NUTRITION RESEARCH PRIORITIES IN MALAYSIA

FOR 10TH MALAYSIA PLAN (2011-2015)

TECHNICAL WORKING GROUP ON NUTRITION RESEARCH
NATIONAL COORDINATING COMMITTEE ON FOOD AND NUTRITION
MINISTRY OF HEALTH MALAYSIA
2009

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ISBN 978-967-5322-04-4

ISBN 978-967-5322-04-4

First Published in Malaysia 2009

Published by:

Technical Working Group on Nutrition Research
National Coordinating Committee on Food and Nutrition

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ACKNOWLEDGEMENT

The Nutrition Research Priorities Technical Committee and the members of the Technical Working Group on Nutrition Research under the governance of the National Coordinating Committee on Food and Nutrition (NCCFN) have established the nutrition research priorities through a series of workshops and meetings. The members of these Technical Working Groups are the representatives from various government agencies, the academia, professional bodies and non-government organizations (NGOs). The close collaboration within this multisectoral framework has led to the success and completion of this document.

Therefore, the contributions and high commitments in the publishing of this document are greatly acknowledged. The warmest appreciation and gratitude go to the:

- Director General of Health Malaysia, Deputy Director General of Health Malaysia (Research and Technical Support), Deputy Director General of Health Malaysia (Public Health), Director of Nutrition Division and Director of Institute for Public Health.
- Chairman of the National Coordinating Committee on Food and Nutrition, Chairman of the Technical Working Group on Nutrition Research and Chairman of the Nutrition Research Priorities Technical Committee.
- Directors of Food Safety and Quality Division, Family Health and Development Division, Disease Control Division and Medical Development Division, Ministry of Health Malaysia.
- Directors of State Health Departments of Kedah, Penang, Perak, Selangor, Pahang, Sabah and Sarawak.
- Chief Secretariat of the National Institutes of Health, Directors of the Institute for Public Health, Institute for Medical Research, Institute for Health System Research and Institute for Health Behavioural Research.
- Director's General of Ministry of Education, Ministry of Regional and Rural Development, Ministry of Agriculture and Agro-Based Industry, Ministry of Science, Technology and Innovation and Malaysia Palm Oil Board.
- Dean of the Faculty of Allied Health Science, Universiti Kebangsaan Malaysia, Dean of the Faculty of Medical and Health Science, Universiti Putra Malaysia, Dean of the Allied-Health Science Lecture, Universiti Islam Antarabangsa Malaysia, Dean of the Faculty of Health Science, Universiti Teknologi Mara, Dean of the Health Science Study Centre, Universiti Sains Malaysia, Dean of the Faculty of Agrotechnology and Food Science, Universiti Malaysia Terengganu, Dean of the School of Food Science and Nutrition, Universiti Malaysia Sabah, Dean of the Faculty of Health Science, Universiti Malaysia Sarawak and Dean of the Pharmacy and Health Sciences, International Medical University.
- All the chairpersons, rapporteurs, facilitators and participants of the workshops and all the individuals that have directly and indirectly contributed to the completion of this document.

FOREWORD BY THE DIRECTOR GENERAL OF HEALTH MALAYSIA

One of the major research challenges in evidence-informed policy making is lacking of timely and comprehensive data needed by the relevant policy makers. However, with limited resources at various levels, research activities need to be prioritised based on the needs that would bring the greatest impact on the quality of health and nutrition of the nation. Thus, research is required to advance the understanding of issues related to nutrition and health which should somehow have commercial potential in line with national research policy.

It is hoped that the implementation of the National Medical Research Registry (NMRR) will strengthen the coordination and monitoring of the research activities in the Ministry of Health Malaysia. Strengthening of research communication, primarily between researchers and policy makers, will subsequently stimulate more application of research findings and activities into evidence-based policy making decisions and practices.

I would like to thank and congratulate the Technical Working Group on Nutrition Research under the National Coordinating Committee on Food and Nutrition (NCCFN) for taking the initiative and challenge to produce this document. I would also like to thank and express my sincere appreciation to all who have contributed significantly and successfully to the completion of this document.

Hopefully, this document will give a clear direction of nutrition research in the country which will enable them to effectively plan in allocating and managing its resources for research. Therefore, policy makers, funding agencies and researchers are encouraged to give priority to issues that have been highlighted in the nutrition research priorities established based on the National Plan of Action for Nutrition of Malaysia (2006-2015).

Y. Bhg. Tan Sri Dato' Seri Dr. Hj. Mohd. Ismail Merican
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FOREWORD BY THE DEPUTY DIRECTOR GENERAL OF HEALTH (RESEARCH AND TECHNICAL SUPPORT)

First of all, I would like to express my greatest gratitude to Nutrition Research Priorities Technical Committee and the Institute for Public Health for taking the challenge to set up the nutrition research priorities for the country. The Research and Technical Support Programme of the Ministry of Health is indeed committed in ensuring the implementation of the evidence-based policy and support. In this respect, the needs and roles of research in evidence-based policy making are very crucial.

One of the major thrust areas of the Ministry of Health in the 9th Malaysia Plan (MP) and 10th MP is to achieve optimum health via research and development. In the 9th MP, the allocation for health research has been increased to RM90 million. The government and the Ministry of Health commitment in research and development is portrayed by setting up specialised fields of research institutes under the umbrella of National Institutes of Health and increasing research funding especially for the 10th MP. Therefore, there are great opportunities for the health staff to carry out research in the health sectors primarily those that are highlighted under the National Health Research Priorities.

More collaborative research with various international and national organisations and institutions within the national health and nutrition research priority areas are greatly encouraged to ensure optimisation of the resources and research findings which are relevant and of great importance to the country's needs.

Hopefully, this document will help the policy makers, funding agencies and researchers in prioritising the research activities in the country.

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FOREWORD BY THE CHAIRMAN OF TECHNICAL WORKING GROUP ON NUTRITION RESEARCH

I would like to thank Y.Bhg. Tan Sri Dato' Seri Dr. Hj. Mohd. Ismail Merican, the Director General of Health Malaysia, Y.Bhg. Dato' Dr. Maimunah A. Hamid, Deputy Director General of Health Malaysia (Research and Technical Support), Y.Bhg. Dato' Dr. Hj. Ramlee Hj. Rahmat, former Deputy Director General of Health Malaysia (Public Health), Rokiah Don, Director of Nutrition Division and Dr. Hj. Yahya Baba, former Director of Institute for Public Health, for their invaluable support and guidance.

I would also like to thank and express my greatest appreciation and acknowledgement to all that have significantly contributed to the success and completion of this document.

One of the main tasks of Technical Working Group on Nutrition Research is to set up a nutrition research priority for the country. This document is established with its primary aim to ensure that nutrition research carried out in the country is in accordance with the national priorities and needs. This nutrition research priority setting process is the result of comprehensive review of the scientific literature and gaps of nutrition knowledge in the country. This has led to the call partnerships with experts from various institutions, universities, professional bodies and non-governmental organisations.

It is hoped that this document is a useful guide for policy makers, funding agencies and researchers in the country.

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ABBREVIATION

CPG	: Clinical Practice Guideline
CRM	: Certified Reference Materials
CVD	: Cardiovascular disease
FCT	: Food Composition Table
FSQD	: Food Safety and Quality Division
HACCP	: Hazard Analysis Critical Control Point
IYCF	: Infant and Young Child Feeding Practices
MANS	: Malaysian Adult Nutrition Survey
MDGs	: Millennium Development Goals
MNT	: Medical Nutrition Therapy
MP	: Malaysia Plan
NCD	: Non-communicable disease
NGOs	: Non-governmental organisations
NHMS II	: Second National Health and Morbidity Survey
NHMS III	: Third National Health and Morbidity Survey
NPANM	: National Plan of Action for Nutrition of Malaysia
QAP	: Quality Assurance Programme
SOP	: Standard Operating Procedure
UNICEF	: United Nation Children Education Fund
WHO	: World Health Organisation

INTRODUCTION

1.1 Introduction

Good nutrition is the foundation for health and an input to the development of the country. In contrast, under-nutrition that includes both macro- and micronutrient deficiencies, leads to deleterious consequences including poor foetal growth, childhood underweight and stunting, and ill-health in pregnant women and elderly persons. Many millions of children die each year before reaching five years of age. Maternal deaths also take a heavy toll particularly in low-income countries. Most of these deaths would be preventable through adequate health care and nutrition.

Healthy dietary practices constitute an important cornerstone of a healthy lifestyle, that includes non-smoking, regular physical activity and maintaining a desirable body weight. Several chronic non-communicable diseases including cardiovascular disease, diabetes, hypertension and certain types of cancer are associated closely with unhealthy lifestyles. The impact of unhealthy lifestyles on healthcare costs including long-term care is on the rise in Malaysia.

In recent decades, Malaysia has attained impressive social economic and health improvements. There have been remarkable decreases in neonatal, infant and toddler mortality rates and maternal mortality ratio. However, the benefits of these improvements do not reach all segments of the population owing to such factors as poverty, lack of information and knowledge, and geographic terrain challenges. Population groups affected include the Orang Asli and other indigenous groups in Sabah and Sarawak, and the urban poor. Reducing health inequalities to access and use of health care services is thus one of the key concerns that should be addressed.

Malaysia has made commendable progress in meeting most of the health and nutrition-related targets of the Millennium Development Goals (MDGs). Nonetheless, challenges remain and need to be addressed if the country intends to achieve all the health targets of the MDGs by 2015. The MDGs targets and other challenges deserving of further research and intervention studies include the double burden of malnutrition, which is the co-existence of underweight/stunting and overweight in children, rapid increase in adult obesity, inadequacy in breastfeeding and complementary feeding practices, unhealthy lifestyles accompanied by the spiralling rise of diet-related non-communicable diseases.

In this respect, the nutrition sector for the 9th Malaysia Plan (MP) affirmed that one of its goals is to enhance research and development. As a follow-up in the 10th MP, greater emphasis will be accorded to research and development related to the reduction of the double burden malnutrition especially through empowerment and healthy lifestyles. This is in line with the primary objective of National Nutrition Policy and National Plan of Action for Nutrition of Malaysia (NPANM, 2006-2015). These national nutrition declarations are aimed at consolidating efforts in combating the double burden of nutritional deficiencies and diet-related chronic diseases.

Thus, in order to achieve these objectives, a nutrition research priority for the country has been formulated. This research priority document was established through a series of workshops and meetings with the participation of experts and experienced representatives from various government agencies, academia, professional bodies and non-governmental organisations (NGOs). This group known as the Nutrition Research Priorities Technical Committee comprised approximately 69 participants selected from across the fields of nutrition, medicine, epidemiology, social sciences, education and applied sciences. Taking into consideration the National Nutrition Policy, NPANM, 2006-2015 and existing health research priorities, seven nutrition research priority problem areas and gaps were identified as shown in Figure 1.1.

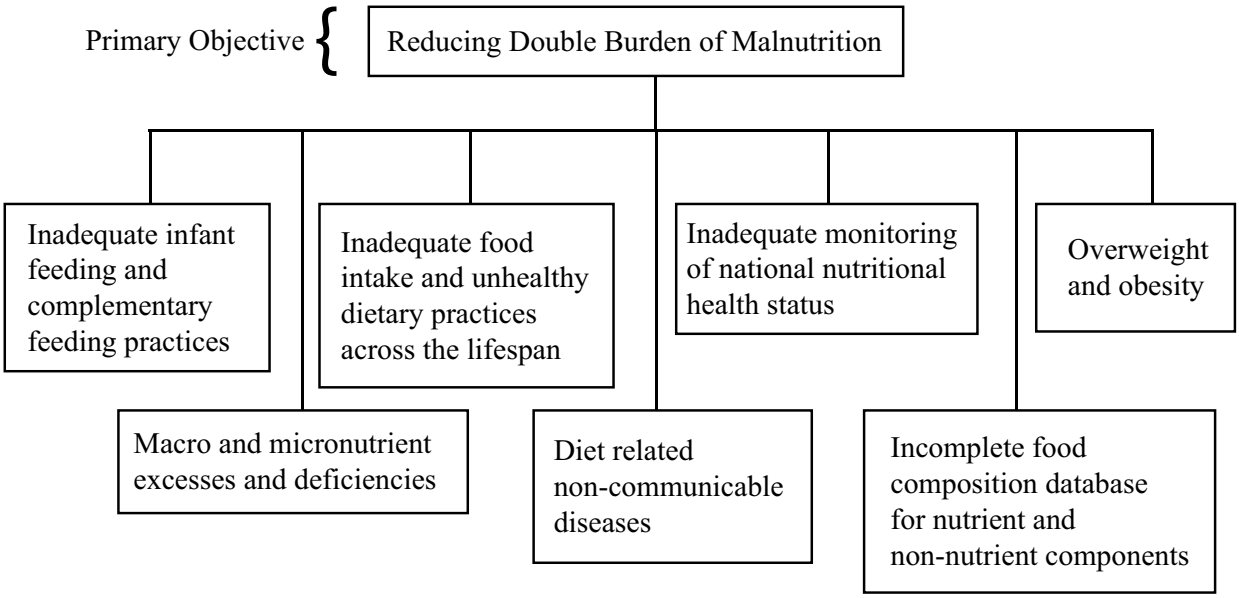

Figure 1.1: Overview of nutrition research priorities for the 10th Malaysia Plan (2011-2015)

Subsequently, the nutrition research problem areas were summarised into seven research priority areas as focal points for future works as follows:

i) Infant feeding and complementary feeding practices
ii) Monitoring of national nutritional status
iii) Food intake and healthy dietary practices across the lifespan
iv) Macro and micronutrient excesses and deficiencies
v) Overweight and obesity
vi) Diet related non-communicable diseases
vii) Food composition database for nutrient and non-nutrient components

A standardised procedure was used to identify nutrition research priority scopes and topics that involved the following steps:

i) To identify the critical gaps in knowledge and determine the research deemed important to fill such gaps.

ii) To list all the possible research purposes, scopes and suggested topics within the important research areas.

iii) To prioritize the research topics by using standardised criteria to determine rank-orders for the topics and to identify priorities within the important topics.

The top ranking research topics have become the Research Priority List for each of the research priority areas. The Research Priority List has been presented within a conceptual framework that provides the purpose and scope of research and suggested research topics or explanatory notes together with the rank order suggested by the groups. Each group has applied similar ranking criteria as shown in Table 1.

Table 1.1: Ranking criteria for selection of research scopes and topics

No	Criteria		Ranking Criteria* (Score)	Remarks
1	Primary criteria	Big impact on health status and/or delivery of services	1 - 10	Need to apply both criterias
		Great public health significance	1 - 10	
2	Secondary criteria	Capacity strengthening	1 - 7	Need to apply maximum 2 criterias
		Gap in knowledge/ evidence that necessitates research	1 - 7	
		Feasibility, practicality, cost and time	1 - 7	
		Importance for client satisfaction	1 - 7	

**Score "1" indicates the lowest/ worst score. The highest total score obtained is given a relative rank "1" to indicate the highest priority*

Research Priority Area 1

Infant Feeding and Complementary Feeding Practices

2 INFANT FEEDING AND COMPLEMENTARY FEEDING PRACTICES

2.1 Introduction

Child nutritional status is an important indicator of the general well-being of a population. Annually, more than one third of over 10 million deaths of children under-five are attributable to under nutrition. Underweight, stunting, wasting and micronutrient deficiencies are still prevalent throughout the developing world, particularly in marginalized and impoverished communities. There is also a rising concern of overweight and obesity in young children. Worldwide, it was estimated that 22 million children under-five were overweight in 2007, of which 75% of these children were from low- and middle-income countries (WHO, 2009). Both forms of malnutrition could be rooted in inappropriate care practices of infants and young children.

Adequate nutrition during infancy and early childhood is critical to child health and development. The period from birth to two years of age is particularly important because of the rapid growth and brain development that occurs during this time. The period is often marked by growth faltering, micronutrient deficiencies, and common childhood illnesses such as diarrhoea, as children transition from exclusive breastfeeding to solid foods in addition to breast milk. Nutritional insults, particularly stunting, that occur before a child reaches 2 years of age, could be irreversible and may have life-long consequences on growth and development (Martorell, Kettle & Schroeder, 1994).

Among the most important infant feeding practices as defined by World Health Organization (WHO) and United Nation Children Education Fund (UNICEF) are initiation of breastfeeding within 1 hour of birth, frequent and on demand feeding, exclusive breastfeeding (defined as breast milk and no other foods or liquids) for the first 6 months of life, breastfeeding complemented with locally available and hygienically prepared, appropriate foods from the age of 6 months, increased breastfeeding during illness and recovery, and continued breastfeeding for up to 2 years of age or beyond, while receiving nutritionally adequate and safe complementary foods (WHO, 2001).

Trend analysis of exclusive breastfeeding patterns in 38 developing countries from the UNICEF global databases (Labbok *et al*., 2006) showed that between 1990 and 2000, exclusive breastfeeding levels in the developing world increased 15% overall among infants younger than 4 months (from 46% to 53%) and among infants younger than 6 months (from 34% & to 39%). The largest improvements occurred in sub-Sahara Africa, where exclusive breastfeeding rates nearly doubled (18% in 1990 to 38% in 2000). The rates also increased in the Middle East and North Africa region (from 29% to 34%). However, the levels of exclusive breastfeeding in these two regions remain among the lowest of the regions analyzed.

In the developing countries, delayed complementary feeding and inadequate quality or quantity of complementary food is among the most common causes of growth faltering (Allen & Gillispie, 2001). Complementary feeding which is defined as provision of foods or liquids along with continued breastfeeding (WHO, 1998) is poorly done in many developing countries, due to lack of information about what foods are appropriate, how much should be given, how they should be given, and their inadequacy in quantity and quality (Tomkins & Watson, 1989).

Complementary foods should be started at the age of six months and appropriate infants and young child feeding practice includes continued breastfeeding or feeding with appropriate calcium rich foods it not breastfeeding, feeding a minimum number of times a day according to age and minimum number of food groups a day (PAHO/WHO, 2003; WHO, 2005).The standard indicator for assessing timely introduction of complementary foods is expressed by the percentage of infants 6 to 9 months who received breast milk and solid or semi-solid in the last 24 hours (WHO,1991). This indicator also provides information on delayed introduction of complementary foods. In the South Asian region, the rate of timely introduction of complementary feeding countries varies from 22% (Pakistan) to 98% (Sri Lanka) (Gupta & Arora, 2007).

