Anci et al., 2009).

Several recent studies have examined the utility of providing water to school children on attentiveness and cognitive functioning in children (Edmonds & Jeffes, 2009; Edmonds & Burford, 2009; Benton & Burgess, 2009). In these experiments, children were not fluid restricted prior to cognitive testing, but were allowed to drink as usual. Overall, these studies indicate that low-to-moderate dehydration may alter cognitive performance.

### 3.3 Caffeine, alcohol, and sweetened drinks

Caffeine is a psychoactive substance. Studies in children and adolescents suggest that caffeine has similar physiological effects in younger individuals as have been shown in adults. For example, moderate to high doses of caffeine (approximately 100 to 400 mg) led to increased reports of nervousness, jitteriness, fidgetiness and decreased reports of sluggishness in children and adolescents (Bernstein et al., 1994). A study by Pollak & Bright (2003), showed higher caffeine intake among seventh to ninth grade students was associated with shorter nocturnal sleep duration, increased wake time after sleep onset and increased daytime sleep. A few studies have also examined physiological responses to caffeine in children and adolescents and have shown that caffeine increases ambulatory blood pressure in a dose dependent manner (Savoca et al., 2005). Withdrawal from caffeine also produced similar effects in a subset of adolescent caffeine users as are seen in some adults, such as headache, drowsiness and fatigue (Bernstein et al., 2002).

The diuretic action of alcohol has been well recognised for many years. The mechanism of action is via inhibition of vasopressin secretion (Rubini, Kleeman & Lamdin, 1955) and the degree of diuresis is proportional to the amount of alcohol consumed (Eggleton, 1942). A study by Shirreffs & Maughan (1997) showed that the addition of alcohol to drinks ingested after exercise-induced dehydration has a tendency to promote an increased urine output relative to that produced after consumption of an alcohol-free beverage with an otherwise identical composition. Apart from this, alcohol consumption is recognised worldwide as a leading risk factor for disease, disability and death (Foltran et al., 2011). It accounts for approximately 4% of death worldwide and 4.6% of the global burden of disease, placing it alongside tobacco as one of the leading preventable causes of death and disability (WHO, 2002).

There is increasing evidence that the rapidly increasing consumption of sweetened drinks by children and adolescents over the last two decades is a major factor in the worldwide obesity epidemic (Schwartz, 2003; Rampersaud,
Furthermore, a high consumption of sweetened drinks may favour dental caries (Heller, Burt & Eklund, 2001), lower bone density (McGartland et al., 2003) and severe presentation of ketoacidosis in diabetes mellitus (McDonnell et al., 2005). Another aspect, which has been known for a long time, but often neglected, is that the post-absorption water status may vary after the consumption of the same amount of different beverages (Krause & Desjeux, 2004). On the whole, beverages with a high carbohydrate or sodium chloride content quench thirst much less than plain water.

**3.4 Basis for recommendation**

In 1989, the U.S. National Research Council estimated that for children aged one year and above, the average water requirement was 1.5 ml per kcal energy expenditure per day (Food and Nutrition Board, 1989). For an average weight 9 year old boy (26 kg) and girl (25 kg) multiplying the energy requirement (NCCFN, 2005) for calorie intake by these factors gives an average fluid intake requirement of 2.7 L and 2.4 L for 7 to 9 year old boys and girls respectively. Assuming that approximately one third (1 L) is derived from food, a conservative estimate is that 7 to 9 year old children require around 1.5 L per day. These requirements will rise in warm weather and when exercising.

Other estimates of daily water requirements for children include those based on findings from the German DONALD study of 479 healthy boys and girls aged 4 to 10.9 years. Estimated adequate intake values of total water for German children in this age group ranged from 1.01 to 1.05 ml per kcal energy expenditure (Manz, Wentz & Sichert-Hellert, 2002). The World Health Organization advises that a 10 kg child should consume 1 L per day and a 5 kg infant, 0.75 L per day under average conditions, but this should be increased depending on conditions, up to 4.5 L, for example if the child is undertaking manual labour in high temperatures (WHO, 2003).

Using the available data on energy requirement in the Malaysian RNI and the U.S. National Research Council water requirement for children (1.5 ml per kcal energy expenditure per day), the recommendation for water is shown in Table 13.2 and 13.3. This recommendation takes into account the water derived from solid food as well as water and beverages. Looking at the usual intake of plain water by adults in Malaysia (Norimah et al., 2008), it is suggested that a 2 to 3 year old child should consume 1 to 2 glasses of plain water daily, a 4 to 12 year old 6 glasses and a 13 to 18 year old 6 to 8 glasses.

**4.0 CURRENT STATUS**

A study called The Youth Behaviour Risk Factor Surveillance Survey (YBRFSS) was carried out by Health Education Division, Ministry of Health Malaysia together with Institute for Health behavioural Research (IHBR) in 2010. This cross-sectional multi-location study was conducted in 50 schools all around Malaysia with around 4088 of students from Form 1, 2 and 4. Data from this study showed that 52% of the respondents had adequate plain water intake (≥ 6 glasses of plain water per day). Another study was carried out by the Ministry of Health (Healthy School Canteen Project) which collected data on water intake among 24 primary schools randomly selected from three states namely Penang, Malacca and Federal Territory of Kuala Lumpur and Putrajaya. A total of 2327 standard 4 and 5 students participated in this study. At baseline, this study showed that the mean intake of water daily was 7.4 glasses. About 54% of them took 6 to 8 glasses of water per day and about 19% took more than 8 glasses daily.
### Table 13.2. Calculation of water requirement for boys according to Malaysian RNI

<table>
<thead>
<tr>
<th>Age</th>
<th>Energy (†) kcal per day</th>
<th>Water requirement (1.5 ml per kcal)</th>
<th>One third coming from solid food</th>
<th>The rest from water and beverages</th>
<th>Glasses</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 years</td>
<td>1000</td>
<td>1500</td>
<td>500</td>
<td>1000</td>
<td>4</td>
</tr>
<tr>
<td>4 to 6 years</td>
<td>1300</td>
<td>1950</td>
<td>650</td>
<td>1300</td>
<td>5</td>
</tr>
<tr>
<td>7 to 9 years</td>
<td>1800</td>
<td>2700</td>
<td>900</td>
<td>1800</td>
<td>7</td>
</tr>
<tr>
<td>10 to 12 years</td>
<td>2200</td>
<td>3300</td>
<td>1100</td>
<td>2200</td>
<td>9</td>
</tr>
<tr>
<td>13 to 15 years</td>
<td>2700</td>
<td>4050</td>
<td>1350</td>
<td>2700</td>
<td>11</td>
</tr>
<tr>
<td>16 to 18 years</td>
<td>2800</td>
<td>4200</td>
<td>1400</td>
<td>2800</td>
<td>11</td>
</tr>
</tbody>
</table>

