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Addressing Malnutrition in Malaysia

Wan Manan Wan Muda, Jomo Kwame Sundaram and Tan Zhai Gen

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Addressing Malnutrition in Malaysia

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EXECUTIVE SUMMARY

Malnutrition remains a huge challenge in Malaysian society. In a food secure country, all should be able to eat sufficiently and healthily, not living in fear of sudden loss of access, physically or economically, to food. Food is, by and large, available and affordable in Malaysia. However, significant challenges remain in how and what Malaysians eat, leading to problematic nutrition outcomes.

Malaysia has long been seen as a melting pot of different cultures, resulting in a variety of traditional foods and food customs coming together and mutating through contact, technological changes and evolving demographic and environmental conditions. Malaysia has also not been exempt from global trends. The current state of food and dietary culture and nutrition is also a consequence of such varied changes.

Undernutrition remains high in Malaysia, even as rates of undernourishment or hunger have improved since Independence. Stunting increased from 17.2% in 2006 to 20.7% of all children below 5 in 2016, while 13.7% of children were underweight in 2006. Micronutrient deficiencies pose a great threat, but are frequently neglected. For example, 4.9 million Malaysians are affected by anaemia, around half of them women between 15 to 45 years of age. The median calcium intake of Malaysians was less than half the recommended level in 2014.

The crises of obesity, diabetes and other non-communicable diseases (NCDs) in Malaysia is much more alarming. Non-communicable diseases (NCDs) dominate the leading causes of premature death and disability in Malaysia. Malaysia is the second fattest country in Southeast Asia and sixth in the Asia Pacific region. The prevalence of known and undiagnosed diabetes increased from 6.9% in 1996 to 17.5% in 2015. In 2015, 30.0% of adults were overweight, and a further 17.7% were obese. Overweight and obesity are risk factors for NCDs such as diabetes, cardiovascular diseases and cancers. NCDs reduce individual productivity and quality of life, and unnecessarily raise health costs, both private and public, with 10–19% of national healthcare expenditure in 2018 spent on obesity-related matters. Studies suggest that overweight and obesity do not just vary significantly with income level, but are also subject to other factors such as genetics, food intake, behaviour, physical activity, illness and 'globalisation', e.g., the rapid spread of food processing and 'convenience foods'. Such connections are rarely linear, e.g., consumption of dietary energy initially tends to increase with income, but 'quantity' may be replaced by 'quality' with further increases in income and food expenditure, greater knowledge and changing food or dietary cultural norms and behaviour. Tackling the underlying factors leading to this crisis will be crucial to ensure better health and public healthcare financing in the future.

Malaysia's nutrition programmes and policies have actively evolved over the years to deal with challenges of the day. Post-independence nutrition programmes focused on improving the living conditions of rural populations who constituted about 70% of the Malaysian population between 1966 to 1970. These included school feeding programmes and programmes for poor and malnourished children. This evolved into the series of National Plans of Action for Nutrition, with the most recent one attempting to address the overweight and obesity crisis. However, some of these programmes have been crippled by lack of intersectoral and multi-stakeholder coordination, sustained financing commitment, human resource capacities and capabilities as well as monitoring and evaluation mechanisms.

A holistic, 'all-of-government' National Nutrition Strategy is urgently needed in order to effectively tackle these issues. Sustainable food systems need to be ensured to promote healthy diets, while public nutrition education needs considerable improvement and strengthening to educate both children and adults on eating healthily. Misleading advertising compromising health and nutrition, especially for children, will need to be restricted. Universal school feeding is also crucial to inculcate good eating habits in children, while improving socialization and cooperation, besides improving academic results and physical development. Anaemia in women of reproductive age needs to be given due attention by encouraging adequate micronutrient intake and temporary supplementation in cases requiring especially urgent attention, e.g., for pregnant women. Food safety will also need to be ensured, including reduction of the overuse and abuse of antimicrobials (antibiotics) for animal, including fish breeding.

Malaysia has progressed considerably in improving food availability, affordability and stability in the country. What remains is to improve nutrition in the country, especially in the face of undernourishment and the crises of obesity and diabetes in the country. Universal school feeding can be crucial for improving nutrition for children and future generations as well as food safety and farmer incomes. Addressing malnutrition in Malaysia should be a key priority for a healthy and more productive Malaysia.

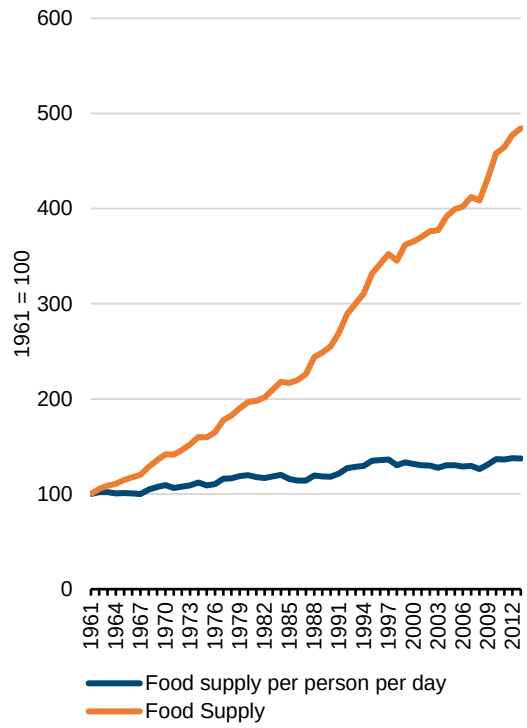
1. FOOD SECURITY AND NUTRITION

1.1. Food Security

A food secure country means everyone has access to sufficient food to meet their dietary needs. Total food available to the country needs to be sufficient, regardless of whether the food is produced locally or imported. Food should also be accessible and affordable to the entire population, regardless of income and location, i.e., even in hard-to-reach rural areas. Food supply needs be stable and resilient to sudden shocks such as famines and civil conflicts. People should be able to consume adequate, safe, healthy and nutritious food, not diets detrimental to their health. Ultimately, in a food secure country, all should be able to eat sufficiently and healthily, not living in fear of sudden loss of access, physically or economically, to food.

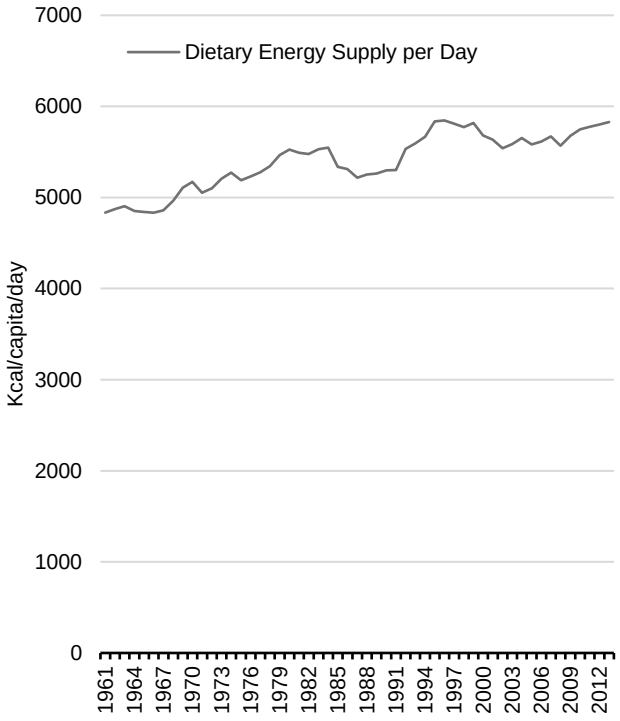
The widespread, if not consensus view is that Malaysia does not face serious food availability issues. Food supplies available in the country are, by and large, sufficient. While rice supply per capita in the country has declined since the 1960s, this is a consequence of dietary diversification as household incomes increase. Meat is an increasingly important part of diets, while Malaysians' major source of animal protein has shifted from fish to poultry and eggs. Rapid increases in poultry production have greatly increased the amount of meat and eggs available for export. However, Malaysia is still heavily dependent on imported beef and milk, while the supply of local fruits per capita has stagnated since the 1960s.

Figure 1.1: Net food supply & net per capita food supply



Source: FAO (various years)

Figure 1.2: Dietary energy supply per day



Source: FAO (various years)

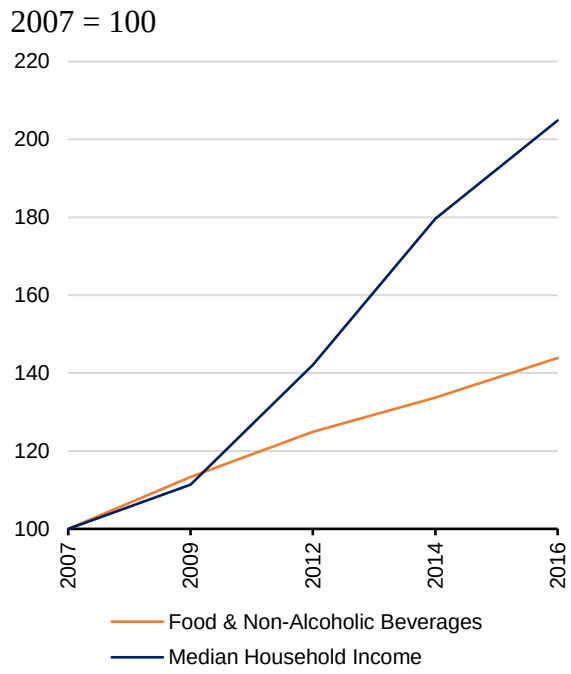
Figure 1.1 shows net food supply and per capita net food supply from 1961 to 2013, indexed from 1961. Net food supply has increased nearly five-fold compared to 1961, while net per capita food

supply has increased 37%. In Figure 1.2, daily dietary energy supply per capita has also increased 21%, from 4835 kcal in 1961 to 5830 kcal in 2013. Thus, the overall amount of food available for the country's population is sufficient, despite the population increase since 1961. The minimum sufficient daily average dietary energy supply is 1,780 kcal per capita (National Coordinating Committee on Food and Nutrition, 2017), but this varies considerably with lifestyles which may range from considerable manual labour to sedentary behaviour.

Having sufficient food in the country does not mean that every person in the country has equal access to food. Physical access to food is not a major issue in Malaysia, given the availability of food stores of various types in most parts of Malaysia and good road connectivity except in a few remote human habitats.

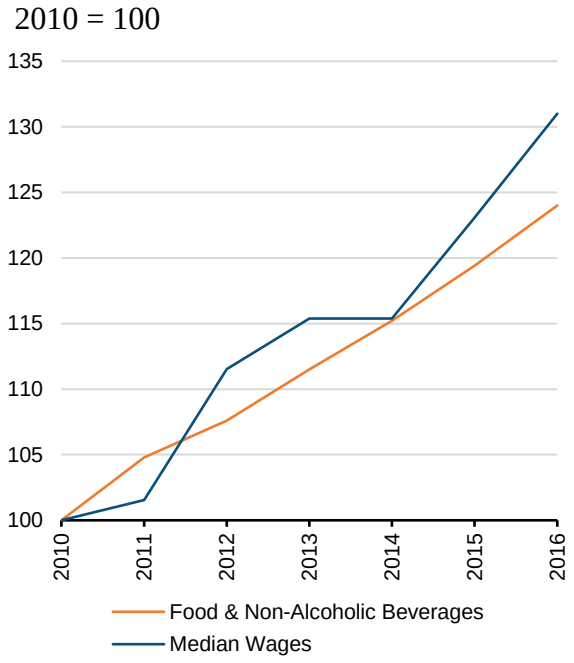
Economic availability, however, raises some concerns, as discussed in *Achieving Food Security for all Malaysians*, a 2019 KRI report. Food accounts for a major share of expenditure of most low- and medium-income households. Households earning less than RM2,000 monthly spent an average of 41.4% on food. From 2003 to 2017, food prices increased by 69%, compared to a 42% increase in the overall consumer price index (CPI), i.e., food price inflation has been higher than the overall increase in prices. However, average household incomes have grown faster than food CPI (Figure 1.3) as median household incomes doubled while food prices increased by only 43% from 2007 to 2016. Thus, household incomes increased more than food prices on average, while median wages roughly increased with food prices (Figure 1.4).

Figure 1.3: Growth of median household income versus F&NAB index, 2007-2016



Source: DOSM (various years)

Figure 1.4: Growth of median wages versus F&NAB index, 2010-2016



Source: DOSM (various years)

Food security policy narratives in Malaysia have long focused on producing enough food, especially rice, within the country. This preoccupation stemmed from colonial policies aimed at

maximizing foreign exchange earnings from British Malaya by minimising the need for food, especially rice imports. Such policies gained new support after the Second World War due to concerns over new food shortages, as experienced during the Japanese Occupation. Since independence, food security in the country has been equated with the self-sufficiency of rice production. However, following the Green Revolution[1] resulting in increased cereal production, and the promotion of international trade liberalisation from the 1980s, it has been argued that food security can be achieved without production self-sufficiency. Instead, food can be imported at lower cost with export earnings from other sources in the country, typically involving more cash crop output. With cheaper food imports and higher incomes, constraints to food affordability will also be reduced. These issues are discussed further in *Achieving Food Security for all Malaysians* and *The Status of the Paddy and Rice Industry in Malaysia*, both earlier KRI reports.

1.2. Nutrition

Malnutrition is an abnormal physiological condition resulting from insufficient, unbalanced or excessive consumption of biologically necessary macronutrients and micronutrients. Three major types of malnutrition are discussed in this report. Food security mainly refers to *undernourishment* primarily associated with insufficient consumption of dietary energy. A second major concern involves *micronutrient deficiencies* of vitamins, minerals and trace elements. The third concern involves *diet-related non-communicable diseases* (NCDs). In recent decades, there has been understandable concern with the related rapid rise of *overweight and obesity*, especially in many middle-income societies such as Malaysia.

Malnutrition, thus, includes 'undernutrition', 'overnutrition' and micronutrient deficiencies (FAO, *et al.*, 2017). Both 'undernutrition' and 'overnutrition' are loosely used terms, with the former sometimes used interchangeably with 'undernourishment', but also used by some to refer to inadequate consumption of micronutrients and macronutrients more generally. 'Overnutrition' is used more colloquially to refer to overconsumption of dietary energy, which may contribute to overweight and obesity, but the term is sometimes also used to refer to overconsumption of salt, oils and fats. The 'double-burden' of malnutrition refers primarily to micronutrient deficiencies and diet-related NCDs although there is a popular tendency today to focus mainly on obesity.

Table 1.1 shows the estimated prevalence of malnutrition worldwide in 2016. Nearly 612 million women, or a third of all the world's women in their reproductive years, are anaemic, while 23% of children below the age of 5 are stunted. While 6% of children below 5 are overweight, 13% of adults are obese[2]. FAO, *et al.* (2017) have also estimated that 57.0% of infants were not exclusively breastfed during their first six months in 2016, as recommended.

[1] The Green Revolution was the movement to use modern agriculture methods of the time to drastically increase the production of food crops and agricultural products.

[2] Children who are overweight have weight-for-height more than 2 standard deviations of WHO's Child Growth Standards median, while adults who are obese have BMIs more than 30.0kg/m^2.

Table 1.1 Prevalence of malnutrition worldwide, 2016

Indicators	*Cases (millions)*	*Share of population*
Stunting among children aged <5 years	154.8	22.9%
Wasting among children aged <5 years	51.7	7.7%
Overweight among children aged <5 years	40.6	6.0%
Obesity among adults	640.9	12.8%
Anaemia among women of reproductive age	613.2	32.8%

Source: FAO, *et al*., 2017

Various kinds of malnutrition can co-exist or occur simultaneously. Many countries are experiencing the 'double burden of malnutrition', with two major types of malnutrition problems co-existing (WHO, 2017). Middle- and low-income countries are experiencing double burdens of malnutrition, where rapid changes in food consumption patterns, overall population disease burdens, rapid urbanisation and demographic changes all contribute to malnutrition (FAO, *et al*., 2018).

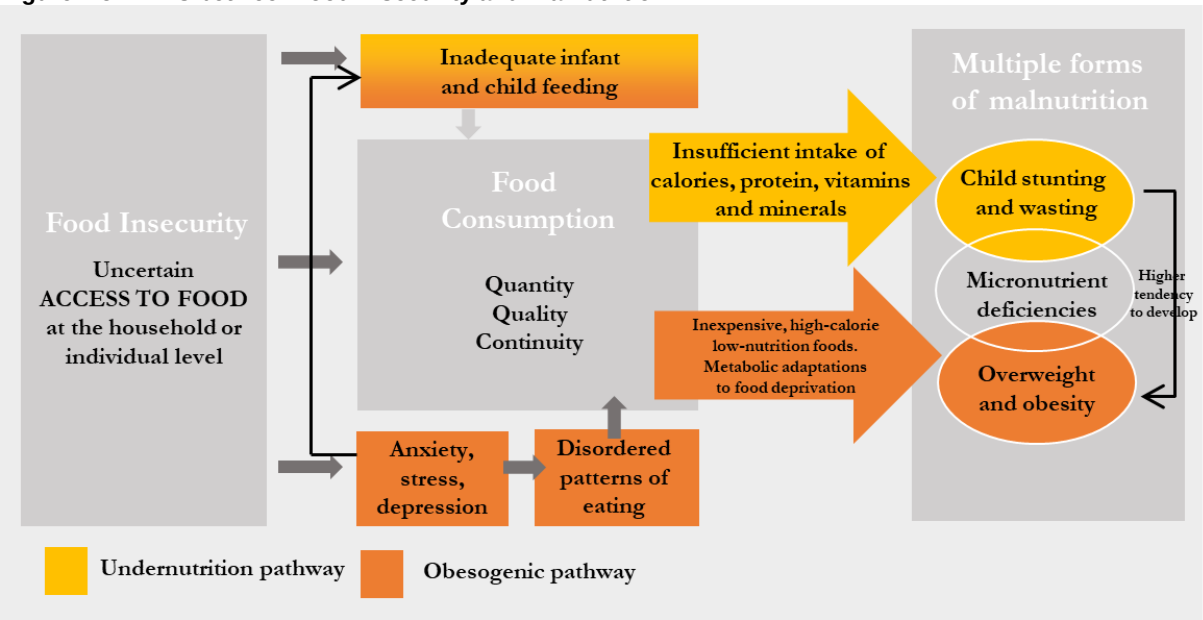
The double burden typically refers to the coexistence of micronutrient deficiencies of vitamins, minerals and trace elements with diet-related non-communicable diseases. However, in popular usage, it may refer to 'undernutrition' (referring more broadly to both macronutrient and micronutrient deficiencies) coexisting with diet-related NCDs, or more narrowly, to overweight and obesity in single individuals, within households and within populations. For example, a person can be obese, but also suffer from insufficient micronutrients, while obese parents may have stunted children.

The double-burden of malnutrition within a household can involve many pathways. Parents in low-income households may use their limited incomes to obtain energy-dense, high calorie foods which may lead to overweight or even obesity. Children on such diets will lack important proteins, vitamins and minerals crucial for infant and child growth. The stress of living with uncertain access to nutritious food impacts household dietary behaviour, e.g., often involving a 'feast-and-famine' mentality, with binging behaviour when food is plenty, increasing the risk of obesity. Beyond these effects, malnourished parents may pass down traits that may result in more obese children, or physically or mentally 'stunted' infants due to malnourished mothers and inadequate breastfeeding, with lasting effects for the next generation.

This report will review different aspects of malnutrition associated with the double-burden of nutrition in Malaysia.