Based on the WHO guiding principles for feeding breastfed (PAHO/WHO, 2003) and non-breastfed children (WHO, 2005), Infant and Young Child Feeding Practices (IYCF) indicator is defined as comprising three components, i.e. continued breastfeeding or feeding with appropriate calcium rich foods if not breastfed, feeding (solid/semi-solid food) minimum number of times per day according to age and breastfeeding status, and feeding minimum number of food groups per day according to breastfeeding status (Mukuria Kothari & Abdrrahim, 2006). Based on this indicator, it was reported that in most South Asian countries, the percentage of children receiving appropriate IYCF practices was less than 55% (Mukuria Kothari & Abdrrahim, 2006).

Breastfeeding and feeding of young children is one of the 6 care components commonly practiced by caregivers. The other 5 components included care for women, psychosocial and cognitive stimulation of children, hygiene practices, food preparation and storage practices and home health practices. Care is broadly defined as 'the provision in the household and the community of time, attention and support to meet the physical, mental and social needs of the growing child and other household members (ICN, 1992). The provision of care will depend on the resources available to the caregivers as well as support at the community, regional, national and international levels. Good care practices related to infant and young child feeding have been shown to positively influence child health and nutrition (Ruel *et al*., 1999; Armar-Klemesu *et al*., 2000; Ruel and Menon, 2002; Sawadogo *et al*., 2006)

INFANT FEEDING AND COMPLEMENTARY FEEDING PRACTICES

In Malaysia, nationally representative data on levels of exclusive breastfeeding was virtually unavailable before the 1990's. The Second National and Health Morbidity Survey (NHMS II) which was conducted in 1996 was the first national survey that used the indicators recommended by WHO for assessing breastfeeding indicators (WHO, 1991) and provided baseline data for the country. Findings of the NHMS II showed that although ever breastfeeding was almost universal, only one third of infants below four month of age were exclusively breastfed (Fatimah *et al.*1999). Significant differences were seen between urban (25.5%) and rural (32.7%) localities with higher prevalence of exclusive breastfeeding in the rural areas.

The Third National Health and Morbidity Survey (NHMS III) which was conducted 10 years after NHMS II reported that there was a decline of about 9.7% in the prevalence of exclusive breastfeeding below four months of age with a larger decline observed in the urban (12.9%) than rural areas (30.7%). Further analyses of the data showed that the overall prevalence of exclusive breastfeeding among infants below six months was only 14.5%. In terms of complementary feeding, only 41.5% infants received timely complementary feeding (i.e between the ages of six to ten months) and complementary food was given to infants as early as two months of age. In addition, only 55.9% of children aged 9-23 months received at least 3 meals a day (IPH, 2008).

Research on various aspects of infant feeding and complementary feeding practices such as care practices and nutritional status, feeding practices in minority groups, feeding practices and dietary adequacy is still lacking in Malaysia. Information derived from these research studies is important for the development of strategies that could enhance the health and nutrition of infant and young children in Malaysia.

2.2 Conceptual Framework on the Purpose and Scope of the Research Priority Area

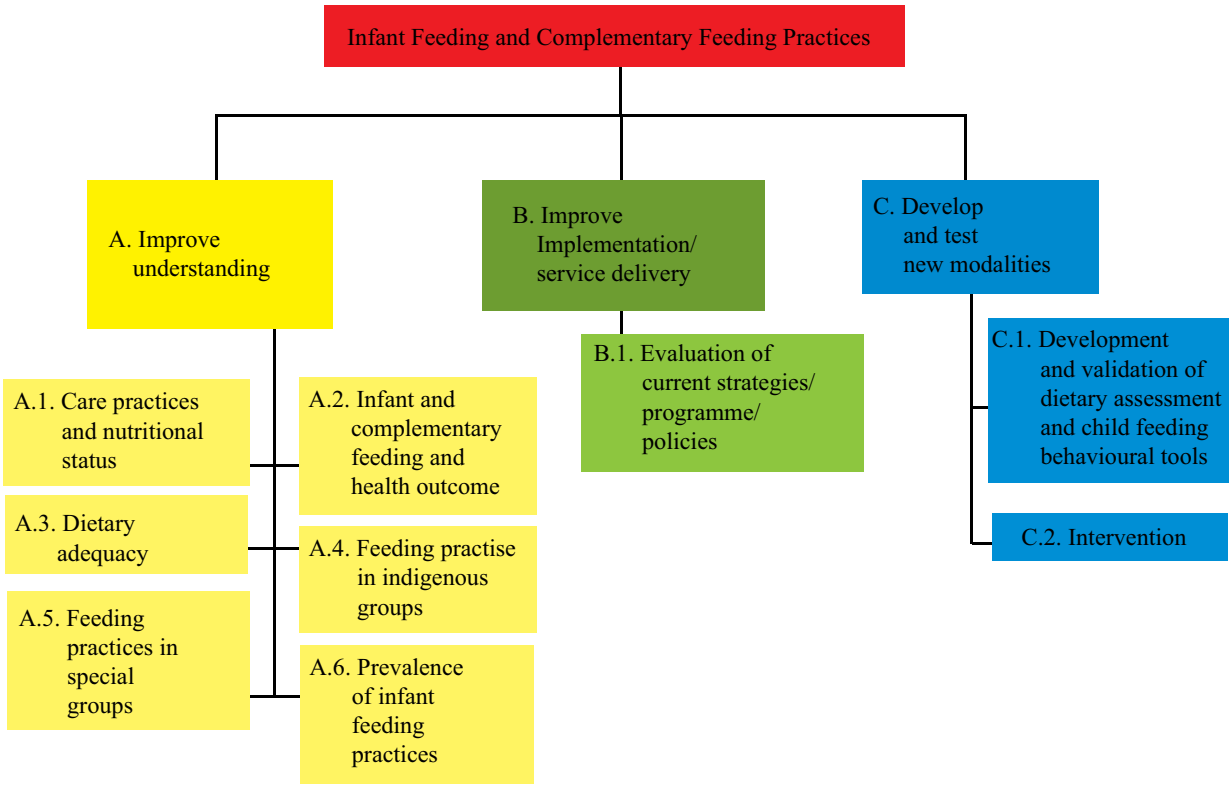

Figure 2.1: Purpose and scope of infant feeding and complementary feeding practices

2.3 Table of Nutrition Research Priority Area

The research priorities are presented in three tables. Table 2.1 presents the research purpose, scope, gaps and needs, rationale for priority ranking and the relative ranks of the scopes and topics. Table 2.2 presents the ranking criteria for suggested topics in each research scope. Table 2.3 presents the relative ranks for each research scope.

Table 2.1: Purpose and scope of infant feeding and complementary feeding practices

Purpose	Research Scope	Research Gaps and Needs	Rationale for Priority Ranking	Suggested Topic and/or Explanatory Notes	Relative Rank (Topic)	Relative Rank (Scope)
A. Improve Understanding	A.1 Impact of care practices on nutritional status of infant and children	Food adequacy is not the only factor that determines child health nutrition. Care practices have also been shown to have positive impact on child growth and survival. However, available local studies on care practices and child health are limited.	As care practices are cultural/ community specific, local information are required to improve understanding, hence in identifying and developing more effective interventions	A.1.1 Determinants of care practices with regards to infant and complementary feeding	1	1
				A.1.2 Impact of care practices on nutrition status	1	
				A.1.3 Impact of care practices on child development	2	
	A.2 Infant and complementary feeding and health outcome	Infant and complementary feeding has long term impact on growth, development and health status. Study on this relationship has produced mixed results.	Need to evaluate the impact of infant and complementary feeding on growth, development and health status in the local setting	A.2.1 Relationship of infant and complementary feeding with obesity	1	2
				A.2.2 Relationship between infant and complementary feeding with chronic diseases in adulthood	1	
				A.2.3 Relationship between breastfeeding practices and infections (acute respiratory infection, asthma, gastro enteritis, eczema)	2	
				A.2.4 Relationship between infant and complementary feeding with micronutrient adequacy	1	
				A.2.5 Impact of infant and complementary feeding on child development (cognitive, psychomotor and psycho-social)	1	

INFANT FEEDING AND COMPLEMENTARY FEEDING PRACTICES

Purpose	Research Scope	Research Gaps and Needs	Rationale for Priority Ranking	Suggested Topic and/or Explanatory Notes	Relative Rank (Topic)	Relative Rank (Scope)
	A.3 Dietary adequacy of infants and toddlers	Several intervention studies have reported active feeding style may improve diet intake and positive effects on child growth. Adequate diet quantity and quality is important for better growth and development. Local studies on feeding styles and practices are lacking and the available studies have mainly focus on overweight and obesity.	Need to pinpoint child feeding behaviour that makes the most difference to child health and development	A.3.1 Impact of care giver feeding behaviour on child food intake	1	3
				A.3.2 Types of food and milk, eating patterns including meals and snacks, sources of energy and nutrients, portions of food commonly consumed by infants and toddlers, energy and nutrient intake, dietary diversity to measure adequacy of diet	1	
				A.3.3 The use and impact on the dietary supplements in children	2	
	A.4 Feeding practices among children of indigenous groups	Socio-culture differences among the various indigenous groups affect feeding practices, dietary intake and nutritional status. More information is needed for health and nutrition intervention strategies.	Information is required to address the service needs of the indigenous people	A.4.1 Infant and complementary feeding among indigenous people	2	5
				A.4.2 Determinants of care practices with regards to infant and complementary feeding among indigenous people	1	
	A.5 Feeding practices among children of special groups	There is no local information on children of HIV mothers and other special group children that requires special diet.	Information is required to address the needs of the special groups	A.5.1 Dietary comparison among children with and without HIV	1	5
				A.5.2 Feeding pattern and nutritional status of HIV children/children with special needs	1	
	A.6. Prevalence of infant feeding practices	Currently indicators of infant feeding practices are inadequate	Lack of evidence and consensus on indicators of appropriate feeding practices in this age group has hindered progress in measuring and improving feeding practices	A.6.1 Assessing infant and young child feeding practices using the 8 indicators (WHO, 2007)	1	7

INFANT FEEDING AND COMPLEMENTARY FEEDING PRACTICES

Purpose	Research Scope	Research Gaps and Needs	Rationale for Priority Ranking	Suggested Topic and/or Explanatory Notes	Relative Rank (Topic)	Relative Rank (Scope)
B. Improve implementation/ service delivery	B.1 Current strategies/ programmes/ policies	Information on evaluation of infant and young child feeding strategies/ programmes/ activities is currently limited.	Many programmes have been implemented over the years. Hence, evaluation is needed to improve the effectiveness of the programmes	B.1.1 Assessing knowledge and skill of staff on infant and complementary feeding	1	8
				B.1.2 Assessing knowledge and skill of staff on growth monitoring	1	
				B.1.3 Assessing the effectiveness of activities such as nutrition component of child health sessions, post natal nursing and home visit	1	
C. Develop and test new modalities	C.1 Development and validation of dietary assessment and child feeding behavioural tools	Current methods of data collection are mostly based on recall method. Existing tools may not have been validated for use in the local context	Appropriate reliable and validated tools are required to conduct studies that will enhance our understanding on child feeding and care practices	C.1.1 Validation of recall method vs. observation in child feeding and care practices	3	6
				C.1.2 Validation of dietary diversity indicators to predict intake of a variety of essential nutrients	1	
				C.1.3 Validation of the child feeding index (8 core indicators, WHO 2007) to be utilized in Malaysia	3	
				C.1.4 Develop and test indicators of care giver feeding behaviours	2	
				C.1.5 Develop/ Validate new dietary assessment tool for children with special needs	2	

INFANT FEEDING AND COMPLEMENTARY FEEDING PRACTICES

Purpose	Research Scope	Research Gaps and Needs	Rationale for Priority Ranking	Suggested Topic and/or Explanatory Notes	Relative Rank (Topic)	Relative Rank (Scope)
	C.2 Intervention studies to improve child feeding and care practices	Current nutritional activities need to be customized and improved to meet the needs of specific groups. There is a need to develop and test various feeding and care strategies to improve child health and nutrition. At present, strategies commonly use in other country setting have not been well utilized in the local setting.	Appropriate approaches will improve child health and development	C.2.1 Develop new cost effective approaches in promoting best practices in child care and feeding (e.g.: nutrition education, counseling, food supplementation, etc)	1	4
				C.2.2 Develop rehabilitative intervention that is culturally appropriate	1	
				C.2.3 Develop low cost complimentary foods prepared locally available ingredients that is culturally accepted	2	
				C.2.4 Assess the efficacy and effectiveness of fortified complementary foods, sprinkles and spreads in addressing dietary gaps, including optimal levels of formulation and ration sizes to improve nutrient intakes	1	

Table 2.2: Ranking criteria for suggested topics in each research scope

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.1 Impact of care practices on nutritional status of infant and children	A.1.1 Determinants of care practices with regards to infant and complementary feeding	8	8		7			23	1
	A.1.2 Impact of care practices on nutritional status	8	8		7			23	1
	A.1.3 Impact of care practices on child development	7	7		6			20	2
A.2 Infant and complementary feeding and health outcome	A.2.1 Relationship of infant and complementary feeding with obesity	7	8		7			22	1
	A.2.2 Relationship between infant and complementary feeding with chronic diseases in adulthood	7	8		7			22	1
	A.2.3 Relationship between breastfeeding practice and infections (acute respiratory infection,asthma, gastro enteritis, eczema)	8	8		4			20	2

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	A.2.4 Relationship between infant and complementary feeding with micronutrient adequacy	8	8		6			22	1
	A.2.5 Impact of infant and complementary feeding on child development (cognitive, psychomotor and psycho-social)	8	8		6			22	2
A.3 Dietary adequacy of infants and toddlers	A.3.1 Impact of care giver feeding behaviour on child food intake	8	8	6				22	1
	A.3.2 Types of food and milk, eating patterns including meals and snacks, sources of energy and nutrients, portions of food commonly consumed by infants and toddlers, energy and nutrient intake, dietary diversity to measure adequacy of diet	8	8		6			22	1

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	A.3.3 The use and impact on the dietary supplements in children	7	6		6			19	2
C.2 Intervention studies to improve child feeding and care practices	C.2.1 Develop new cost effective approaches in promoting best practices in child care and feeding. (e.g.: nutrition education, counseling, food supplementation, etc)	9	9				7	25	1
	C.2.2 Develop rehabilitative intervention that is culturally appropriate	10	8				7	25	1
	C.2.3 Develop low cost complimentary foods prepared locally available ingredients that is culturally accepted	8	8				7	23	2
	C.2.4 Assess the efficacy and effectiveness of fortified complementary foods, sprinkles and spreads in addressing dietary gaps, including optimal levels of formulation and ration sizes to improve nutrient intake	9	9				7	25	1

INFANT FEEDING AND COMPLEMENTARY FEEDING PRACTICES

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.4 Feeding practices among children of indigenous groups	A.4.1 Infant and complementary feeding among indigenous people	6	6		6			18	2
	A.4.2 Determinants of care practices with regards to infant and complementary feeding among indigenous people	6	6		7			19	1
A.5 Feeding practices among children of special groups	A.5.1 Dietary comparison among children with and without HIV	7	7		7			21	2
	A.5.2 Feeding pattern and nutritional status of HIV children/children with special needs	7	7		7			21	2

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
C.1 Development and validation of dietary assessment and child feeding behavioural tools	C.1.1 Validation of recall method vs. observation in child feeding and care practices	7	6		7			20	3
	C.1.2 Validation of dietary diversity indicators to predict intake of a variety of essential nutrients	8	8		7			23	1
	C.1.3 Validation of the child feeding index (8 core indicators, WHO 2007) to be utilized in Malaysia	7	7		6			20	3
	C.1.4 Develop and test indicators of care giver feeding behaviours	8	7		7			22	2

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	C.1.5 Develop/ validate new dietary assessment tool for children with special needs	8	7		7			22	2
A.6. Prevalence of infant feeding practices	A.6.1 Assessing infant and young child feeding practices using the 8 indicators (WHO, 2007)	9	7		6			22	1
B.1 Current strategies/ programmes/ policies	B.1.1 Assessing knowledge and skill of staff on infant and complementary feeding	10	7	6				23	1
	B.1.2 Assessing knowledge and skill of staff on growth monitoring	10	7	6				23	1
	B.1.3 Assessing the effectiveness of activities such as nutrition component of child health sessions, post natal nursing and home visit	10	7				6	23	1

*1 = the lowest/ worst

Table 2.3: Relative ranks for each research scope

Research Scope	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
	Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.1 Impact of care practices on nutritional status of infant and children	9	9		7			25	1
A.2 Infant and complementary feeding and health outcome	9	8		7			24	2
A.3 Dietary adequacy of infants and toddlers	8	8	7				23	3
C.2 Intervention studies to improve child feeding and care practices	8	8				6	22	4
A.4 Feeding practices among children of indigenous groups	7	7		7			21	5
A.5 Feeding practices among children of special groups	7	7		7			21	5
C.1 Development and validation of dietary assessment and child feeding behaviour tools	7	6		7			20	6
A.6. Prevalence of infant feeding practices	6	6			6		18	7
B.1 Current strategies/ programmes/ policies	6	5				6	17	8

*1 = the lowest/ worst

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Research Priority Area 2

Monitoring of National Nutritional Status

3 MONITORING OF NATIONAL NUTRITIONAL STATUS

3.1 Introduction

The evolution in the lifestyle and dietary habits of Malaysians that has taken place over the last decade can be largely attributed to both in the family and social environment. These factors are known to affect the nutritional status of the community, whether children or adults. Reduced physical activity and changes in the diet have been the contributing factors to the rising prevalence of overweight and obesity both among children and adults (Mohd Ismail *et al*., 2009; IPH, 2008). However Malaysia, being a country in nutrition transition, it is quite typical that double burden of malnutrition coexist (NCCFN, 2006).

It is very important that national nutritional status surveys are carried regularly in order to set up baseline and social diagnosis data, and later on to strengthen it. Currently there is only one Malaysian adult nutrition survey (MANS) [(MOH, 2008)] which was carried out among adults aged 18 to 59 years, while several national and health morbidity surveys such as, NHMS II (1966) and NHMS III (2006) as well as Malaysian non communicable diseases (Malaysia NCD Surveillance 2006; IPH 1999; IPH 2008) have been carried out. Other large scale studies on nutritional status of school children (Mohd Ismail *et al*., 2009; Moy *et al*. 2004; Kasmini *et al*., 1997) and young children (MOH, 2000) have also been reported. In assessing the nutritional status, in some studies only the anthropometry is used as the key tool (IPH, 2008, Kasmini *et al*., 1997). In future nutritional status studies, it is imperative that all key components of nutritional status assessment be measured as this will ensure a comprehensive evaluation. This assessment should include determining the anthropometric status, energy and nutrient intakes, dietary/ meal pattern as well as habitual food intake and physical activity pattern.