Adapted from: NCCFN (2005), Values are rounded up to the nearest tens

### Table 13.3. Calculation of water requirement for girls according to Malaysian RNI

<table>
<thead>
<tr>
<th>Age</th>
<th>Energy (†) kcal/ day</th>
<th>Water requirement (1.5 ml/ kcal)</th>
<th>One third coming from solid food</th>
<th>The rest from water and beverages</th>
<th>Glasses</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 years</td>
<td>1000</td>
<td>1500</td>
<td>500</td>
<td>1000</td>
<td>4</td>
</tr>
<tr>
<td>4 to 6 years</td>
<td>1300</td>
<td>1950</td>
<td>650</td>
<td>1300</td>
<td>5</td>
</tr>
<tr>
<td>7 to 9 years</td>
<td>1600</td>
<td>2400</td>
<td>795</td>
<td>1600</td>
<td>6</td>
</tr>
<tr>
<td>10 to 12 years</td>
<td>2000</td>
<td>3000</td>
<td>1000</td>
<td>2000</td>
<td>8</td>
</tr>
<tr>
<td>13 to 15 years</td>
<td>2200</td>
<td>3300</td>
<td>1100</td>
<td>2200</td>
<td>9</td>
</tr>
<tr>
<td>16 to 18 years</td>
<td>2200</td>
<td>3300</td>
<td>1100</td>
<td>2200</td>
<td>9</td>
</tr>
</tbody>
</table>

Adapted from: NCCFN (2005), Values are rounded up to the nearest tens
5.0 Key Recommendations

Key recommendation 1
Drink an adequate amount of plain water daily.

How to achieve
1. Give children aged 2 to 3 years small amounts of plain water up to 1 to 2 glasses and for 4 to 18 years old, 6 to 8 glasses.
2. Ensure plain water is available all the time both at school and at home.
3. Ensure the child drinks plain water frequently even when not thirsty.
4. Encourage the child to drink more water when he is active.
5. Choose plain water instead of sweetened beverages.
6. Give more water when your child is sick.

Key recommendation 2
Avoid alcoholic beverages.

How to achieve
1. Increase the awareness of your children about the dangers of alcohol consumption. Do not wait until they have started.
2. Make your children aware of peer and media influence on their initiation of alcohol use. Help them be assertive in resisting alcohol.
3. Choose only non-alcoholic beverages at social gatherings.
ADDITIONAL RECOMMENDATION

Children aged 6 to 18 years who are active in sports and with regular training should drink according to schedule as in Table 13.4.

Table 13.4. Drinking schedule for those (6 to 18 years old) active in sports and with regular training

<table>
<thead>
<tr>
<th></th>
<th>Before exercise</th>
<th>During exercise Every 20 minutes</th>
<th>After exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain water</td>
<td></td>
<td>½ - 1 glass (120-240 ml)</td>
<td></td>
</tr>
<tr>
<td>(6 to 12 years old)</td>
<td></td>
<td></td>
<td>3/5 – 1¼ glass (150-270 ml)</td>
</tr>
<tr>
<td>Plain water</td>
<td></td>
<td>1-2 glass (240-480 ml)</td>
<td>3/5 – 1¼ glass (150-300 ml)</td>
</tr>
<tr>
<td>(13 to 18 years old)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluids containing</td>
<td>-</td>
<td>If exercising more than 60 minutes in high intensity activity</td>
<td></td>
</tr>
<tr>
<td>carbohydrate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4 to 8g per 100ml)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and electrolytes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Casa et al., (2000); Convertino et al., (1996); Orange County Department of Education (2012); Sports Medicine Australia (1997)
REFERENCES


Malaysian Dietary Guidelines for Children and Adolescents
Key Message 14
Consume Safe and Clean Foods and Beverages
1.0 TERMINOLOGY

**Bisphenol A**
Bisphenol A (BPA) is an industrial chemical used in the manufacture of polycarbonate baby feedings bottles and plastic containers. BPA is known to cause interruption to the human hormonal system, disrupting the body’s function. However, thus far there has been no evaluation carried out on the effect of BPA on babies’ hormonal systems. This has create uncertainty over the safety of exposing babies to BPA.

**Cross contamination**
Cross-contamination is the transfer of harmful microorganisms from one item of food to another via a non-food surface such as human hands, equipments or utensils. It may also be a direct transfer from a raw food to a cooked food.

**Food and water borne illness**
A food-or water-borne illness is any illness resulting from the consumption of contaminated food and drinking water. Most cases are actually infections caused by a variety of food-borne pathogenic bacteria, viruses and parasites.

**Food poisoning**
Food poisonings presents with acute onset of vomiting and/or diarrhoea and/or symptoms from other systems as a result of ingesting contaminated foods, which contains infectious, toxigenic micro-organisms or noxious elements.

**Fresh food**
Fresh foods is raw foods that have not changed colour, do not have unpleasant odour, is not withered and its texture remain unchanged.

**Label**
Label refers to a food label which complies with the Malaysian Food Regulations 1985 (MOH, 1985) and contains the main requirements as stated in Appendix 1.

**Personal hygiene**
Personal hygiene is generally defined as cleanliness of the body and proper maintenance of personal appearance. This generally includes all body areas and clothing.

**Safe water**
Water that is clean and free from contamination and does not have objectionable taste or odour.
2.0 INTRODUCTION

Food-borne illnesses are the result of eating organisms or toxins in contaminated food. Food can be contaminated by bacteria, viruses, mould, metals, chemicals and natural poisons which may also be present in fish and plants (Hodate, 2004). The adverse health effects of food-borne diseases range from gastroenteritis to life-threatening conditions, including cancer, birth defects as well as neurological, hepatic and renal syndromes.

Food-borne disease are caused by presence of a food borne hazard in a food or beverages and are defined by Codex Alimentarius as “a biological, chemical or physical agent in, or condition of food, with the potential to cause an adverse health effect”. Many of these hazards have long been recognised and addressed through food safety control measures (WHO, 2007a).

Food-borne diarrhoeal diseases are among the most common illnesses worldwide. Each year, diarrhoeal diseases cause an estimated 1,300 million episodes worldwide and result in some four to five million deaths among children below the age of 5. As many as 70% of diarrhoeal diseases in developing countries are believed to be of food-borne origin (WHO, 2006). In addition, many people suffering from enteric diseases recover after a few days and do not visit doctor (FAO, 2008). The U.S. Centers for Disease Control and Prevention estimated that about one in three persons in the USA fall ill each year due to food-borne diseases: Children, pregnant women, the immune compromised and the elderly are at greatest risk of both contracting food-borne diseases and suffering more serious adverse health effects (WHO, 2006).