1.3. Food Security and Nutrition: The Links

Figure 1.5: Links between food insecurity and malnutrition



Adapted from: FAO, *et al.*, 2018

Food insecurity can cause malnutrition through two ways: insufficient food consumption and poor dietary behaviour (FAO, *et al.*, 2018). For countries and communities with unstable, insufficient or unaffordable food supplies, hunger and insufficient intake of calories, proteins, vitamins and minerals will worsen malnutrition, especially among children. Lower middle-income and especially low-income countries and households are more likely to purchase and consume low-cost, high-calorie, energy-dense food, such as carbohydrates, to overcome hunger, inadvertently worsening overweight and obesity issues. 'Feast-and-famine' cycles may also occur, where food binging and overeating occur when food is believed to be readily available are interspersed with food shortages and deprivation. The body's metabolic system adapts to this cycle, usually increasing the probability of overweight and obesity. Psychological issues such as anxiety, stress and pressure on individuals may induce excessive eating and metabolic changes increasing overweight and obesity. This may increase consumption of high calorie foods, such as sugar. All this contributes to the seeming paradox of the 'double-burden' of malnutrition, with childhood stunting and wasting coexisting with high shares of overweight and obese adults in food insecure societies or communities.

The evidence of food insecurity leading to stunting is strong, especially in low- and middle-income countries. However, the pathways leading to overweight and obesity still require further research (Maitra, 2018). Studies also show that binge-eating, due to 'feast-and-famine' conditions, increases overweight and obesity, while food insecurity increases intake of high calorie food to cope with cyclical food availability, with women more likely to be overweight and obese in these situations.

Childhood food insecurity will have lasting impacts on an individual's nutrition and health. Many studies have shown that children younger than five who experience low birthweight and childhood stunting are likely to end up overweight and obese later in life. Past anxieties may also induce greater consumption of high calorie food to pre-empt possible future hunger pangs.

Malaysia, as a developing country approaching high-income status, is experiencing the 'double-burden', with both child wasting and stunting (FAO, *et al.*, 2018), while remaining the 'fattest country' in Southeast Asia (Verma, *et al.*, 2013). This 'double-burden' of malnutrition continues despite sufficient food availability and stability, and improved affordability. Hence, the next challenge is to ensure that diets or food consumption behaviour are diverse, balanced and nutritious.

This report therefore goes beyond the traditional food security focus on food availability, access, affordability, stability and utilisation to consider what and how Malaysians eat and its consequences for health and nutrition. Chapter 2 examines changing behaviours and diets in Malaysian society in relation to malnutrition. Chapter 3 provides an overview of undernourishment, Chapter 4 of micronutrient deficiencies, Chapter 5 of diet-related non-communicable diseases, and Chapter 6 of overweight and obesity. Chapter 7 provides a brief historical overview of nutrition programmes and policies in Malaysia, followed by proposals for a National Nutrition Strategy in Chapter 8. The report ends with consideration of school feeding programmes as a policy option.

1.4. Changing Behaviours and Diets: Food Supply and Consumption

How and what people eat is subject to many factors, including cultural traditions, food availability and changes in the way food is produced, traded, prepared and consumed. As household incomes rise and food supply increases and becomes more diverse, the Malaysian diet has changed, becoming more diversified. Changes in diet have also been affected by cultural trends, not only absorbing, but also transcending diverse influences from many cultures.

Food behaviours and dietary preferences are widely considered to be markers of ethnic and cultural identities. In most multi-ethnic societies, food is a cultural marker of ethnic identity, involving the image and reputation of specific ethnic and sub-ethnic groups, especially in terms of tradition and 'authenticity' (Ramli, *et al.*, 2017). Conversely, food consumption and food preparation processes define identity in terms of community, ethnicity, generation, gender, locale, occupation and religion (Nor, *et al.*, 2012). This also includes the tools, techniques and ingredients with which food is prepared. In other words, food customs define cultures and ethnic identities (Verbeke & Poquiviqui López, 2005).

Malaysia has long been seen as a melting pot of different cultures, resulting in a variety of traditional foods and food customs coming together and mutating through contact (Adzahan, *et al.*, 2011). There are several varieties of what may be deemed traditional diets in different parts of Malaysia, which have changed significantly over time. Some traditional diets are said to have been preserved and passed on unchanged from generation to generation, although this is rarely the case. Such traditional diets are nonetheless very much part of Malaysia's variegated and changing cultural heritage, although many ostensibly traditional foods have been adapted, if not invented recently, while others have often changed in different, if subtle ways.

1.5. Culture and Diets: Historical trends

1.5.1. 'Traditional Malay' Diets

Food has long been associated with cultural identity and is widely considered an integral component of the culture and heritage of the 'Malay world'. To many Malays, rice is the principal staple at the centre of daily life; a meal is not considered complete without rice (Raji, *et al.*, 2017). Rice is seen as providing more than mere nourishment; its consumption is believed to offer great benefits for body and soul. Uncooked rice is typically boiled without seasoning and served with dishes which supply other nutrients. Food that accompanies rice, for those with the means to afford them, include fish, eggs, poultry or other meat, and also cooked or raw vegetables (*ulam).* Rice has also played a major role in the traditional Malay ceremonies for marriage, circumcisions, births and deaths, among others. *Pulut* (glutinous rice) is a common feature of special meals and ceremonies.

Traditional Malay diets may have undervalued several kinds of food with dietary taboos, preferences and other misconceptions. Malays are believed to have considered only two foods, namely rice, a staple source of dietary energy essential for sustaining physical activity, as well as fish and several other aquatic foods. Many believe the latter necessary for acquiring physical strength, implicitly recognising this important source of animal protein. Traditional Malay diets also include vegetables and fruits, although it has been argued that vegetables were simply additives to enhance the taste of rice-based meals, while fruits were seen as pleasurable supplements. Taboos are also said to have contributed to removing several foods, such as some types of vegetables, from traditional Malay diets (Laderman, 1984). Important regional and even local differences exist, e.g., the northern and eastern states of Peninsular Malaysia have been influenced by Siamese/Thai cuisine, while other states have been more influenced by regions in Indonesia and beyond.

As the demography of Malaysia has changed over time, traditional Malay diets have absorbed influences from Chinese, Indian, Siamese/Thai, Arab, European and other cuisines. Thus, Malay diets today are essentially fusion diets, with traces of many different cultures and cuisines, while retaining some truly traditional components. This changing diet has, in turn, influenced Malay culture and history, with knowledge passed on and preserved (Hamzah, *et al.*, 2013). Some better known traditional cooking ingredients for Malays include lemongrass, *pandan* (screwpine) and *kaffir* (lime) leaves as well as fresh herbs such as *daun kemangi* (a type of basil leaf), *daun kesum* (polygonum or laksa leaf), nutmeg, turmeric and *bunga kantan* (wild ginger buds). The Malay diet has also used various spices, such as cumin and coriander, as well as Indian and Chinese spices such as pepper, cardamom, star anise and fenugreek (Hassan, 2011). This process of blending and fusing cuisines persists to this day, with Malaysians continuing to combine elements of various cuisines to create contemporary dishes.

The implications of traditional diets for nutrition remain mixed. It is still difficult to ascertain to what extent macronutrient and micronutrient needs were met by traditional diets. It is easier to understand certain beliefs in historical context. For example, the older generation of Malaysians considered chubby babies to be 'healthy', probably reminiscent of a time when food shortages or other problems threatened food deprivation, even wasting among young children. It is also unclear

how much traditional food supplies were subject to seasonal supply constraints, especially those affected by the monsoons.

Without romanticising the adequacy of traditional diets, it is also often erroneous to adopt the modernist conceit that these diets were always inferior, as suggested by the example of eating polished white rice[3].

1.5.2. Colonial Influences on Malaysian Diets

Malaysia has a long and uneven history of colonisation by Europeans. The Federation of Malaya, Sarawak, North Borneo and Singapore, formed Malaysia in 1963, after Brunei pulled out of the proposed federation of former British territories in the region. Subsequently, Singapore pulled out less than two years later in August 1965. Beforehand, the famous Melaka empire was colonised by the Portuguese and then, by the Dutch from the early 16th CE century. From 1786 to 1957, the British would then gain greater control of the territories that later came to constitute Malaysia (Loo & McKerchar, 2014). Lengthy, albeit uneven British colonial rule had wide reaching impacts, not only for the development of Malaysia, but also, for its food cultures.

In the minds of many of the British, differences over food matters underscored colonial superiority over the natives (Leong-Salobir, 2011). As the British considered Malaysian foods and diets to be inferior, imperial domination and colonial culture extended to matters of food and diet as well. As elsewhere in the colonial world (Earle, 2012), many Malaysians, especially the elite, embraced British food practices as superior, 'correct' and modern. In the minds of many, food processing implied modernity, health and superiority.

By contrast, Asian foods were seen as inferior, with Malay food the least processed, and hence, most 'primitive'. While many 'traditional' foods of the pre-colonial era remain staples of Malaysian diets, colonial legacies in food and dietary matters are also enduring (Hamzah, *et al.*, 2013). Large-scale consumption of wheat, confectionary, milk and meat can be traced to Western modernization. With growing commodification, processing and induced new food preferences, food industries have grown in lands such as Malaysia.

Several factors have contributed to the food acculturation of both indigenous peoples and Europeans in the colonial world. In the early centuries and decades of colonisation, European men often came alone, leaving their women behind. With limited food supplies from Western sources, food production and processing in the colonies adapted to meet changing demand, with Western food surrogates incorporated into Western cuisine as well as Malaysian diets. Colonial authorities

3 Almost a century ago, it was found that beri-beri, a disease brought on by Vitamin B deficiency, was most widespread among ethnic Chinese who ate the most polished white rice (Carter, 1977). In contrast, there were no cases among ethnic Malays, who ate 'pounded rice' (to separate rice grains from their husks). Most ethnic Indians also did not suffer as much from beri-beri as they mainly ate par-boiled rice, which retains some of the rice germ. Today, most Malaysians eat polished white rice, but beri-beri is an affliction of the past as more diversified contemporary diets include Vitamin B from other sources.

often encouraged production of preferred Western foods in the colonies, e.g., in the cooler highlands in the tropical and equatorial zones (Collingham, 2001).

The economic organisation of colonialism extended from trade to production, and imperial governance involved not only a colonial state apparatus, but also private business interests for commodity production and processing, meanwhile, the nature of colonial demography changed with the formation of families. Western food became increasingly available, even in colonies which were not settler colonies with significant settler farmer populations. Where possible, a certain amount of food was produced locally to reduce foreign exchange used to import such foods from abroad. Cultivating food crops was deemed important in colonial Malaysia to minimise foreign exchange used for food imports, especially from outside the sterling zone.

The growth of agriculture, including food commodities for export, has also been important. However, in colonial Malaya, much more foreign exchange could be earned with the production and export of cash crops such as coffee and later, rubber. For plantations to capture more rents, colonial authorities restricted smallholder cultivation of rubber (Drabble, 1973; Bauer, 1948). To this end, a variety of measures were deployed, including by requiring rice cultivation on land designated as Malay reserve (Kratoska, 1982). With the changing nature of colonial presence, the roles of Malaysian women also changed significantly. Over time and with advances in maritime transportation, British men increasingly formed and maintained families in the colonies, as 'local' or 'native' women were retained to work as domestic workers, cooks, nannies and even wet-nurses in their homes. Such work often involved learning how to cook food for the colonial *tuans* and *mems*, and performing other household services, often at the behest of British women. Thus, in their roles in such households, local women began emulating what is best described, non-pejoratively, as colonial cuisine. This was a consequence not only of local women working for and staying with the British, but sometimes, also due to living with and marrying them (Casey, 2017; Chaudhuri & Strobel, 1992).

Owing to considerations of distance, costs, and cold storage and transportation difficulties, innovation and adaptation became important elements of colonial dietary innovation, involving material supplies, preparation and consumption. With the far-flung nature of the British empire, other indigenous foods from elsewhere, especially India, also found their way into imperial cuisine, not only in the 'centre', but also in the 'periphery'. Hence, colonial food culture was not simply English or British food culture brought over to the colonies, but experienced change and evolution in various parts of the empire. At the same time, colonial food culture transformed Malaysian foods and diets, albeit in an interactive or dialectical fashion.

1.5.3. 'Modern' Diets and Changing Dietary Consumption

Especially since the Second World War, growing capabilities in processing food, including methods to effectively store food for longer periods, have come to re-shape and displace preceding cultural and behavioural elements, including diets (Nummer, 2002). Unlike the pre-WW2 generation, food processing has enabled consumers to have greater access to 'fast', 'instant', 'convenient' or 'ready-to-eat' processed food.

The modern food system has come about due to a series of transitions heavily influenced by international trends and practices, not least in the Western world. Food production and processing sought to increase food supply efficiency, including to soldiers in distant lands. As during the American Civil War, when tin plating boomed to preserve meat and other food supplies for the war front, the exigencies of waging war, during the first and second world wars, required states and businesses to respond innovatively.

Improvisation as well as innovation rose to the challenge by developing both labour-saving and capital-saving techniques in both agriculture and food processing. Within decades, and with support from sympathetic law, policy and decision makers, these quickly grew to become powerful industries, in agrochemicals, agricultural machinery, rural infrastructure and food processing, that have re-shaped food practices including food retailing and consumption.

Since then, the food industry, and consequently, food culture, is increasingly influenced by technological rationalisation and intensification. Processed food that lasts longer continues to account for a rising proportion of consumed food, while food consumption has become less defined by geography as logistics have improved (Spaargaren, *et al.*, 2012). The food market is still expanding and integrating globally. Local food shortages can be a thing of the past where the means and political will exists. Conversely, food variety and choices have expanded. However, marginal or subsistence food producers have also been immiserated by land displacement, ecological constraints and commercialisation of food production, marketing and consumption. Some of these factors are also said to have contributed to the increasing stabilisation of food supplies.

The increasing global reach of the food supply chain has meant that new power relations have emerged between 'the local' and 'the global' in food provision, retail and consumption. The debate over the cost and benefits of consuming 'local' or 'global' foods is still ongoing, including among food scientists and policy makers on the most sustainable and economical methods to ensure sufficient and affordable food (Coelho, *et al.*, 2017).

Meanwhile, food affordability for most consumers remains subject to economic, especially cash income considerations (Green & Foster, 2005). Meanwhile, predominantly national regulatory frameworks seem to have lost considerable ground in the face of corporate-led globalisation's push for responsible 'self-regulation'. Commercial food sales for preparation at home as well food preparation for consumption outside the home or even at home have grown rapidly.

Meanwhile, other influences have contributed to reorganising major segments of important food value chains and networks. Farmers producing food as well as consumers buying food have progressively lost out to oligopolistic and oligopsonistic corporations. Food transnational corporations have gained power, not only by supplying machines and other materials to farmers, but also by buying food products from farmers, or processing and marketing food to consumers.

'Foodie culture' advocates have contributed to fostering the impression that consumers are collectively able to dictate the terms and conditions for buying and consuming food. It remains to

be seen how such varied forms of seeming consumer empowerment have effectively promoted and safeguarded consumers' interests and welfare besides non-commercial values in food culture.

Undoubtedly, business profitability considerations are being challenged and replaced by a variety of new approaches and value orientations, including a renewed and better-informed prioritisation of environmental and health considerations. Public sensitivity has undoubtedly grown with respect to the impacts of food production and consumption on nature, climate and the environment, even the well-being of animals bred for food.

However, such awareness of sustainability issues in relation to food has not yet resulted in major changes in food practices in most of the world. This may be partly due to weakened state capacities in terms of regulation and enforcement, greater transnational corporate power, as well as insufficient awareness of public health and other threats, e.g., in relation to anti-microbial resistance (AMR), compromising the efficacy of antibiotic use in protecting human health, and the abuse and excessive use of agro-chemicals in food production.

Cultural dimensions of food have undoubtedly become a major issue. Different lifestyle groups use food practices as markers to articulate their socio-cultural status and tastes in various ways. Food-related behaviours have thus become important modes for cultural expression and differentiation, especially some aspects of Western culture and trends. Demand for associated food products, including modern fast/instant/convenient food versions of the ostensibly traditional, is increasing.

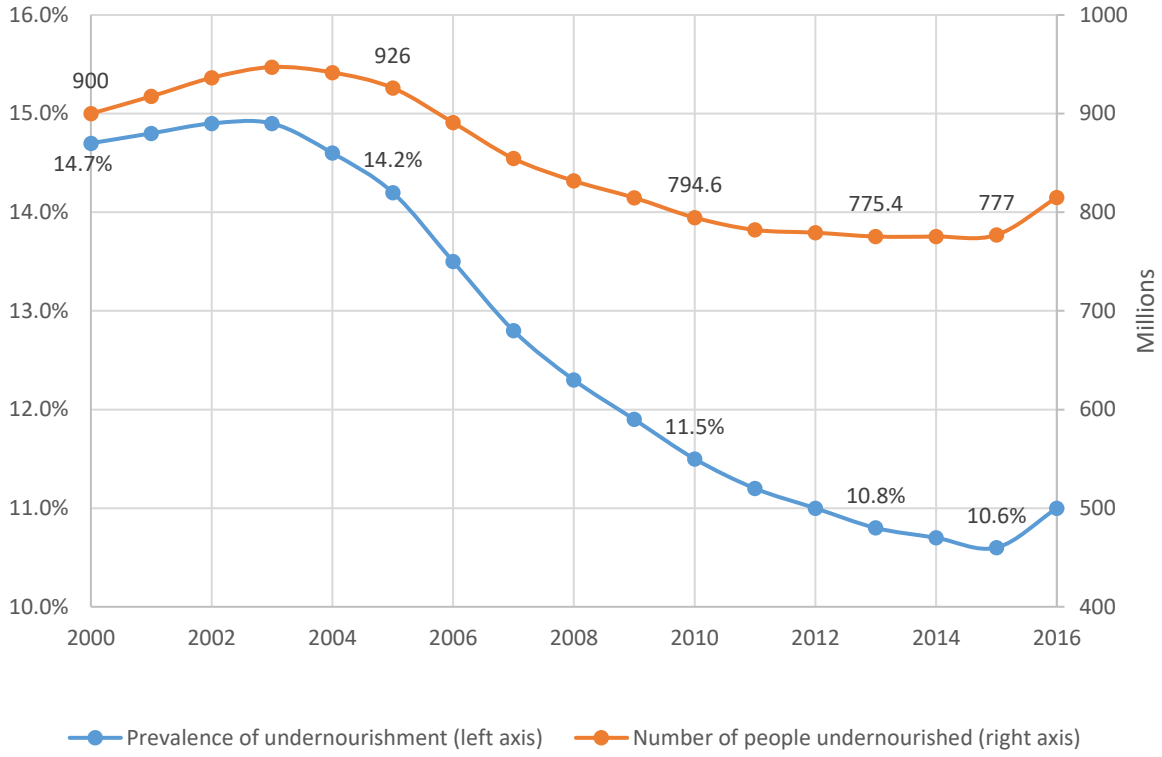
For example, supermarkets have been fast expanding in urban Malaysia. Sales of fresh food in Asia by leading supermarket and retail chains did not slow during 2001–2005 and then, 2005–2009 (Reardon, *et al.*, 2012). Even smaller towns are seeing the growing presence of small supermarkets. A study of Thai consumers (Kelly, *et al.*, 2014) reported that frequent shopping at supermarkets and convenience stores tends to increase consumption of six 'problem foods', namely sugar-sweetened beverages, snacks, processed meats, Western-style bakery products, 'convenience' foods and deep-fried foods.

Much more still needs to be examined regarding the changing diets of Malaysians against this backdrop of increasing, albeit uneven globalisation and technological advancement. However, there is little doubt that Malaysia has not been exempt from global changes and trends.

2. UNDERNOURISHMENT

2.1. Stunting

Figure 2.1: Prevalence and number of undernourished people worldwide, 2000–2016



Source: FAO, *et al.*, 2017

The number and percentage of undernourished people in the world has decreased since 2000, with the share of undernourished people falling by 123 million from 14.7% (900 million) in 2000 to 10.6% (777 million) in 2015 (Figure 2.1). However, since 2015, dietary energy undernourishment seems to be rising again, with the share of undernourished rising to 11.0% (815 million) in 2016.