With this background on past nutritional status carried out in Malaysia, it is clear that there is still a lack of national level data for several age groups in the population. In particular there is a need to study adolescents, elderly and the vulnerable groups such as infants and toddlers, preschoolers, pregnant women, elderly and the indigenous groups, On top of that, there is also a call for an improvement in the implementation with regards to the monitoring of national nutritional status. There should be regular periodic surveys, at least every 5 years or even every 10 years as long as the surveys are detailed and concise. There is also a need to improve the accessibility to the existing reports of past surveys. The development and the evaluation of a national nutrition data bank and a web based monitoring system are also required. Some emerging needs on the behavioural and socio economic issues need to be addressed. Currently there is no database on behavioural and economic factors.

The current food composition table in Malaysia has complete data on the macronutrients for 580 of raw foods and 203 of cooked food items (Tee *et al*., 1997). There is an urgency to improve and update the existing food composition database especially in some micronutrients such as zinc, selenium, vitamin D, vitamin B12, folic acid, fibre and fatty acids. This updated nutrient database is greatly and urgently needed in determining the dietary intake of all target groups in future national nutritional surveys and healthy dietary practices across the lifespan.

A large baseline database on nutritional status would be most useful to assist relevant policy makers, stakeholders and ministries such as Ministry of Health, Ministry of Education and Ministry of Women, Family and Community Development and the Ministry of Agriculture as a means to develop appropriate guidelines. In the food industries, such database could also help the industry to produce the right choice of food for the population.

3.2 Conceptual Framework on the Purpose and Scope of the Research Priority Area

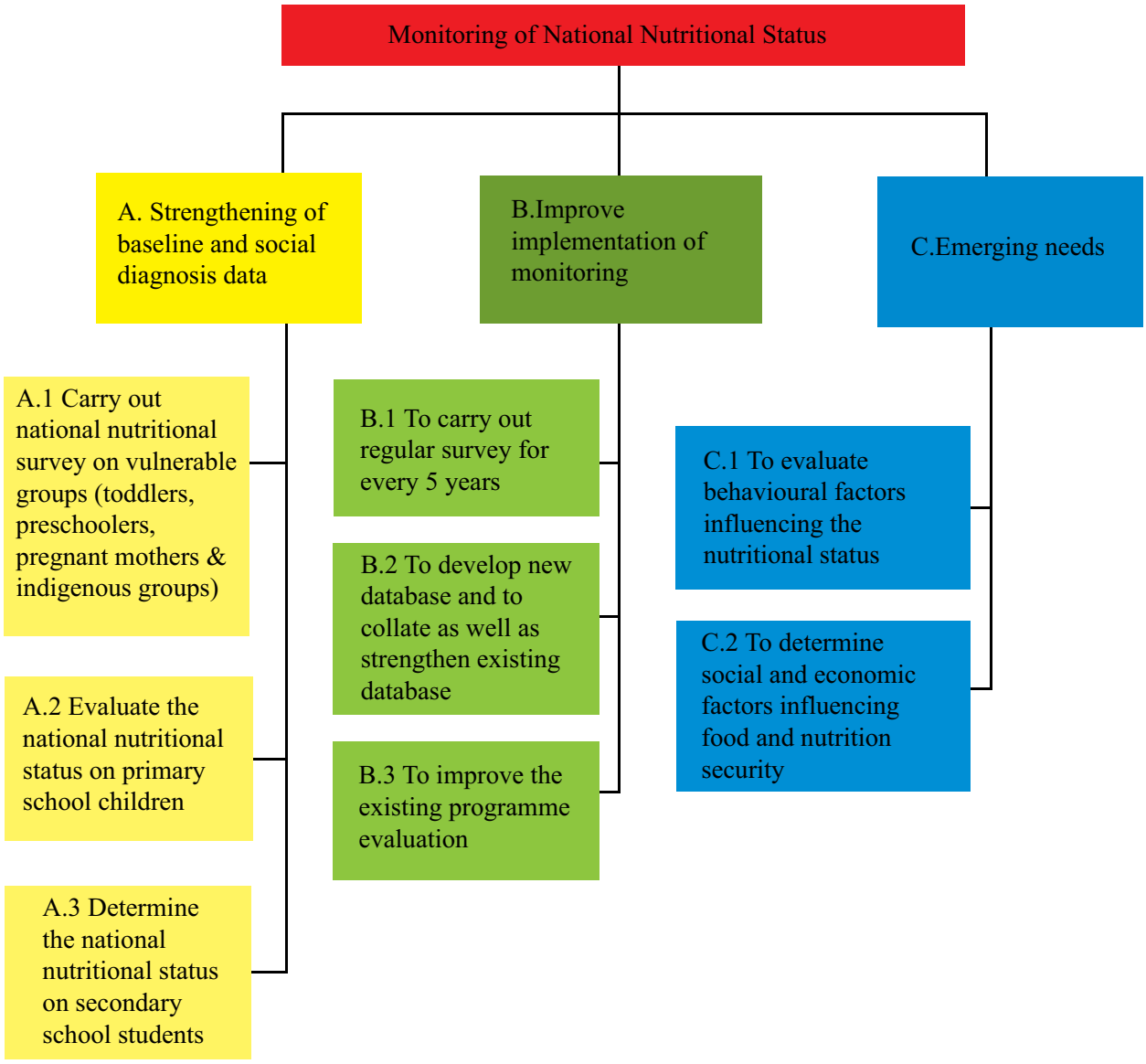

Figure 3.1: Purpose and scope of monitoring of national nutritional status

3.3 Table of Nutrition Research Priority Area

The research priorities are presented in three tables. Table 3.1 presents the research purpose, scope, gaps and needs, rationale for priority ranking and the relative ranks of the research purpose. Table 3.2 presents the ranking criteria for suggested topics in each research purpose. Table 3.3 presents the relative ranks for suggested topics of each research purpose.

Table 3.1: Purpose and scope of monitoring of national nutritional status

Purpose	Research Scope	Research Gaps and Needs	Rationale for Priority Ranking	Suggested Topic and/or Explanatory Notes	Relative Rank (Purpose)
A. Strengthening of baseline and social diagnosis data	A.1 Carry out national nutritional survey on vulnerable groups (toddlers, preschoolers, pregnant mothers & indigenous group)	Lack of national level data for suggested groups :- Nutritional status consist of the following components • food intake/ pattern • anthropometry • physical activity • biochemical • socio economics Total diet study to determine risk exposure to contaminants	The baseline data important for needs assessment and decision making process (policies and programmes) Food consumption statistics will be a pre-requisite to risk exposure and contamination.	A.1.1 National nutrition survey among toddlers and preschoolers	2
				A.1.2 National nutrition survey among elderly	
				A.1.3 National nutrition survey among pregnant women	
				A.1.4 National nutrition survey among indigenous group	
	A.2 Evaluate the national nutritional status on primary school children			A.2.1 National nutrition survey among primary school children	
	A. 3 Determine the nutritional status on secondary school students			A.3.1 National nutrition survey among secondary school students	
B. Improve implementation of monitoring	B.1 To carry out regular survey for every 5 years	No database No periodic survey Less accessibility of some existing reports	Ensuring proper planning, implementing, coordinating, monitoring and evaluation of the programmes and projects	B.1.1 National nutritional status survey among secondary school students for every 5 years	1
	B.2 To develop new database, collate and strengthen existing database			B.1.2 National nutritional status survey among primary school children for every 5 years	
	B.3 To improve the existing programme evaluation			B.1.3 National nutritional status survey among adults and elderly for every 5 years	
				B.2.1 Development and evaluation of National Nutrition Data Bank	
				B.3.1 Development and evaluation of web based monitoring system	

MONITORING OF NATIONAL NUTRITIONAL STATUS

Purpose	Research Scope	Research Gaps and Needs	Rationale for Priority Ranking	Suggested Topic and/or Explanatory Notes	Relative Rank (Purpose)
C. Emerging needs	C.1 To evaluate behavioural factors influencing to nutritional status	No database on behavioural and economic factors No comprehensive data on food balance sheet	The baseline data important for need assessment and decision making process (policies and programmes).	C.1.1 Evaluation of risk behaviour and socio economic factors on food consumption	3
	C.2 To determine social and economic factors influencing food and nutrition security			C.1.2 Determination of factors affecting the risk behaviour on dietary pattern and physical activity	
				C. 2.1 Evaluation of national study on food and nutrition security	

Table 3.2: Ranking criteria for suggested topics in each research purpose

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Ranks
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A. Strengthening of baseline and social diagnosis data	A.1.1 National nutrition survey among toddlers and preschoolers	8	8		7		7	30	3
	A.1.4 National nutrition survey among indigenous group	8	6		7		6	27	5
	A.3.1 National nutrition survey among secondary school students	8	8		7		7	30	3
B. Improve implementation on monitoring	B.2.1 Development and evaluation of National Nutrition Data Bank	9	9		7		7	32	1
	B.3.1 Development and evaluation of web based monitoring system	9	9		7		6	31	2
C. Emerging needs	C.1.1 Evaluation of risk behaviour and socio- economic factors on food consumption	8	8		7		6	29	4
	C.2.1 Evaluation of national study on food and nutrition security	8	8	6	7			29	4

*1 = the lowest/ worst

Table 3.3: Relative ranks for suggested topics in each research purpose

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Ranks
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B. Improve implementation on monitoring	B.2.1 Development and evaluation of National Nutrition Data Bank	9	9		7		7	32	1
	B.3.1 Development and evaluation of web based monitoring system	9	9		7		6	31	2
A. Strengthening of baseline and social diagnosis data	A.3.1 National nutrition survey among secondary school students	8	8		7		7	30	3
	A.1.1 National nutrition survey among toddlers and preschoolers	8	8		7		7	30	3
C. Emerging needs	C.1.1 Evaluation of risk behaviour and socio- economic factors on food consumption	8	8		7		6	29	4
	C.2.1 Evaluation of national study on food and nutrition security	8	8	6	7			29	4
A. Strengthening of baseline and social diagnosis data	A.1.4 National nutrition survey among indigenous group	8	6		7		6	27	5

*1 = the lowest/ worst

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Research Priority Area 3

Food Intake and Healthy Dietary Practices Across the Lifespan

4 FOOD INTAKE AND HEALTHY DIETARY PRACTICES ACROSS THE LIFESPAN

4.1 Introduction

Malaysia is proud to have achieved a dramatic child mortality decline in the past three decades, which was concurrent with decreased poverty rate and improved maternal health care. The role of nutrition has been one of the underlying driving force for the improvement in overall health of the population, particularly the decline in incidence of malnutrition in children. If we look at the role of nutrition and health across lifespan, we will witness many shortcomings that we have to grapple with in the coming decades. The age groups such as children, adolescents, adults and the elderly still require vast overall improvement in relation to nutritional status vis-à-vis non-communicable diseases or its antecedents. It is tragic that after having targeted healthy lifestyle campaigns for 12 years (1991- 2002), the results was very disappointing. The results of the NHMS II showed that overweight and obesity among adults were 17% and 4%, respectively (IPH, 1997). However, one year after the completion of the campaign, the Malaysian Adult Nutrition Survey (MANS) 2003, revealed that the prevalence of overweight has increased to 27% and obesity prevalence has risen to 12%. In addition, the recent NHMS III findings reported that the prevalence of overweight and obesity were 29% and 14%, respectively (IPH, 2008).

Another official report from the Malaysian Ministry of Health was the NCD Risk Factors in Malaysia, which showed an alarming prevalence on the state of non-communicable diseases in the country. The general prevalence of raised blood pressure, hypercholesterolemia, central obesity, physical inactivity and unhealthy diet among adults were, 25.7%, 53.3%, 48.6%, 60.1% and 72.8%, respectively (MOH, 2006). All the above findings were directly related to the food intake and dietary practices among our population. Despite our success in meeting some of the Millennium Development Goals (MDGs) targets, we failed in meeting our lifestyle campaigns objectives and the National Plan of Action for Nutrition of Malaysia (NPANM).

In order to have a more effective plan of action in combating the growing nutrition and health challenges in the near future, research is one of the primary area that needs to be nurtured. Policy and programme rooted in evidence based research will shed new light into our future plan of action.

Areas of studies or topics which are relevant to this research priority area are proposed for priority funding and support as listed in the respective sections.

4.2 Conceptual Framework on the Purpose and Scope of the Research Priority Area

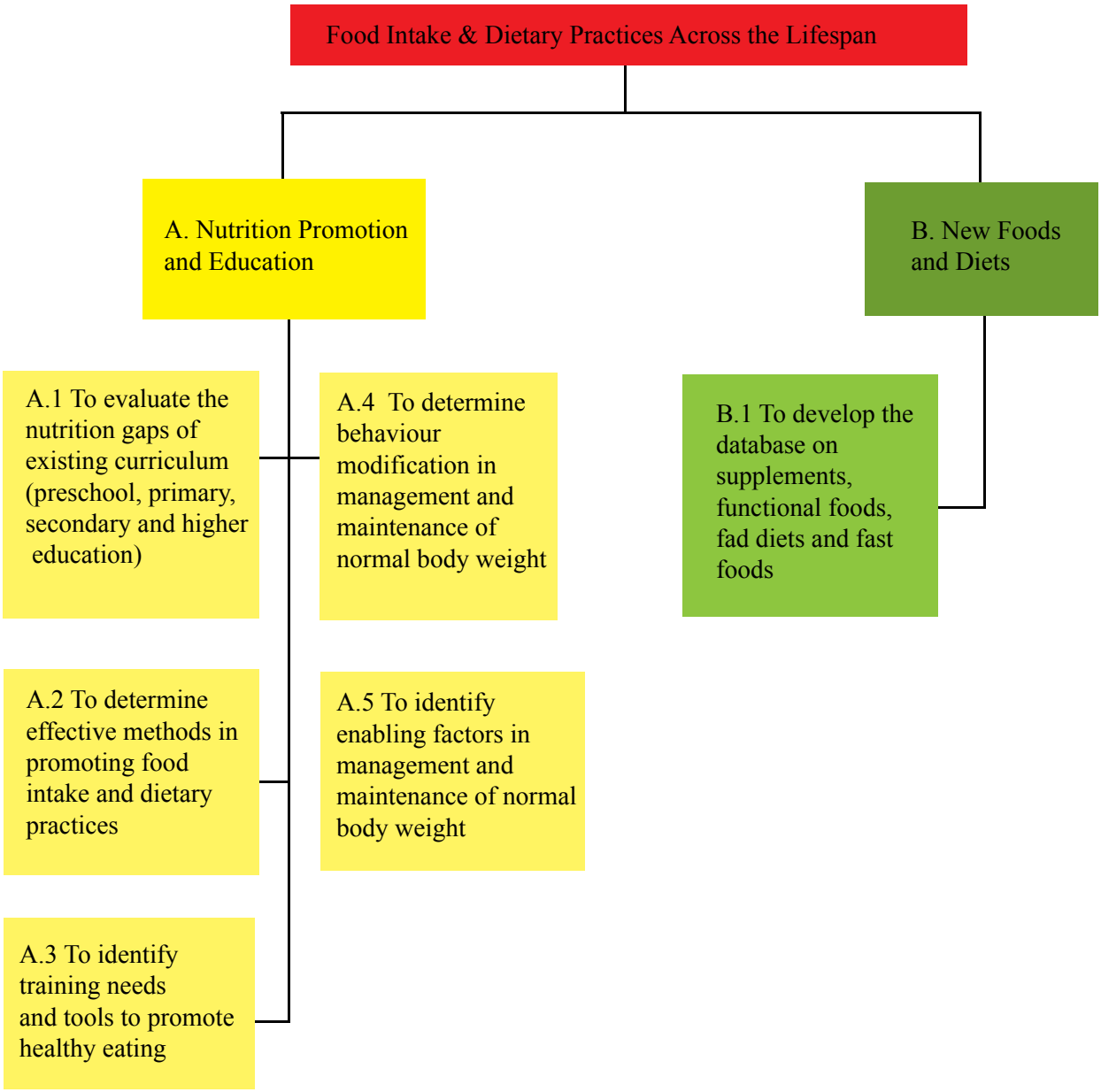

Figure 4.1: Purpose and scope of food intake and dietary practices across the lifespan

4.3 Table of Nutrition Research Priority Area

The research priorities are presented in three tables. Table 4.1 presents the research purpose, scope, gaps and needs, rationale for priority ranking and the relative ranks of the research purpose. Table 4.2 presents the ranking criteria for suggested topics of each research purpose. Table 4.3 presents the relative ranks for suggested topics in each research purpose.