Food safety is the responsibility of several agencies in Malaysia, principally the Food Safety and Quality Division (FSQD), Ministry of Health (MOH). Recognising that educating the young on the importance of good hygienic practices as a way to reduce food-borne illnesses is a strategy that would have lasting impact, MOH has launched the Food Safety Campaign with the theme “SEE, SMELL, TASTE” in 2010. This campaign is the follow-up to the Food Safety Promotion Programme in schools that was implemented from 2007 to 2009. This programme is one of the initiatives taken by the government to reduce food poisoning cases that often occur in schools, involving primary and secondary school children. Acknowledging the importance of hygiene, the food Hygiene Regulations were gazetted in 2009 to provide an infrastructure to control the hygiene and safety of food, including the preparation, handling, distribution, sale and consumption of food to protect public health.
A technical summary report from the MOH (2006) stated that there are still pockets of areas in Malaysia with poor basic sanitation and environment facilities. It is recommended that in order to prevent and control food-borne diseases, inter-agency involvement, in particular between agencies that are responsible for the provision of basic environmental facilities and local authorities, plays an important role in enforcing laws related to the establishment and operation of food outlets. The report also stated that data from the National Disease and Pathogen Surveillance System, which links to systems from various related agencies, will provide useful information that is important for a better understanding of food-borne diseases in Malaysia.

In addition to regulations, it is important to educate consumers to choose safe and clean food and beverages. Health education in food safety is both possible and cost-effective, but it should be culture-specific and should respond to technological, economic and social situations that prevail in a particular society or cultural group.

3.0 SCIENTIFIC BASIS

Food-borne diseases, commonly but inaccurately known as food poisoning, are defined by the World Health Organization (WHO, 2007) as diseases that are usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food. Available data suggests that nearly all cases of food-borne diseases are caused by microbiological contaminates and that mishandling at some stage of the food chain is often responsible for the resulting illness. Microbiological contamination often occurs as a result of poor food handling. Therefore, good food hygiene practices are important to prevent cross-contamination, including proper preparation, storage and handling of food, thorough cooking of food especially meat and meat products and washing of hands before handling food.

The trends and possible contributing factors for the outbreaks of food-borne diseases in Malaysia were examined by Meftahuddin (2002). The diseases were mainly cholera, typhoid fever, hepatitis A, dysentery and food poisoning. The incidence rate for all the major food-borne diseases steadily declined from 1988 to 1997, except for food poisoning and cholera. Statistics of food poisoning from the year 1996 to 1997 showed that 66.5% of the outbreak occurred in schools, whereas only 0.4% originated from contaminated food sold at various public food outlets. The school-age group is always more likely to be affected than the general population. Amongst the contributing factors identified are unhygienic food handling practices, inadequate safe water supply and poor environmental sanitation.
In many countries, improper handling of food at home is a major cause of food-borne illnesses. The three main reasons for improper food handling are: (i) lack of knowledge concerning food borne diseases, their causes, symptoms and implications; (ii) lack of perception of the extend of the threat or risk; and (iii) lack of knowledge about how to change behaviours. All these impediments can be addressed by providing education about food-borne diseases, their causes, health effect and impact on human and societal development, as well as the measures to avoid them. Proper handling of food along the entire food supply can help to ensure the safety of food.

Human beings themselves are a major source of food contamination. Food poisoning or food infection frequently arises from food contamination due to germs transmitted by coughing or sneezing, infected wounds, pimples or faecal material. It is ironic that people are both the culprits and the victims in food spoilage and food poisoning incidents.

It is suggested that a multi-sectoral approach between MOH and other government agencies or private agent needs to be undertaken in the management of food-borne diseases in order to curb the incidence of such diseases in Malaysia.

**4.0 CURRENT STATUS**

Food- and water-borne diseases continue to be a public health problem in Malaysia and other developed countries. They include diseases like cholera, typhoid and paratyphoid fever, hepatitis A, dysentery and food poisoning. In Malaysia, notification of communicable diseases, including food-borne diseases, is compulsory under the Prevention and Control of Infectious Diseases Act (Act 342). Cases reported to the nearest District Health Office are fully investigated and appropriate control and preventive measures are taken to prevent spreading and recurrent episodes. This surveillance system has been strengthened through the introduction of the electronic mode of disease notification called Communicable Disease Control Information System (CDCIS), as well as standardised case definitions and preparation of guidelines on disease management.

It is recognised that health hazards from food can arise from any part of the entire food chain; from raw materials, from handling and through all the stages involved in the processing, transportation, storage, sale and consumption of food. Outbreak of food-borne diseases can be reduced if both consumers and food handlers understand the importance of correct hygienic food practices. The hygienic aspects of food premises are a major concern for public health officers and inspectors in efforts to prevent food-borne illness. A study of the hygiene standard of food premises and microbiological quality of food provided findings on hygienic standard of food premises in relation to microbiological quality of food for further analysis of sources of food contamination. One study found an overall relationship between microbiological findings of selected food examination and the hygiene score of food premises. Training in food handling and practices on the parameters identified should be focused more on the premises with low hygiene score (Zaliha, 2009).

Health education is one of the most effective means of reducing the problem of food-borne illnesses but this will only be effective if it convinces everyone involved along the food chain, from food handlers to the consumers, to improve their food safety habits. If both food handlers and consumers play their respective
Malaysian Dietary Guidelines
for Children and Adolescents

Malaysian Dietary Guidelines
for Children and Adolescents

Over the past 10 years, food-borne diseases have been on the decrease in Malaysia. Over the same period from 1999 to 2009, the average incidence of cholera, typhoid, hepatitis A and dysentery was less than 5 cases per 100,000 populations (Figure 14.1). In 2009, the incidences of these diseases were around 1 per 100,000 populations. This can be attributed to the vast improvement in living conditions, such as the provision of safe water supply, adequate and proper housing and better environmental sanitation. Improvements in educational status of its population also play an important role.

Nonetheless, food poisoning episode still pose to be a public health problem (Figure 14.2), especially in schools. In 2010, the incidence of food poisoning was 43.28 per 100,000 populations, which was higher than its incidence in 2009. There were a total of 353 episodes of food poisoning, with 43.6% occurring in schools. The most common risk factors were inappropriate holding temperature and holding time (19.8%) and untrained food handlers 9.3%. (Table 14.1)

![Figure 14.1. Trends of Cholera, Typhoid/ Paratyphoid, Hepatitis A and Dysentery in Malaysia, 1999 – 2009](source: MOH (2009))
Table 14.1. Contributing factors for food poisoning in 2010