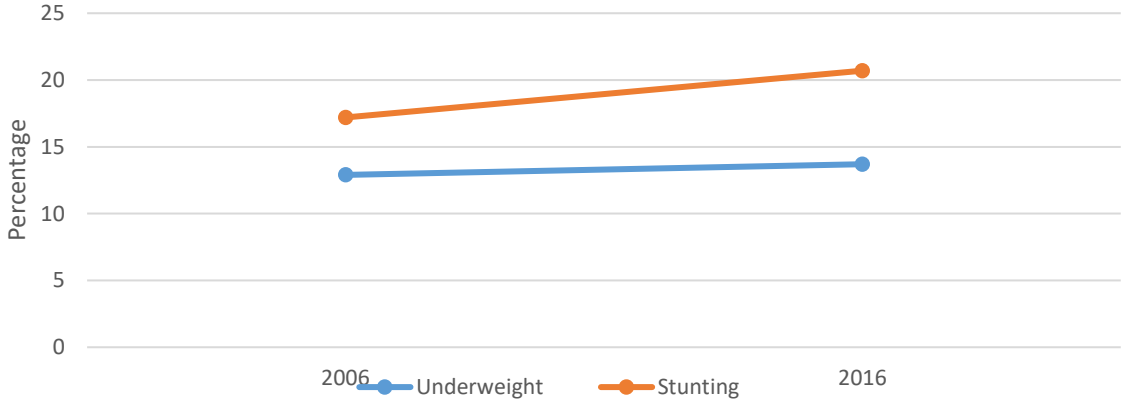
Stunting[4] is the most common consequence of undernutrition affecting infants before and soon after birth. It is a largely irreversible outcome of inadequate nutrition, with infant length, in terms of height lost early on, rarely recovering later in life. Stunting has long-term effects on individuals, including diminished cognitive and physical development, reduced productive capacity, poor health, and increased risk of degenerative diseases, such as diabetes, later in life.

The evidence suggests continuing decreases in the prevalence of stunting among children, both globally and regionally. However, stunting still affects almost one in four children, equivalent to 150 million children under the age of five years globally (FAO, *et al.*, 2017). If current global trends continue, projections indicate 127 million stunted children under 5 years of age in 2025. The rates of childhood wasting remain very high, especially in South Asia (Hayashi, *et al.*, 2017). These conditions increase the risk among children of impaired cognitive ability, weak school performance and early death from infection.

[4] Children too short for their age because of chronic undernutrition during the most critical periods of growth and development in early life (FAO, *et al.*, 2017).

In Malaysia, local studies in both Peninsular and East Malaysia in the 1980s found high prevalence of chronic undernutrition and underweight among children and households (Chen, 1981; Chong, *et al.*, 1984; Counihan, 1993). While such reports of undernutrition seem to have fallen in the 1990s, a large-scale collaborative study assessing nutritional status in fishing, paddy, rubber, coconut and estates found persistent underweight, stunting and wasting among children under 18 during 1992-1995 (Chee, *et al.*, 1997; Khor & Tee, 1997). Another study of preschool children between 1 to 6 years of age in Baling, Kuala Kangsar, Kuala Terengganu and Machang found chronic undernutrition, with 22.5% of the children stunted and 9.7% wasted (Chee, *et al.*, 2002).

Figure 2.2: Percentage prevalence of undernutrition among Malaysian children under 5 years old, 2000 to 2016



Source: Ministry of Health Malaysia, 2016

Figure 2.2 shows the prevalence of undernutrition among Malaysian children under 5 years of age. National nutrition surveys have found increasing stunting among children under 5 nationally, from 17.2% in 2006 to 20.7% in 2016. The share of underweight children in their population age cohort actually increased from 12.9% in 2006 to 13.7% in 2016. The Southeast Asian Nutrition Survey (SEANUT) of 2013 found that 8.4% of Malaysian children aged 6 months to 12 years were stunted, 9.8% were overweight, and 11.8% obese (Poh, *et al.*, 2013).

Table 2.1 shows patterns of undernutrition varying with income, ethnicity, location and state. Children from households earning less than RM1,000 monthly had much higher rates of underweight and stunting than the national averages. The share of underweight children in households earning less than RM1000 in 2006 increased from 18.1% of all children to 18.8% in 2016. Similarly, stunting rates also increased from 21.0% in 2006 to 29.8% in 2016. Rural households had higher rates of underweight and stunting than their urban counterparts. All ethnic groups saw increased stunting from 2006 to 2016, while changes in the underweight rates varied among ethnic groups. In 2016, Kelantan had the highest rate of stunting at 34% of children 5 years and below, followed by Terengganu at 26.1% and Pahang at 25.7%. But the increase in Pulau Pinang was highest among all states, more than doubling from 2006 to 2016, followed by Kelantan with an 83% increase.

Table 2.1: Underweight and stunting by sociodemographic characteristics of children from the NHMS 2006 and NHMS 2016 surveys

Sociodemographic characteristics	*Underweight (WAZ <-2SD)*		*Stunting (HAZ <-2SD)*	
	2006 (%)	*2016 (%)*	*2006 (%)*	*2016 (%)*
Household income < RM1000	18.1	18.8	21.0	29.8
Strata				
Urban	11.4	12.9	13.5	19.2
Rural	16.0	15.1	19.4	23.3
Ethnicity				
Malay	14.3	13.6	16.5	21.3
Chinese	5.2	8.5	7.7	14.1
Indian	10.5	15.3	8.7	17.1
Other Bumiputra	18.4	17.5	22.8	24.9
Others	18.9	21.7	19.6	29.5
State				
Johor	11.3	11.4	14.7	12.0
Kedah	12.4	15.9	12.2	18.1
Kelantan	16.8	16.8	18.6	34.0
Melaka	12.6	13.4	12.6	14.1
N Sembilan	10.2	12.3	10.6	19.1
Pahang	13.2	12.9	14.8	25.7
Pulau Pinang	9.0	16.7	9.8	20.3
Perak	14.4	15.2	15.6	23.7
Perlis	19.0	18.4	14.3	20.8
Selangor	10.6	11.3	13.5	18.5
Terengganu	14.8	10.8	16.2	26.1
Sabah	19.1	15.2	26.9	23.5
Sarawak	13.5	17.8	15.5	23.1
WP KL	8.1	8.3	11.4	10.5
WP Putrajaya		12.9		24.3
WP Labuan	13.3		16.0	
Malaysia	13.2	13.7	15.8	20.7
Malaysian	12.9	13.8	15.5	20.8
Non-Malaysian	25.7	10.2	29.9	18.3

Sources: NHMS 2006, NHMS 2016

[a] Data for children under 18 years old; excluding Labuan

[b] Data for children under 5 years old; including Labuan

*The survey sample sizes for undernutrition measures were not equal; hence, for each socioeconomic characteristic of the children, the undernutrition measure with the smallest sample size is assumed to be the sample size for both measures. For example, if the survey sample size for underweight in NHMS 2006 was 2891 and for stunting 3454, the survey sample size is reported as 2891.

2.2. Box 1: Nutritional Assessment of Malnutrition

The nutritional status of a person is not simply a function of dietary intake (energy and nutrients), but also of body nutrient stores, body composition and the body's utilisation of the nutrients consumed. No single method can measure nutritional status. Normally, a nutritional assessment is conducted to determine the nutritional status of an individual or population. Nutritional assessment is an initial step for further action to follow, often an intervention project or programme. A combination of four different methods is employed to determine a person's nutritional status, following the 'ABCD' mnemonic:

a) Anthropometric measurement

b) Biochemical readings

c) Clinical evaluation

d) Dietary intake

When nutritional assessment is carried out, several indicators are used (as in Tables 2.2 and 2.3) to determine nutritional status, health status, and food purchases (Beghin, *et al.*, 1988).The nutritional status of children is evaluated using a Z-score designating anthropometric value as a few standard deviations (SD), or Z-scores, below or above the reference mean or median value (FAO, *et al.*, 2017).

Table 2.2: Indicators of malnutrition

Common anthropometric measurements in children

- Weight-for-age (WAZ): Low WAZ indicates underweight
- Height-for-age (HAZ): Low HAZ indicated stunting/shortness
- Weight-for-height (WHZ): Low WHZ indicates thinness/wasting
- Mid Upper Arm Circumference (MUAC): Low MUAC indicates thinness/wasting

Formula for calculating nutritional status

- $\text{Z score} = \frac{\text{observed value} - \text{median value of the reference population}}{\text{standard deviation value of the reference population}}$
- Body mass index = weight (in kg) / height^2 (in metres)

Table 2.3: Cut-off values for different types of malnutrition among children under 5 years of age

Type of malnutrition	Cut-off values
Underweight	Weight for age < -2 SD of WHO Child Growth Standards median
Stunting	Height for age < -2 SD of WHO Child Growth Standards median
Wasting	Weight for height < -2 SD of WHO Child Growth Standards median or mid upper arm circumference <12.0cm
Overweight	Weight-for-height > +2 SD of WHO Child Growth Standards median

3. 'HIDDEN HUNGER': MICRONUTRIENT DEFICIENCIES

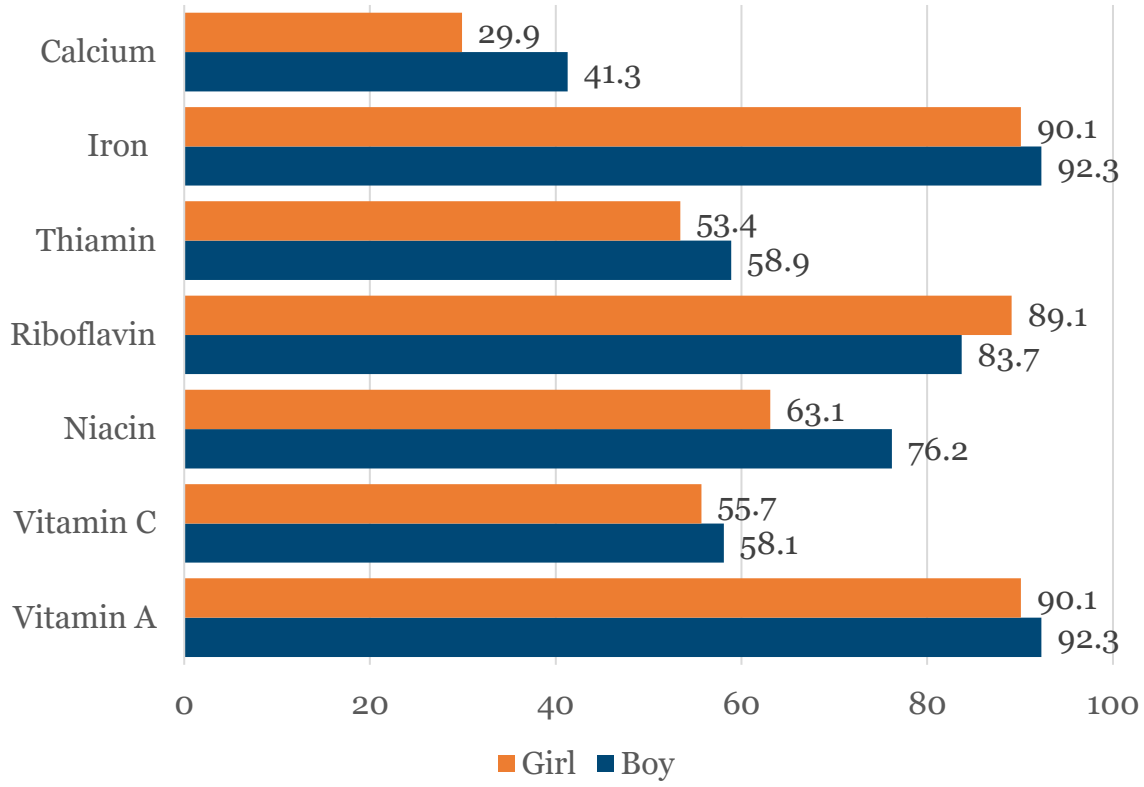
Micronutrient deficiencies, or 'hidden hunger', are especially widespread in the developing world. They have been receiving greater attention in recent years. Micronutrient deficiencies can have adverse consequences on growing children due to impairment of growth, weakened immune systems as well as compromised physical and mental development, which may not be reversible by subsequent nutrition interventions (Viteri & Gonzalez, 2002).

Micronutrients are nutrients only needed in minuscule quantities. These are typically vitamins, minerals and trace elements, all substances that enable the body to produce enzymes, hormones and other substances essential for normal growth and development. Although the amounts needed are very small, the consequences of their absence can be severe. Iodine, Vitamin A and iron are perhaps the most important from a global public health perspective; their absence from diets poses a major threat to the health and development of populations worldwide, particularly to children and pregnant women in vulnerable environments.

The problem of micronutrient deficiencies in Malaysia has not received much attention in the media as compared to visually more conspicuous problems such as obesity and stunting among children. 'Hidden hunger' was thought to have been eliminated with the disappearance of vitamin deficiency diseases, such as beri-beri and scurvy, half a century ago. Indeed, micronutrient deficiencies are difficult to detect as their signs and symptoms are not very manifest in comparison with other forms of undernutrition and overnutrition. A child may be suffering from mild micronutrient deficiencies without showing anatomical or clinical symptoms to the naked eye, except through biochemical analysis of the blood or urine.

Micronutrient deficiencies are believed to be widespread in Malaysia, although nutrition studies have not been done frequently in the country over the last two decades. Recent studies of micronutrient deficiencies in Malaysia are limited with the exception of iodine studies leading to ongoing programmes for iodine deficiency disorder (IDD) control and prevention by the Ministry of Health. A Nutrition Society of Malaysia (NSM) study of school children aged 6 to 17 years found that more than half the children met at least 80% of the values prescribed in the Recommended Nutrient Intake (RNI) for Malaysians for Vitamin A, Vitamin C, thiamine, riboflavin, niacin and iron (Figure 3.1). However, only 30% of girls and 41% of boys achieved the recommended calcium intake (Nutrition Society of Malaysia, 2015).

Figure 3.1: Nutrient intakes as a percentage of children's Recommended Nutrient Intake



Source: Nutrition Society of Malaysia, 2015

3.1. Iodine Deficiency Disorders (IDD)

Iodine deficiency is the world's most prevalent, yet easily preventable, cause of brain damage. There are about 740 million people affected by goitre globally, and about 2.2 billion were at risk of iodine deficiency disorders (IDD) in 1999 (World Health Organisation, 2001). Iodine deficiency is one of the main causes of impaired cognitive development in children, but the number of countries facing iodine deficiency as a public health problem has declined significantly (World Health Organisation, 2004).

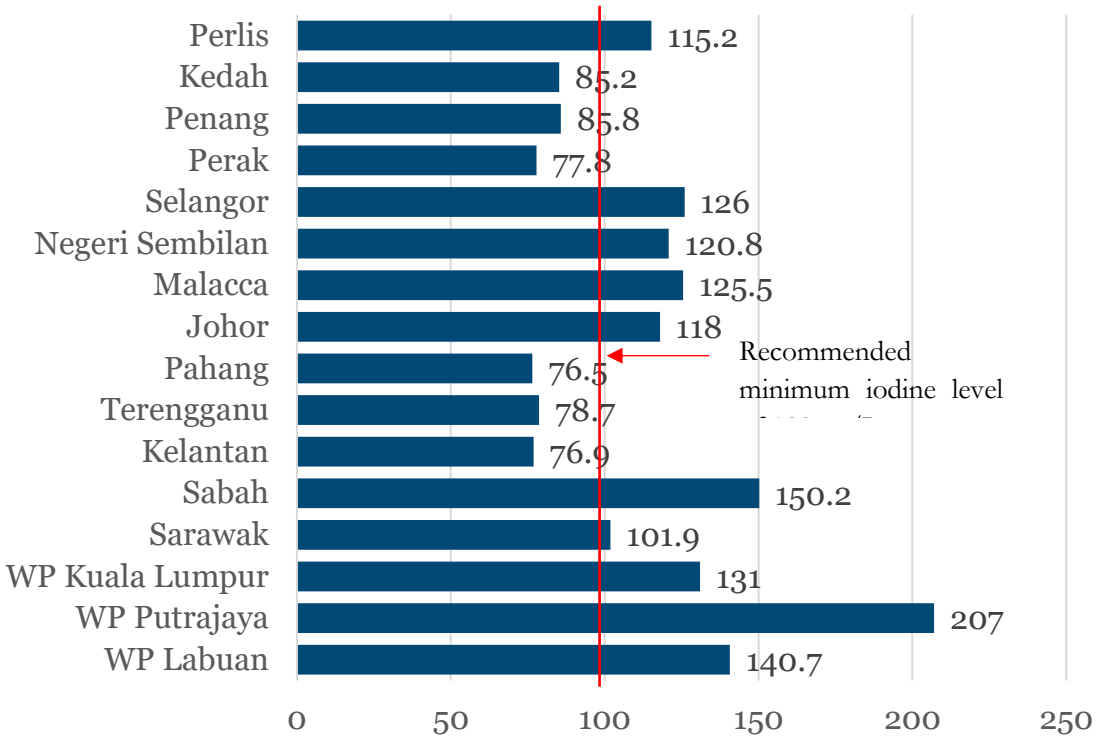
As the body does not synthesise iodine, consuming it is essential. Iodine is required for the synthesis of the thyroid hormones needed for the regulation of metabolic activities in all cells of the human body. These hormones are also required for normal growth, particularly for brain growth starting in the foetal period within the womb until the child is 3 years of age. Iodine deficiency is the most prevalent cause of preventable mental retardation in the world. Severe iodine deficiency can impair thyroid functions, which can lead to lower metabolic rates, growth retardation and brain damage. Long term iodine deficiency can result in irreversible mental retardation (Pemberton, *et al.*, 2005; Oetting & Yen, 2007; Rovet, 2014). Iodine deficiency can lead to enlargement of the thyroid (goitre), hypothyroidism and intellectual disabilities among infants and children whose mothers were iodine deficient during pregnancy. Lack of iodine in the body also hampers production of adequate thyroid hormones.

Iodine deficiency occurring during foetal and neonatal growth and development leads to irreversible damage of the brain and central nervous system, and consequently, to irreversible

mental retardation. Iodine deficiency will also cause thyroid hormone imbalance and lead to impaired mental functions, especially among children, as well as goitre, hypothyroidism and other hormonal imbalances in adults (Zaleha, 2013). While iodine deficiency affects all populations at all stages of life, as shown in Table 3.1, efforts to diagnose and treat iodine deficiency need to focus on the most vulnerable, namely pregnant women, lactating women, women of reproductive age, and children below 3 years of age (Hetzel, 1983; Dunn, 2003).

In Malaysia, a nationwide survey of children aged 8–10 years found that they have consumed just enough iodine[5]. Overall national prevalence of IDD[6] for all ages, was 48.2%, indicating that nearly half the population did not have adequate iodine intake. Figure 3.2 shows urinary iodine levels (µg/L) in Malaysia by state in 2008. In five states, namely Kedah, Penang, Perak, Pahang, Terengganu and Kelantan, median urinary iodine levels were below 100 µg/day, classified by WHO/ICCIDD[7]/UNICEF criteria as experiencing IDD. IDD is more prevalent among rural children with the total goitre rate in Malaysia at 2.1%, especially prevalent among the Orang Asli (Selamat, *et al.*, 2010).

Figure 3.2: Urinary iodine level (µg/L) in Malaysia by state, 2008



Source: Wan Nazaimoon & Rusidah, 2010

Iodising common table salt (iodised salt supplementation) is one way to increase iodine intake among vulnerable groups. Since 1997, Malaysia has had a salt iodisation programme in Sabah and Sarawak to overcome iodine deficiency among indigenous populations. Water iodinator systems

[5] The national median urinary iodine (UI) was 109µg/L, suggesting borderline IU adequacy compared to the recommended iodine level of 100 µg/L and above (Selamat, et al., 2010).

[6] Based on WHO/ICCIDD/UNICEF criteria of UI<100 µg/day.