Table 4.1: Purpose and scope of food intake and dietary practices across the lifespan

Purpose	Research Scope	Research Gaps and Needs	Rationale for Priority Ranking	Suggested Topic and/or Explanatory Notes	Relative Rank (Purpose)
A. Nutrition promotion and education	A.1 To evaluate the gaps of nutrition on existing curriculum (preschool, primary, secondary, higher education)	No database	Ensuring proper planning, implementing, coordinating, monitoring and evaluation of the programmes and projects The baseline data important for needs assessment and decision making process (policies and programmes)	A.1.1 Gap analysis of nutrition curriculum in the current education system	1
	A.2 To determine effective methods in promoting food intake and dietary practices			A.2.1 Determination of effective method in promoting dietary practices by age groups	
				A.2.2 Identifying effective strategies in promoting healthy dietary practices	
	A.3 To identify training needs and tools to promote healthy eating			A.3.1 Identification of training needs among health staffs on healthy eating	
	A.4 To determine the roles of behaviour modification in management and maintenance of normal body weight			A.3.2 Evaluation on the understanding of Dietary Guidelines and Food Pyramid	
				A.4.1 Assessing behavioural changes in relation with dietary practices	
	A.5 To identify enabling factors in management and maintenance of normal body weight			A.4.2 Evaluation of knowledge, attitudes and practice on the management and maintenance of normal body weight	
				A.5.1 Determination of dietary practices by ethnic groups and zones	

Purpose	Research Scope	Research Gaps and Needs	Rationale for Priority Ranking	Suggested Topic and/or Explanatory Notes	Relative Rank (Purpose)
				A.5.2 Risk behaviour factors in management and maintenance of normal body weight	
				A.5.3 Determination of dietary practices in relation to non-communicable Diseases	
				A.5.4 Barriers in the management and maintenance of normal body weight	
				A.5.5 Relationship of household food security and body mass index	
				A.5.6 Development of body weight and physical activity policies	
B. New foods and diets	B.1 To develop the database on supplements, functional foods, fad diets and fast foods	No baseline data on functional food, fad diet and fast food consumption No existing policy or regulation for fad diets and fast foods	The baseline data important for needs assessment and decision making process (policies and programmes)	B.1.1 Functional foods use among various age groups	2
				B.1.2 Fad diet practices among adolescents and adults	
				B.1.3 Fast food practices among various age groups	
				B.1.4 Convenient foods practices among various age groups (fast foods, hawker's)	
				B.1.5 Development of new food and diet policies	

Table 4.2: Ranking criteria for suggested topics in each research purpose

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance or Client Satisfaction		
A. Nutrition promotion and education	A.2.2 Identifying effective strategies in promoting healthy dietary practices	7	7		6		6	26	6
	A.3.1 Identification of training needs among health staffs on healthy eating	7	7		5		6	25	7
	A.3.2 Evaluation of the understanding of Dietary Guidelines and Food Pyramid	8	7		7		6	28	4
	A.4.1 Assessing behavioural changes in relation to dietary practices	9	8	7		7		31	1
	A.4.2 Evaluation of knowledge, attitudes and practices on management & maintenance of normal body weight	7	7			5	5	24	8
	A.5.1 Determination of dietary practices by ethnic groups and zones	6	6		6	6		24	8

FOOD INTAKE AND HEALTHY DIETARY PRACTICES ACROSS THE LIFESPAN

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	A.5.2 Risk behavioural factors in management and maintenance of normal body weight	8	8			6	7	29	3
	A.5.3 Determination of dietary practices and in relation to non-communicable diseases	8	8	7		7		30	2
	A.5.5 Relationship between household food security and body mass index	6	5		6		6	23	9
	A.5.6 Development of body weight and physical activity policies	7	7		5		6	25	7

FOOD INTAKE AND HEALTHY DIETARY PRACTICES ACROSS THE LIFESPAN

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.5.2 Risk behavioural factors in management and maintenance of normal body weight	A.5.2 Risk behavioural factors in management and maintenance of normal body weight	8	8			6	7	29	3
	A.5.3 Determination of dietary practices in relation to non-communicable diseases	8	8	7		7		30	2
	A.5.5 Relationship between household food security and body mass index	6	5		6		6	23	9
	A.5.6 Development of body weight and physical activity policies	7	7		5		6	25	7

FOOD INTAKE AND HEALTHY DIETARY PRACTICES ACROSS THE LIFESPAN

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B. New foods and diets	B.1.1 Functional foods use among various age groups	7	7		6	6		26	6
	B.1.2 Fad diet practices among adolescents and adults	7	7		7		6	27	5
	B.1.4 Convenient food practices among various age groups (fast foods, hawker's)	8	8		7		6	29	3
	B.1.5 Development of new food and diet policies	5	6	6		6		23	9

*1 = the lowest/ worst

Table 4.3: Relative ranks for suggested topics for each research purpose

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A. Nutrition promotion and education	A.4.1 Assessing behavioural changes in relation with dietary practices	9	8	7		7		31	1
	A.5.3 Determination of dietary practices in relation to non-communicable diseases	8	8	7		7		30	2
	A.5.2 Risk behavioural factors in management and maintenance of normal body weight	8	8			6	7	29	3
B. New foods and diets	B.1.4 Convenient food practices among various age groups (Fast foods, hawker's)	8	8		7		6	29	3
A. Nutrition promotion and education	A.3.2 Evaluation on the understanding of Dietary Guidelines and Food Pyramid	8	7		7		6	28	4
B. New foods and diets	B.1.2 Fad diet practices among adolescents and adults	7	7		7		6	27	5

FOOD INTAKE AND HEALTHY DIETARY PRACTICES ACROSS THE LIFESPAN

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A. Nutrition promotion and education	A.2.2 Identifying effective strategies in promoting healthy dietary practices	7	7		6		6	26	6
B. New foods and diets	B.1.1 Functional food use among various age groups	7	7		6	6		26	6
A. Nutrition promotion and education	A.3.1 Identification of training needs among health staffs on healthy eating	7	7		5		6	25	7
	A.5.6 Development of body weight and physical activity policies	7	7		5		6	25	7
	A.4.2 Evaluation of knowledge, attitudes and practices on management & maintenance of normal body weight	7	7			5	5	24	8
	A.5.1 Determination of dietary practices by ethnic groups and zones	6	6		6	6		24	8

FOOD INTAKE AND HEALTHY DIETARY PRACTICES ACROSS THE LIFESPAN

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	A.5.5 Relationship between household food security and body mass index	6	5		6		6	23	9
B. New foods and diets	B.1.5 Development of new food and diet policies	5	6	6		6		23	9

*1 = the lowest/ worst

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Research Priority Area 4

Macro and Micronutrient Excesses and Deficiencies

5 MACRO AND MICRONUTRIENT EXCESSES AND DEFICIENCIES

5.1 Introduction

Malaysia faces the double burden of both undernutrition and overnutrition challenges. While protein-energy malnutrition and micronutrient deficiency persist in low-income and indigenous population, prevalence of overweight children especially from urban areas is emerging and obesity among adults has been growing. Hence, the need to pursue studies on macronutrient and micronutrient excesses and deficiencies has been identified as one of the priority research areas.

Micronutrient deficiencies are a significant cause of malnutrition and associated ill health throughout the world. It is described as the hidden hunger as it often goes unnoticed, even by those affected. Consequences of subclinical forms of micronutrient deficiency can be far reaching, affecting physical growth and causing problems with immunological and cognitive maturation that may be irreversible. Micronutrient deficiencies also lead to birth defects, blindness, as well as decreased school and work performance and poor general health.

In Malaysia, much has been done in identifying and combating problems of "old" but persistent micronutrient deficiencies such as iron deficiency in young children, female subjects of reproductive age and the elderly; iodine deficiency particularly in Sarawak and Sabah and among Orang Asli women and to a lesser extent mild subclinical vitamin A deficiency in rural children. However, there are still gaps in knowledge and cost-effective intervention strategies to be explored.

At the same time, there is a paucity of information on emerging micronutrient deficiency problems identified worldwide such as zinc, selenium, folate and vitamin B12. The other scenario is the rise of micronutrient deficiencies thought to have been overcome such as vitamin D. Rickets due to vitamin D deficiency is hardly reported now but hypovitaminosis D seems to be re-emerging as a worldwide phenomenon not only in Western countries but also in Asia. Recent local studies have shown that despite the abundance of sunshine in the country, Malaysian primary school children, young adults and elderly do not have adequate vitamin D status. Calcium intake is perpetually low (less than 500 mg) across all age-groups. Health consequences of poor vitamin D status include osteoporosis (coupled with low calcium intake) and have been linked with increased risk of other chronic diseases such as diabetes and some cancers.

With this background information on the current situation in Malaysia, the framework for purpose and scope for this research priority area is shown in Figure 5.1. The first focus will be to strengthen epidemiological understanding on the extent of certain macro or micronutrient deficiencies or excesses in the country. In this respect, there is a need to carry out national assessment on the prevalence of deficiency of important micronutrients including zinc and folate, vitamin D and macronutrients such as

dietary fibre and trans fatty acids where data is lacking. The rationale is to develop a sound dataset on the status of Malaysians and the link to health outcomes if deficiencies or excesses exist in our population. The second focus of research priority is in evaluating current strategies and developing novel ways to improve micronutrient status. Several intervention efforts have been put in place by the Ministry of Health to help alleviate these micronutrient deficiencies including iron, folic acid and multivitamin supplementation as well as milk and food supplement programmes. These existing food supplement programmes should be evaluated periodically for their efficacy and efficiency, toward rendering these programmes more cost-effective. For example, studies on feasibility of food fortification can test if this vehicle can be a cost-effective measure to combat micronutrient deficiencies.

While the use of micronutrient supplements serves as an important approach toward the alleviation of malnutrition in specific conditions, the long-term solution of micronutrient deficiency lies in food-based intervention programmes. Innovative methods to tap on locally available foods can be developed for their specific nutrients to alleviate micronutrient deficiencies.

The third focus of research is on enhancing current delivery systems, to help intervention strategies reach deserving target subjects. Intervention efforts need to be intensified especially among the poor in rural and urban areas. Innovative technologies can be used to track target groups and ensure delivery of programmes reach them.

5.2 Conceptual Framework on the Purpose and Scope of the Research Priority Area

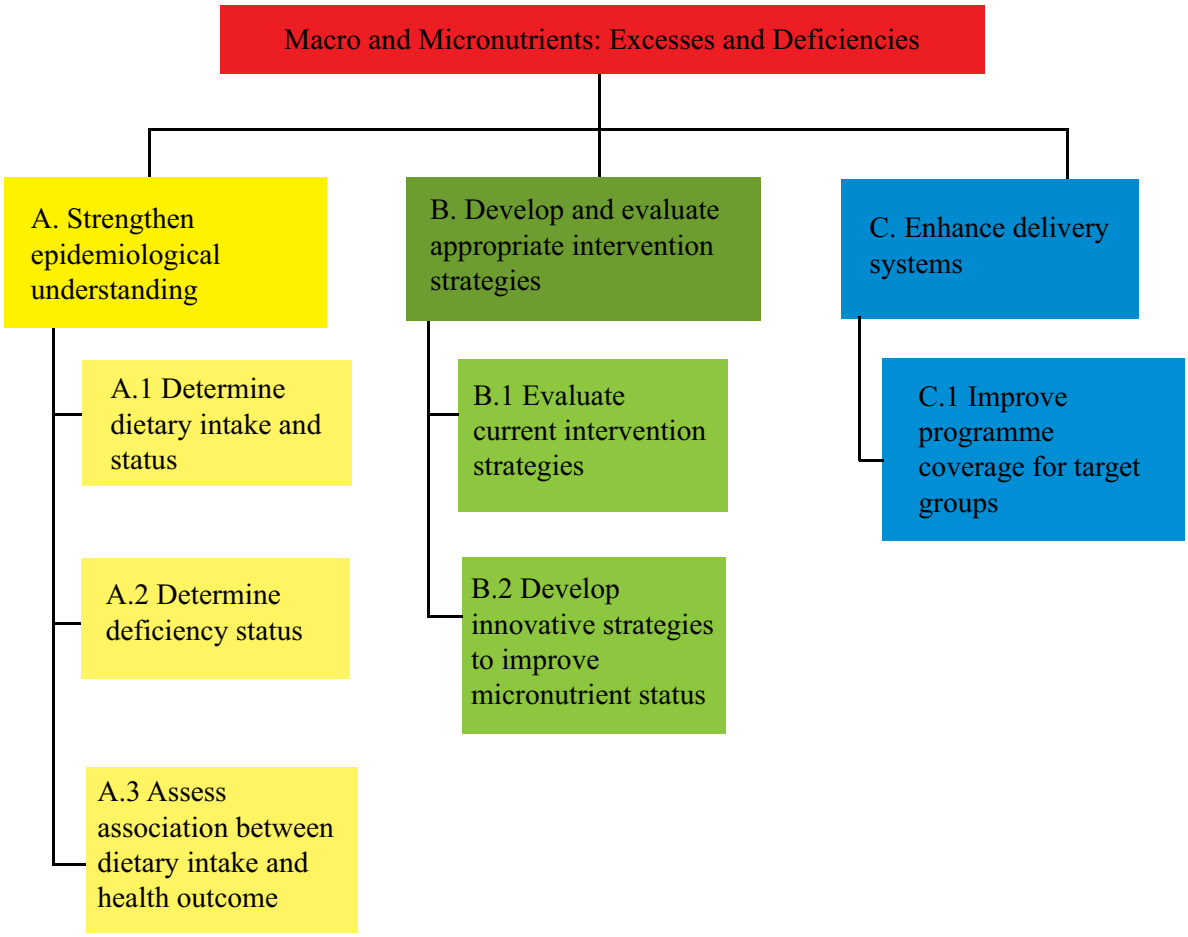

Figure 5.1: Purpose and scope of macro and micronutrients excesses and deficiencies

5.3 Table of Nutrition Research Priority Area

The research priorities are presented in three tables. Table 5.1 presents the research purpose, scope, gaps and needs, rationale for priority ranking and the relative ranks of the scopes and topics. Table 5.2 presents the ranking criteria for suggested topics in each research scope. Table 5.3 presents the relative ranks for each suggested topic.

Table 5.1: Purpose and scope of macro and micronutrients excesses and deficiencies

Purpose	Research Scope	Nutrients	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Purpose)
A. Strengthen epidemiological understanding	A.1 Determine dietary intake and status	Fats, fatty acids	Understanding status of trans fatty acid intake in population	A.1.1 Assessment of trans fatty acid intake in children and adults	15	4
		Carbohydrate, dietary fibre	Amount and type of dietary fibre in the population	A.1.2 Assessment of dietary fibre intake (amount and types) across population	10	2
		Zinc	Gap in data on typical dietary intake and prevalence of zinc status	A.1.2 Assessment of dietary fibre intake (amount and types) across population	7	1
		Selenium	Gap in data on typical dietary intake and prevalence of selenium status	A.1.4 Assessment of dietary intake of selenium of adults	17	5
		Vitamin A, selenium, zinc	Lack of data on bioavailability of micronutrients in local foods and meal pattern context	A.1.5 Determination of bioavailability of vitamin A, selenium, zinc in mixed diet	11	3
	A.2 Determine deficiency status	Zinc	Lack of data on zinc in children, reproductive age women, pregnancy and elderly	A.2.1 Prevalence of zinc deficiency in children, reproductive age women, pregnancy and elderly	8	2
		Selenium	Lack of data on selenium deficiency in adults	A.2.2 Prevalence of selenium deficiency in adults	20	3
		Calcium, Vitamin D	Lack of data on vitamin D status in the population	A.2.3 Determination of vitamin D status and associated factors across population	5	1

Purpose	Research Scope	Nutrients	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Purpose)
	A.3 Assess association between dietary intake and health outcome	Fatty acid	Plasma fatty acid profile of population and cardiovascular risk	A.3.1 Assessing dietary intake and fatty acid profile of population in relation to cardiovascular risk	13	6
		Carbohydrate, fats	Ratio of carbohydrate and fats on cardiovascular risk	A.3.2 Impact of different intake levels of carbohydrate and fats on cardiovascular risks (feeding trials)	6	3
			Impact of glycemic index on health or diseases outcomes	A.3.3 Effects of glycemic index on metabolic syndrome	18	8
		Zinc	Lack of data on association between zinc intakes and status and health outcomes	A.3.4 Effects of zinc status and health outcomes: growth retardation, immune status and pregnancy outcome	3	2
		Selenium	Association between selenium intake and chronic disease	A.3.5 Association of selenium status on diabetes and cancer risk	14	7
		Calcium, Vitamin D	Impact of low calcium intake and vitamin D status on health outcomes e.g. bone health across lifespan	A.3.6 Association of calcium and vitamin D status on health outcomes e.g. osteoporosis, colon cancer, cardiovascular	2	1
		Vitamin B12, folate	Lack of data on prevalence of vitamin B12 deficiency in specific population	A.3.7 Assessment of vitamin B12, folate and homocysteine in relation to cardiovascular risks	12	5
		Vitamin B12, folate, ferum	Lack of data on prevalence of vitamin B12, folate and ferum amongst children and elderly.	A.3.8 Interactions between vitamin B12, folate and ferum in anaemia amongst children and elderly	9	4
B. Develop and evaluate appropriate intervention strategies	B.1 Evaluate current intervention strategies	Iron, folate	Need data for effectiveness of wheat flour fortification	B.1.1 Determine iron and folate status pre and post fortification	1	1
		Folic acid, iron	Lack data on compliance of folic acid and iron supplementation in pregnancy	B.1.2 Determine compliance rate and associated factors of folic acid and iron supplementation among pregnant women	4	2

Purpose	Research Scope	Nutrients	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Purpose)
	B.2 Develop innovative strategies to improve micronutrient status	-	Need for convenient food products (cost effective) for target groups	B.2.1 Formulation of convenient food products (cost effective) for target groups	16	1
C. Enhancing delivery systems	C.1 Improve programme coverage for target groups	-	Difficulty to trace target groups for programme delivery	C.1.1 Applying GPRS technology to improve programme coverage	19	1

Table 5.2: Ranking criteria for suggested topics in each research scope

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.1 Determine dietary intake and status	A.1.1 Assessment of trans fatty acid intake in children and adults	6	4		2	2		14	15
	A.1.2 Assessment of dietary fibre intake (amounts and types) across population	6	4		4	2		16	10
	A.1.3 Assessment of dietary intake of zinc amongst children, reproductive age women, pregnancy and elderly	6	4		4	4		18	7
	A.1.4 Assessment of dietary intake of selenium of adults	4	4		4	2		14	17
	A.1.5 Determination of bioavailability of vitamin A, selenium, zinc in mixed diet	4	4		4	3		15	11

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.2 Determine deficiency status	A.2.1 Prevalence of zinc deficiency in children, reproductive age women, pregnancy and elderly	6	4		4	4		18	8
	A.2.2 Prevalence of selenium deficiency in adults	4	4		2	2		12	20
	A.2.3 Determination of Vitamin D status and associated factors across population	6	6		4	4		20	5
A.3 Assess association between dietary intake and health outcome	A.3.1 Assessing dietary intake and fatty acid profile of population in relation to cardiovascular risk	4	4		4	2		14	13
	A.3.2 Impact of different intake levels of carbohydrate and fats on cardiovascular risks (feeding trials)	6	6		4	4		20	6
	A.3.3 Effects of glycemic index on metabolic syndrome	4	2		2	4		12	18

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	A.3.4 Effects of zinc status and health outcomes: growth retardation, immune status and pregnancy outcome	7	7		4	4		22	3
	A.3.5 Association of selenium status on diabetes and cancer risk	4	4		4	2		14	14
	A.3.6 Association of calcium and vitamin D status on health outcomes e.g. osteoporosis, colon cancer, cardiovascular	8	8		4	4		24	2
	A.3.7 Assessment of vitamin B12, folate and homocysteine in relation to cardiovascular risks	6	4		2	2		14	12
	A.3.8 Interactions between vitamin B12, folate and ferum in anaemia amongst children and elderly	6	7		2	2		17	9

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.1 Evaluate current intervention strategies	B.1.1 Determine iron and folate status pre and post fortification	8	8		5	5		26	1
	B.1.2 Determine compliance rate and associated factors of folic acid and iron supplementation among pregnant women	7	6		4		4	21	4
B.2 Develop innovative strategies to improve micronutrient status	B.2.1 Formulation of convenient food products (cost effective) for target groups	4	4		2		4	14	16
C.1 Improve programme coverage for target groups	C.1.1 Applying GPRS technology to improve programme coverage	4	4		2	2		12	19