<table>
<thead>
<tr>
<th>Category</th>
<th>Contributing factors</th>
<th>Frequency (%)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contamination of raw materials</td>
<td>Contaminated raw material</td>
<td>92 (8.40)</td>
<td>185 (15.78)</td>
</tr>
<tr>
<td></td>
<td>Unsafe thawing process</td>
<td>38 (3.47)</td>
<td>38 (3.47)</td>
</tr>
<tr>
<td></td>
<td>Contaminated water</td>
<td>20 (1.82)</td>
<td>20 (1.82)</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>35 (3.19)</td>
<td>35 (3.19)</td>
</tr>
<tr>
<td>Contamination during cooking/ secondary to</td>
<td>Undercooked/ inadequate cooking</td>
<td>78 (7.12)</td>
<td>78 (7.12)</td>
</tr>
<tr>
<td>processing technique</td>
<td>Inadequate reheating</td>
<td>34 (3.10)</td>
<td>34 (3.10)</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>17 (1.55)</td>
<td>17 (1.55)</td>
</tr>
<tr>
<td>Contamination during storage, transportation</td>
<td>Inadequate holding temperature</td>
<td>92 (8.40)</td>
<td>92 (8.40)</td>
</tr>
<tr>
<td>and serving</td>
<td>Inadequate holding time</td>
<td>125 (11.41)</td>
<td>125 (11.41)</td>
</tr>
<tr>
<td></td>
<td>Cross contamination from raw materials</td>
<td>116 (10.59)</td>
<td>116 (10.59)</td>
</tr>
<tr>
<td></td>
<td>Contaminated utensils</td>
<td>41 (3.74)</td>
<td>41 (3.74)</td>
</tr>
<tr>
<td></td>
<td>Unsafe packaging/ defect in packaging</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td></td>
<td>Poor storage</td>
<td>29 (2.64)</td>
<td>29 (2.64)</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>22 (2.00)</td>
<td>22 (2.00)</td>
</tr>
<tr>
<td>General contamination (contamination along</td>
<td>Unhygienic premises</td>
<td>82 (7.48)</td>
<td>82 (7.48)</td>
</tr>
<tr>
<td>the food process</td>
<td>Food handlers who are untrained</td>
<td>102 (9.31)</td>
<td>102 (9.31)</td>
</tr>
<tr>
<td></td>
<td>Food handlers who are unhygienic</td>
<td>85 (7.76)</td>
<td>85 (7.76)</td>
</tr>
<tr>
<td></td>
<td>Food handlers who are ill</td>
<td>4 (7.76)</td>
<td>4 (7.76)</td>
</tr>
<tr>
<td></td>
<td>Cross contamination from consumers</td>
<td>19 (1.73)</td>
<td>19 (1.73)</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>23 (2.11)</td>
<td>23 (2.11)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>1095 (100)</td>
</tr>
</tbody>
</table>

Source: MOH (2010)
5.0 KEY RECOMMENDATIONS

Key recommendation 1
Keep clean.

How to achieve
1. Teach children to wash their hands with soap and clean water before and after eating as well as after going to the toilet, playing outside, blowing their nose, coughing or sneezing and handling pets or dirty materials.
2. Teach children to use tongs/ spoons/ forks, instead of their hands, when buying self-service food at the school canteen.
3. Clean all surfaces and equipments used for food preparation.
4. Always change dish cloths and hand towels regularly.
5. Protect kitchen areas from insects, pests and other animals.

Key recommendation 2
Prepare food hygienically.

How to achieve
1. Ensure personal hygiene, cleanliness of cooking utensils and food at all stages of food preparation to avoid food poisoning.
2. Wash hands before and after handling food, before preparing baby’s food and feeding baby, after changing baby’s diapers, after going to the toilet and frequently during food preparation.
3. Sterilise infant feeding bottles, cups and breast pump kits, following the instructions, before every feeding session. If there are no instructions, then the utensils should be submerged in boiling water for 5 to 10 minutes.
4. Use separate chopping boards for raw and ready-to-eat food. If the same chopping board and utensils are used, wash thoroughly between use.
5. Avoid handling foods if you have cuts, burns or wound on your hand unless properly bandaged.

Key recommendation 3
Cook food thoroughly.

How to achieve
1. Cook food thoroughly, especially meat and meat products, poultry, eggs and seafood. Bring foods like soups and stews to a boiling temperature.
2. Reheat cooked food thoroughly until it reaches boiling temperature.
3. When using a microwave oven to cook, rotate and stir the food so that it cooks evenly.
**Key recommendation 4**
Keep food appropriately.

**How to achieve**
1. Do not prepare food too early. Do not leave cooked food at room temperature for more than two hours.
2. Serve hot food hot and cold food cold.
3. Promptly refrigerate all cooked and perishable food (preferably below 5°C) as soon as possible, always within two hours after purchase.
4. Cooked food should not be kept longer than three days in the refrigerator.
5. Wait for food to cool down before you put it in the fridge.
6. Packed food for school or day care centre can safely be prepared earlier, provided they are kept in the fridge. Ensure that ready-to-eat raw food and cooked food are separated.
7. Store raw and cooked food separately to avoid raw food contaminating cooked foods (cross contamination).
8. Store meat, poultry and seafood in the freezer compartment.
9. All food should be covered.

**Key recommendation 5**
Use safe water and safe raw materials.

**How to achieve**
1. Use clean and safe water.
2. Select fresh and wholesome foods.
3. Boil water for drinking, including water that is used to prepare infant formula for non-breastfed babies.

**Key recommendation 6**
Read the product label.

**How to achieve**
1. When infant formula is used, the instructions for preparation must be followed strictly.
2. Teach children to read the expiry date on food packaging.
3. Buy or consume food that has not expired.
4. Read the list of ingredients to get information on allergens.
5. Always follow the food storage instructions on the label.
Key recommendation 7
Choose clean and safe foods.

How to achieve
1. Choose food that is still hot, fresh and kept in a clean container.
2. Teach children to use their senses (see, smell, taste) to recognise contaminated or spoiled food.
3. Discard all leftover foods and drinks brought back from school.
4. Discard unfinished milk.
5. Children should be warned against sharing drinking bottles because of the risk of infection.
6. Avoid sharing spoons when feeding children.

Key recommendation 8
Use safe foods containers.

How to achieve
1. For formula-fed babies, choose feeding bottles that are not made with Bisphenol A (BPA). These bottles are usually labeled as ‘BPA free’.
2. Check the inner surface of the feeding bottle regularly. If there are scratches or damage to the feeding bottle, it should be replaced.
3. Avoid placing/pouring hot food or beverage directly into a plastic container or bottles.

Key recommendation 9
Choose clean and safe premises to eat.

How to achieve
1. Choose food premises that are situated in clean areas far away from traffic fumes, rubbish dumps, clogged drains or septic tanks.
2. Choose food premises where the food handlers practise good personal hygiene.
3. Choose premises that serve properly-covered food and beverages.
4. Patronise clean food premises equipped with basic facilities and that are free of pets, rodents, pests and insects.
REFERENCES


APPENDICES

Appendix 1. General requirements for labelling of food

1. Language to be used
   (a) In the case of food produced, prepared or packaged in Malaysia, be in Bahasa Malaysia; or
   (b) In the case of imported food, be in Bahasa Malaysia or English.
       And in either case may include translation thereof in any other language.