[7] ICCIDD refers to the International Council for Control of Iodine Deficiency Disorders

have been used in selected schools in Terengganu to increase iodine supply among school children (Lim, *et al.*, 2006). Lim, *et al.* (2012) reported moderate iodine deficiency among Orang Asli (aborigines) in Hulu Selangor. Besides poor dietary intake of iodine, high consumption of goitrogenic[8] food, such as tapioca leaves, was associated with high prevalence of goitre among the native populations of Sarawak (Khor, 2002)

3.2. Vitamin A

Vitamin A deficiency (VAD) is another widely prevalent micronutrient deficiency in many developing countries, with 250 million children under 5 years affected globally (World Health Organisation, 2018). Young children and pregnant women in low-income regions of South Asia and Africa have been hit hardest. VAD is the leading cause of preventable blindness among children, and also increases the risk of disease and death from severe infection. An estimated 250,000 to 500,000 Vitamin A-deficient children become blind every year, with half dying within 12 months of losing their sight (World Health Organisation, 2018). In pregnant women, VAD causes night blindness and may increase the risk of maternal mortality.

Vitamin A is a fat-soluble vitamin essential for life and health. Vitamin A is required by the body for functions such as maintenance of vision, growth, reproduction, bone development, brain development and a healthy immune system. Common symptoms of deficiencies include keratinization, dry skin, xerophthalmia, infections, weak bones and poor teeth.

VAD is normally the result of habitually low intake of Vitamin A, or can be due to increased dietary requirements, e.g., when physiological needs are greater, such as during infancy, early childhood, pregnancy and lactation. During lactation, Vitamin A in highly absorbable forms is passed from mother to infant via breastmilk. Other situations requiring more Vitamin A are during infections or illnesses such as diarrhoea. The most common strategies to eliminate VAD are by improving Vitamin A consumption and by controlling any infections.

According to the Malaysian Adults Nutrition Survey 2014 (MANS 2014), the median intake of Vitamin A among Malaysian adults is 480 µg/day, which is 88% of the RNI for Vitamin A[9] (Zainuddin, 2015). A study of Malaysian children in 2013 found that more than half of school-age children achieved at least 80% of the Vitamin A RNI (Nutrition Society of Malaysia, 2015). Overall, the population of Malaysia probably consumes adequate levels of Vitamin A, as shown above. However, this has yet to be corroborated by tests of Vitamin A levels in serum, which would be difficult and costly to undertake.

[8] Goitrogenic food is food that inhibits thyroid activity.

[9] The median intakes for men and women were 494µg/day (93% of RNI) and 471µg/day (85% of RNI) respectively. Rural populations were found to have higher UI (494 µg/day), 90% of RNI, compared to their urban counterparts (473 µg/day), 87% of RNI.

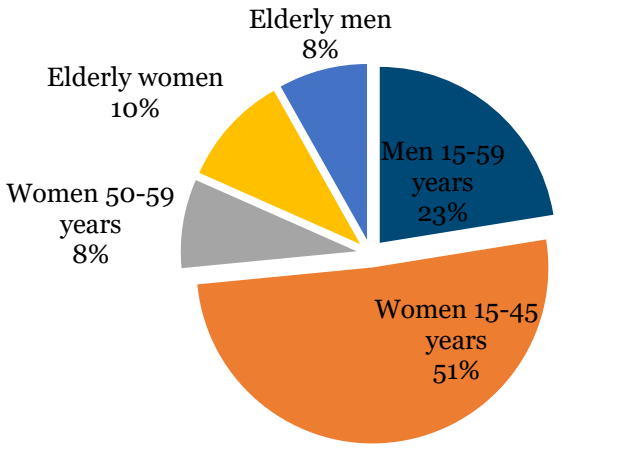
3.3. Iron Deficiency Anaemia (IDA)

Iron is one of the most publicly recognised micronutrients. Iron is an important component of haemoglobin, the molecule transporting oxygen through the body via blood. Non-communicable diseases (NCDs) associated with IDA include chronic kidney disease, chronic heart failure, cancer and inflammatory bowel disease. The usual indicators for assessing iron status and iron stores are levels of serum ferritin, transferrin saturation and serum soluble transferrin receptors.

Anaemia affects roughly a third of the world's population with about half the anaemic suffering iron deficiency (Lopez, *et al.*, 2016). It is a major global public health problem affecting maternal and child mortality as well as physical performance, and typically results in referral to healthcare professionals. Those vulnerable to IDA include children aged 0–5 years, women of childbearing age, and pregnant women. Iron deficiency and nutritional anaemia affect more than 3.5 billion people, i.e., about half the world's population (UNICEF, *et al.*, 1999). Women and children under 5 years have the highest IDA burden (Kassebaum, *et al.*, 2014). According to MANS 2014, Most adult men reached the recommended Malaysian RNI level for iron, but only 52% of women achieved the recommended level (Zainuddin, 2015).

Figure 3.3 shows 4.9 million Malaysians affected by anaemia by age group. Around half of the anaemic population were women aged 15 to 45 years old, followed by men between 15 to 59 years. Another study found 28.3% of adolescent girls to be anaemic (Chang, *et al.*, 2009). The elderly comprised 18% of all anaemic people in the country. Awaluddin, *et al.* (2017) found approximately 35% of the Malaysian elderly (aged over 60 years) to be anaemic. A 1999 study found that 33.2% of the elderly in Kelantan had mild to moderate anaemia, with iron supplementation significantly alleviating the problem among the study subjects (Abdul Manaf, *et al.*, 1999). A 2002 study found 24.4% of the elderly in remote communities on the Rejang River, Sarawak to be anaemic (Sagin, *et al.*, 2002).

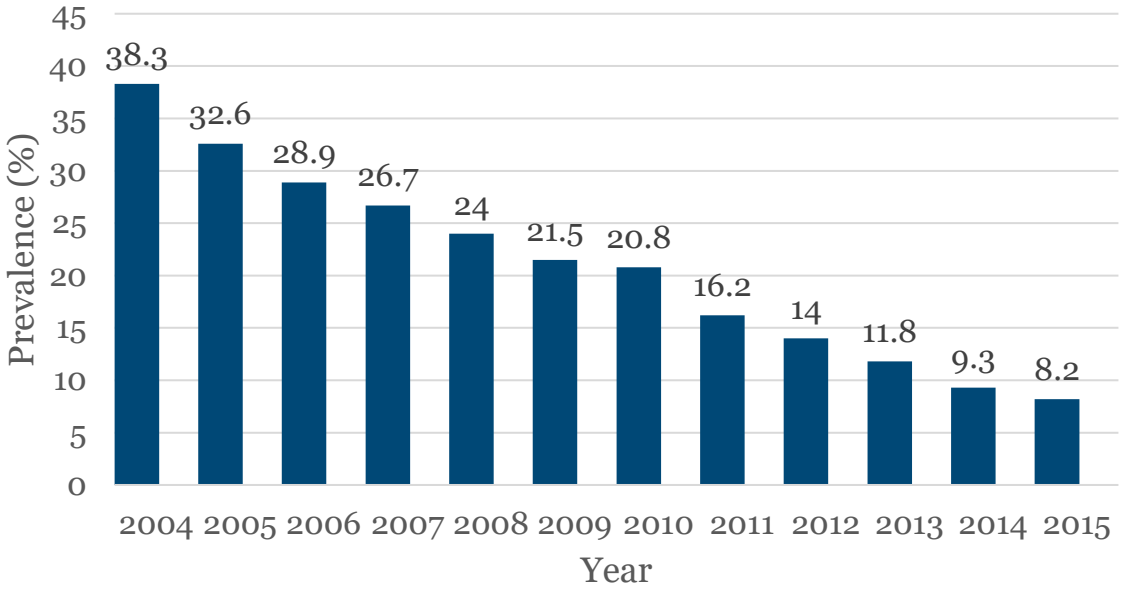
Figure 3.3: Population affected by anaemia by age group, 2015



Total population 4.9 million (95% CI 4.6-5.1)

Source: NHMS 2015, as reported by Awaluddin, *et al.*, 2017

Figure 3.4: Prevalence of anaemia (Hb, 11gm) among pregnant mothers at the 36th week of gestation who attended government health facilities, 2004–2015



Source: Health Information Centre, Ministry of Health, Malaysia

Pregnant mothers who attend government health clinics may be found to be anaemic due to monitoring of their haemoglobin (Hb) levels at 36 weeks gestation. Figure 3.4 shows declining anaemia among pregnant mothers in the 36th week of gestation, falling from 38.3% in 2004 to 8.2% in 2015 (Ministry of Health Malaysia, 2016). Milman (2015) found that 80–90% of pregnant women in Malaysia had low iron status, while 38-42% had developed anaemia.

3.4. Vitamin D

Vitamin D maintains normal levels of calcium and phosphate in blood that regulates bone mineralisation and muscle contraction. Vitamin D[10] can be synthesised in the body with the help of sunlight. Vitamin D deficiency can lead to rickets in children and osteomalacia[11] in adults. Hilger, *et al.* (2014) estimated that 37.3% of the global population were Vitamin D deficient. Various studies in Malaysia have also shown that many Malaysians are also deficient in Vitamin D, with female adolescents, pregnant women and overweight/obese men at greater risk of vitamin D deficiency[12].

[10] also known as calciferol

[11] Osteomalacia is a disease associated with the 'softening' of the bones.

[12] Khor, et al. (2011) reported that 35.3% of school children aged 7-12 years had serum concentrations of calcifedol (a molecule derived from Vitamin D) of less than 37.5 nmol/L, indicative of Vitamin D deficiency, while another 37% had insufficient Vitamin D, with 25(OH)D less than 50 nmol/L, indicating lower amounts of vitamin D. Another study by Nabila, et al. (2016) of secondary school children aged 13 years found 78.9% had Vitamin D deficiency, with female adolescents at higher risk of being Vitamin D deficient. The prevalence of Vitamin D insufficiency among Malaysian men was 22.7%, and higher among Malays (34.0%) compared to Chinese (15.5%) (Chin & Ima-Nirwana, 2014). Overweight/obese and sedentary men were at greater risk of suffering Vitamin D deficiency (Chin, et al., 2014), while a study of the Vitamin D intake of Malaysian athletes found 65.6% met the RNI. A study of pregnant women in Kelantan found Vitamin D deficiency [25(OH) D <50 nmol/L] rates of 60% and 37% in their second and third trimesters respectively.

Intakes of multivitamins during pregnancy were found to help increase Vitamin D levels during these vulnerable periods. Higher maternal vitamin D levels in the second trimester of pregnancy were associated with elevated levels of vitamin D in breast milk after delivery (Jan Mohamed, *et al.*, 2014). While no national level studies are available, some age groups are more susceptible to the lack of vitamin D, such as school children aged 7-12 years old (Khor, *et al*, 2011).

3.5. Folate

Folate or folic acid is important for the metabolism of amino acids. Folate deficiency among females of child bearing age is related to fetal development, more specifically neural tube defects (NTDs) of the fetus, especially during the second and third trimesters of pregnancy. Boo, *et al.* (2013) found the prevalence of NTDs in Malaysia to be 0.42 per 1,000 live births. The most common types of NTDs recorded were anencephaly, spina bifida and encephalocele. More than 90% of new-borns with anencephaly and half of new-borns with encephalocele did not survive (Boo, *et al.*, 2013).

There are few studies of folate deficiency in Malaysians. Roshidah and Khalid (1994) found 31% of hospitalised patients in Malaysia were deficient in folate. A study by Khor, *et al.* (2006) of women of child bearing age found their median intake of dietary folate to be only half the Malaysian Recommended Nutrient Intake (National Coordinating Committee on Food and Nutrition, 2017); 15.1% had plasma folate deficiency, while 84.8% had red blood cell folates below 906 nmol/L, which put them at higher risk of neural tube defects during pregnancy. A study by Chew, *et al.* (2011) of Malaysian adults found that the Malay population tended to have lower serum and blood folate. Poor intake of dietary folate, especially of green vegetables and legumes, probably contributes to folate deficiency among Malaysians. MANS 2014 reported that folic acid supplement was one of the top five commonly consumed vitamin, mineral and food supplements, listed fifth after Vitamin C, multivitamins, calcium, and Vitamin B complex.

3.6. Calcium

Calcium provides structure and strength to the human skeleton; 99% of body calcium is in the bones and teeth, with the rest to be found in soft tissues and blood. Calcium deficiency can cause demineralisation of bones and lead to bone related diseases such as osteoporosis and osteomalacia. Calcium deficiency is also associated with muscle cramps. Kumssa, *et al.* (2015) estimated that 3.5 billion people were at risk of calcium deficiency due to inadequate consumption of food with calcium. The global mean supply of dietary calcium is 684mg/capita/day, with 90% of those at risk of calcium deficiency in Africa and Asia. Balk, *et al.* (2017) found dietary calcium intake in many Asian countries averaging less than 500 mg/day compared to the 1,000mg/capita/day recommended for adults, less than half the recommended amounts.

The calcium intake recommendation for the Malaysian population is 400mg/day for infants, 500-700mg/day for children, and 1000mg/day for adults (National Coordinating Committee on Food and Nutrition, 2017). The median calcium intake of Malaysian adults is 357 mg/day, or 43% of the RNI (Zainuddin, 2015). A 2013 Nutrition Society of Malaysia study of school children found that only 29.9% of girls and 41.3% of boys achieved the recommended calcium intake. According

to MANS 2014, average calcium intake for all sociodemographic groups in Malaysia did not even reach half the RNI recommendation[13].

Chee, *et al.* (2002) found low consumption of calcium rich food by Malaysian adults despite good knowledge of osteoporosis risks. Elderly women face a higher risk of bone demineralization; thus, supplementing calcium rich food, such as milk, with more calcium for the elderly is useful to overcome bone demineralization. Chee, *et al.* (2003) found that supplements of high calcium skimmed milk to elderly Chinese women was effective in slowing bone loss at the clinically important lumbar spine and hips; milk supplementation also improved their serum calcium status.

3.7. Conclusion

Micronutrient deficiencies tended to be neglected in the past because they are invisible, not infectious and inconspicuous, even to the observant eye (unlike, say, marasmus or obesity). Furthermore, effective interventions often depend on several actions undertaken by agencies in sectors that may not be connected, operating at different levels. Thus, it is difficult to evaluate the success of any particular intervention, while the benefits of reducing micronutrient deficiencies often take a long time to show results. Strong commitments are required from all partners. Both nutrition-specific and nutrition-sensitive intervention approaches will be needed in agriculture, public health, sanitation, social protection and education.

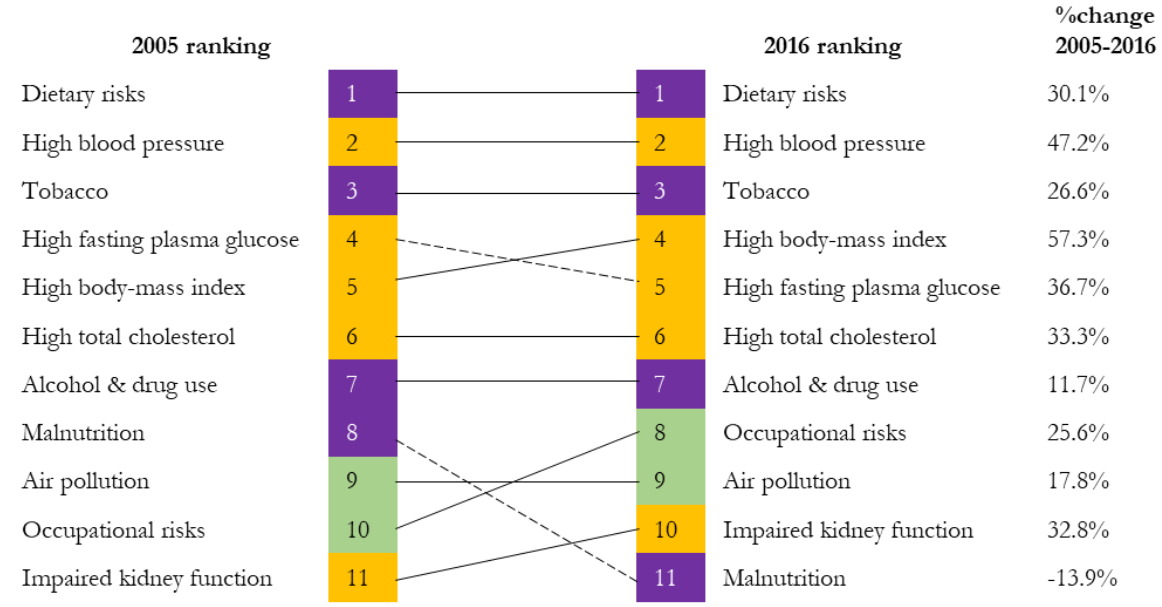
Finally, the sustainability of an intervention or programme can help ensure positive outcomes, no matter how slowly. Thus, food-based approaches provide important ways to improve micronutrient intake worldwide, particularly among the less well-off and less well-informed. Food-based approaches can involve dietary diversification and modification (DDM), food fortification and agricultural interventions, as opposed to supplementation of specific nutrients to meet immediate deficits among vulnerable groups (Shetty, 2011; Gibson, 2014; Greiner, 2014). Undoubtedly, doses of supplements, such as Vitamin A capsules (VAC), folate and iron tablets, can provide quick remedies to severe deficiencies, but they are relatively costly, or often not sustainable in the long run (Latham, 2010).

[13] Furthermore, a study of university students in the Kelang Valley found calcium intake among male and female students to be 415 mg/day and 421 mg/day respectively (Abdull Hakim, et al., 2012). Chee, et al. (2002) found that post-menopausal women in Kuala Lumpur got an average of 450mg of calcium daily.

4. DIET-RELATED NON-COMMUNICABLE DISEASES

Non-communicable diseases (NCDs) are chronic, long-term diseases resulting from a combination of genetic, physiological, environmental and behavioural factors. Four diseases or conditions are normally identified as the major NCDs, namely cardiovascular diseases (CVDs), cancer, diabetes mellitus and chronic obstructive pulmonary disorder (COPD), accounting for over 80% of all premature NCD deaths (WHO, 2018). People from all age groups, regions, and countries are affected by NCDs, contributing to 71% of mortality globally. NCDs dominated the leading causes of premature death and disability for all ages in 2005 and 2016 (IHME, 2018). The three risk factors that account for the greatest disease burden in Malaysia are dietary risks, high blood pressure and tobacco smoking, as shown in Figure 4.1 (IHME, 2018), underscoring the significance of diet-related NCDs.

Figure 4.1: Leading causes of premature death and disability



Note: Solid lines indicate that a cause has moved up in ranking or stayed the same; broken lines indicate that a cause has moved down in ranking. Risk factors are colour coded: *orange* for metabolic risks, *green* for environmental or occupational risks, and *purple* for behavioural risks.
Adapted from IHME, 2018

NCD deaths are preventable as most behavioural risk factors -- such as unhealthy diets, physical inactivity, tobacco use and harmful use of alcohol – can be modified (WHO, 2018). Low-cost solutions often exist for governments and other stakeholders to reduce common modifiable risk factors. Monitoring NCD trends, risks and progress in mitigation are important to guide policies and priorities.

This chapter seeks to advance understanding of selected diet-related NCDs, their status in Malaysia and some consequences.

4.1. Cardiovascular Diseases

CVDs include heart diseases, vascular diseases of the brain, and diseases of blood vessels. CVDs affect the heart or blood vessels, and include congenital heart disease, disorders of the peripheral vascular system, diseases of the aorta, endocarditis, orthostatic hypotension, hypertension, heart failure, arrhythmia, heart valve disease, coronary artery disease and arteriosclerosis. CVDs are the major cause of global mortality and disease related disability. At any BMI level, Asian populations are at greater risk of CVD and diabetes mellitus, compared to Caucasians (WHO Expert Consultation, 2004).

In Malaysia, CVDs have been the leading cause of morbidity and mortality for more than a decade, but data is limited on the prevalence of CVDs in the country (WHO, 2015). Abnormal lipids, hypertension, current smoking, diabetes and abdominal obesity are five major modifiable risk factors contributing to cardiovascular diseases. The Institute of Public Health (IPH) show the prevalence of these risk factors beginning to increase from around the age of 30 years (IPH, 2015).