*1 = the lowest/ worst

Table 5.3: Relative ranks for each suggested topic

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.1 Evaluate current intervention strategies	B.1.1 Determine iron and folate status pre and post fortification	8	8		5	5		26	1
A.3 Assess association between dietary intake and health outcome	A.3.6 Association of calcium and vitamin D status on health outcomes e.g. osteoporosis, colon cancer, cardiovascular	8	8		4	4		24	2
A.3 Assess association between dietary intake and health outcome	A.3.4 Effects of zinc status and health outcomes: growth retardation, immune status and pregnancy outcome	7	7		4	4		22	3
B.1 Evaluate current intervention strategies	B.1.2 Determine compliance rate and associated factors of folic acid and iron supplementation among pregnant women	7	6		4		4	21	4
A.2 Determine deficiency status	A.2.3 Determination of vitamin D status and associated factors across population	6	6		4	4		20	5
A.3 Assess association between dietary intake and health outcome	A.3.2 Impact of different intake levels of carbohydrate and fats on cardiovascular risks (feeding trials)	6	6		4	4		20	6

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.1 Determine dietary intake and status	A.1.3 Assessment of dietary intake of zinc amongst children, reproductive age women, pregnancy and elderly	6	4		4	4		18	7
A.2 Determine deficiency status	A.2.1 Prevalence of zinc deficiency in children, reproductive age women, pregnancy and elderly	6	4		4	4		18	8
A.3 Assess association between dietary intake and health outcome	A.3.8 Interactions between Vitamin B12, folate and ferum in anaemia amongst children and elderly	6	7		2	2		17	9
A. 1 Determine dietary intake and status	A.1.2 Assessment of dietary fibre intake (amount and types) across population	6	4		4	2		16	10
A.1 Determine dietary intake and status	A.1.5 Determination of bioavailability of vitamin A, selenium, zinc in mixed diet	4	4		4	3		15	11
A.3 Assess association between dietary intake and health outcome	A.3.7 Assessment of vitamin B12, folate and homocysteine in relation to cardiovascular risks	6	4		2	2		14	12

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.3 Assess association between dietary intake and health outcome	A.3.1 Assessing dietary intake and fatty acid profile of population in relation to cardiovascular risk	4	4		4	2		14	13
A.3 Assess association between dietary intake and health outcome	A.3.5 Association of selenium status and diabetes and cancer risk	4	4		4	2		14	14
A.1 Determine dietary intake and status	A.1.1 Assessment of trans fatty acid intake in children and adults	6	4		2	2		14	15
B.2 Develop innovative strategies to improve micronutrient status	B.2.1 Formulation of convenient food products (cost effective) for target groups	4	4		2		4	14	16
A.1 Determine dietary intake and status	A.1.4 Assessment of dietary intake of selenium among adults	4	4		4	2		14	17
A.3 Assess association between dietary intake and health outcome	A.3.3 Effects of glycemic index on metabolic syndrome	4	2		2	4		12	18
C.1 Improve programme coverage for target groups	C.1.1 Applying GPRS technology to improve programme coverage	4	4		2	2		12	19
A.2 Determine deficiency status	A.2.2 Prevalence of selenium deficiency in adults	4	4		2	2		12	20

*1 = the lowest/ worst

Research Priority Area 5

Overweight and Obesity

6 OVERWEIGHT AND OBESITY

6.1 Introduction

The accelerated phase of industrialization and urbanization in recent decades has inevitably brought about changes in lifestyle of Malaysians (Ismail, 2002). Changes in dietary habits and sedentary lifestyles are known to be associated with changes in health and increased prevalence of chronic diseases in the population. Obesity is a major contributor to the global burden of disease such as type 2 diabetes, cardiovascular diseases, hypertension and certain cancers (WHO, 2000). It also drastically reduces quality of life and is costly in terms of absence from work and use of health resources besides posing numerous psychosocial problems such as depression, lowered self esteem, job discrimination and other form of social stigmatization (WHO, 2000).

Available data suggest that prevalence of overweight and obesity in Malaysia over the last decade has matched that of some developed countries (Ismail *et al*., 2001). The Second National Health Morbidity Survey in 1996 (IPH 1999) reported a prevalence of 17% overweight and 4 % obesity in adults, while the recent NHMS III conducted in year 2006 (IPH 2008) revealed an increase of overweight and obesity to 29% and 14%, respectively.

For children and adolescents, the NHMS III reported a prevalence of 5.4% for overweight based on the CDC (2000) weight-for-age charts (IPH 2008). Tee *et al*. (2002) studying 5,995 children aged 7 to 10 years in Kuala Lumpur reported a prevalence of overweight of 9.7% among boys and 7.1% among girls based on >95th percentile of the BMI-for-age (WHO 1995). In marked contrast, Khor & Tee (1997) reported a prevalence of less than 2% among 3,000 rural children.

Among male adolescents, the prevalence increased from 1% in 1990 to 6% in 1997 (Ismail & Zulkifli, 1996; Ismail & Vickneswary, 1999). A study carried out in 2004 on 5294 adolescents aged 12-18 years reported a prevalence of overweight and obesity in boys were 20.3% and girls were 17.7% (Poh *et al*. 2003). A survey of 11,500 school children aged 6-12 years in Peninsular Malaysia revealed about 10% were overweight and 6% obese for both sexes with small differences between urban and rural children (Ismail *et al*., 2009). A recently completed survey of primary school children in Peninsular and East Malaysia found 12.6% overweight and 13.5% obese based on the WHO (2007) BMI-for-age growth reference (Ruzita *et al*., 2009).

It should be noted that these studies were reported using different cut-offs/criteria for defining overweight. The findings are therefore not strictly comparable. Moreover, there has been suggestion that BMI cut-off points may not be universally appropriate for determination of obesity (Deurenberg, 2001). There have also been suggestions that abdominal obesity may be better associated with obesity-related health risks (Zhu *et al*., 2002; Janssen, Katzmarzyk & Ross, 2004), and hence the call for appropriate waist circumference references for adult populations (Misra, Wasir & Vikram, 2005), and for children (McCarthy, 2006).

The process of obesity management covers a spectrum of strategies ranging from prevention through weight maintenance and management of obesity co-morbidities to weight loss. The elements of this spectrum are interdependent so, truly effective management strategies will need to address all elements in a coordinated manner through a variety of settings (Ismail, Poh & Zawiah, 2005).

As Malaysia progresses rapidly towards a developed economic status, a national strategy needs to be developed to prevent, treat and manage obesity. Obesity research in Malaysia is very much in its infancy. It is imperative that a multi-disciplinary programme with projects that has not been carried out before be supported in order to improve our understanding on how to reduce the escalation of this rising epidemic.

Figure 6.1 shows the conceptual framework on the purpose and scope of the research priority areas for obesity and overweight. The research scope covers three general areas, namely improvement in understanding the problems related to overweight and obesity, improvement in the effectiveness of obesity prevention and management, and development of new modalities in relation to the diagnosis and treatment of overweight and obesity.

In the scope 'improvement of understanding', two separate sub-scopes were identified, namely epidemiology, which includes determining prevalence in the population as well as risk factors and costs; and aetiology, which includes the causes of overweight and obesity. The sub-scope of epidemiology covers the definition of overweight and obesity; obesity and CVD risk factors; early nutrition and adult adiposity; and economic and social costs of overweight and obesity. The sub-scope of aetiologies covers dietary intake in relation to appetite control, eating behaviour and dieting; metabolic susceptibility; physical activity; and the genetics of obesity.

The scope 'improving effectiveness' covers both the prevention and intervention aspects, as well as management of obesity, and policy and environment affecting overweight and obesity. The scope 'development of new modalities' covers diagnosis of overweight and obesity, and treatment methods, including herbal, functional foods, and other novel and practical intervention strategies.

6.2 Conceptual Framework on the Purpose and Scope of the Research Priority Area

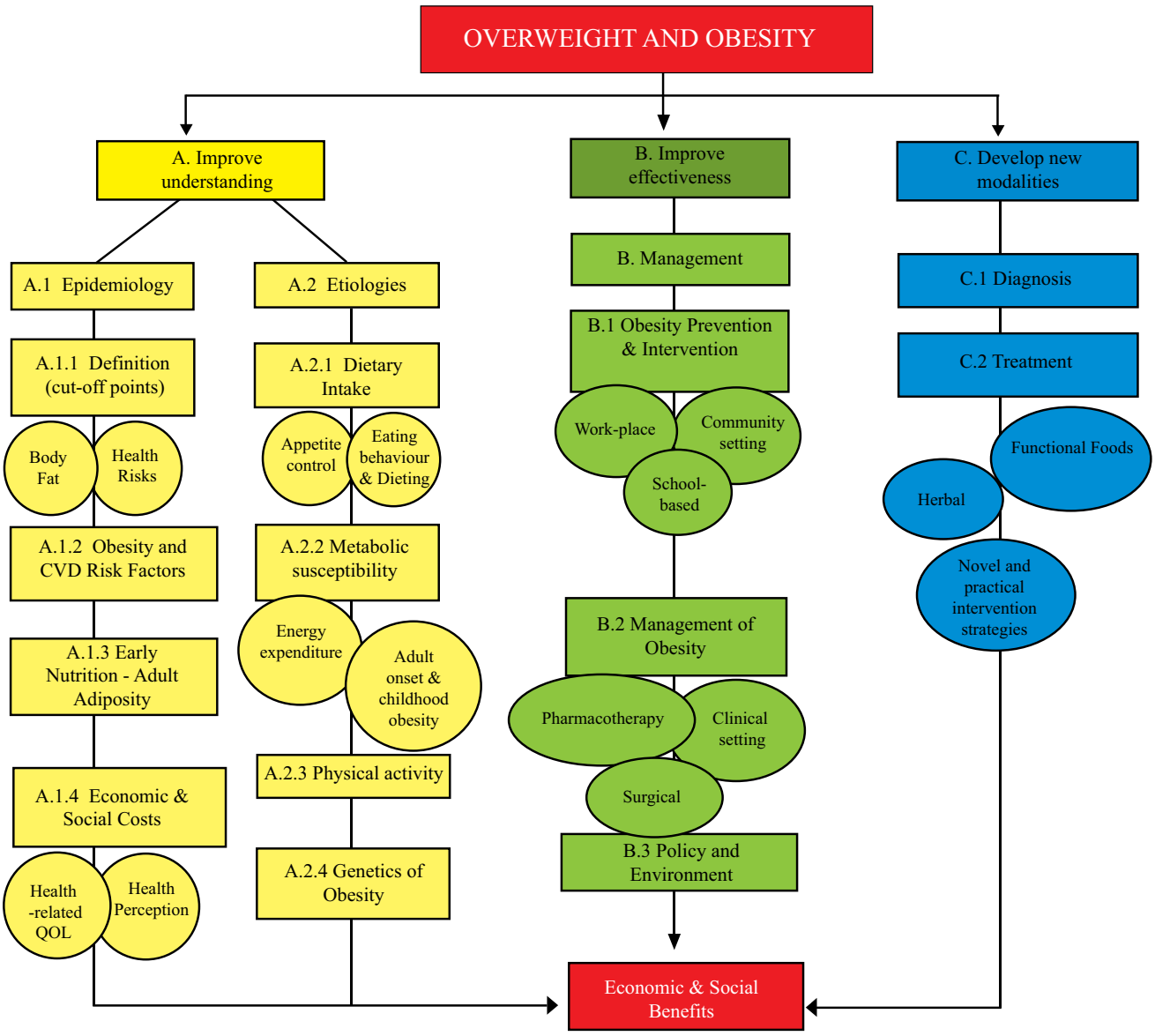

Figure 6.1: Purpose and scope of overweight and obesity

6.3 Table of Nutrition Research Priority Area

The research priorities are presented in three tables. Table 6.1 presents the research purpose, scope, gaps and needs, rationale for priority ranking and the relative ranks of the scopes and topics. Table 6.2 presents the ranking criteria for suggested topics in each research scope. Table 6.3 presents the relative ranks for each research scope.

Table 6.1: Purpose and scope of overweight and obesity

Purpose	Research Scope	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Topic)
A.1 Improve understanding on Epidemiology of Obesity	A.1.1 Definition of overweight and obesity	Current BMI definition by WHO is controversial for Asians/ Malaysians. For the same BMI, it has been suggested that Asians have higher body fat composition and thus predispose them to comorbidities	A.1.1.1 Definition of BMI cut-offs for Malaysians based on body fat composition A.1.1.2 Cohort study to identify appropriate of BMI cut-offs for Malaysians based on to co-morbidities	2	1
			A.1.1.2 Cohort study to identify appropriate of BMI cut-offs for Malaysians based on comorbidities	2	1
		Waist circumference is an important indicator of central obesity. Cut-offs for waist circumference of adults are known, but not for children and adolescents	A.1.1.3 Development of waist circumference centile charts for children and adolescents	2	2
	A.1.2 Obesity and cardiovascular risk factors	There is lack of sufficient data and the consequence of higher body fat in Malaysian has not been scientifically established	A.1.2.1 Relationship between body composition and morbidity in adult Malaysians	4	2
			A.1.2.2 Relationship between body composition and health risks in children and adolescents	4	1
	A.1.3 Early nutrition and adult adiposity	Defining early predictors of obesity in Malaysia is important, as premature age of adiposity rebound and catch-up growth (after foetal, neonatal and infant growth retardation) have repeatedly been shown to be strong determinants of later obesity	A.1.3.1 To establish appropriate growth standard chart from birth to adulthood in order to define the normal age-range for onset of adiposity rebound of healthy children in various ethnic groups in Malaysia (cohort study)	2	1
			A.1.3.2 To define which paediatric population groups are at risk to show neonatal or post-natal catch-up growth	2	2
			A.1.3.3 The relationship between breastfeeding practices on the development of obesity	2	2

OVERWEIGHT AND OBESITY

Purpose	Research Scope	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Topic)
	A.1.4 Economic and social costs of obesity	Economic cost of obesity in Malaysia need to be assessed as increased cost of obesity-related healthcare that Malaysia can ill-afford	A.1.4.1 The economic and personal health costs of overweight and obesity	3	2
			A.1.4.2 The economic burden of obesity and obesity-related chronic diseases	3	3
		Obesity has a significant impact on health-related quality of life and functional capacity of individuals in the society	A.1.4.3 Psychosocial factors and quality of life in obese adults	3	1
			A.1.4.4 To study social problems related to obesity among children in schools	3	1
		Public perception of health in relation to obesity influences the success of obesity prevention and management	A.1.4.5 Parental perception of childhood obesity	3	3
			A.1.4.6 Cultural and social influences on obesity and body image	3	4
			A.1.4.7 Weight related stigmatization in Malaysian population	3	4
A.2 Improve understanding on aetiologies of overweight and obesity	A.2.1 Dietary intake, appetite control and eating behaviour	Appetite control studies have never been reported in Malaysia. There is a need to understand the effect of palm-based oil and fats, as well as protein, on appetite control	A.2.1.1 Effects of fatty acids on appetite control	1	1
			A.2.1.2 Effects of proteins and amino acids on appetite control	1	4
			A.2.1.3 Investigation on appetite biomarkers among obese children	1	2
		Eating behaviour especially higher consumption during night-time and dieting may affect energy intake. Psychological mechanisms influencing eating may help maintain appropriate body weight and prevent weight gain. Improper weight loss methods may lead to yoyo effect on body weight	A.2.1.4 Night eating behaviour and syndrome and its relationship with obesity	1	3
			A.2.1.5 Energy intake regulation among shift worker	1	4
			A.2.1.6 Identification of psychological mechanisms influencing eating behaviour	1	2
			A.2.1.7 Relationship between stress and eating behaviour	1	5
			A.2.1.8 Survey of weight loss methods being practised by Malaysian population	1	3
			A.2.1.9 Dieting behaviour and body weight of adolescents and young adults	1	1
			A.2.1.10 The role of diet composition on body weight	1	3
	A.2.2 Metabolic susceptibility	Identification of individuals who are prone to obesity is important as there is poor prognosis for the success of long-term management of obesity	A.2.2.1 Metabolic predisposition to adult-onset obesity	2	2
			A.2.2.2 Metabolic predisposition to childhood-onset obesity	2	1

Purpose	Research Scope	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Topic)
	A.2.3 Physical activity	With the advent of technological advances, Malaysians lead a largely sedentary lifestyle and consequently higher rates of obesity. There is a need for in depth understanding of the current situation and factors affecting physical inactivity	A.2.3.1 Effect of work hours on opportunity for physical activity and exercise	1	2
			A.2.3.2 Survey of existing physical activity curriculum and co-curriculum programme in schools	1	4
			A.2.3.3 Assessment of physical activity level in relation to obesity	1	3
			A.2.3.4 Factors influencing physical activity level of older adults	1	1
			A.2.3.5 Factors influencing physical activity level of children and adolescents	1	1
	A.2.4 Genetics of obesity	Genes and the environment interact to influence development of overweight and obesity. To date, there is no known study in this area carried out in Malaysia.	A.2.4.1 The genetics of childhood obesity	3	1
			A.2.4.2 Determination of heritability of obesity-related phenotypes	3	2
			A.2.4.3 Phenotyping of eating behaviour and food intake	3	2
B. Improve effectiveness of intervention and management of obesity	B.1 Obesity prevention and intervention	In dealing with inequalities in health status as a fundamental principle of public health, it is necessary to consider the specific issues which make particular groups more vulnerable to weight gain. There is a lack of available model for the prevention and interven-tion of obesity	B.1.1 Development and evaluation of school-based behavioural intervention programmes for the prevention of overweight in children	2	2
			B.1.2 Development, implementation and assessment of the effectiveness of appropriate obesity intervention programmes in schools	2	2
			B.1.3 Effectiveness of existing nutrition and physical activity curriculum and co-curriculum programme in schools	2	3
			B.1.4 Evaluation of best practices in workplace for obesity prevention and treatment	2	3
			B.1.5 Effectiveness of park-based obesity prevention and management programme	2	5
			B.1.6 Develop media campaign to prevent obesity and evaluate its effect	2	1
			B.1.7 Cost effectiveness of obesity prevention programmes	2	4
	B.2 Management of obesity	Success rate of the various approaches to obesity management is low, and as such there is a need to develop more practical and effective approaches	B.2.1 Effectiveness of drugs and supplements in obesity management	4	4
			B.2.2 Development and evaluation of behaviour modification strategies for clinical management of obese patients	4	1
			B.2.3 Development and evaluation of strategies for promotion of weight loss and weight maintenance, and prevention of weight regain	4	2