2. Particulars in labelling
   (a) The appropriate designation of the food or a description of the food containing the common name of its principal ingredients:
       e.g. orange juice and corn oil.
   (b) In the case of mixed or blended food, words which indicate that the contents are mixed or blended, as the case may be, and such word shall be conjoined with the appropriate designation of the food, in the following form:
       e.g. mixed orange and mango juice.
   (c) Where the food contains beef or pork, or its derivatives, or lard, a statement as to the presence, in the form “contains (state whether beef or pork, or its derivatives, or lard)”: e.g. contains lard.
   (d) Where the food contains added alcohol, a statement as to the presence in that food of such alcohol, in the form “contains alcohol”.
   (e) Where the food contains food additive, a statement as to the presence in that food of such food additive, in the form:
       e.g. contains permitted food conditioner.
   (f) Where the food consists of two or more ingredients, the appropriate designation of each of those ingredients should be in descending order of proportion by weight.

3. Net weight
   A statement of the minimum net weight or volume or number of the contents of the package.

4. Manufacturer/ country of origin
   In the case of food locally manufactured or packed, the name and business address of the manufacturer or packer, or the owner of the rights of manufacture or packing or the agent of any of them; and in the case of imported food, the name and business address of manufacturer or packer or the owner of the rights of manufacture, or the agent of any of them,
and the name and business address of the importer in Malaysia and the name of the country of origin of the food.

5. Date marking
(a) In these Regulations, “date marking” in relation to a package of food, means a date permanently marked or embossed on the package or in the label on the package, of any food signifying the expiry date or the date of minimum durability of the food, as the case may be.
   (1) The expiry date in respect of any food shall be shown in one of the following forms:
      (i) “EXPIRY DATE or EXP DATE (date/month/year) or (month/year)"
      (ii) “USE BY (date/month/year) or (month/year)"
      (iii) “CONSUME BY or CONS BY (date/month/year) or (month/year)"
(2) The date of minimum durability in respect of any food, shall be shown in the following form: “BEST BEFORE or BEST BEF [(date/month/year) or (month/year)]"
(b) Where the validity of the date marking of a food to which this regulation applies is dependent on its storage, the storage direction of that food shall also be required to be borne on its label.

6. Claims on the label
As the phrase suggests, a nutrition claim is any claim made on a label of a food product pertaining to its nutritional quality.

   Nutrient content claim - A claim describing the level of a nutrient in a food product
   Nutrient comparative claim - A claim that compares the nutrient levels and/or energy value
   Nutrient function claim - A claim that describes the physiological role of the nutrient in growth, development and normal functions of the body
   Claim for enrichment, fortification or other words of similar meaning - As specified in Regulation 26 (7)

7. Nutrition labelling
Nutrition labelling means a description intended to inform the consumer of the nutrient content of a food.

The nutrients that must be declared on a nutrition label are energy, protein, carbohydrate and fat. In addition, total sugars must also be declared for ready-to-drink beverages. They do not include alcoholic beverages.
<table>
<thead>
<tr>
<th>Nutrient</th>
<th>100ml contains</th>
<th>250ml contains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>199kJ</td>
<td>500kJ</td>
</tr>
<tr>
<td></td>
<td>47kcal</td>
<td>120kcal</td>
</tr>
<tr>
<td>Protein</td>
<td>0.5g</td>
<td>1.3g</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>10.5g</td>
<td>26.3g</td>
</tr>
<tr>
<td>of which sugars</td>
<td>trace</td>
<td>26.3g</td>
</tr>
<tr>
<td>Fat</td>
<td>trace</td>
<td>trace</td>
</tr>
<tr>
<td>of which saturates</td>
<td>trace</td>
<td>trace</td>
</tr>
<tr>
<td>Fibre</td>
<td>trace</td>
<td>trace</td>
</tr>
<tr>
<td>Sodium</td>
<td>trace</td>
<td>trace</td>
</tr>
<tr>
<td>Salt equivalent</td>
<td>trace</td>
<td>trace</td>
</tr>
</tbody>
</table>

*Guideline daily amounts*
Key Message 15

Educate Children on the Use of Nutrition Information on Food Labels
1.0 TERMINOLOGY

**Food label**
A food label includes 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 (MOH, 1983).

**Nutrition claims**
Nutrition claim is any claim made on a label of a food product pertaining to its nutritional quality (FSQD, 2010).

**Nutrition information**
Nutrition information on food labels is often taken to include two types of information, namely nutrition label and nutrition claims.

**Nutrition label**
Nutrition label is a listing of the level of nutrient(s) as displayed on the food label. It is meant to provide factual information about the nutritional content of the product (FSQD, 2010). It is also known as a nutrition information panel (NIP).

**Nutrition information panel (NIP)**
The nutrition information panel (NIP) or a nutrition label is a table found in one section of a food label declaring the amount of energy, carbohydrate, protein and fat, as well as vitamins and minerals contained in the food (FSQD, 2010).

**Pre-packaged food**
Pre-packaged food is food packaged or made up in advance in a container, ready for offer to the consumer, or for catering purposes. A package includes anything in which or any means by which food is wholly or partly cased, covered, enclosed, contained, placed or otherwise packed in any way whatsoever and includes any basket, pail, tray or receptacle of any kind whether opened or closed (MOH, 1983).

2.0 INTRODUCTION

The National Plan of Action for Nutrition of Malaysia (NPANM) (2006-2015) (NCCFN, 2006) has identified several targets aimed at reducing the prevalence of nutrition disorders among children, including protein-energy malnutrition, micronutrient deficiencies and overweight and obesity. Several strategies and intervention programmes have been identified in NPANM, including those to promote healthy eating and active living among children. Educating children
to make appropriate food choices have been recognised as an effective long term strategy towards promoting healthier food consumption pattern. One of the ways of doing this would be to encourage children to make use of the nutrition information on food labels to make appropriate choices when selecting pre-packaged foods.

The habit of reading food labels, including the nutrition information on such labels, should be inculcated from childhood. Young children can be guided into understanding the information, while older children can read the information themselves. Such habits will be able to in identifying the nutrients contained in a package of food and guide them in making better food choices. For example, children can learn not to choose pre-packaged foods high in fat, sugar, salt while preferring to make more frequent choices of foods high in vitamins, minerals and fibre. The best place to learn about nutrition information on food labels would be in grocery stores, minimarkets and supermarkets. Parents can bring their children along when they go shopping and have them try some of the simple exercises at the stores. For example, when shopping for breakfast cereals, let the children first choose a product that they like, then the parents can explain and teach them to select breakfast cereals based on the nutrition information on the labels.