- 13.8 million adults are either overweight or obese: 7.0 million men and 6.8 million women.
- 10.3 million adults have hypercholesterolemia: 4.8 million men and 5.5 million women.
- 6.5 million adults have hypertension: 3.4 million men and 3.1 million women.
- 4.8 million men smoke.
- 3.8 million adults have diabetes mellitus: 1.8 million men and 1.9 million women.

More than one of these five cardiovascular risk factors may be found in almost half of Malaysian adults:

- 43.2% had two or more of these risk factors (Nuur, *et al.*, 2012)
- 47% of those at least 30 years of age face increased cardiovascular (CV) risk, with 26.7% at high CV risk, and 20.3% at intermediate CV risk.
- In another study, these risk factors contributed to about 80% of heart failure[14] (Yusuf, *et al.*, 2004).

Studies have been done to reduce mortality due to diet-related NCDs. It has been predicted that mortality due to coronary heart disease (CHD) in the United Kingdom could be halved by small changes in cardiovascular risk factors: a 1% decrease in cholesterol in the population could lead to a 2–4% CHD mortality reduction; a 1% reduction in smoking prevalence could lead to 2000 fewer CHD deaths per year; while a 1% reduction in diastolic blood pressure could prevent around 1500 CHD deaths each year (WHO Europe, 2018).

Four-fifths of CHD mortality reduction in Finland during 1972–1992 has been explained by declines in major risk factors. Similarly, in Ireland, almost half (48.1%) of the reduction in CHD mortality rates during 1985–2000 among those aged 25–84 years has been attributed to improvements in risk factors. In both countries, the greatest benefits appear to have come from reductions in mean cholesterol concentrations, smoking prevalence and blood pressure levels (WHO Europe, 2018).

[14] Specifically, heart attacked (also known as myocardial infarctions).

Effective measures are available for people at high risk. For example, combination drug therapy (such as aspirin, beta blocker, diuretic and statin) can lead to a 75% reduction in myocardial infarction (heart attack) among those at high risk. But many such interventions are not being implemented, while about half of coronary patients in the world still require more intensive blood pressure management (WHO Europe, 2018).

4.2. Cancer

A cancer or tumour is a disorder involving abnormal or uncontrolled growth and spread of cells arising from a change in a single cell. The change may start by external agents or inherited genetic factors, and can affect almost any part of the body. The transformation from a normal cell into a tumour cell is a multistage process with growth often invading surrounding tissue and even spreading (metastasising) to distant sites. A cancer is also known as a neoplasm (from the Greek neo for new, and plasma, or a thing formed), which is the autonomous growth of tissues that have escaped the normal restraints on cell proliferation and exhibit varying degrees of similarity to their precursors. It usually appears as a tumour (swelling) made of a mass of cells. In general, neoplasms are irreversible, and their growth, for the most part, is autonomous (Rubin & Reisner, 2009).

There are two kinds of tumours: benign and malignant. Benign tumours more closely resemble their tissue of origin, do not penetrate (invade) adjacent tissue borders, or metastasize to distant sites, remaining localised overgrowths where they arise. Cancers are malignant tumours; these are capable of invasion (spreading neoplasms to adjacent areas) and metastasis (implanting neoplasms in non-neighbouring sites) (Rubin & Reisner, 2009).

According to the WHO (2018), cancer accounted for 8.8 million deaths in 2015. The most cancer deaths worldwide are due to cancers of the:

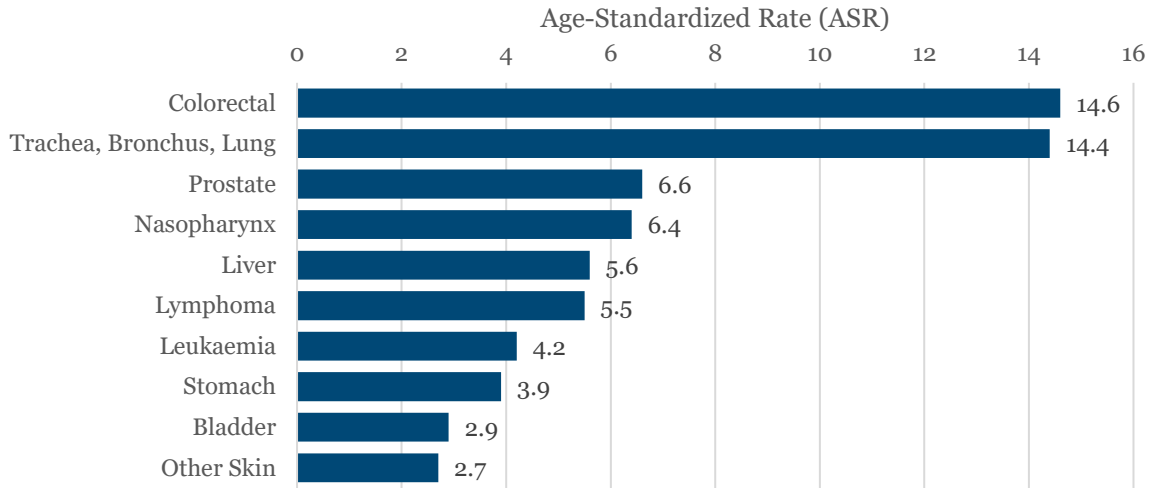
- Lung (1.69 million deaths)
- Liver (788 000 deaths)
- Colorectal (774 000 deaths)
- Stomach (754 000 deaths)
- Breast (571 000 deaths)

In high-income countries, the leading causes of cancer deaths are lung cancer among men and breast cancer among women. Approximately 70% of reported cancer deaths occur in low- and middle-income countries (WHO, 2018), where cancer levels vary with prevailing underlying risks.

Like most developed and advanced developing countries, Malaysia is experiencing an epidemiological transition, with cancers becoming more prevalent. In 2012, there were 37,400 new cancer cases in Malaysia (Cancer Index, 2017). In 2015, cancer was the third cause of death, contributing to 13.6% of all deaths in Ministry of Health (MoH) hospitals compared to 8.9% in 1996. Cancer was the second cause of death in private hospitals, accounting for 25.6% of deaths in 2015. The government spent RM240 million on oncology drugs in 2015 (Ministry of Health Malaysia, 2017). In 2016, the leading causes of cancer deaths were trachea, bronchus and lung cancers for males (2.4%), and breast cancer for females (3.8%) (Department of Statistics Malaysia, 2017).

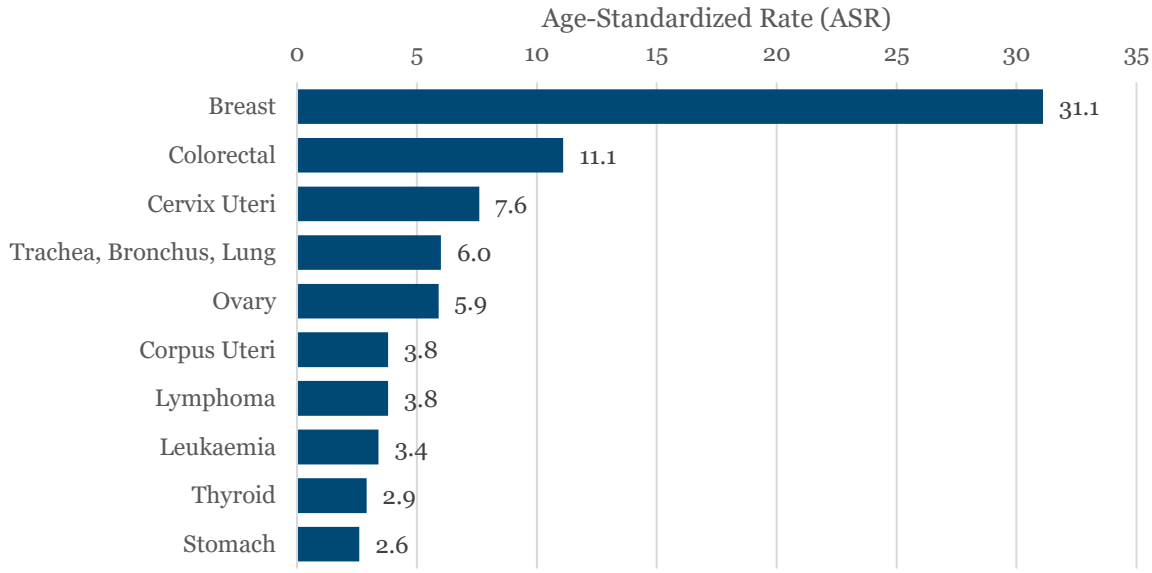
The ten most common cancers among males and females in Malaysia during 2007–2011 are shown in Figures 4.2 and 4.3 (Omar & Tamin, 2011). For men, the most frequent cancer from 2007 to 2011 was colorectal cancer, at 14.6 per 100,000 persons, closely followed by trachea, bronchus and lung cancer at 14.4. For women, the most frequent cancer, by far, was breast cancer at 31.1 per 100,000 persons, followed by colorectal cancer at 11.1 per 100,000 persons. The link between cancer and diet is variable and hard to prove, but research has indicated links between cancer and diets (Key, *et al.*, 2004).

Figure 4.2: Ten most frequent cancers among males in Malaysia, 2007-2011



Source: Omar & Tamin, 2011

Figure 4.3: Ten most frequent cancers among females in Malaysia, 2007-2011



Source: Omar & Tamin, 2011

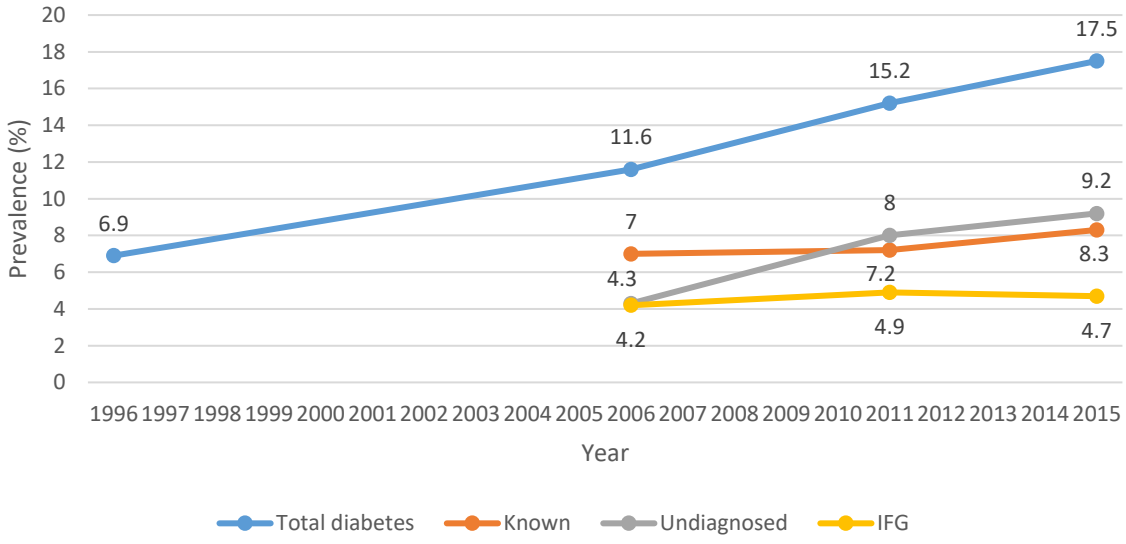
4.3. Diabetes Mellitus

Diabetes mellitus is a chronic disease that occurs when the pancreas does not produce enough insulin (a hormone that regulates blood sugar), or alternatively, when the body cannot effectively use the insulin it produces. There are three forms of diabetes, namely type I, type II and gestational diabetes mellitus. Type I diabetes is characterised by a lack of insulin production. Type II diabetes is due to the body's ineffective use of insulin. Gestational diabetes is characterised by hyperglycaemia, or raised blood sugar, which usually first appears or is diagnosed during pregnancy. Type I and II diabetes are more common than gestational diabetes, while type II diabetes is much more common than type I diabetes (WHO, 2017)

The overall risk of death among diabetics is at least twice that of their peers without diabetes. There are currently 425 million people with diabetes worldwide, with this number expected to reach 629 million by 2045, with type 2 diabetes (T2DM) being the most common form of the disease (American Diabetes Association, 2018; IDF, 2017). Type II diabetes accounts for around 90% of all diabetes worldwide and is predicted to become the seventh leading cause of death in the world by 2030. 80% of diabetes deaths occur in low- and middle-income countries, while total deaths from diabetes are projected to rise by more than half in the next decade (WHO, 2017). Reports show that type II diabetes in children, previously rare, has increased worldwide. In developed countries, most people with diabetes are beyond retirement age, whereas in developing countries, those most frequently affected are between 35 to 64 years old.

In Malaysia, there were over 3,492,600 cases of diabetes in 2017 (IDF, 2018). The National Health and Morbidity Surveys (NHMS) found the prevalence of DM in 2015 to be 17.5%, more than double the rate in 1996 (Figure 4.4) (IPH, 1996; IPH, 2008; IPH, 2011; IPH, 2015). Females, the elderly, Indians and urban residents appear more likely to be afflicted by diabetes.

Figure 4.4: Trends in prevalence of total diabetes milletus (known and undiagnosed), known diabetes milletus, undiagnosed diabetes milletus and impaired fasting glucose (IFG), 1996-2015



Source: NHMS, 1996, 2006, 2011, 2015

4.4. Conclusion

NCDs are already the leading and still growing health problem in most countries. Action is urgently needed to reduce NCDs' negative impacts on socioeconomic development. The main challenges for policy and regulatory interventions require the intersectoral participation and cooperation of multiple stakeholders as well as different government ministries and agencies.

Modifiable behavioural risk factors, such as tobacco use, unhealthy diets, physical inactivity and harmful alcohol consumption, will need to be addressed through appropriate and effective policies and legislation. Thus, prevention and control of NCDs will require focusing on reducing associated risk factors. Until these strategies are in place, better management of NCDs is urgently needed to detect, screen for and treat diseases, particularly through primary health care.

Poverty is closely linked to NCDs (WHO, 2017). The socially disadvantaged are more vulnerable to NCDs due to greater exposure to harmful products such as tobacco, unhealthy dietary habits and limited access to affordable health services. Ability to secure access to treatment will be a challenge for poorer sections of the population who are also more vulnerable to these diseases and have been incurring increased out-of-pocket expenditure for healthcare.

NCDs are part of the national healthcare burden impacting individuals and society. A comprehensive approach to address them will have to involve many sectors, particularly health, finance, education, agriculture, transport, planning and others, with specific targets to reduce risks associated with NCDs and to promote healthy living.

5. OVERWEIGHT AND OBESITY

Overweight and obesity[15] pose a widespread and fast spreading health problem, irrespective of age, sex, ethnicity, social status or place of residence, affecting over two billion people worldwide (Seidell, 2001). For adults aged 18 years and above, a body mass index (BMI) between 25.0 to 29.9 kg/m^2 is considered overweight, while a BMI of 30.0 kg/m^2 or more is defined as obese (WHO, 2015). In fact, this is a recent phenomenon of the 21st century as fast growing overweight and obesity has reached pandemic proportions.

Studies from developed countries and data from developing countries testify to greatly increased prevalence in recent years. An estimated 6% of children under 5, around 41 million, were overweight in 2016, up from 5.3% in 2005. The prevalence of overweight and obesity among adults worldwide rose by 27.5% between 1980 and 2013 (WHO, 2017). In 2016, 52% of adults aged 18 years and above, or more than 1.9 billion adults, were overweight and obese, with at least 650 million considered clinically obese.

Nutrition problems in developing countries are said to have changed from the previous problem of hunger or undernourishment to the dual problems of 'hidden hunger' and obesity (Doak, *et al.*, 2005). The growing double burdens of micronutrient deficiencies and obesity is indeed a major challenge in Southeast Asia as well. But many countries are still facing the hunger problems while more and more in their populations suffer from excess weight. There are also more women than men who are overweight and obese in developing countries, whereas the condition is more prevalent among men in developed countries (Ng, *et al.*, 2014).

5.1. Obesity in Malaysia

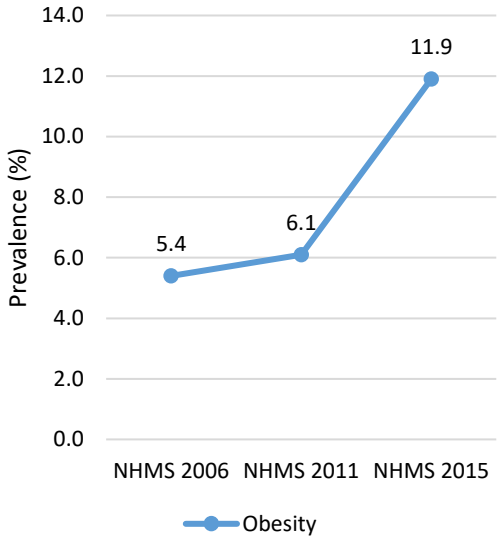
The rising prevalence of overweight and obesity in Malaysia is not isolated, but part of a global pandemic (Roth, *et al.*, 2004; Popkin, *et al.*, 2012; Swinburn, *et al.*, 2011). However, Malaysia has become the fattest country in Southeast Asia and is sixth in the Asia Pacific region, mainly after countries in the South Pacific (Verma, *et al.*, 2013).

This rise in prevalence can be seen among both children and adults. Figure 5.2 shows obesity (BMI-for-age) among Malaysian children and adolescents aged under 18 years for selected years during 2006-2015, while Figure 3 shows obesity among adults aged 18 years and over during 1996-2015. Prevalence of obesity among Malaysians younger than 18 increased from 5.4% in 2006 to 11.9% in 2015 (Figure 5.1). For adults aged 18 and above, the percentage overweight almost

[15] For children and adolescents between 5 to 19 years old, the threshold for overweight is between 1 to 2 standard deviations above the WHO Child Growth Standards for that age, while the threshold for obesity is 2 standard deviations and above. For children below the age of 5, the threshold for overweight is 2 to 3 standard deviations above the WHO Child Growth Standards for that age, while the obesity threshold is 3 standard deviations and above (WHO, 2015).

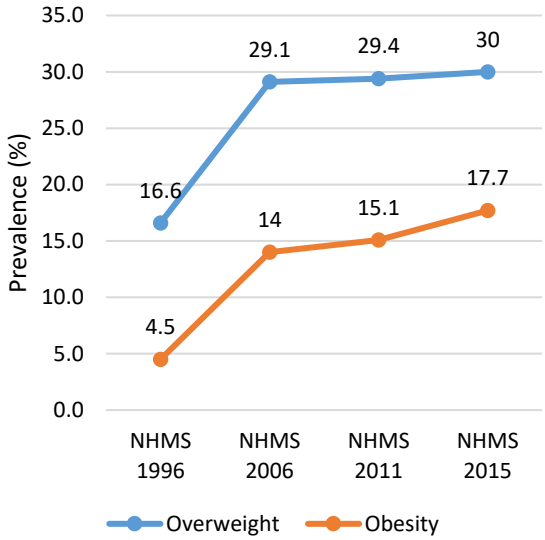
doubled in 10 years from 16.6% in 1996 to 29.1% in 2006, before rising slightly to 30.0% in 2015. The percentage obese also increased from 4.5% in 1996 to 17.7% in 2015, a four-fold increase over 19 years.

Figure 5.1: Obesity (BMI-for-age[16]) among Malaysians aged <18 years



Sources: NHMS 2006, 2011, 2015

Figure 5.2: Obesity among adults aged ≥18 years



Sources: NHMS 1996, 2006, 2011, 2015

The third National Health and Morbidity Survey (NHMS III) 2006 estimated the national prevalence of abdominal obesity among Malaysian adults at 17.4%, with prevalence much higher among women (26.0%) than men (7.2%) (Figure 5.2). Overweight and obesity also vary widely within the Malaysian population, by ethnicity, age, regional, gender, incomes, genetic and economic differences (IPH, 2015). The prevalence of abdominal obesity increased steadily with age until 50-59 years, after which it declined. In 2015, 14.2% of Malaysian adolescents aged 12–19 were overweight, while 10.1% were obese (Sharif Ishak, *et al.*, 2016).