OVERWEIGHT AND OBESITY

Purpose	Research Scope	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Topic)
			B.2.4 Effectiveness of health education in managing obesity and its comorbidities	4	3
	B.3 Policy and environment	There is lack of data on the impact of policies and the environment on obesity. To prevent and manage obesity, governments, food industries, the media, communities and individuals need to work together to modify the environment so that it is less conducive to weight gain.	B.3.1 Determination of social and political factors that contribute to overweight and obesity in the population	1	5
			B.3.2 Evaluation of the feasibility of providing incentives to employees that support health eating habits and active lifestyle	1	4
			B.3.3. The role of food industry towards healthy eating and obesity prevention	1	2
			B.3.4 The impact of built environment on physical activity and obesity prevention	1	1
			B.3.5 The 'obesogenic' environment and its effects on dietary intake and obesity	1	2
			B.3.6 Compliance of food service providers towards existing guidelines	1	4
			B.3.7 Assessment of media messages affecting obesity	1	3
			B.3.8 Impact of agriculture subsidies on food production and supply as well as cost and consumption pattern on development of obesity	1	6
			B.3.9 Identification of environmental factors that can be changed to improve physical activity levels	1	1
C. Developing new modalities	C.1 Diagnosis	Obesity has traditionally been defined based on BMI cut-offs. However, it is known that BMI does not truly reflect body composition.	C.1.1 Identification of other indices to define obesity	4	1
	C.2 Treatment	Functional foods and herbal traditional medication have been used for the prevention and treatment of obesity. However, there has been no scientific evidence on the efficacy and safety	C.2.1 Identification of foods rich in specific ingredients (e.g. specific fatty acids, other phytochemicals) that can stimulate thermogenesis and fat oxidation polyphenols (assessed by indirect calorimetry) as well as improve glucose tolerance (assessed by OGTT)	1	3
			C.2.2 Identification of local bioactive food ingredients	1	3
		Novel and practical intervention strategies are important for the treatment of obesity	C.2.3 Comparison on the effectiveness of different methods of weight reduction for obese individuals	1	2

Purpose	Research Scope	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Topic)
			C.2.4 Randomised Control Trials of obesity prevention programmes (individual / group)	1	1

Table 6.2: Ranking criteria for suggested topics in each research scope

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.1.1 Definition of overweight and obesity	A.1.1.1 Definition of BMI cut-offs for Malaysians based on body fat composition	8	7		7	6		28	1
	A.1.1.2 Cohort study to identify appropriate of BMI cut-offs for Malaysians based on co-morbidities	8	7		7	5		27	1
	A.1.1.3 Development of waist circumference centile charts for children and adolescents	8	5		5	6		24	2
A.1.2 Obesity and cardiovascular risk factors	A.1.2.1 Relationship between body composition, BMI and morbidity in adult Malaysians	8	8		3	6		25	2

OVERWEIGHT AND OBESITY

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	A.1.2.2 Relationship between body composition, BMI and health risks in children and adolescents	9	8		5	6		28	1
A.1.3 Early nutrition and adult adiposity	A.1.3.1 To establish BMI standard chart from birth to adulthood in order to define the normal age-range for onset of adiposity rebound of healthy children in various ethnic groups in Malaysia	6	8	7	6			27	1
	A.1.3.2 To define which paediatric population groups that are at risk to show neonatal or post-natal catch-up growth	6	8	6	5			25	2
	A.1.3.3 The relationship between breastfeeding practices and development of obesity	8	7		4	6		25	2
A.1.4 Economic and social costs of obesity	A.1.4.1 The economic and personal health costs of overweight and obesity	8	8	6	5			27	3

OVERWEIGHT AND OBESITY

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	A.1.4.2 The economic burden of obesity and obesity-related chronic diseases	8	7	6	5			26	3
	A.1.4.3 Psychosocial factors and quality of life in obese adults	8	8			7	6	29	1
	A.1.4.4 To study social problems related to obesity among children in schools	8	8		6		7	29	1
	A.1.4.5 Parental perception of childhood obesity	7	7		5	7		26	3
	A.1.4.6 Cultural and social influences on obesity and body image	6	6		5		5	22	4
	A.1.4.7 Weight related stigmatization in Malaysian population	7	5			5	6	23	4
A.2.1 Dietary intake, appetite control and eating behaviour	A.2.1.1 Effects of fatty acids on appetite control	9	9	7	5			30	1
	A.2.1. 2 Effects of proteins and amino acids on appetite control	7	7	5	5			24	4

Research Scope	Suggested Topic and/ or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	A.2.1.3 Investigation on appetite biomarkers among obese children	8	9	7	5			29	2
	A.2.1.4 Night eating behaviour and syndrome and its relationship with obesity	9	8		6		5	28	3
	A.2.1.5 Energy intake regulation among shift worker	5	8			6	5	24	4
	A.2.1.6 Identification of psychological mechanisms influencing eating behaviour	9	8	6	6			29	2
	A.2.1.7 Relationship between stress and eating behaviour	5	5			5	4	19	5
	A.2.1.8 Survey of weight loss methods being practised by Malaysian population	9	8			6	5	28	3
	A.2.1.9 Dieting behaviour and body weight of adolescents and young adults	9	9			6	6	30	1

OVERWEIGHT AND OBESITY

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	A.2.1.10 The role of diet composition on body weight	7	7		5		5	24	3
A.2.2 Metabolic susceptibility	A.2.2.1 Metabolic predisposition to adult-onset obesity	7	8	6	6			27	2
	A.2.2.2 Metabolic predisposition to childhood-onset obesity	8	8	6	7			29	1
A.2.3 Physical activity	A.2.3.1 Effect of work hours on opportunity for physical activity and exercise	8	8			6	6	28	2
	A.2.3.2 Survey of existing physical activity curriculum and co-curriculum programme in schools	7	7		5	6		25	4
	A.2.3.3 Assessment of physical activity level in relation to obesity	8	8		5	5		26	3
	A.2.3.4 Factors influencing physical activity level of older adults	9	9		6	6		30	1
	A.2.3.5 Factors influencing physical activity level of children and adolescents	9	9		6	6		30	1

OVERWEIGHT AND OBESITY

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.2.4 Genetics of obesity	A.2.4.1 The genetics of childhood obesity	8	7	6	6			27	1
	A.2.4.2 Determination of heritability of obesity-related phenotypes	6	7	6	6			25	2
	A.2.4.3 Phenotyping of eating behaviour and food intake	6	7	6	6			25	2
B.1 Obesity prevention and intervention	B.1.1 Development and evaluation of school-based behavioural intervention programmes for the prevention of overweight in children	8	8		6	6		28	2
	B.1.2 Development, implementation and assessment of the effectiveness of appropriate obesity intervention programmes in schools	8	8		6	6		28	2
	B.1.3 Effectiveness of existing nutrition and physical activity curriculum and co-curriculum programme in schools	8	8		5	6		27	3

OVERWEIGHT AND OBESITY

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	B.1.4 Evaluation of best practices in workplace for obesity prevention and treatment	8	8			6	5	27	3
	B.1.5 Effectiveness of park-based obesity prevention and management programme	7	7			5	5	24	5
	B.1.6 Develop media campaign to prevent obesity and evaluate its effect	9	8			6	6	29	1
	B.1.7 Cost effectiveness of obesity prevention programmes	7	7	6	6			26	4
B.2 Management of obesity	B.2.1 Effectiveness of drugs and supplements in obesity management	8	5				5	18	4
	B.2.2 Development and evaluation of behaviour modification strategies for clinical management of obese patients	8	8			6	6	28	1

OVERWEIGHT AND OBESITY

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	B.2.3 Development and evaluation of strategies for promotion of weight loss and weight maintenance, and prevention of weight regain	7	8		6	5		26	2
	B.2.4 Effectiveness of health education in managing obesity and its comorbidities	6	6		5		6	23	3
B.3 Policy and environment	B.3.1 Determination of social and political factors that contribute to overweight and obesity in the population	8	7	5	5			25	5
	B.3.2 Evaluation of the feasibility of providing incentives to employees that practice healthy eating habits and active lifestyle	8	8			5	6	27	4
	B.3.3. The role of food industry towards healthy eating and obesity prevention	9	9		6	5		29	2

OVERWEIGHT AND OBESITY

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	B.3.4 The impact of built environment on physical activity and obesity prevention	9	9		6	6		30	1
	B.3.5 The 'obesogenic' environment and its effects on dietary intake and obesity	9	9			5	6	29	2
	B.3.6 Compliance of food service providers towards existing guidelines	8	8			5	6	27	4
	B.3.7 Assessment of media messages affecting obesity	8	8		6	6		28	3
	B.3.8 Impact of agriculture subsidies on food production and supply as well as cost and consumption pattern on development of obesity	7	7		5	4		23	6
	B.3.9 Identification of environmental factors that can be changed to improve physical activity levels	9	9		6		6	30	1

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
C.1 Diagnosis	C.1.1 Identification of other indices to define obesity	6	6	6	5			23	1
C.2 Treatment	C.2.1 Identification of foods rich in specific ingredients (e.g. specific fatty acids, other phytochemicals) that can stimulate thermogenesis and fat oxidation polyphenols (assessed by indirect calorimetry) as well as improve glucose tolerance (assessed by OGTT)	7	5	5	5			22	3
	C.2.2 Identification of local bioactive food ingredients for treatment of obesity	7	5	5	5			22	3
	C.2.3 Comparison on the of effectiveness of different methods of weight reduction for obese individuals	8	8		6	5		27	2
	C.2.4 Randomised Control Trials of obesity prevention programmes (individual / group)	9	8	6	6			29	1

*1 = the lowest/worst score

Table 6.3: Relative ranks for each research scope

Research Scope	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
	Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.2.1 Dietary intake, appetite control, eating and dieting	9	9	6	6			30	1
A.2.3 Physical activity	9	9		6	6		30	1
B.3 Policy and environment	9	9		6	6		30	1
C.2 Treatment (new modalities)	9	8	7	6			30	1
A.1.1 Definition of overweight and obesity	8	8		6	6		28	2
A.1.3 Early nutrition and adult adiposity	8	8	6	6			28	2
A.2.2 Metabolic susceptibility	8	8	6	6			28	2
B.1 Obesity prevention and intervention	8	8		6	6		28	2
A.1.4 Economic and social costs of obesity	8	8		5	6		27	3
A.2.4 Genetics of obesity	7	8	6	6			27	3
A.1.2 Obesity and cardiovascular risk factors	8	6		3	6		23	4
B.2 Management of obesity	7	6		5		5	23	4
C.1 Diagnosis (new modalities)	6	6	6	5			23	4

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Research Priority Area 6

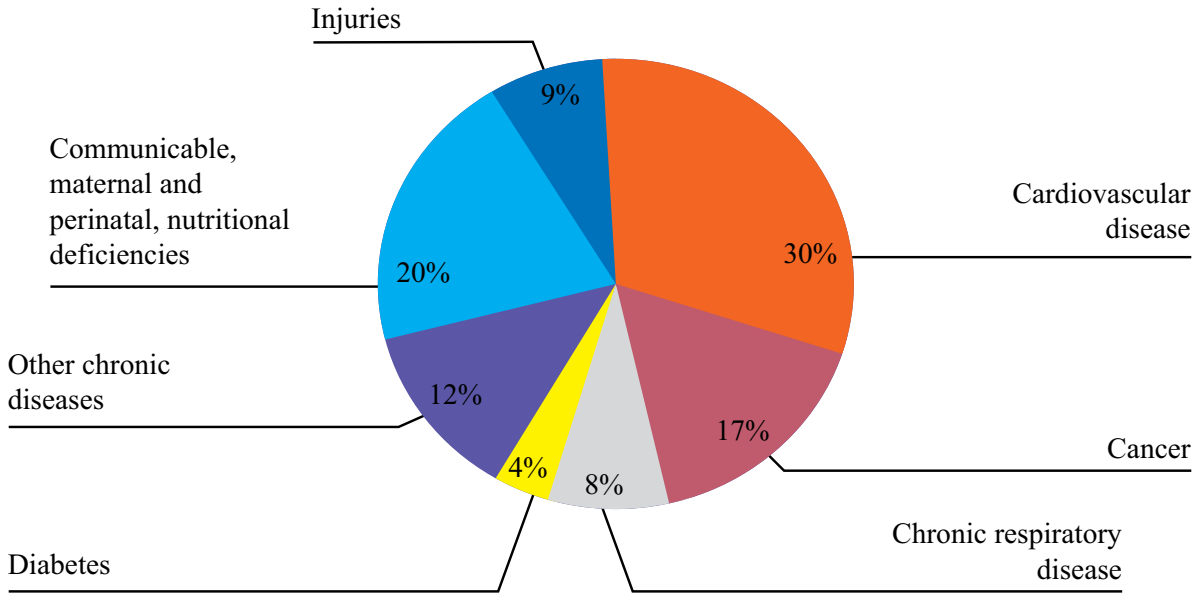
Diet Related Non-Communicable Diseases

7 DIET RELATED NON-COMMUNICABLE DISEASES

7.1 Introduction

Diet and nutrition are important factors in the promotion and maintenance of good health at all stages of life. During the past two decades, surmounting evidence from population-based epidemiological studies has helped to clarify the role of diet in preventing and controlling morbidity and premature mortality from non-communicable diseases (NCDs). In nearly all countries of the world, accelerated industrialization has resulted in urbanization, economic development and market globalization leading to improved standards of living accompanied by dramatic changes in diets and lifestyles. These patterns combined with a decline in energy expenditure that is associated with a sedentary lifestyle have had a significant negative impact on the health and nutritional status of populations particularly in developing countries and in countries in transition. Because of these changes in dietary and lifestyle patterns, chronic NCDs including obesity, diabetes mellitus, cardiovascular disease (CVD), hypertension and stroke, and some types of cancer are becoming increasingly significant causes of disability and premature death in both developing and newly developed countries,

The burden of chronic diseases which include cardiovascular diseases, cancers, diabetes and obesity is rapidly increasing worldwide. In 2001, chronic diseases contributed approximately 59% of the 56.5 million total reported deaths in the world and 46% of the global burden of disease (WHO/ FAO, 2003). In Malaysia of the total burden of disease, majority or about two thirds of this burden is contributed by non-communicable diseases in men (65%) and women (74%) (Yusof *et al*, 2005).



Source: Yusof *et al*. 2005

Figure 7.1: Deaths by cause at all ages in Malaysia, 2002

Table 7.1: Top 10 causes of DALYs by sex in Malaysia 2000

Rank	Disease	Males		Disease	Females	
		DALYs	%		DALYs	%
1	Ischaemic heart disease	164,846	10.0	Ischaemic heart disease	113,887	9.2
2	Road traffic accidents	133,789	8.2	Cerebrovascular disease	86,372	7.0
3	Cerebrovascular disease	94,059	5.7	Unipolar major depression	67,211	5.4
4	Septicemia	70,232	4.3	Septicemia	57,483	4.6
5	Acute lower respiratory tract infection	49,649	3.0	Diabetes mellitus	56,390	4.6
6	Diabetes mellitus	47,060	2.9	Hearing loss	38,994	3.1
7	Chronic obstructive pulmonary disease	45,459	2.8	Acute lower respiratory tract infection	37,890	3.1
8	Hearing loss	44,566	2.7	Asthma	32,815	2.6
9	Unipolar major depression	42,259	2.6	Road traffic accidents	28,946	2.3
10	Cirrhossis	37,902	2.3	Osteoarthritis	26,925	2.2
	Total (111 disease)	1,646,896	100	Total (111 disease)	1,240,997	100

Source: Yusof *et al*., 2005

7.2 Conceptual Framework on the Purpose and Scope of the Research Priority Area

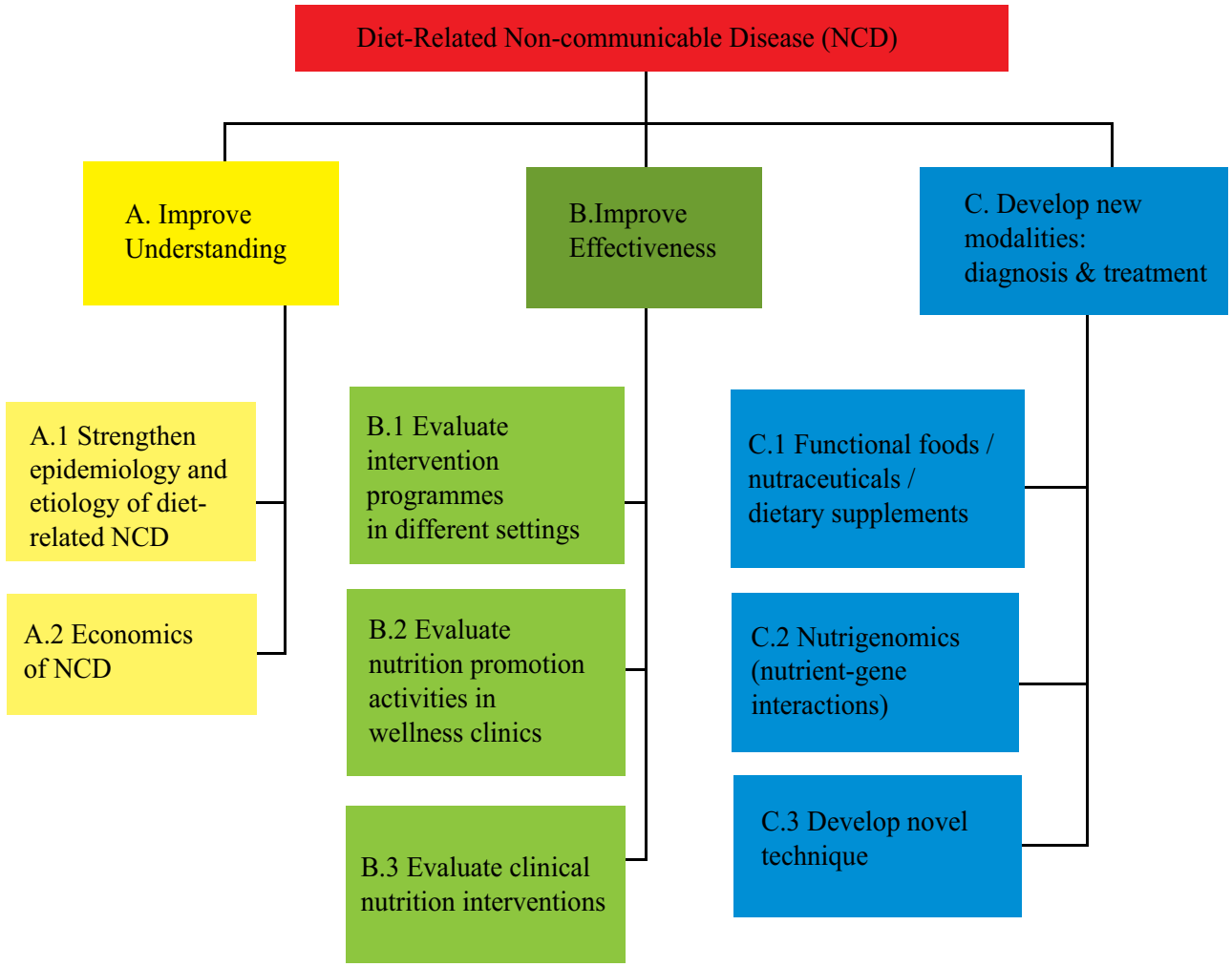


Figure 7.2: Purpose and scope of diet related non-communicable diseases

7.3 Table of Nutrition Research Priority Area

The research priorities are presented in three tables. Table 7.1 presents the research purpose, scope, gaps and needs and the relative ranks of the scopes and topics. Table 7.2 presents the ranking criteria for suggested topics in each research scope. Table 7.3 presents the relative ranks for suggested topics.