Nutrition labels and nutrition claims are available on pre-packaged foods regulated by the Ministry of Health Malaysia. All those involved in providing nutrition education to children should include such information as one of the ways of improving eating habits. It is vital that such basic tools of food choices be taught to children at a young age. Make use of the recommendations and notes in these guidelines on how to educate children on the use of such information.

### 3.0 SCIENTIFIC BASIS

#### 3.1 The importance of nutrition information on food labels

Nutrition labels or NIP is a table found on the label of a pre-packaged food, showing the amount of energy, carbohydrates, protein and fats, as well vitamins and minerals contained in the products. Reading the nutrition label on food packaging enable us to know how much nutrients is consumed in the pre-packaged food. Such information also enables us to compare the nutritional content among different brands and find out which ones are higher or lower in certain nutrients.

NIP consists of three main parts (Figure 15.1). In the first part of nutrient listing, it shows the energy, carbohydrate, protein and fat declared in the NIP. Vitamins
and minerals may also be listed in the NIP. In the second part, the amounts of energy and other nutrients are listed per 100 g (for solid foods) or per 100 ml (for beverages). For instance, every 100 g of food in this example (Figure 15.1) provides your child with 525 kcal (energy). The third part of the NIP presents the amounts of nutrients per serving, that is the amounts of nutrients and energy your child receives in each serving of the food (Tee et al., 2010).

A child’s body has multiple needs and requires a host of nutrients and their diet should comprise adequate balanced mix of cereals and products, vitamins-rich fruits and vegetables, milk and milk products, meat, fish and eggs, as well as protein and dietary fibre-rich legumes. Reading nutrition labels can help children to compare foods and find the foods that have the nutritional value according to their needs. Nutrition labels can help them to limit the amount of fat, sugar, sodium and cholesterol in their diet by making it easy for them to compare one food item with another and choose the one with lower amounts of these nutrients. Conversely, they can use food labels to find food items higher in minerals, vitamins, fibre and protein (Whitney & Rolfes, 2002).

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Per 100 g</th>
<th>Per serving (20 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal)</td>
<td>525</td>
<td>105</td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>56.2</td>
<td>11.2</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>8.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>29.8</td>
<td>6.0</td>
</tr>
</tbody>
</table>

**Nutrient listing**

The list shows the energy, carbohydrate, protein and fat declared in the NIP.

Vitamins and minerals could also be listed.

**Amount of nutrients**

This shows the amount of energy and nutrients per 100 g (solid food product) or per 100 ml (beverage product).

For instance, every 100 g of this food provides your child 525 kcal (energy).

**Amount of nutrients per serving**

This is the amount of nutrients and energy your child receives in each serving of the food.

In the example above, each serving of 20 g gives your child 105 kcal of energy.

If your child consumes 2 servings of the food, the energy and nutrients consumed will be doubled.
In a study of 301 African-American adolescents (aged 10 to 19 years old) in the United States of America, Huang *et al.*, (2004) observed that almost 80% of subjects reported sometimes or always reading nutrition labels, a proportion similar to that reported for adults. It was also found that more females than males read nutrition labels, as observed in other studies. The investigators felt that there could be a lack of understanding of label information or inability of the adolescents to translate the information into practical use. It was felt that despite being increasingly read, the rate of comprehension and accurate use of nutrition labels remain low even in adults. Therefore, though nutrition labelling may potentially yield significant benefits, early education that takes into account gender specific issues is clearly needed to help the public better understand and use nutrition labels.

There are no local studies that investigate various aspects of the understanding and use of nutrition labels among Malaysian children. There is therefore a lack of information on how children in the country perceive such nutrition information, their understanding as well as potential use.

### 3.2 Nutrition labelling and food purchasing

Nutritional labelling has emerged as an important aspect of consumers’ decision of purchasing pre-packaged foods. If trustworthy nutritional labels are available, nutritional labels could assist the consumer in making better choices during food purchases. The regulatory environment in some countries has long recognised the potential of standardised on-pack nutrition information and has mandated the presence of nutritional labels on all processed food products. In many countries, nutrition labelling is voluntary on almost all pre-packaged foods. In Malaysia, for example, it has become compulsory since 2003 to state the content of energy, protein, carbohydrate and fat for most pre-packaged foods (MOH, 1985). Nutritional content in food products is considered to be a credence attribute.

Drichoutis, Lazaridis & Nayga, (2006) synthesised the findings of nutritional labels into studies that spanned almost two decades. Various aspects were studied, including the determinants of label use, the debate on mandatory labelling, the label formats preferred by consumers and the effect of nutrition label use on the purchase and dietary behaviour. These reviewers found that in general, nutritional label use affects purchasing behaviour mainly because it influences valuations and perceptions of the product and consumers want to avoid the negative nutrients in food products. In addition, health claims have been found to create favourable judgements about a product. For example, when a product features a health or nutrient content claim, consumers tend to view the product as healthier and are more likely to purchase it.

The review also showed that most empirical research suggests that provision and use of information can significantly change dietary patterns (Drichoutis, Lazaridis & Nayga, 2006). Several studies have found that nutritional label use contributes to a better dietary intake or to reduced consumption of ‘unhealthy’ foods. Nutritional label used is also associated with diets high in vitamin C, low in cholesterol and lower percentage of calories from fat. Other studies have found nutritional label use to increase dietary quality of consumers, with higher improvements detected when health claim information was used.

In a study in Denmark, Norgaard & Brunso (2009) found that when children are taken shopping
for food, parents discuss evaluation and choice of food with their children and children help to choose food products. Children might influence their family’s purchase of food and if they are taught to use nutritional information and become more involved in health, they might supply their parents with ideas for healthier food (Norgaard & Brunso, 2009). The type of foods that parents choose to purchase and feed their children can have influence on children’s body weight. The study also showed that families do not plan their food shopping before going to the shops. Many decisions are made at the shelves and parents as well as the children use information on food labels to make food choices (Norgaard & Brunso, 2009).

The habit of reading these nutrition labels should be taught since childhood. This can be achieved by reading the nutrition labels and paying attention to what is contained in the packaging and emphasizing that one of the ways to prevent degenerative diseases is to limit the intake of fat, sugar, sodium and cholesterol and increase fibre (Drichoutis, Lazaridis & Nayga, 2006).

### 3.3 Teaching NIP to children and adolescents

Childhood is a period of continuous education about healthy eating including good nutrition. Appropriate use of food is important in establishing lifetime nutrition practices (NHMRC, 2003). Nutrition information on food labels has been recognised as one of the strategies adopted to assist consumers in adopting healthy dietary practices (WHO, 2004). NIPs can provide children a general idea about the types of nutrients, serving size and calories in a single serving of food. Older children and teenagers can also use NIPs to compare the nutrient content between different foods, thus helping them to choose of healthier versions of foods.