Housewives had the highest prevalence of abdominal obesity compared to other occupational groups. Income seemed inversely related to abdominal obesity, with the prevalence of abdominal obesity at 13.7% for households earning more than RM5,000 monthly, compared to 18.2–18.4% of households earning RM1,000–3,000 (Kee, *et al.*, 2008). Prevalence was higher among Indians and Malays compared to Chinese.

Table 5.1 shows the prevalence of obesity among children and adolescents aged below 18 years of age in 2015. Childhood and adolescent obesity was highest among Chinese at 13.0%, followed by Indians at 12.6%. Prevalence of obesity was also higher in urban areas compared to rural areas, particularly in Kuala Lumpur, where 19.4% of the child and adolescent population were obese. Prevalence of child and adolescent obesity was also higher among boys.

[16] As noted earlier, there are different BMI thresholds at different ages for children to be considered overweight or obese.

Table 5.1: Obesity among children and adolescents aged under 18 years, 2015

Sociodemographic characteristics	*Obesity (BMI for age > +25D)*	
	Estimated population	*Prevalence (%)*
Ethnicity		
Malays	600,008	11.8
Chinese	185,828	13
Indians	64,227	12.6
Bumiputras	143,887	11.7
Others	12,128	4.9
Age group		
0-4	168,219	7.6
5-9	335,413	14.8
10-14	349,888	14.4
15-17	152,558	9.6
Location		
Urban	744,872	12.1
Rural	261,206	11.2
Malaysia	1,006,078	11.9
State		
Johor	94,660	10.4
Kedah	64,651	10.4
Kelantan	61,265	10
Melaka	24,804	11.3
N Sembilan	36,505	12.5
Pahang	65,838	12.8
Pulau Pinang	54,149	13.3
Perak	90,274	14.1
Perlis	7,953	11.4
Selangor	188,501	13
Terengganu	42,820	10.6
Sabah	89,651	8
Sarawak	102,382	13.4
Kuala Lumpur	79,607	19.4
WP Putrajaya	3,016	8.7
Gender		
Male	592,052	13.6
Female	414,025	10

Prevalence of child and adolescent obesity was highest among Chinese, followed by Indians and Malays.

Prevalence of child and adolescent obesity was highest among those aged 5-9 years.

Prevalence of child and adolescent obesity was higher in urban areas.

Prevalence of child and adolescent obesity was highest in Kuala Lumpur.

Prevalence of child and adolescent obesity was higher among males.

Source: IPH, 2015

Table 5.2: Prevalence of overweight among adults aged 18 years and above, 2015

Sociodemographic characteristics	*WHO 1998 (BMI 25.0-29.9 kg/m²)*	
	Estimated population	*Prevalence (%)*
Ethnicity		
Malays	2,843,281	31
Chinese	1,208,446	28.1
Indians	449,880	35
Other Bumiputras	646,909	31.2
Others	487,976	25.3
Age group		
18-19	153,459	16.6
20-24	518,738	19.6
25-29	565,411	22.2
30-34	703,096	29.4
35-39	635,258	33
40-44	633087	35.8
45-49	622,338	38.8
50-54	563953	39.3
55-59	453,077	37.9
60-64	314,031	35.4
65-69	219,293	34.6
70-74	130,425	35.7
75+	134,325	27.1
Location		
Urban	4,363,317	30.7
Rural	1,273,176	28.1
Malaysia	5,636,492	30
State		
Johor	677,417	31.0
Kedah	317,039	30.1
Kelantan	291,144	30.3
Melaka	153349	31.8
N Sembilan	166,015	27.7
Pahang	254,693	26.9
Pulau Pinang	347,899	30.6
Perak	462,786	29.8
Perlis	45650	30.2
Selangor	1,136,524	30.3
Terengganu	188,256	28.9
Sabah	622,254	28.2
Sarawak	508,623	30.1
WP Kuala Lumpur	394,085	33.7
WP Putrajaya	16761	37
Gender		
Male	3,110,010	31.6
Female	2,526,483	28.3

Source: IPH, 2015

Prevalence of overweight adults was highest among Indians, followed by Other Bumiputras.

Prevalence of overweight adults increased with age, peaking at 50-54 years, before gradually decreasing.

Prevalence of overweight adults higher in urban areas.

Prevalence of overweight adults highest in WP Putrajaya.

Higher prevalence of overweight adults among males than females

Table 5.2 shows the prevalence of overweight among adults 18 years and above in 2015. Prevalence of overweight was highest among Indians at 35%, followed by Bumiputras at 31.2%. Prevalence of overweight adults was highest for adults 50–54 years of age at 39.3%, followed by those 45–49 years old at 38.8%. Overweight prevalence of adults was highest in Putrajaya at 37.0%, followed by Kuala Lumpur at 33.7%.

Table 5.3 shows the prevalence of obesity among adults 18 years and above in 2015. It was highest among Indians at 27.1%, followed by Bumiputras at 18.0%. Similarly, obesity prevalence was highest for adults 50–54 years old at 22.3% of the population, i.e., over a fifth of adults in that age cohort. Obesity was highest in Putrajaya at 25.8%, followed by Negeri Sembilan at 23.5%, and higher among females (20.6%) than males (15.0%).

Table 5.4 shows the prevalence of overweight and obesity among adults by income. It was highest for those with incomes of RM9,000–9,999, with 34.2% overweight and 22.2% obese respectively. Prevalence in other income strata was quite similar, ranging from 27.3% to 34.2% for overweight and 16.5–22.2% for obesity. The narrow range of prevalence suggests that obesity and overweight do not significantly vary by income level, indicating that other factors, including food culture, behaviour and eating habits, may have greater impact than income.

Table 5.3: Obesity among adults aged 18 years and above, 2015

Sociodemographic characteristics	*WHO 1998 (BMI ≥ 30.0 kg/m²)*	
	Estimated population	*Prevalence (%)*
Ethnicity		
Malays	1,941,463	21.1
Chinese	500,742	11.7
Indians	348,255	27.1
Other Bumiputras	374,376	18
Others	148,708	7.7
Age group		
18-19	107,676	11.7
20-24	319,554	12.1
25-29	464,627	18.3
30-34	411,477	17.2
35-39	397,164	20.6
40-44	372,503	21.1
45-49	306,431	19.1
50-54	298,571	20.8
55-59	266,976	22.3
60-64	181,907	20.5
65-69	109,298	17.3
70-74	49,406	13.5
75+	27,956	6.1
Location		
Urban	2,520,901	17.7
Rural	792,643	17.5
Malaysia	3,313,544	17.7
State		
Johor	395,080	18.1
Kedah	252,536	20.5
Kelantan	155,226	16.2
Melaka	105,679	21.9
N Sembilan	141,384	23.5
Pahang	183,700	19.4
Pulau Pinang	156,383	13.8
Perak	272,745	17.5
Perlis	33,750	22.3
Selangor	703,254	18.7
Terengganu	121,326	18.6
Sabah	294,959	13.4
Sarawak	311,647	18.4
WP Kuala Lumpur	174,210	14.9
WP Putrajaya	11,665	25.8
Gender		
Male	1,473,258	15
Female	1,840,286	20.6

Source: NHMS 2015

Prevalence of adult obesity highest among Indians, followed by Malays and Other Bumiputras.

Prevalence of adult obesity increased with age, peaking at 50-54 years, before gradually decreasing.

Prevalence of adult obesity slightly higher in urban areas

Prevalence of adult obesity highest in WP Putrajaya.

More female adults obese compared to males

Table 5.4 Overweight and obesity by income group, 2015

Overweight

Sociodemographic characteristics	*WHO 1998 (BMI 25.0-29.9 kg/m²)*	
	Estimated population	*Prevalence (%)*
< RM1000	732,089	29.1
RM1000–1999	933,565	30.1
RM2000–2999	949,041	31.1
RM3000–3999	740,464	30.7
RM4000–4999	525,661	28.5
RM5000–5999	421,783	28.5
RM6000–6999	290,200	30.3
RM7000–7999	216,096	28.5
RM8000–8999	172,860	27.3
RM9000–9999	114,270	34.2
≥ RM10000	539,464	32.4

Obesity

Sociodemographic characteristics	*WHO 1998 (BMI 25.0-29.9 kg/m²)*	
	Estimated population	*Prevalence (%)*
< RM1000	416,728	16.5
RM1000–1999	513,165	16.5
RM2000–2999	522,625	17.1
RM3000–3999	442,041	18.3
RM4000–4999	342,309	18.6
RM5000–5999	265,212	17.9
RM6000–6999	176,373	18.4
RM7000–7999	155,266	20.5
RM8000–8999	130,577	20.6
RM9000–9999	74,251	22.2
≥ RM10000	274,996	16.5

Source: NHMS 2015

5.2. Factors Contributing to Overweight and Obesity

Diet is the most important cause of diet-related non-communicable diseases globally. The world, especially developing countries, has been experiencing a 'nutrition transition'. As people become more economically developed, they abandon traditional plant-based diets and begin eating more refined and processed foods, as well as more meat and fat. This has resulted in increased obesity and other risk factors for chronic diseases in such societies (Doak, *et al.*, 2005). It was assumed that changes in diet were strongly influenced by income, culture and personal taste. However, contrary to popular beliefs, overweight and obesity are not solely due to excessive food intake, but also by multiple factors leading to overweight and obesity.

5.2.1. Genetic Factors

Children are likely to be overweight when their parents are overweight as well. Scientists have identified the gene responsible for predisposing a child to obesity. However, not all overweight children have overweight parents; about 30% of obese children have parents who were not overweight (Wright, *et al.*, 2001).

5.2.2. Food Intake

Total daily per capita availability of calories in Malaysia rose from 4835 kJ per person in 1961 to 5830 kJ in 2013, a 1.2 fold increase over 52 years. But the amount of annually available sugar and sweeteners per capita rose much more from 28.8 kg to 48.7 kg between 1967 and 2007, a rise of 70%. According to MANS 2014, among the top ten foods consumed by Malaysians daily, sugar was second highest at 55.9%, next only to rice. Consumption of soft drinks by Malaysians has been significantly associated with becoming overweight (Boo, *et al.*, 2010; Miljkovic, *et al.*, 2008). Rising sugar consumption may also be due to sugar addiction (Swarna Nantha, 2014), encouraged by the low price of sugar in Malaysia due to hefty government subsidies, which was only removed in 2014 (Suganya, 2013).

There has also been increased consumption of generally cheaper energy-dense processed food, including convenient, fast and obesogenic[17] food (Dixon, *et al.*, 2007; Guldan, 2010). Growing consumption of processed convenience foods and greater fast food marketing have probably contributed to increasing overweight and obesity (Anderson, *et al.*, 2011; Franco, 2010). Fat intake has increased by 33% from the early 1960s (Academy of Sciences Malaysia, 2013) while fast food generally contains high levels of calories and saturated fats.

5.2.3. Physical Activity and Sedentary Behaviours

Engaging in sedentary activities, in offices or driving, and leisure, such as television viewing, have increased over the last half century, while time spent on productive care activities at home—like cooking, cleaning, childcare and repairing things—has diminished, as commuting time to and from work away the home has increased (Sturm, 2004). Individuals engaged in less active and more sedentary activities tend to be more overweight (Mendoza, *et al.*, 2007). Of course, this can be also due to an urban built environment that is conducive for obesity[18].

This also seems to be the case in Malaysia. Rapid 'modernisation', including urbanisation, in recent decades has changed Malaysian lifestyles and behaviours. A majority of Malaysians spend less time on physical activity at work or during their leisure time, and increasingly use transport as opposed

[17] Tending to cause obesity

[18] There is growing concern that urban built environments have contributed to obesity (Feng, *et al.*, 2010). Urban sprawl has relocated populations to suburbs away from concentrated locations, often segregating low-skilled, low-income workers low-income families and ethnic and sub-ethnic communities, while increasing distances between job locations and residences. Such developments have decisively changed physical activity as changes in travel modes significantly alter energy use. While time spent on transportation has increased, suburbanization, street design and land use patterns have tended to reduce physical activity required to move around (Amarasinghe, *et al.*, 2009). Thus, the influence of transportation modes on human energy expenditure is affected by the built environment of cities and transportation corridors (Pratt, *et al.*, 2004). Residents of sprawling and unfriendly neighbourhoods, especially women, are less likely to walk and consequently, tend to weigh more (Frumkin, 2016). Thus, the built environment and transportation arrangements discourage residents from walking or taking public transportation to work, encouraging high private vehicle ownership, miles travelled per capita as well as ground-level environmental pollution and hazards. Increased reliance on automobile transportation, reduced walking to destinations, less neighbourhood cohesion and greater environmental degradation (Freeman, 2001). Transportation difficulties and the greater availability of urban food outlets encourages more people who can afford it to buy food to consume outside the home. Fresh products, such as fresh fruits and vegetables, are limited or of poor quality for those with less means. Not surprisingly, some Southeast Asian studies link obesity to urbanization (Angkurawaranon, *et al.*, 2014).

to walking or climbing stars. According to the MANS, 33.5% of adults did not have physically active lifestyles, with the adult population spending an average of 74.4% of their daily waking hours on sedentary activities (Poh, *et al.*, 2010).

5.2.4. Medical Illness

Certain medical illnesses, such as endocrinal and neurological problems, increase susceptibility to other diseases. Furthermore, medication, such as steroids, taken for treatment and management of specific illnesses, may contribute to weight gain.

5.2.5. Globalisation

Three major aspects of globalisation directly influence health and obesity through how we obtain and consume food (Chopra, 2002):

a) Growth in cross-border trade, facilitated by lowering tariffs and non-tariff barriers, has been associated with increased mobility of capital and labour, lowering costs and accelerating communications and economic interdependence. Such trends have accelerated the growth and consolidation of large transnational corporations organising food production, distribution and marketing.
b) Along with greater movement of capital and people, diffusion of cultural influences across national boundaries has also been greater.
c) The partial and uneven extension of governance involving international institutions, such as the World Trade Organization (WTO), increasingly constrain nation states and even the role and influence of other institutions, e.g., the World Intellectual Property Organisation (WIPO), in shaping the international economic environment, with new policies and regulation.

The international food trade has grown since the spice trade and colonisation, but especially in recent times. The pace and scale of change in the food trade in the decades before the 2008–2009 global financial crisis were unprecedented. The food trade grew from USD224 billion in 1972 to USD438 billion in 1998, with food now accounting for 11% of global trade, even more than fuel (Chopra, 2002). This increase has been accompanied by the consolidation of food production and processing by large transnational corporations (TNCs). Table 5.5 shows the top ten TNCs in food manufacturing and processing by total sales in 2016.

Table 5.5: Top ten transnational corporations in food manufacturing and processing by total sales, profits and employees, 1998

Transnational corporations	*Sales (US$ bn)*	*Profit (US$ bn)*	*Main products*	*Employees*
Philip Morris	74.95	7.25	Tobacco, cereals, beverages	79,500
Cargill	107.16	2.37	Cereals, seeds, oils, beverages	150,000
Unilever	64.96	7.94	Oils, dairy, beverages, meals	169,000
Nestle	94.77	4.11	Beverages, cereals, infant food	335,000
PepsiCo	62.79	6.37	Beverages, snacks	264,000
Coca-Cola	41.86	6.52	Beverages, foods	123,200
McDonalds	24.62	4.68	Restaurants	375,000
Mondelez	25.92	1.65	Coffee, dairy products, confectionary, cereals	99,000

Source: Chopra, 2002

Globalisation has also created a cultural environment where people have access to common information mediated by corporate advertising networks employing television and other mass media, including social media. This has also led to a global consumer culture, with TNCs dominating food production, processing and supply. Thus, globalisation of the food industry has affected dietary behaviour and food consumption through the cultural changes it has engendered, which ultimately shape the nutrition and health status of populations everywhere (Sobal, 2001).

5.2.6. Fast Food Phenomena

'Fast food' is quickly served, reasonably priced (for its targeted consumer segment) and associated with certain lifestyles to be emulated, thus providing attractive, readily available alternatives to home cooking. While convenient and affordable to busy people with little time to prepare meals at home, fast foods are typically high in calories, fat, especially saturated fats, sugar and salt. Fast foods are appealing as they are widely available, considered culturally acceptable and affordable.

The growing popularity and spread of fast food in Asia are not new. Kentucky Fried Chicken (KFC), for example, opened its first outlet in the Philippines over half a century ago, in 1967 (Eric, 2002). The fast food industry in Southeast Asia has grown manifold over the last five decades. Of

the major fast food chains, KFC has expanded its presence in Southeast Asia since the 1970s, while McDonalds came in the 1980s, just before Pizza Hut.

Table 5.6: KFC outlets in Southeast Asia and Japan

Countries	*First established*	*Number of outlets*	*Year*	*Population (millions)*	*Population per outlet (millions)*
Indonesia	1979	580	2017	265	0.456
Malaysia	1973	700	2017	32	0.045
Thailand	1984	500	2018	69	0.138
Philippines	1967	237	2016	103	0.434
Japan	1970	1181	2016	127	0.107

Source: List of countries with KFC restaurants, 2018, Wikipedia.

KFC was established in the Philippines in 1967, followed by Japan and Malaysia, in 1970 and 1973 respectively. Now, Malaysia has the lowest population per outlet or the highest density of outlets per population (45,000 people per outlet) in Asia, while Indonesia has one outlet per 456,000 (Figure 5.6).

Table 5.7: McDonalds' outlets in Southeast Asia and Japan

Countries	*First established*	*Year*	*Number of outlets*	*Population (millions)*	*Population per outlet (millions)*
Indonesia	1991	2004	109	241	2.21
		2016	170	261	1.53
Malaysia	1982	2004	164	23	0.14
		2017	265	32	0.12
Thailand	1985	2004	99	64	0.65
		2017	240	69	0.287
Philippines	1981	2004	542	87	0.36
		2017	572	106	0.185
Japan	1970	2004	3774	127	0.03
		2015	2975	127	0.042

Source: List of countries with McDonalds restaurants, 2018, Wikipedia.
Note: McDonalds Malaysia targets 450 more restaurants by 2025, *New Straits Times*, 2017.

In 2004, there were 3774 McDonalds' outlets in Japan, the highest among the five East Asian countries compared (Figure 5.7). Japan had the lowest population ratio per outlet, with one outlet per 30,000 people; next was Malaysia, with 140,000 people per outlet. Population per outlet was highest in Indonesia, with 1.53 million per outlet in 2016.

Table 5.8: Pizza Hut outlets in Southeast Asia and Japan

Country	*Year*	*Number of outlets*	*Population (millions)*	*Population per outlet (millions)*
Indonesia	2002	69	231	3.35
	2016	326	261	0.8
Malaysia	2002	94	23	0.24
	2017	392	32	0.081
Thailand	2002	83	62	0.75
	2017	92	69	0.75
Philippines	2002	93	85	0.91
	2018	173	106	0.61
Japan	2002	293	127	0.43
	2018	173	127	0.343

Sources: (Crunchbase, 2018; Pizza Hut Philippines, 2016; The Star Online, 2018; USDA Foreign Agricultural Service, 2016; Inside Retail Asia, 2017)

Pizza Hut came to Southeast Asia later, with the number of Pizza Hut outlets still growing. In 2017, there were 392 outlets in Malaysia, with a population ratio of 81,000 people per outlet (Figure 5.8).