Table 7.1: Purpose and scope of diet related non-communicable diseases

Purpose	Research Scope	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Topic)
A. Improve understanding	A.1 Strengthen epidemiology and aetiology data in relation to diet-related NCD in Malaysia	A.1.1 Available data is still inadequate and non-confirmatory	A.1.1.1 Prevalence of NCD in relation to nutritional status, dietary behaviour, lifestyle	1	4
			A.1.1.2 Cohort study on nutritional risk factors including dietary pattern, health-related behaviours, physical activity, etc. for NCDs (diabetes, cancers, obesity, hypertension, CVD, metabolic syndrome, etc) in relation		1
			A.1.1.3 Impact of inequalities in socio-economic status, healthcare accessibilities, culture, psychosocial factors and environment in various population groups on risks of NCDs		2
	A.2 Economics of NCD	A.2.1 Inadequate national on the healthcare cost of NCD	A.2.1.1 Study on the economic costs of NCD	3	3
B. Improve effectiveness	B.1 Evaluate intervention programmes in different settings (community, institution, workplace & school)	B.1.1 Ineffectiveness of current intervention programmes in reducing prevalence of NCD	B.1.1.1 Role of media (TV, internet, printed media, etc) and inter-personnel communication in delivering and influencing dietary and lifestyle behaviour in the general population and specific target groups such as children, adolescents and elderly	2	1
		B.1.2 Poor understanding on the roles of psychosocial factors, perception, optimistic bias, motivators and barriers for behavioural change	B.1.2.1 Identification, implementation and evaluation of psychosocial factors including theories in reducing prevalence of diet-related NCD	1	2
		B.1.3 Inadequate published data on the outcomes of previous and current intervention programmes	B.1.2.3 Develop and evaluate intervention programmes to reduce risk of diet-related NCD such as obesity, metabolic syndrome, diabetes, CVD, hypertension, cancers etc. in different settings (work place, schools and communities).		1

Purpose	Research Scope	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Topic)
	B.2 Evaluate nutrition promotion activities in wellness clinics	B.2.1 Inadequate published data on the effectiveness of nutrition promotion	B.2.1.1 Evaluate and improve the effectiveness of current nutrition programmes in wellness clinics	2	2
		B.2.2 Inadequate published data on the outcomes of previous and current intervention programmes	B.2.2.1 Systematic review and meta-analysis of scientific reports, documents, publications from previous studies carried out in Malaysia		3
	B.3 Evaluate clinical nutrition interventions	B.3.1 Inadequate awareness among health professionals and caregivers on importance of medical nutrition therapy (MNT), CPG, SOP, QAP in NCD management	B.3.1.1 Evaluate effectiveness of MNT, CPG, SOP, QAP in relation to clinical management of diet-related NCD among health professionals.	2	4
			B.3.1.2 Evaluate knowledge on the importance of medical nutrition therapy among carers of NCD patients.		4
		B.3.2 Inefficient methods of delivering dietary counselling and implementation of MNT	B.3.2.1 Effective methods for delivering dietary counselling and intervention in clinical and community settings		3
			B.3.2.2 Development and evaluation of state-of-the-art educational tools for specific diseases in clinical setting.		5
			B.3.2.3 Identifying factors that support positive dietary behaviour change and compliance to dietary advice and guidelines.		4
			B.3.2.4 Develop and evaluate personalized dietary interventions using web-based technology		4
			B.3.2.5 Identification of novel methods of enhancing awareness and behaviour change in individual and community		4
C. Develop new modalities: diagnosis & treatment	C.1 Functional foods/nutraceuticals/ dietary supplements	C.1.1 Lack of scientific data to support the role of local functional foods, nutraceuticals and food supplements in prevention and treatment of NCD.	C.1.1.1 Identification and characterisation of potential local functional foods, nutraceuticals, dietary supplements for prevention and treatment for NCD - including chemistry, mechanisms of action, preclinical data and efficacy etc.	1	1
			C.1.1.2 Clinical trials on functional foods, nutraceuticals, dietary supplements etc for NCD	1	1
	C.2 Nutrigenomics (nutrient-gene interactions)	C.2.1 No local scientific data on the role and interaction between diet/nutrient intake and genes in the Malaysian population	C.2.1.1 Studies on the interaction and role of diets/nutrients on genotyping, gene expression, proteomics, metabolomics in relation to NCD	3	2

Purpose	Research Scope	Research Gaps and Needs	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Topic)
		C.2.2 Lack of scientific data on nutritional biomarkers for NCD in local population	C.2.2.1 Identification of new nutritional biomarkers for NCD risk	3	2
	C.3 Develop novel techniques	C.3.1 Inadequate availability and accessibility of novel techniques for use in field, laboratory and clinical settings	C.3.1.1 Develop novel techniques for delivery of community interventions in relation to NCD such as methods for creating public awareness	3	4
			C.3.1.2 Develop novel techniques for nutritional assessment such as dietary assessment method		4
			C.3.1.3 Develop novel analytical techniques for assessment of NCD risk factors.		3

* 1= The lowest/worst score

Table 7.2: Ranking criteria for suggested topics in each research scope

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.1 Strengthen epidemiology and aetiology of diet-related NCD	A.1.1.1 Prevalence of NCD in relation to nutritional status, dietary behaviours, lifestyles	6	7		5	5		23	4
	A.1.1.2 Cohort study on nutritional risk factors for NCD (diabetes, cancers, obesity, hypertension, CVD, metabolic syndrome, etc) in relation to dietary pattern, health-related behaviours, physical activity, etc.	8	8		7		7	30	1
	A.1.1.3 Role of culture, socio-economic status, psychosocial factors and environment in relation to risk of NCDs	8	8		6		7	29	2
A.2 Economics of NCD	A.2.1.1 Study on the economic costs of NCD	8	8		6	5		27	3

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.1 Evaluate community intervention programmes	B.1.1.1 Role of media (TV, internet, printed media, etc) and inter-personnel communication in delivering and influencing dietary and lifestyle behaviour in the general population and specific target groups such as children, adolescents and elderly	8	8		7		7	30	1
	B.1.2.1 Identification, implementation and evaluation of effectiveness of psychosocial theories to reduce prevalence of diet-related NCD	8	8		6	6		28	2
	B.1.2.2 Develop and evaluate intervention programmes to reduce risk of diet-related NCD such as obesity, metabolic syndrome, diabetes, CVD, hypertension and cancer in different settings.	8	8		7		7	30	1

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.2 Evaluate nutrition promotion activities in wellness clinic	B.2.1.1 Evaluate and improve the effectiveness of current nutrition programmes in wellness clinics	8	8		6		6	28	2
	B.2.2.1 Systematic review and meta-analysis of scientific reports, documents, publications from previous studies carried out in Malaysia	6	6	6			6	24	3
B.3 Evaluate clinical nutrition interventions	B.3.1.1 Evaluate effectiveness of MNT, CPG, SOP, QAP in relation to clinical management of diet-related NCD among health professionals.	6	6	5			5	22	4
	B.3.1.2 Evaluate effectiveness of awareness programme among carers of NCD patients on the importance of nutrition therapy.	6	7			5	7	25	4
B.3 Evaluation of clinical nutrition interventions	B.3.2.1 Effective methods of delivering dietary counselling and intervention in clinical and community setting	6	7			5	6	24	3

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
	B.3.2.2 Development and evaluation of state-of-the-art educational tools for specific diseases in clinical setting.	6	6			8	8	28	5
	B.3.2.3 Identifying factors that support positive dietary behaviour change and compliance to dietary advice and guidelines.	6	6		5		5	22	4
	B.3.2.4 Develop and evaluate personalized dietary interventions using web-based technology	6	6			5	5	22	4
	B.3.2.5 Identification of novel methods of enhancing awareness and behaviour change in individual and community	6	6			5	5	22	4

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
C.1 Functional foods/ nutraceuticals/ dietary supplements	C.1.1.1 Identification and characterisation of potential local functional foods, nutraceuticals, dietary supplements for prevention and treatment of NCD - including chemistry, mechanisms of action, preclinical data and efficacy etc.	8	8		7		7	30	1
	C.1.1.2 Clinical trials on functional foods, nutraceuticals, dietary supplements etc for NCD	8	8		7		7	30	1
C.2 Nutrigenomics (nutrient-gene interactions)	C.2.1.1 Studies on the interaction and role of diets/ nutrients on genotyping, gene expression, proteomics, metabolomics in relation to NCD	8	8	6	6			28	2
	C.2.2.1 Identification of new nutritional biomarkers for NCD risk	8	8	6	6			28	2

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
C. 3 Develop novel techniques	C.3.1.1 Develop novel techniques for delivery of community interventions in relation to NCD such as methods for creating public awareness	6	7		5		6	24	4
	C.3.1.2 Develop novel techniques for nutritional assessment such as dietary assessment method	6	7		5		6	24	4
	C.3.1.3 Develop novel analytical techniques for assessment of NCD risk factors.	7	7	6	6			26	3

* 1 = the lowest/worst score

Table 7.3: Relative ranks for suggested topics

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.1 Strengthen epidemiology and aetiology of diet-related NCD	A.1.1.2 Cohort study on nutritional risk factors for NCD (diabetes, cancers, obesity, hypertension, CVD, metabolic syndrome, etc) in relation to dietary pattern, health-related behaviours, physical activity, etc.	8	8		7		7	30	1
B.1 Evaluate community intervention programmes	B.1.1.1 Role of media (TV, internet, printed media, etc) and inter-personnel communication in delivering and influencing dietary and lifestyle behaviour in the general population and specific target groups such as children, adolescents and elderly	8	8		7		7	30	1

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.1 Evaluate community intervention programmes	B.1.2.3 Develop and evaluate intervention programmes to reduce risk of diet-related NCD such as obesity, metabolic syndrome, diabetes, CVD, hypertension and cancers in different settings.	8	8		7		7	30	1
C.1 Functional foods/ nutraceuticals/ dietary supplements	C.1.1.1 Identification and characterisation of potential local functional foods, nutraceuticals, dietary supplements for prevention and treatment of NCD - including chemistry, mechanisms of action, preclinical data and efficacy etc.	8	8		7		7	30	1
C.1 Functional foods/ nutraceuticals/ dietary supplements	C.1.1.2 Clinical trials on functional foods, nutraceuticals, dietary supplements etc for NCD	8	8		7		7	30	1
A.1 Strengthen epidemiology and aetiology of diet-related NCD	A.1.1.3 Role of culture, socio-economic status, psychosocial factors and environment in relation to risk of NCDs	8	8		6		7	29	2

DIET RELATED NON-COMMUNICABLE DISEASES

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.1 Evaluate community intervention programmes	B.1.2.1 Identification, implementation and evaluation of effectiveness of psychosocial theories to reduceprevalence of diet-related NCD	8	8		6	6		28	2
B.2 Evaluate nutrition promotion activities in wellness clinic	B.2.1.1 Evaluate and improve the effectiveness of current nutrition programmes in wellness clinics	8	8		6		6	28	2
C.2 Nutrigenomics (nutrient-gene interactions)	C.2.1.1 Studies on the interaction and role of diets/nutrients on genotyping, gene expression, proteomics, metabolomics in relation to NCD	8	8	6	6			28	2
C.2 Nutrigenomics (nutrient-gene interactions)	C.2.2.1 Identification of new nutritional biomarkers for NCD risk	8	8	6	6			28	2
A.2 Economics of NCD	A.2.1.1 Study on the economic costs of NCD	8	8		6	5		27	3
B.2 Evaluate nutrition promotion activities in wellness clinic	B.2.2.1 Systematic review and meta-analysis of scientific reports, documents, publications from previous studies carried out in Malaysia	6	6	6			6	24	3

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.3 Evaluation of clinical nutrition interventions	B.3.2.1 Effective methods of delivering dietary counselling and intervention in clinical and community setting	6	7			5	6	24	3
C. 3 Develop novel techniques	C.3.1.3 Develop novel analytical techniques for assessment of NCD risk factors.	7	7	6	6			26	3
A.1 Strengthen epidemiology and aetiology of diet-related NCD	A.1.1.1 Prevalence of NCD in relation to nutritional status, dietary behaviour and lifestyle	6	7		5	5		23	4
B.3 Evaluate clinical nutrition interventions	B.3.1.1 Evaluate effectiveness of MNT, CPG, SOP, QAP in relation to clinical management of diet-related NCD among health professionals.	6	6	5			5	22	4
B.3 Evaluate clinical nutrition interventions	B.3.1.2 Evaluate effectiveness of awareness programme among carers of NCD patients on the importance of nutrition therapy.	6	7			5	7	25	4

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.3 Evaluate clinical nutrition interventions	B.3.2.3 Identifying factors that support positive dietary behaviour change and compliance to dietary advice and guidelines.	6	6		5		5	22	4
B.3 Evaluate clinical nutrition interventions	B.3.2.4 Develop and evaluate personalized dietary interventions using web-based technology	6	6			5	5	22	4
B.3 Evaluate clinical nutrition interventions	B.3.2.5 Identification of novel methods of enhancing awareness and behavioural change in individual and community	6	6			5	5	22	4
C. 3 Develop novel techniques	C.3.1.1 Develop novel techniques for delivery of community interventions in relation to NCD such as methods for creating public awareness	6	7		5		6	24	4

Research Scope	**Suggested Topic and/or Explanatory Notes**	**Ranking Criteria (Score 1-10)***		**Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria ***				**Total Score**	**Relative Rank**
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
C. 3 Develop novel techniques	C.3.1.2 Develop novel techniques for nutritional assessment such as dietary assessment method	6	7		5		6	24	4
B.3 Evaluation clinical nutrition interventions	B.3.2.2 Development and evaluation of state-of-the-art educational tools for specific diseases in clinical setting.	6	6			8	8	28	5

* Note: 1 = the lowest/worst score.

References

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Yusoff AF, Mustafa AN, Kaur GK, Omar MA, Vos T, Rao VPC & Begg S (2005). Malaysian Burden of Disease and Injury Study. In: *Forum 9*, Mumbai, India, (1-24). 12-16 September, 2005.

Research Priority Area 7

Food Composition Database for Nutrient and Non-Nutrient Components

8 FOOD COMPOSITION DATABASE FOR NUTRIENT AND NON-NUTRIENT COMPONENTS

8.1 Introduction

The first and current Food Composition Table (FCT) was published in 1997 (Tee *et al*., 1997) using data from work carried out between the 1980s and 1990s. It is still used by nutritionists, food scientists, food safety personnel, policy makers and the industry for a variety of purposes, which are listed in Appendix 1. The FCT has complete data on the macronutrients and micronutrients for 580 raw foods and 203 cooked food items.

There is now an urgent need for an improved FCT with inclusion of nutrients and non-nutrients, including bio-active compounds, anti-nutrients, contaminants, toxicants, and additives, which are not available in the current table. A conceptual framework highlighting priority research areas is given in Figure 8.1. At the food / meal / dish level, values might need to be revised as meal ingredients and portion sizes change. Wider varieties of processed foods are becoming available as well as new plant varieties and animal husbandry technology. Therefore, it is timely to have an improved and updated FCT for nutrients and non-nutrients. The improved and expanded FCT will include non-nutrient contents of selected foods.

It is also timely that the FCT is made available as a database with a mechanism for updates by authorised researchers, which could then be made available for all users. The new Food Composition Database (FCD) should first and foremost collate existing data for macro-, micro- and non-nutrients. The second stage would be to add new data to the FCD. Aspects which are currently unavailable in the present FCT must be included, for example, rates of nutrition retention after cooking and food processing, values for cooked dishes, new food items from the East Coast states, Sabah and Sarawak, and functional ingredients. A full list of the research needs are given in Figure 8.1 and described in Table 8.1. The new FCD should be one database for all users. Therefore it should incorporate information on contaminants and additives. All these work will require preliminary work to identify, adapt and validate laboratory methods.

The nature of the FCD meant that the research needs identified here have to be carried out simultaneously. To achieve all these, several research scopes have been given priority rank 1. The basis for ranking is shown in Tables 8.2 and 8.3. One of the mechanisms to achieve an improved FCD lies in workload sharing. A proposed Malaysian FCD Working Group which could be set up is given in Appendix 2.

The availability of an improved FCD will enable a wide variety of food and nutrition related activities to be carried out in the country. It is justifiable to say that most of the identified research priorities in this research area would be dependent on the successful implementation of this work, particularly studies requiring investigation of dietary intakes.