The impact of nutrition information on food choices is important in considering how young adolescents develop personal eating behaviours. Study by Hawthorne et al., (2006) in Houston, USA demonstrated that after a teaching session, NIP label can be an effective educational tool to increase nutrition knowledge in young adolescents. This study showed that young adolescents successfully learned how to read and understand NIP labels through educational sessions. The investigators felt that such an educational program could readily be implemented in a variety of settings, including schools and community educational settings. This type of educational programme can be a part of larger programmes designed to decrease the incidence of overeating high-calorie foods and development of obesity.

### 4.0 CURRENT STATUS

Nutritional label use has been found to influence food purchases, nutrient intake and dietary quality among adults in other countries (Kim, Nayga & Capps, 2000; Kim, Nayga & Capps, 2001; Teisl & Levy, 1997). However, since the gazettement of nutrition labels and claims regulation in 2003 in Malaysia, there has been no national survey on the use of NIP among children and adolescents.

Nutrition education is incorporated into the primary and secondary school curriculum in various subjects, including Physical and Health Education, Malay and English language as well as Science subjects. Besides that, there are currently a few nutrition education programmes carried out by various institutions and organisations which undertake to teach young children good eating habits and healthy food choices such as ‘Healthy Schools Programme’ and ‘Healthy Lifestyle in Children’ (Poh, 2005; Ruzita, Wan Azdie & Ismail, 2007).
There is, however, no information on nutrition labelling and claims in most of these educational materials for children. Recognising the importance of imparting such nutrition information on food labels to children, Nutrition Month Malaysia has included such information, especially understanding nutrition information panels in several of its various publications targeted at children. These include ‘Raising Healthy Eaters’ (Tee et al., 2009a), ‘Easy Nutrition Planner’ (Tee et al., 2009b) and ‘Smart Nutrition’ (Tee et al., 2010). There has to be greater efforts in educating children on the use of such information, to establish a good foundation in understanding food choices.

Nutrition information on food labels has been included in the curriculum of secondary schools. Greater efforts should be made to teach such information in interesting and practical ways, e.g. through Health and Physical Education session. Experiences in other countries have shown that it is important to impact such information to children at a young age.
5.0 **KEY RECOMMENDATIONS**

**Key recommendation 1**  
Educate children on the nutrition information found on food labels.

**How to achieve**  
1. Inculcate the habit of reading all nutrition information to make healthier choices from young.  
2. Encourage awareness among friends and family and share label reading tips for healthier choices.  
3. Find opportunities to read together nutrition information on food labels.  
4. Explain how to look out for healthier options of food products to the children.  
5. Encourage children and adolescents to read the nutrition information by themselves.

**Key recommendation 2**  
Create various opportunities to educate children about the nutrition information on food labels.

**How to achieve**  
1. Talk about nutrition and food choices during daily activities, for example during meal times at home, at the restaurants or shopping at the supermarket.  
2. Prepare shopping lists and include healthier food items.  
3. Parents should take time to read food labels during grocery shopping with their children.  
4. Use the nutrition information in the menu when available to select foods with lower calories, fat, sugar and sodium.

**Key recommendation 3**  
Explain the components in the Nutrition Information Panel (NIP) for older children.

**How to achieve**  
1. Show ways to read the NIP as follows:  
   i. Determine the serving size (in g or ml as stated on the packet).  
   ii. Find out the number of servings in the packet.  
   iii. Show the child the three main columns of the NIP:  
      a) the nutrient listing;  
      b) nutrients per 100 g/ 100 ml and  
      c) nutrients per serving.
2. Teach how to calculate the nutrients consumed when taking more than 1 serving.
3. Explain the basic functions of energy and the key nutrients such as carbohydrate, protein and fat.
4. For certain components which are not commonly found on NIP such as sugar, check the ingredient listing to determine the presence of these components.

**Key recommendation 4**
Explain the meaning of ‘Nutrient Content Claim’ and ‘Nutrient Comparative Claim’.

**How to achieve**
1. Familiarise the children with the example of nutrient content claim such as ‘low-sugar’, ‘low sodium’ or ‘high in calcium’ and nutrient comparative claim such as ‘reduced fat’, ‘less sodium’ or ‘more vitamin C’.
2. Encourage the children to pick up foods which carry words ‘source of’, ‘high in’, ‘more’, ‘extra’ or ‘increased’ nutrients such as vitamins, minerals or dietary fibre.
3. Encourage the children to pick up foods which carry words such as ‘low in’, ‘free of’, ‘reduced’, ‘less’, ‘fewer’ or ‘light’ sugar, fat, cholesterol or sodium (salt).

**Key recommendation 5**
Make nutrition labeling education as part of school activities.

**How to achieve**
1. Strengthen the nutrition labelling component in the school curriculum.
2. Show the children the basics of the nutrition information panel and explain how a healthy diet is made up of different kinds of foods and nutrients.
3. Explain that food ingredients on the label are listed in descending order of weight.
4. Use interactive games and resources to reinforce basic nutrition concepts.
5. Be positive. Make it fun, rather than a source of arguments over choosing the products.
6.0 ROLE OF PARENTS, CAREGIVERS AND TEACHERS

It is important for parents to start teaching how to read food labels in children since childhood. Teaching nutrition information to children at a young age encourages healthy habits in the future. Many opportunities can be created for such teaching sessions and they do not have to be formal in nature. Parents can be a role model for their children in choosing a healthy food (USFDA, 2007a). Parent can teach their children comparing products using quantity per serving and quantity per 100 g, explain to their children on the NIP while do shopping and going through each part of the nutrition label with examples of healthy and unhealthy contents.

Moulding and changing children’s behaviour takes effort, but the reward of a healthy, energetic child make all the work worth the battle. Consistent encouragement and patience will ultimately steer their palettes on the path to a healthier and brighter future. Family, school and community-wide efforts are needed to promote healthful eating patterns and food choices among adolescents (Roxanne, 2011).

The aim of reading food labels as well as understanding the food pyramid should be strengthening as part of the said curriculum or be integrated in the campaign carried out in schools. Early childhood educators have the opportunity to improve children’s food choices because they interact with children daily. Interactive lesson plans should be used to attract the children’s attention (Birch & Fisher, 1998).

Family members and teachers can influence the food preferences of young children by providing healthy food choices, offering multiple opportunities to prepare and eat new foods and serving positive role models through their own food choices. As influential role models for their children, parents are in a key position to reinforce and urge their kids to look for, read and think about the NIP on food packaging and use mealtime and grocery shopping as a means to teach kids to read labels together and discuss healthy eating habits (USFDA, 2007b). As a parent, understanding what all that information means will help you make healthier food choices for your child. In turn, it helps to meet his nutritional needs, while limiting the amount of unnecessary fat and sugar in his diet (Zaitun & Mahenderan, 2011).
REFERENCES


APPENDICES

Appendix 1. Tips on using the Nutrition Information Panel (NIP)

Tips on using the NIP:

(a) Consider all components in making food choices
   i. Look at the amount of energy and other nutrients in the food. Consider how these nutrients contribute to the total daily intake and the nutritional needs of your growing child.
   ii. Make food choices based on the overall nutrient content of a food, not merely on one or two nutrients.