5.3. Impacts of Overweight and Obesity

5.3.1. Health Impact

Overweight and obesity have contributed to increasing non-communicable obesity-related chronic diseases such as diabetes, osteoarthritis, osteoporosis, cardiovascular diseases, cancers, sleep apnoea, and other health troubles, which have, in turn, increased morbidity and mortality (Amarasinghe & D'Souza, 2012). Obstructive sleep apnoea is common among the obese. The lower propensity to exercise for obese individuals reduces the intensity and frequency of physical activity required to lose weight. Such behaviour aggravates their health problems (Forhan and Gill 2013). Thus, obesity leads to reduced vitality, poorer sleep quality, less sleep, increased sleep disturbances, more daytime sleepiness, increased stress levels, poor mental health and general health, increasing fatigue and body weight (Amarasinghe, *et al.*, 2009; Zammit, *et al.*, 2010). In Malaysia, 73% of deaths were caused by non-communicable diseases, often associated with obesity (WHO, 2014).

5.3.2. Economic Impact

Obesity increases injuries and disability, while reducing productivity (Gates, *et al.*, 2008; Heinen & Darling, 2009). In turn, lower worker productivity increases costs and reduces profits (van der Starre, *et al.*, 2013). Obesity-induced productivity losses and work limitations also reduce individuals' social participation and contributions (Rodbard, Fox and Grandy 2009). Overweight and obesity significantly burden economies with higher medical costs to treat obesity-related conditions and higher absenteeism among workers (IPH, 2016). In Southeast Asia, the costs of

obesity are highest in Malaysia, with 10–19% of national healthcare spending spent on obesity-related matters (Economist Intelligence Unit, 2018).

5.3.3. Social Impact

Obesity also affects the individual's quality of life. Obesity can impair individuals' physical functions, personal health, sexual functioning, self-esteem and work performance (Kolotkin & Crosby, 2002; Silva, *et al.*, 2008), e.g., causing the obese to have poorer sexual satisfaction (Kolotkin, *et al.*, 2006). The obese also face limitations in daily activities such as dressing, housework, bending, squatting, stooping, lifting, walking, climbing stairs, and consequently, limit participation and mobility in social life and work activities. Obesity impairs cardiopulmonary functions, with the obese experiencing shortness of breath and swelling of the lower extremities due to physical exertion (Zavorsky, *et al.*, 2007). Such unpleasant and even distressing sensations, coupled with joint pain and skin friction, serve to reduce mobility.

The adverse impact of excess weight on psychological and social wellbeing is increasingly acknowledged. Western society places most responsibility for obesity on personal failings (Kim & Anne Willis, 2007). Failure to achieve more socially acceptable body norms causes many obese people to experience various forms of prejudice, discrimination, stigmatisation, psychological distress and low self-esteem (Puhl & Heuer, 2009). Overweight and obese people are typically dissatisfied with their 'body images', disappointed with their own failures to approach the ideals, which can enhance feelings of inadequacy and low self-esteem (Goswami, *et al.*, 2012; Tzafettas, 2009). Negative attitudes towards and discriminatory behaviour against obese individuals are evident in work settings, health care facilities, educational institutions and the media (Puhl & Heuer, 2009). About a quarter of obese people experience work-related discrimination, e.g., in getting hired, often receiving lower wages, or being bypassed for promotion (Tessier, 2009).

5.4. Conclusion

Various efforts have failed to curb the rapid growth of overweight and obesity in Malaysia over recent decades. An obesity epidemic has begun, requiring urgent implementation of effective policies to substantially reduce fat and sugar intake, and to increase physical activity. Some countries have already or had adopted policy measures, such as taxes on sugar or fat, to check obesity. In Malaysia, the government prefers 'soft policies', such as public education programmes and campaigns to check the spread of obesity by increasing awareness.

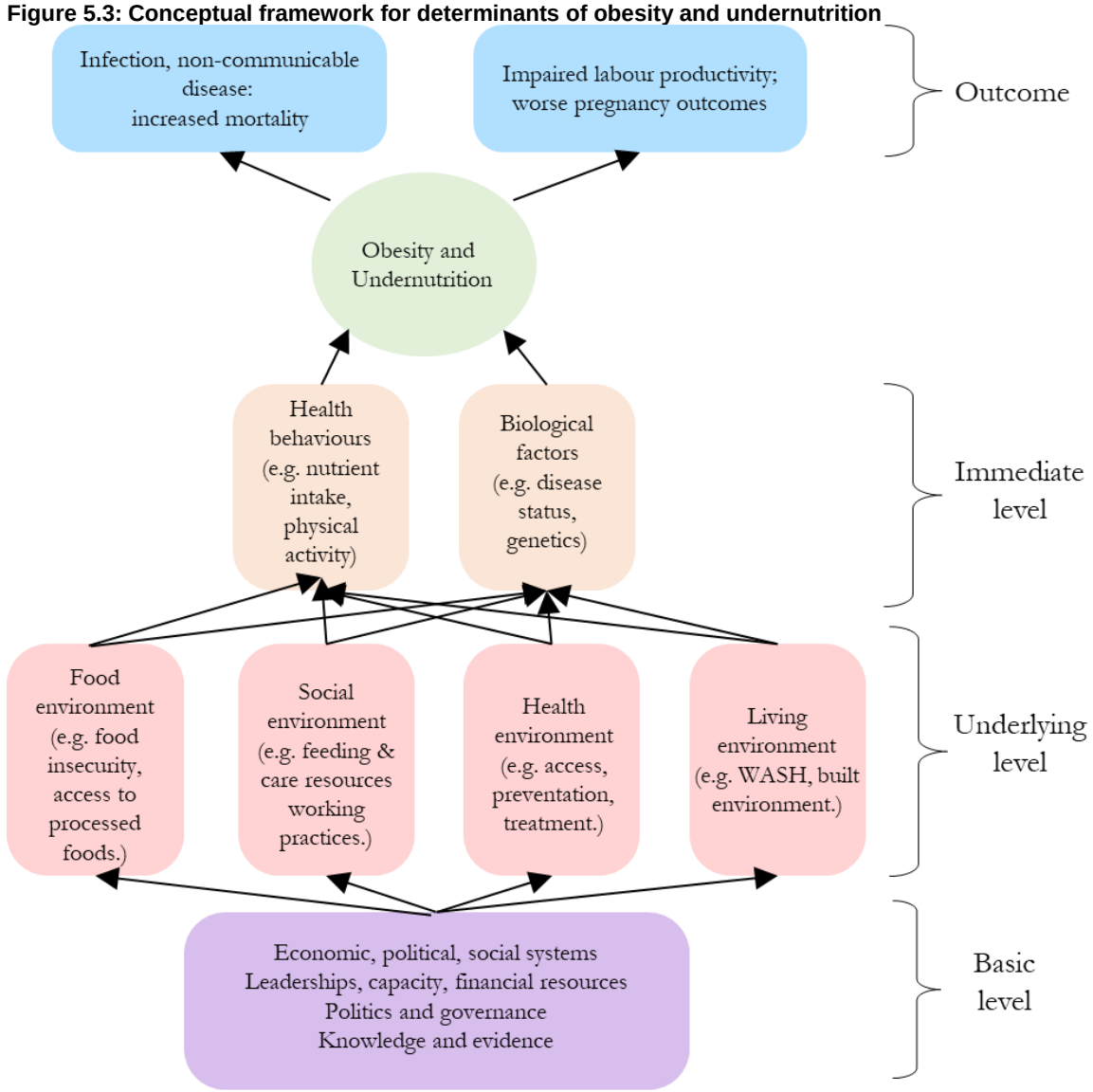
Despite obesity being a major risk factor worsening many non-communicable diseases, most Malaysians seem unaware of the many adverse consequences of being overweight and obese (Mansor & Harun, 2014). Soft policies have not been effective in discouraging more people from consuming unhealthy processed foods (Milio, 1990). Health promotion and education alone have clearly not been enough to promote desirable behavioural changes especially in an environment that does not effectively encourage healthy living.

There is little coordination in policymaking, impeding the development and implementation of a comprehensive strategy to tackle obesity. Findings from research and evaluations of obesity reducing interventions are not effectively appreciated, let alone disseminated and incorporated into

policy. In fact, evaluations of interventions are rare despite some well-executed policies. There is little large-scale research; hence, there is little national, or even local data on the determinants of healthy eating behaviours needed to develop more effective policy measures. Obesity is not currently regarded as a public health priority by ministries other than the health ministry, limiting resources available for interventions.

On the other hand, obesity programmes and research in Malaysia in recent decades mainly focus on prevention, management and treatment. One reason for the inefficacy of policy measures is due to the longstanding focus on the immediate causes of obesity (Figure 5.3), especially on tackling health behaviours, including nutrient intake and physical activity, while ignoring underlying drivers of obesity, including food, social, health and living environments. Food environment includes food insecurity and access to processed food while the social environment includes feeding, care resources and working practices. Health environment includes access to, prevention of and treatment in the healthcare system. Finally, living environments include the built environment and the hygiene of the living environments.

Figure 5.3: Conceptual framework for determinants of obesity and undernutrition



Source: Haddad, *et al.*, 2015

The international food industry and trade are one such factor. Food trade has become more complex, with food supplies coming increasingly from abroad. The food chain from farm to table has changed, as what is consumed may include ingredients from many sources via various supply chains. Supply chain complexity has grown over the decades due to increased international supply of food products.

The international food trade is likely to continue to grow. Growing corporate control of food production and trade has involved a significant increase in food processing, transforming the very nature of food products available to consumers. Such food processing has not only transformed diets, but also had important consequences for food utilisation and hence, human nutrition.

Thus, the nature and quality of food consumed needs to be evaluated, especially when obesity has been linked to poor quality diets, involving refined carbohydrates and processed or 'ultra-processed' foods high in fat, salt, sugar and other additives for preservation, taste enhancement and to induce product loyalty. The nutrition transition has apparently transformed diets to become more 'energy rich, but micronutrient poor'. Affordable foods often have 'empty calories' (sugar/fat) while naturally micronutrient-rich food has become more expensive. As the volume and varieties of food increase, food choices pose new dilemmas for consumers. We need to shift to sustainable diets as unhealthy foods are spreading in developing countries with the promotion of fast food and sugar sweetened beverages by giant transnational chains.

Additional efforts are required to achieve nutritional wellbeing in food secure households to ensure nationwide access to adequate, nutritious, safe and quality foods. Only policies and regulations can ensure an environment that is more preventive of non-communicable disease, including obesity prevention. 'Hard' policies, such as regulation or fiscal policies (e.g., taxes on unhealthy food and beverages), may be cheaper interventions to prevent obesity (Gortmaker, *et al.*, 2011) and reduce ill health and death due to obesity related diseases (Nnoaham, *et al.*, 2009; Smed, *et al.*, 2007). Comprehensive approaches, involving multiple stakeholders, are needed (James, 2009) for better, perhaps even 'win-win' outcomes (Campbell, *et al.*, 2009).

Food policy should be harmonised with agriculture policy, which rarely happens. Agriculture, food and nutrition policies need to address health issues, especially by focusing on food and dietary diversity. As international food trade grows, transnational food chain governance can help improve monitoring, while strong enforcement and controls at the national level are very much required. In a country like Malaysia, which is facing multiple burdens of malnutrition, the role of food in relation to improving nutrition will be crucial. The final chapter will consider some issues in this connection.

Ultimately, balanced and diversified diets are still the simplest answer to improving nutrition for the people. Nutrition problems cannot be solved in the long term with a single approach except for temporary emergency measures. A holistic food system-based approach to nutrition thus offers a more sustainable, economic and effective way to improve nutrition.

6. NUTRITION PROGRAMMES AND POLICIES

Malaysia's nutrition programmes and policies have evolved over the years to deal with changing perceptions of the nutrition challenges of the day. This chapter reviews existing programmes and policies from Independence until the present.

6.1. History of Malaysia's School Feeding Programmes

6.1.1. Applied Food and Nutrition Project

The Applied Nutrition Program (ANP) was initiated and conceptualised by the Food and Agriculture Organisation (FAO), the World Health Organisation (WHO), and the United Nations Children's Emergency Fund (UNICEF) in the 1950s when the nutrition projects they had been supporting worldwide were not yielding expected improvements in food availability and nutritional adequacy (Ismail, 1979). There were no large-scale national programmes to develop comprehensive strategies to improve nutrition after Malayan independence in 1957 until the effort to initiate an ANP during the First Malaysia Plan period (1966–1970) based on a 1966 pilot programme. Subsequently, as part of the "Gerakan Pembaharuan" community and social development programme, the Applied Food and Nutrition Project (AFNP) was launched. This was the result of various planning and consultation efforts to improve the living conditions of rural populations who constituted about 70% of the Malaysian population at the time.

The AFNP was an integrated inter-agency programme, covering health, education and food production, and included a supplementary feeding programmes for infants, toddlers and pregnant women. By the end of 1975, there were AFNP projects in Kelantan, Terengganu, Pahang, Perak and Selangor, covering 2.4 million people (Economic Planning Unit, 1976). At the end of 1980, the AFNP was extended to around 40 districts in the peninsula, and to parts of Sabah and Sarawak. In 1985, the AFNP covered 3.5 million people in the peninsula, and 600,000 in Sabah and Sarawak (Ali, *et al.*, 1984). Greater emphasis was given to areas with serious malnutrition problems, particularly in Terengganu, Kelantan, Perak, Kedah and Pahang, where toddler mortality rates were higher than elsewhere in the peninsula. At the same time, emphasis was placed on improving community health and sanitation, and on agricultural programmes for food production to improve nutrition. The overall objectives of the AFNP were to:

a) Initiate improvements in food and nutrition throughout Malaysia, over a period of 10 years;
b) Strengthen formulation of a national food and nutrition policy by identifying priorities and inter-agency programming;
c) Showcase the AFNP as an integral part of community development;

The AFNP employed an integrated approach, with a four-pronged strategy within a community development framework:

a) *Economic:* Extension services and administrative services for agricultural, livestock and fisheries production;

b) *Health and Sanitation:* Maternal and child health care, immunisation, family planning, nutrition surveillance, treatment, rehabilitation, and environmental sanitation[19];
c) *Supplementary Feeding:* Supplementary feeding in health clinics, 'pre-schools', child-care centres and primary schools;
d) *Nutrition Education:* Nutrition education through extension activities, health clinics, pre-school education, school health education and community education.

The specific operational objectives of the AFNP were to:

a) increase the production, distribution and availability of food. This included Department of Veterinary Services assistance to farmers and rural households to breed a larger variety of food animals, while the Fisheries Department assisted in freshwater fish production;
b) promote desirable dietary practices in families, particularly among pregnant mothers and children, including Ministry of Health clinics in rural areas;
c) improve maternal health and child development through better pregnancy spacing;
d) improve provision and utilisation of various services directed at families;
e) provide supplementary feeding to vulnerable groups as a stop-gap measure until food availability is sufficient;
f) promote 'self-help' efforts through community involvement and participation;
g) enhance health and nutrition education through maternal and child health services, pre-school education, school curricula, home economics and other extension services, as well as via the mass-media. This involved the Ministry of Education providing hygiene, food and nutrition education in schools;
h) improve the competence of personnel involved in food and nutrition through intra-agency and inter-agency training and orientation.

Implementation of this plan had mixed results. A 1979 nationwide evaluation by the Ministry of Health found improved utilisation of various health clinic services, but also that some traditional food habits and postnatal taboos for feeding children still persisted, including restrictions on fish, eggs, vegetables and fruits in the diets of infants and toddlers (Ministry of Health Malaysia, 1979). An evaluation of the AFNP's nutrition components by Ali, *et al.* (1984) found that despite the national decline in underweight and stunting, nutrition deficiencies in Kuala Selangor were still alarming, at 35.7% and 51.1% in AFNP and non-AFNP communities respectively.

Undoubtedly, the AFNP was an ambitious and comprehensive programme with promising potential outcomes. Such a large-scale national programme required the full commitment and participation of all involved. They did not achieve the results envisaged as the pre-conditions necessary for success were not realised. The reasons for these shortfalls included:

[19] Environmental sanitation is about improving or maintaining the basic sanitation conditions.

a) Poor coordination and cooperation

As no single body was responsible for overall project implementation, lack of coordination and cooperation among government departments resulted. There was a shortage of human resources in the coordinating committees at state and district level, while some departments remained inactive despite having programme responsibilities. Cooperation between school and community was also not achieved. Reporting of various activities at state, district and school level was rare and difficult. Furthermore, no formal evaluation was established to identify, address and remedy problems, e.g., to improve efficacy and efficiency, or to deal with mismanagement and abuse.

b) Unrealistic expectations

At the school level, the workloads of teachers and students were heavy, leaving little time for AFNP activities. There was also inadequate funding for the AFNP. For example, the subsidy for students under the SSF was only 29 cents per day, insufficient to ensure nutritious good quality diets. Partisan politics was also involved in selecting districts or participants, besides lack of dedication among some AFNP staff, and lack of cooperation by participants. Low budgets, unsuitable venues and poor scheduling of implementation also plagued the programme.

c) Top-down approach by heads of departments and ministries

The AFNP employed a 'top-down approach', with decisions made by different heads of departments or ministries. None of the AFNP participants or recipients were invited to be part of the committees which deliberated on issues relating to budgeting, implementation, resource distribution and personnel selection.

6.1.2. School Feeding

The School Supplementary Feeding Program (SSFP), popularly known in Malay as Rancangan Makanan Tambahan Sekolah (RMTS), is an integrated effort carried out in conjunction with primary schools' nutrition and health programmes. The SSFP was first implemented by the British Military Administration (BMA) after World War II as an emergency relief programme (Ministry of Education Malaysia, 1986). In 1964, the agencies involved in the SSFP were voluntary welfare bodies such as the Malaya Children's Welfare Association and statutory bodies such as the Federal Land Development Authority (FELDA). At that time, food aid was sponsored by the Catholic Relief Service of America, through the Catholic Welfare Service of Malaysia. After 25 years, the programme ended when the US ended food aid from 1972. During the quarter century, 468 schools and 98,910 schoolchildren benefited from the programme (Zuraini, 2017).

In 1974, the SSFP was implemented in Hulu Langat district by the Selangor State Government under the Applied Food and Nutrition Program (AFNP). Soon after, this programme was extended to other districts in the state. In 1976, the Malaysian Government formally initiated the SSFP in conjunction with a pilot project of the National AFNP under the Prime Minister's Department covering 12 districts in six states. By 1979, the programme was extended by the Ministry of Education to schools with 200 or less students in all districts in Malaysia.

In 1980, the education ministry left the main AFNP programme to implement SSF independently. With a budget of RM20 million, it provided supplementary feeding to about 660,000 children in

6,403 primary schools in the country. The programme was associated with the New Economic Policy, the national five-year plans and the community development programme. The programme was geared to the needs of vulnerable, poorer socioeconomic groups, to reduce imbalances among groups differentiated by geography (urban vs rural), ethnicity (Malay, Chinese, Indian, other Bumiputra, etc), and socioeconomic status. In 1989, the programme was extended to all schools irrespective of the number of students enrolled (Ministry of Education Malaysia, 1993).

There have been studies of SSFP implementation. A Ministry of Education, Malaysia (1984) study found the allocation of RM0.20 per child then to be insufficient due to price increases. Another study by the Ministry of Education, Malaysia (1986) found poor budgetary disbursements to schools, resulting in late payments received by food contractors in schools.

From 1995, children selected for the SSFP were entitled to daily meals for 150 schooldays, compared to 135 schooldays before. Likewise, budget allocations per child in 1995 increased from RM0.45 to RM0.80 in Peninsular Malaysia, and from RM0.50 to RM0.85 in Sabah and Sarawak. The main reason was the increased cost of SSFP menu options. In 1995, 20 menu options were introduced to all participating schools compared to the ten options previously. Schools had the option to use all 20 options or to select those preferred by the children. The revised options were better with respect to ingredients, methods of preparation and recommended serving sizes (Ministry of Education Malaysia, 1995).