8.2 Conceptual Framework on the Purpose and Scope of the Research Priority Area

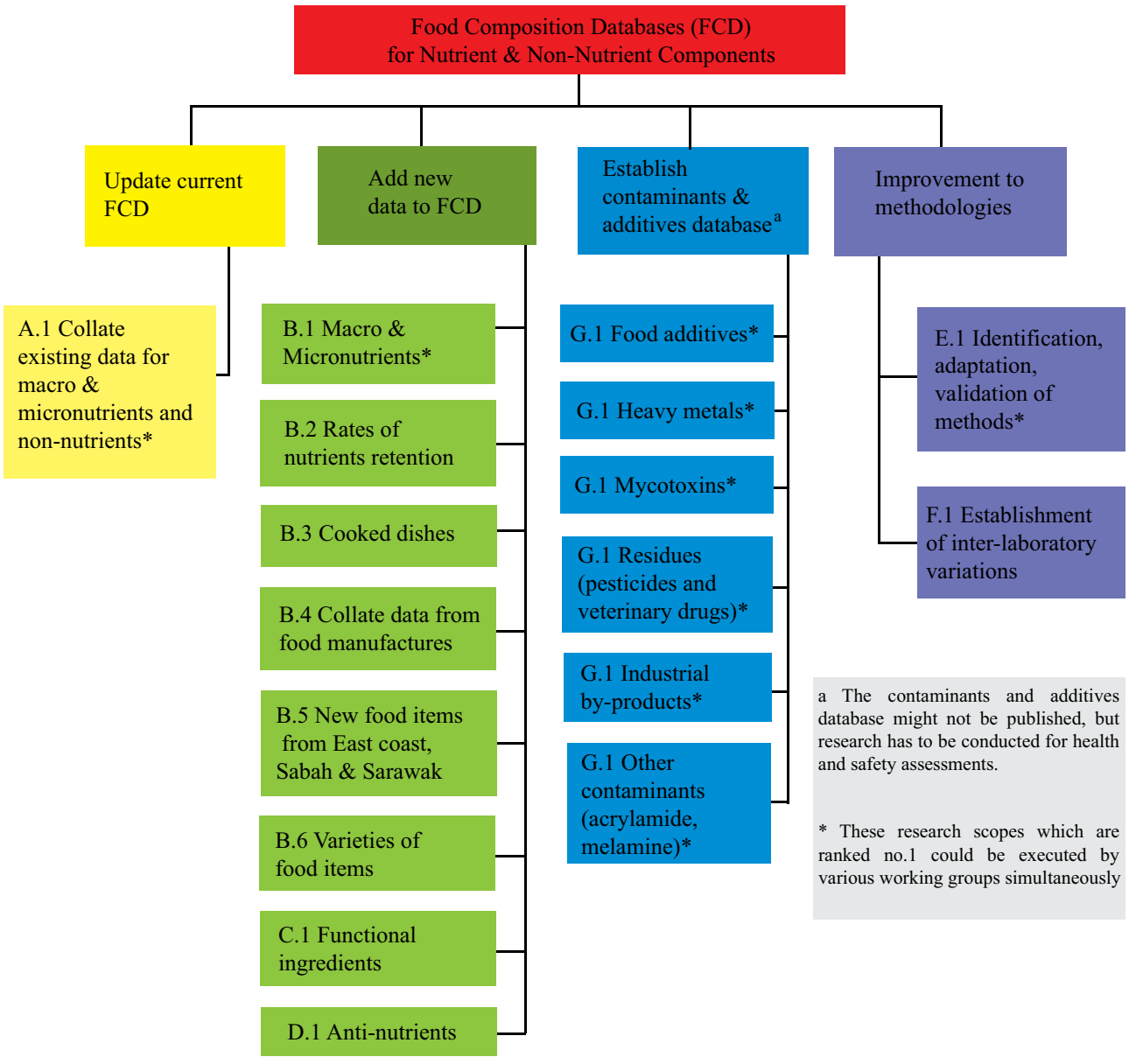

Figure 8.1: Purpose and scope of food composition database for nutrients and non-nutrient components

FOOD COMPOSITION DATABASE FOR NUTRIENT AND NON-NUTRIENT COMPONENTS

Table 8.1: Purpose and scope of food composition database for nutrients and non-nutrient components

Purpose	Research Scope	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Topic)
Update current FCD	A.1. Collate data on existing fatty acids, macronutrients, minerals, phyto-chemicals of food and non-nutrients into the current FCD	The data is scattered among various laboratories in the country, and there is an urgent need to collate all existing data into one database. This is of utmost urgency and should be achieved using currently available funding.	1*	1*
Add new data to FCD	B.1. Add data on new macro and micronutrients into the database	Incomplete macronutrients in current FCD (sugars, dietary fibre, fatty acid profile including trans-fatty acids) especially in view of an increase of prevalence of NCDs eg. CVD, Diabetes Mellitus , cancers. Micronutrients for eg. iodine, folate, selenium, zinc, haem and non-haem iron, vitamin A in view of the continued prevalence of sub-clinical deficiencies in Malaysia especially among lower socio-economic groups	2	1*
Add new data to FCD	B.2. Add data on rates of nutrient retention after cooking treatment	Information on nutrient profile of cooked food, particularly vegetables, which are currently not available because food lose nutrients through leaching during the cooking process, or certain nutrients become more bio-available after cooking.	2	2
Add new data to FCD	B.3. Add data on wider variety of cooked dishes	Information on nutrient profile of cooked dishes, including their standard recipes and method of preparation, especially when the percentage of Malaysians eating out is increasing. The group anticipates that the percentage of households using readily-prepared meals would be increasing	2	2
Add new data to FCD	B.4. Collate data from food manufacturers	Nutrition information of processed food and fortified food from manufacturers because processed foods are becoming more popular in Malaysian households	2	4
Add new data to FCD	B.5. Add and analyze nutrient content of food items currently not in the FCD	Information on nutrient profile of new food and meals/dishes, especially from East Coast states, Sabah and Sarawak, which are currently not available. In addition to that, information on nutrient profile of 'under-utilised' fruits and vegetables.	2	5
Add new data to FCD	B.6. Expand the varieties available for each food item	Information on nutrient profile of different variation available for certain food items (e.g. rice could be further elucidated with white rice, brown rice, red rice, highland rice, basmati rice, long-grain rice, glutinous rice, various degrees of polished rice, hybrid rice, etc.)	2	6
Improvement to methodologies	E.1. Improvements to methodologies	Identification, adaptation, modification and validation of methodologies to analyse for A, B, and C	2	1*

FOOD COMPOSITION DATABASE FOR NUTRIENT AND NON-NUTRIENT COMPONENTS

Purpose	Research Scope	Suggested Topic and/or Explanatory Notes	Relative Rank (Scope)	Relative Rank (Topic)
Add new data to FCD	C.1. Elucidate types and amounts of functional ingredients in food	Information on amounts and bioavailability of polyphenols, carotenoids, plant sterols and stanols in view of their recognised importance in chronic diseases, particularly CVD and cancers	3	3
Add new data to FCD	D.1. Elucidate types and amounts of food components which might interfere with nutrient uptake and absorption	Examples of anti-nutrients which are lacking are phytates, oxalates, trypsin inhibitors.	4	8
Improvement to methodologies	F.1. Establishment of inter-laboratory variations	Development of Certified Reference Materials (CRM). There is insufficient efforts at the present time but this is required in order for A, B, and C to be carried out by various laboratories throughout Malaysia	5	7
Establish a contaminant database	G.1. Determine the types and amounts of these chemicals in the food for exposure assessments	Collate information on contaminant levels for exposure assessments and HACCP (lead, mercury, mycotoxins, pesticide residues, industrial by-products (PCBs, furans, dioxins), antibiotic residues, acrylamides, food additives with the Food Safety and Quality Division (FSQD) and other research institutions.	6	1*

* Note: The relative ranks for ranking No. 1 could be executed by various working groups simultaneously.

Table 8.2: Ranking criteria for suggested topics in each research scope

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.1. Collate data on existing fatty acids, macronutrients minerals, phytochemicals of food and non-nutrients into the current FCD	The data is scattered among various laboratories in the country, and there is an urgent need to collate all existing data into one database. This is of utmost urgency and should be achieved using currently available findings.	10	10			7	7	34	1
B.1. Add data on new macro and micronutrients into the database	Incomplete macronutrients in current FCD (sugars, dietary fibre, fatty acid profile including trans-fatty acids) especially in view of an increase prevalence of NCDs eg. CVD, DM, cancers. Micronutrients for eg. iodine, folate, selenium, zinc, haem and non-haem iron, vitamin A in view of the continued prevalence of sub-clinical deficiencies in Malaysia especially among lower socio-economic groups.	10	10		7		7	34	1

Table 8.2: Ranking criteria for suggested topics in each research scope

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.2. Add data on rates of nutrient retention after cooking treatment	Information on nutrient profile of cooked food, particularly vegetables, which are currently not available because food lose nutrients through leaching during the cooking process, or certain nutrients become more bio-available after cooking.	9	10		7		7	33	2
B.3. Add data on wider variety of cooked dishes	Information on nutrient profile of cooked dishes, including their standard recipes and method of preparation, especially when the percentage of Malaysians eating out is increasing. The group anticipates that the percentage of households using readily-prepared meals would be increasing.	9	10		7		7	33	2

Table 8.2: Ranking criteria for suggested topics in each research scope

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.4. Collate data from food manufacturers	Nutrition information of processed food and fortified food from manufacturers because processed foods are becoming more popular in Malaysian households	6	10			7	5	28	4
B.5. Add and analyse nutrient content of food items currently not in the FCD	Information on nutrient profile of new food and meals/dishes, especially from East Coast states, Sabah and Sarawak, which are currently not available. In addition to that, information on nutrient profile of 'under-utilised' fruits and vegetables.	8	8		7		4	27	5

Table 8.2: Ranking criteria for suggested topics in each research scope

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.6. Expand the varieties available for each food items	Information on nutrient profile of different variation available for certain food items (e.g. rice could be further elucidated with white rice, brown rice, red rice, highland rice, basmati rice, long-grain rice, glutinous rice, various degrees of polished rice, hybrid rice, etc.)	7	7		7		4	25	6
C.1. Elucidate types and amounts of functional ingredients in food	Information on amounts and bioavailability of polyphenols, carotenoids, plant sterols and stanols in view of their recognised importance in chronic diseases, particularly CVD and cancers.	8	10			7	7	32	3
D.1. Elucidate types and amounts of food components which might interfere with nutrient uptake and absorption	Examples of anti-nutrients which are lacking are phytates, oxalates and trypsin inhibitors.	5	6		7		3	21	8

Table 8.2: Ranking criteria for suggested topics in each research scope

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
E.1. Improvements to methodologies	Identification, adaptation, modification, validation of methodologies to analyse for A, B, and C.	10	10	7	7			34	1
F.1. Establishment of inter-laboratory variations	Development of Certified Reference Materials (CRM). There is an insufficient effort at the present time but this is required in order for A, B, and C to be carried out by various laboratories throughout Malaysia.	5	5	7			5	22	7

Table 8.2: Ranking criteria for suggested topics in each research scope

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
G.1. Determine the types and amounts of these chemicals in the food for exposure assessments	Collate information on contaminant levels for exposure assessments and HACCP (lead, mercury, mycotoxins, pesticide residues, industrial by-products (PCBs, furans, dioxins), antibiotic residues, acrylamides, food additives with the Food Safety and Quality Division (FSQD) and other research institutions.	10	10		7		7	34	1

* Note: For Ranking Criteria (Sore 1 – 7, 1 = the lowest/worst score)

Table 8.3: Relative ranks for suggested topic

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
A.1. Collate data on existing fatty acids, macronutrients, minerals, phytochemicals of food, and non-nutrients into the current FCD	The data is scattered among various laboratories in the country, and there is an urgent need to collate all existing data into one database. This is of utmost urgency and should be achieved using currently available funding.	10	10			7	7	34	1
B.1. Add data on new macro and micronutrients into the database	Incomplete macronutrients in current FCD (sugars, dietary fibre, fatty acid profile including trans-fatty acids) especially in view of an increase of prevalence of NCDs eg. CVD, DM, cancers Micronutrients for eg. iodine, folate, selenium, zinc, haem and non-haem iron, vitamin A in view of the continued prevalence of sub-clinical deficiencies in Malaysia especially among lower socio-economic groups	10	10		7		7	34	1

Table 8.3: Relative ranks for suggested topic

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
E.1. Improvements to methodologies	Identification, adaptation, modification, validation of methodologies to analyse for A, B, and C	10	10	7	7			34	1
G.1. Determine the types and amounts of these chemicals in the food for exposure assessments	Collate information on contaminant levels for exposure assessments and HACCP (lead, mercury, mycotoxins, pesticide residues, industrial by-products (PCBs, furans, dioxins), antibiotic residues, acrylamides, food additives with the Food Safety and Quality Division (FSQD) and other research institutions	10	10		7		7	34	1

Table 8.3: Relative ranks for suggested topic

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.2. Add data on rates of nutrient retention after cooking treatment	Information on nutrient profile of cooked food, particularly vegetables, which are currently not available because food lose nutrients through leaching during the cooking process, or certain nutrients become more bio-available after cooking	9	10		7		7	33	2
B.3. Add data on wider variety of cooked dishes	Information on nutrient profile of cooked dishes, including their standard recipes and method of preparation, especially when the percentage of Malaysians eating out is increasing. The group anticipates that the percentage of households using readily-prepared meals would be increasing	9	10		7		7	33	2

Table 8.3: Relative ranks for suggested topic

Research Scope	Suggested Topic and /or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
C.1. Elucidate types and amounts of functional ingredients in food	Information on amounts and bioavailability of polyphenols, carotenoids, plant sterols and stanols in view of their recogn-ised importance in chronic diseases, particularly CVD and cancers	8	10			7	7	32	3
B.4. Collate data from food manufacturers	Nutrition information of processed food and fortified food from manufacturers because processed foods are becoming more popular in Malaysian households	6	10			7	5	28	4
B.5. Add and analyse nutrient content of food items currently not in the FCD	Information on nutrient profile of new food and meals/dishes, especially from East Coast states, Sabah and Sarawak, which are currently not available. In addition to that, information on nutrient profile of 'under-utilised' fruits and vegetables	8	8		7		4	27	5

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		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
B.6. Expand the varieties available for each food items	Information on nutrient profile of different variation available for certain food items (e.g. rice could be further elucidated with white rice, brown rice, red rice, highland rice, basmati rice, long-grain rice, glutinous rice, various degrees of polished rice, hybrid rice, etc.)	7	7		7		4	25	6
F.1. Establishment of inter-laboratory variations	Development of Certified Reference Materials (CRM). There is an insufficient effort at the present time but this is required in order for A, B, and C to be carried out by various laboratories throughout Malaysia	5	5	7			5	22	7

Table 8.3: Relative ranks for suggested topic

Research Scope	Suggested Topic and/or Explanatory Notes	Ranking Criteria (Score 1-10)*		Ranking Criteria (Score 1-7) - Choose Max. 2 Criteria *				Total Score	Relative Rank
		Big Impact On Health Status and/or Delivery of Services	Great Public Health Significance	Capacity Strengthening	Gap In Knowledge/ Evidence that Necessitates Research	Feasibility, Practicality, Cost and Time	Importance for Client Satisfaction		
D.1. Elucidate types and amounts of food components which might interfere with nutrient uptake and absorption	Examples of anti-nutrients which are lacking are phytates, oxalates and trypsin inhibitors	5	6		7		3	21	8

* Note: 1 = the lowest/worst score. The relative ranks for ranking No. 1 could be executed by various working groups simultaneously

References

Tee ES, Mohd Ismail N, Mohd Nasir A & Khatijah I (1997). Nutrient Composition of Malaysian Foods. 4th Edition. Malaysian Food Composition Database Programme, Institute for Medical Research, Kuala Lumpur: 310p.

Appendix 1: Users of the current Food Composition Tables and urgent needs to be addressed

Users	Scope of Use	Specific Needs to be Addressed
Nutritionists	Community dietary intake and nutritional assessments	Inclusion of macronutrients (e.g. sugars, dietary fibre, fatty acid profile including trans-fatty acids).
	Nutritional surveys	Micronutrients, especially nutrients with marginalised deficiencies in Malaysians (currently unavailable: iodine, folate, selenium, zinc; urgent need for expansion of list: vitamin A)
	Nutrition education to communities and patients	Information on nutrient profile of cooked dishes, including their standard recipes and method of preparation.
		Nutrition information of processed food and fortified food from manufacturers
		Information on nutrient profile of food and meals, especially from East Coast states, Sabah and Sarawak, which are currently not available. In addition to that, information on nutrient profile of 'under-utilised' fruits and vegetables.
Dietitians	Individual dietary assessments / menu planning	Please refer to the list above.
	Patient counselling / education	
	Compliance evaluation of diet therapy	
Food scientists	Food product development	A more complete database is required. The current FCT does not address the needs of this group.

FOOD COMPOSITION DATABASE FOR NUTRIENT AND NON-NUTRIENT COMPONENTS

Users	Scope of Use	Specific Needs to be Addressed
Food industry, particularly small and medium size industries	Nutrition information panel labelling	Correct portion sizes with accurate nutrient profiles
Health researchers / scientists	Clinical interventions	A more complete database is required. The current FCT does not address the needs of this group.
	Compliance evaluation of feeding trials	
Health education personnel	Health and nutrition education	Correct portion sizes with accurate nutrient profiles
Schools / hospitals / armies	Health and nutrition education within the institutional system	Correct portion sizes with accurate nutrient profiles
	Planning of rations	
Food safety personnel	Exposure assessments	Information on contaminant levels for exposure assessments and HACCP (lead, mercury, mycotoxins, food additives)

Appendix 2: Proposed set up of the Malaysian Food Composition Database Working Group

Globally, there has always been a great deal of importance given to development of quality and comprehensive food database. The Food and Agriculture Organisation (FAO) has initiated the INFOODS in 1983. Subsequently, regional databases were established for example ASEAN foods, which Malaysia participated since the 1980s. In order to have a viable research and policy tool, as well as diagnostic tool in nutrient adequacy, the database requires periodic updates as highlighted in Chapter 8.

The mechanism to achieve an improved Food Composition Database lies in workload sharing. We propose a group to be set up and named, the Malaysian FCD Working Group. Membership could come from institutions currently actively involved in data generation towards the FCD.

Smaller working groups could be set up along the lines of:

- Macronutrients (particularly sugars, dietary fibre, fatty acids, amino acids)
- Vitamins (particularly vitamin A, folate)
- Minerals (particularly iodine, selenium, zinc, haem and non-haem iron)
- Non-nutrient compounds, functional ingredients, bioactive compounds
- Toxicants, contaminants

Once identified, the groups could agree on common methodology for analyses of each component, and establish acceptable inter-laboratory coefficient of variations.

There must be a continued commitment to update the FCD in a 5-year period cycle, which is in tandem with the INFOODS initiative of the Food and Agriculture Organisation (FAO). The types of commitment envisaged include finance, human resource and capacity building. The model which could be used is the continuous commitment given to the National Health and Morbidity Surveys. In between the 00periodic improvements, the FCD Working Group established could continue with work in data collation from universities and research institutions.