(b) Compare nutritional value of different brands of similar foods
   i. The NIPs of different brands of a similar food can be used to determine which ones are higher or lower in certain nutrients.
   ii. Always compare based on 100 g or 100 ml of the products. Serving sizes may not be suitable as they may differ between brands.
   iii. Compare the content of all the nutrients on the labels of the different brands available for the same food item, not just the level of one nutrient.

Source: Tee et al., (2010)

Appendix 2. Example of some instructions/activities that can be used to educate children in reading the Nutrition Information Panel by parents, caregivers or teachers

1. Look at the serving size on the box of food (e.g. cereals).
2. Give your child a measuring cup to measure out a serving size of the cereal. This will familiarise your child with what a serving size looks like.
3. Discuss with the child the difference between calories and fats. Examples of things you can tell the child are that you need calories and fats to survive and they can be very positive when eaten correctly. They give the body energy and endurance, along with carbohydrates. When a food has more calories, carbohydrates and fat than a body burn can within a day they can cause weight gain.
4. Ask the child to locate calories and fat on the nutrition label.

5. Tell your child what saturated fats, \textit{trans} fat, cholesterol and sugar are, such as these items are bullies to the body because they take away nutritional value and cause weight gain and they should be eaten in small amounts or avoided possible.

6. Ask your child to locate saturated fats, \textit{trans} fat, cholesterol and sugar on the nutrition label and to read out the percentages of each to determine if the amount included in the cereal is small or large.

7. Discuss with your child vitamins, fibre and minerals. These items are heroes to the body, giving the child strength as well as helping the body to function properly.

8. Ask the child to locate the amount of vitamins, fibre and minerals within 1 serving. The daily values section of the food label can give you a good idea of how much of the daily vitamins and minerals the child is getting with this serving size.

9. Read the list of ingredients of the cereal together, saying out loud whether each item is health or not. For items you don’t know, look them up to educate yourself and your child about them and find out the effects these items can have on the body.

Source: USFDA (2007a)
Malaysian Dietary Guidelines
for Children and Adolescents
List of Participants

Participants of Consensus Meeting on the Malaysian Dietary Guidelines for Children and Adolescents, 14 – 15 May 2012
Participants of Consensus Meeting on the Malaysian Dietary Guidelines for Children and Adolescents, 14 – 15 May 2012

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<table>
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<tr>
<th>No.</th>
<th>Name</th>
<th>Position</th>
<th>Institute/Division</th>
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<tr>
<td>37</td>
<td>Haszlin Hashim</td>
<td>Dietitian</td>
<td>Universiti Malaya Medical Centre</td>
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<td>38</td>
<td>Suhaila Abd Ghaffa</td>
<td>Nutritionist</td>
<td>Institute for Public Health</td>
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<td>Nor Hayati Mustafa Khalid</td>
<td>Nutritionist</td>
<td>Institute for Medical Research</td>
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<td>40</td>
<td>Siti Mariam Ali</td>
<td>Senior Assistant Director</td>
<td>National Lactation Centre</td>
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<td>Siti Saadiah Hassan Nudin</td>
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<td>Institute for Health Behavioural Research</td>
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<td>42</td>
<td>Mohd Zabri Johari</td>
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<td>43</td>
<td>Julia Jamaludin</td>
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<td>Strategic Planning and International Division</td>
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<td>44</td>
<td>Zahari A. Hasan</td>
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<td>45</td>
<td>Aainaa Mastura Abu Bakar</td>
<td>Assistant Director</td>
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<td>46</td>
<td>Prof. Dr. Mohd Ismail Noor</td>
<td>Lecturer</td>
<td>Faculty of Health Sciences</td>
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<td>Assoc. Prof. Datin Dr. Safiah Md. Yusof</td>
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<td>Dr. Mahenderan Appukutty</td>
<td>Lecturer</td>
<td>Faculty of Sports Science and Recreation</td>
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<td>Prof. Dr. Norimah A. Karim</td>
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<td>52</td>
<td>Prof. Dr. Aminah Abdullah</td>
<td>Dean</td>
<td>Faculty of Science and Technology</td>
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<tr>
<td>53</td>
<td>Prof. Dr. Zalilah Mohd Shariff</td>
<td>Deputy Dean</td>
<td>Faculty of Medicine and Health Sciences</td>
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</table>
54. **Assoc. Prof. Dr. Mohd Sokhini Abd Mutalib**
   Lecturer
   Faculty of Medicine and Health Sciences
   Universiti Putra Malaysia

55. **Assoc. Prof. Dr. Loh Su Peng**
   Lecturer
   Faculty of Medicine and Health Sciences
   Universiti Putra Malaysia

56. **Dr. Mohd Nasir Mohd Taib**
   Lecturer
   Faculty of Medicine and Health Sciences
   Universiti Putra Malaysia

57. **Dr. Barakatun Nisak Mohd Yusof**
   Lecturer
   Faculty of Medicine and Health Sciences
   Universiti Putra Malaysia

58. **Dr. Hamid Jan Jan Mohamed**
   Lecturer
   School of Health Sciences
   Universiti Sains Malaysia

59. **Dr. Sakinah Harith**
   Lecturer
   School of Health Sciences
   Universiti Sains Malaysia

60. **Dr. Wan Azie Mohd Abu Bakar**
   Lecturer
   Kuliyyah of Allied Health Sciences
   International Islamic University Malaysia

61. **Dr. Tee E Siong**
   President
   Nutrition Society of Malaysia

62. **Prof. Dr. Poh Bee Koon**
   Secretary
   Malaysian Association for the Study of Obesity (MASO)

63. **Dr. Zuraidah Abdul Latif**
   Deputy President
   Lactation Advisor and Consultant Association Malaysia

64. **Dr. Hung Liang Choo**
   Representative
   Malaysian Paediatric Association

65. **Voon Phoohi The**
   Research Officer
   Malaysian Palm Oil Association (MPOB)

66. **Yu Kin Len**
   Representative
   Federation of Malaysian Consumer Association (FOMCA)

67. **Koo Pei Fern**
   Representative
   Federation of Malaysian Manufacturers (FMM)

68. **Hasreena Hashim**
   Representative
   Federation of Malaysian Manufacturers (FMM)

69. **Yap Lee Sheer**
   Representative
   Federation of Malaysian Manufacturers (FMM)

70. **Yeap Pau Wei**
   Representative
   Federation of Malaysian Manufacturers (FMM)