The aims of the SSF programme in primary schools were to:

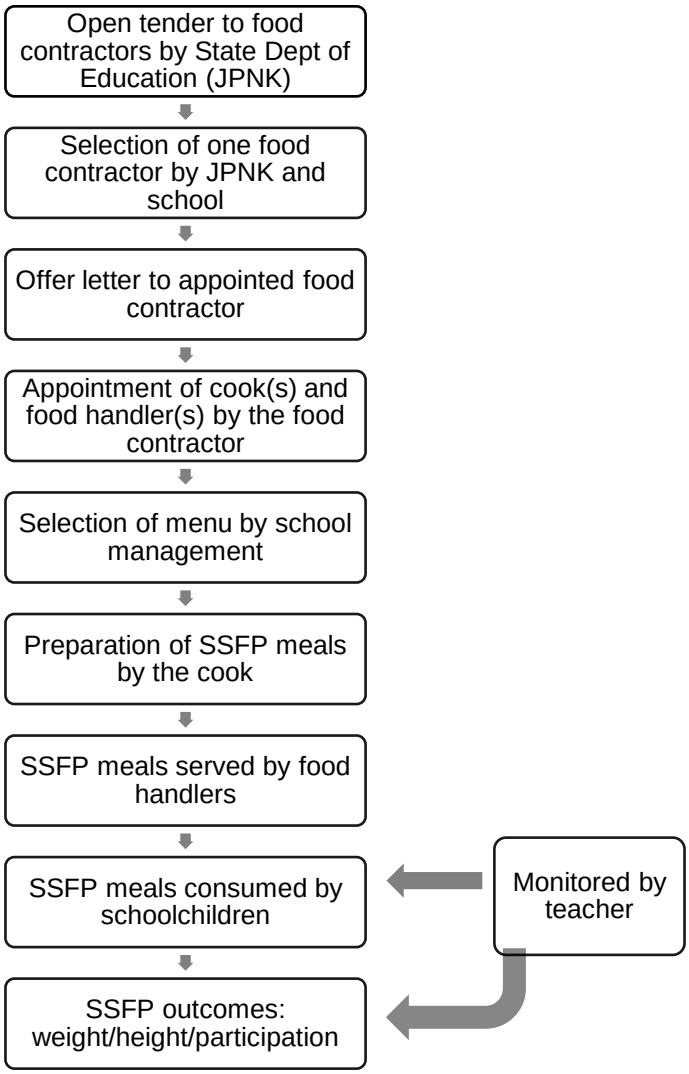
a) provide part of the daily protein-energy and other nutrition requirements of needy children, and supplement their calories requirements for school and personal growth before puberty.
b) create opportunities for formal and informal nutrition education (balanced diets, sources of nutrients, personal cleanliness, food hygiene, sanitation) through utilisation of locally available foodstuff.
c) complement the AFNP.
d) create a focal point for school-community cooperation by involving parent-teacher associations and community groups.
e) provide informal community education on health and nutrition.

Another AFNP programme innovation was training 'Important Officers' (Pegawai-pegawai Penting) from among teachers to organise school feeding. By 1975, up to 176 primary school teachers had been so designated nationwide.

Generally, the quality of food prepared by food caterers and voluntary personnel (teachers) was better than that prepared by canteen operators. This finding was similar to that of an earlier report by the Terengganu State Education Department (1994). The reasons were that canteen operators operated at higher cost, which included paying rental for working premises, wages to workers, and use of their own serving and cooking facilities. SSFP food was prepared in bulk and also sold to other non-SSFP schoolchildren in the canteen. Contracted and voluntary SSFP caterers prepared the food in bulk outside the school, usually at home, which was then brought to the school. The

food was then served, either by food caterers or school teachers using serving facilities provided by the school.

Figure 6.1: Summary of SSFP implementation



A cross-sectional study found a need to improve budget disbursement to schools in order to be more effective (Arop, *et al.*, 2000). Recycling the food menus in a two-week cycle have found increased acceptance among most children in most schools. The nutrient content of the food served improved with the budget increase from RM0.45 to RM0.80 per child. The parents surveyed wanted the programme to continue to avoid children from low income families going hungry during school hours. However, the study excluded children whose academic performances were poor. It is difficult to conclude if SSFP helped with overall improvement in academic performance or cognitive development since there were few evaluations of SSFP outcomes (Ibrahim, 1997).

Reports also show that the increased budget allocation saw a concurrent increase in the nutrient content of the food served (Teoh 1975). However, not all menus met the recommended nutrient

content level of 1/4–1/3 of the Malaysian recommended dietary intake (RDI) of thiamine, riboflavin, niacin and calcium. The low levels of needed minerals and vitamins in food prepared may be due to the modes of food preparation.

Apart from food operators given tenders to run school canteens and prepare SSFP dishes, food handlers and cooks, with good practices, were crucial for SSFP implementation. A study by Nik Rosmawati (2017) of 16 primary schools in Kelantan found food handlers' knowledge of food safety and healthy diets for children was not encouraging.

One of the most important aspects of SSFP implementation is the quality of food prepared and served by food caterers. SSFP meals were expected to contribute 25–35% of schoolchildren's daily recommended nutrient intake (RNI) requirements, as stipulated by the MOE (Ministry of Education Malaysia, 1993). They were expected to provide 350–400 kilocalories of energy and 5-40 grams of protein daily (Ibrahim, 1997). Of micronutrients, only vitamins A and C were in the SSFP meals provided (Arop, *et al.*, 2003).

Similar findings were reported by Wan Nudri and Abdullah (1996) and Nik Rosmawati, *et al.* (2014) who found the food that was made available in schools to be unhealthy due to high fat and calorie content. Furthermore, there were limited options available for dairy products, fruits and vegetables (Nik Rosmawati, *et al.*, 2014) due to reduced ingredients used to prepare certain meals and beverages (Jabatan Audit Negara, 2009). As continued monitoring and evaluation are necessary to improve implementation, these findings can help improve implementation, especially management of such programmes.

The biggest impact of the SSF involved reducing protein-energy malnutrition among children (Kandiah & Tee, 1990). A study by Mohd Shahril, *et al.* (2000) of 129 schools in Peninsular Malaysia found that 97.0% of the children liked and were happy with the food served, 88.6% reported that they ate all the food served, while only 3.0% disliked the food given. The parents surveyed also appreciated the programme and wanted SSF to continue. Another study of the impact of a school milk programme in an Ulu Selangor school found protein-energy malnutrition had declined significantly after two years of SSF (Chen, 1989). Underweight declined from 15.3% to 8.6%, stunting from 16.3% to 8.3%, and wasting from 2.6% to 1.7% (Chen, 1989).

Another significant achievement of the SSF was increased school attendance, particularly by children from poor families. Evaluating the impact of the SSF in 15 rural primary schools, Kandiah and Tee (1990) found mean attendance rates went up in schools with SSF compared to 'control' schools without SSF, with the decline in absenteeism attributed to the SSF.

6.1.3. Programme for Malnourished Children

The Rehabilitation Program for Undernourished Children (*Program Pemulihan Kanak-Kanak Kekurangan Zat Makanan*) was launched in 1989 by the Malaysian Government as a short-term effort to improve the nutritional status of children aged 6 months to 6 years from 'hard core' or extremely poor families. Children who meet the eligibility criteria are given food aid for at least 6 months to help them get more balanced diets and nutritious food to achieve better physical and

mental growth. Each child in the programme was supplied with food baskets containing 14 basic foods for weight gain (Bahagian Pemakanan Kementerian Kesihatan Malaysia, 2014). There were 13 packages of basic food combinations that could be supplied to these children, including rice, dried anchovies, cooking oil, full cream powdered milk, formula milk, rice noodles, sardines, hen's eggs, biscuits, multivitamins, margarine, chocolate malt powder, breakfast cereals and special milk.

Recent studies found limited success for these packages, with outcomes differing for various ethnic groups (Mas Harithulfadhli, 2015; Mohd Ridzuan, 2016). Another worrying trend is the temptation of using packages with multivitamins and special milk as quick measures to achieve weight gain, ignoring the need for proper diets, nutrition education, health, hygiene, sanitation and food safety.

6.1.4. National Plan of Action for Nutrition

The National Plan of Action for Nutrition of Malaysia (NPANM) was a blueprint for nutrition outlining Malaysia's commitment and response to the global call for the eradication of malnutrition agreed to at the first International Conference on Nutrition (ICN) in Rome in December 1992. The NPANM was drafted in 1994, with the National Coordinating Committee on Food and Nutrition (NCCFN) formed in March. The first NPANM provided a multi-sectoral nutrition framework for the Seventh Malaysia Plan (7MP) for 1996–2000. This was followed by NPANM II (2006–2015) and NPANM III (2016-2025), with NPANM III coinciding with the Eleventh and Twelfth Malaysia Plans.

NPANM I incorporated all eight themes of the World Declaration and Plan of Action for Nutrition in Rome plus an additional theme, i.e., promoting breastfeeding. The general objective of NPANM I was "to achieve and maintain the health and nutritional well-being of all Malaysians through access by all to nutritionally adequate diets, safe foods and healthy living conditions in a manner that is environmentally sound and socially sustainable" (Ministry of Health, Malaysia, 1996).

NPANM I called for incorporating nutrition objectives, considerations and components into development policies and programmes, while pushing for more 'nutrition sensitive[20]' issues to be incorporated into the Seventh Malaysia Plan. This included setting up a national nutrition council as the high-level national nutrition coordinating body. As Malaysia did not have any national food and nutrition policy at that time, it was deemed important to formulate such a policy. In 1999, the first Malaysian dietary guidelines were issued to guide Malaysians in adopting healthy eating and dietary practices.

Overall, NPANM I was a very comprehensive document of nutrition recommendations, strategies, targets, programmes and activities to be implemented in line with the 1992 World Declaration and Plan of Action for Nutrition. In the interim, between NPANM I, which ended in 2000, and NPANM II (Ministry of Health Malaysia, 2006), which started in 2006, the National Food Safety

[20] Nutrition sensitive issues and policies are issues which can impact nutrition.

and Nutrition Council (NFSNC) was established in 2001, chaired by the Minister of Health. The functions of NFSNC were to:

a) establish and enhance cooperation and coordination in facing new food safety and nutrition challenges at local, regional and international levels.
b) formulate a stable food safety and nutrition control system based on scientific evidence using integrated surveillance, enforcement, inspection, research and development methods. In addition, due consideration and attention were to be given to food factors relating to culture and religion.
c) ensure government food safety and nutrition monitoring and enforcement at every stage of food production. This involves various central (federal), state and local authorities, consumers and other stakeholders, including the private sector.
d) serve as an advisory body to the government on all matters related to food safety and nutrition; formulate a long-term strategic action plan; identify key issues and form new technical committees to coordinate related matters as well as for development and investment purposes.

The National Nutrition Policy of Malaysia was approved by the cabinet in 2003 and published in 2005. The policy aims to achieve and maintain the nutritional well-being of Malaysians in line with Vision 2020. The policy has three objectives:

1. enhance and maintain nutritional well-being for all Malaysians.
2. ensure household food security for all.
3. strengthen inter- and intra-sectoral linkages for the development and implementation of all nutrition-related activities in the country.

The first recommended nutrient intakes (RNI) were published by the NCCFN, which became the reference for nutritional requirements for Malaysians of all age groups and by gender. Despite some lacunae, the half-decade between NPANM I and NPANM II saw achievement of the three major recommendations of NPANM I.

NPANM II (2006–2015) was grossly watered down compared to NPANM I, containing only one general objective and two specific objectives. The general objective was to achieve and maintain optimal nutritional well-being for Malaysians. The specific objectives were to enhance the nutritional status of the population and to prevent and manage diet-related noncommunicable diseases. The second Malaysian dietary guidelines were published in 2010.

The NPANM II period saw improvements in breastfeeding and infant feeding practices, with the percentages of mothers exclusively breastfeeding for 4 months and for 6 months meeting targets set. Wasting declined from 14.9% in 2006 to 8.0% in 2015, while the prevalence of underweight only decreased slightly from 12.9% to 12.4%, short of the targets set. Low birth weight and stunting increased from 10.6% to 11.3% and from 17.2% to 17.7% respectively (see Table 7). While Malaysia may be an upper middle-income country on the cusp of becoming a high-income nation, it is well behind on several social indicators associated with development.

However, NPANM II also neglected other important nutrition issues that need to be addressed. This includes ensuring continued access to sufficient supplies of safe foods for nutritionally adequate diets for all, and achieving sustainable, environmentally sound development goals contributing to improved nutrition and health. Unlike NPANM I, strategies and actions for "caring for the socio-economically deprived and nutritionally vulnerable" and "preventing and managing infectious diseases" were missing. Worse, this shift in focus anticipated future directions taken by the Ministry of Health's Nutrition Division and various national committees.

NAPNM III (2016-2025) (Ministry of Health Malaysia, 2016) is a more comprehensive and better documented blueprint compared to NPANM II. NPANM III reviewed the achievements and shortcomings of progress towards the nutrition and nutrition-related targets of NPANM II.

No nutrient intake targets for Malaysian adults have yet been met except for iron. In fact, according to the 2014 Malaysian Adult Nutrition Survey (MANS), all nutrient intakes, including calories, had dropped below the 2003 baseline. According to the 2014 MANS, more than half the population had intakes of dietary energy, calcium, thiamine and vitamin C below the RNI levels for adult Malaysians. Intakes of fruits and vegetables were also generally below the official Malaysian food pyramid recommendations of two servings of fruits and three servings of vegetables daily[21].

6.1.5. Healthy Lifestyle Campaign (1991-2002)

An important nutrition-related programme initiated by the Ministry of Health was the Healthy Lifestyle Campaign, launched on 25 May 1991, recognising the role of lifestyles in health and disease. The campaign's short and medium-term objectives were to increase Malaysian public awareness and knowledge of diseases due to unhealthy lifestyles, and to motivate the public to adopt health-promoting practices, behaviours and lifestyles. The long-term objective was to lower morbidity and mortality rates due to lifestyle-related diseases.

The programme had two phases. Phase 1 (1991-1996) focused on themes related to diseases (cardiovascular disease, AIDS/STD, food safety, child health, cancer and diabetes mellitus) strongly associated with lifestyles, behaviours and practices. Lifestyle risk factors, such as unhealthy eating, lack of physical activity, cigarette smoking and stress, were communicated to the public. Phase 2, from 1997 until 2002, focused on specific healthy practices and their long-term effects on lifestyles. The approach was to provide knowledge and enhance skills enabling people to adopt healthier practices and behaviours.

The results of 12 years of campaigns at national and local levels were not very encouraging as the prevalence of overweight, obesity and noncommunicable diseases continues to increase. The main criticism was that too many themes were developed, implemented and sustained, and too many complex health behaviours were targeted for implementation of the programme. The changing year-long campaigns also proved difficult to plan, implement and evaluate.

[21] The Malaysian food pyramid was the original basis for the RNI, but was later reconceived as the Malaysian Healthy Plate in 2016.

6.2. Policies and Strategies to Tackle Obesity and NCDs

Various policies and strategies have been introduced to tackle obesity and NCDs in Malaysia. These were usually introduced and implemented as stand-alone policies or as part of a wider national health policy. The latest guideline or strategy is the National Strategic Plan for Non-Communicable Diseases (NSP-NCD), 2016-2025. This plan focuses on three types of NCDs (cardiovascular diseases, diabetes, and cancer) and on four shared NCD risk factors (tobacco use, unhealthy diets, physical inactivity, harmful alcohol use). The five objectives of the plan are to:

1. strengthen national capacity, leadership, governance, multi-sectoral action and partnerships for better NCD prevention and management.
2. reduce modifiable risk factors and the underlying social determinants of NCDs by creating health-promoting environments.
3. strengthen and re-orient health systems to better prevent and control NCDs and their underlying social determinants through people-centred primary health care and universal health coverage.
4. promote and support high-quality national research and development capacity for NCD prevention and control.
5. Monitor NCD trends and determinants, and evaluate progress in prevention and control.

The KOSPEN (Komuniti Sihat Pembina Negara, or Healthy Community) programme was also introduced as an intervention by establishing Guidelines on Weight Management Programmes for Overweight and Obese Persons. Policies and guidelines against obesity and NCDs were also detailed in NPANM III. One of its main enabling strategies was 'preventing and controlling obesity and other diet-related NCDs' by strengthening policies supporting healthier behaviours. NPANM III also suggested several 'hard' policies to prevent and control obesity (see below) which have yet to be implemented:

a) Incorporating healthy BMI as part of weight management goals
b) Banning 'unhealthy' food advertising for children on television
c) Imposing tax on sugar-sweetened beverages
d) Imposing mandatory restrictions on the operating hours of food outlets

Finally, the Healthier Choice Logo (HCL) campaign seeks to address the increasing prevalence and burden of NCDs, provide a framework to develop healthier food supplies for the country, and help consumers identify healthier options in the same food categories or types.

7. PROPOSALS FOR NATIONAL NUTRITION STRATEGY

Summary: Key Considerations for a new National Nutrition Strategy

- For effective implementation of policies to improve nutrition, an **enabling policy environment** is essential. This means explicit political commitment, greater investment, cross-ministerial policies and plans, and multi-stakeholder governance mechanisms.
- **Sustainable food systems** are key to promoting healthy diets, with innovative food system solutions appropriate to national conditions needed.
- Information and education concerning healthy dietary practices are vital, but consumers must also be empowered with enabling **food environments** that provide safe, diverse and healthy diets affordable to all Malaysians.
- **Complementary actions** in other sectors are needed for a coherent 'all of government' approach, including international trade and investment, nutrition education and information, social protection, health system delivery of direct 'nutrition specific' interventions, and other health services to improve nutrition, water, sanitation, hygiene and food safety.
- To ensure **accountability**, the National Nutrition Strategy should adopt appropriate national targets higher than existing global targets for improving maternal, infant and young child nutrition, and for noncommunicable disease (NCD) risk factor reduction.

7.1. Background

There has been some progress in reducing hunger and malnutrition since Malayan independence in 1957, the formation of Malaysia in 1963, the New Economic Policy from 1971 and the 1992 first International Conference on Nutrition (ICN), but progress has been uneven and unacceptably slow. The prevalence of those suffering from chronic dietary energy insufficiency, or undernourishment, has declined, but remains worrying, according to anecdotal reports. Stunting (chronic malnutrition) still affects 17.7% of children under 5 years of age in 2015, while wasting (acute malnutrition) affects 8% of children under 5 years of age. In addition, it is suspected that most Malaysians suffer from one or more micronutrient deficiencies.

Furthermore, besides problems of chronic undernourishment (hunger) and micronutrient deficiencies ('hidden hunger'), most countries in the world are also facing increasing problems associated with obesity (body mass index [BMI] > 30) and other diet-related noncommunicable diseases (NCDs). Over 52% adults are obese and overweight and 6% children under 5 years of age are overweight, while diet-related NCDs are becoming serious global public health problems, even in low- and middle-income countries, creating the 'multiple burdens' of malnutrition (hunger/undernourishment; micronutrient deficiencies; obesity and diet-related NCDs).

Meanwhile, the food system has continued to evolve, with a greater share of food consumed now processed, and a great deal traded internationally. The availability of highly-processed commercial food products high in fat, sugars and salt/sodium has increased, often replacing healthy local diets and foods with needed micronutrients, and resulting in excessive consumption of energy, fats, sugars and salt. The fundamental challenge today is to sustainably improve nutrition by implementing coherent policies, better coordinating actions across all relevant sectors, as well as strengthening, preserving and recovering healthy and sustainable food systems.

7.2. Purpose and Targets

The proposed National Nutrition Strategy (NNS) is largely voluntary. The purpose of the NNS will be to guide implementation of coherent efforts to combat malnutrition in Malaysia. Such efforts should be guided by the commitments of the Rome Declaration on Nutrition adopted by the 2014 Second International Conference on Nutrition (ICN2) [22]. Building on existing commitments, goals and targets, this report proposes a set of policy options and strategies which the government, acting in cooperation with other stakeholders, should incorporate into its national nutrition, health, agriculture[23], education, development and investment plans, and consider in negotiating international agreements to improve nutrition for all.

As governments have primary responsibility for action at the country level, preferably in consultation with major stakeholders, especially affected communities, the recommendations are principally addressed to Malaysian government decision-makers. They should consider the appropriateness of recommended policies and actions in relation to national and local needs and conditions, as well as other national policy priorities and legal frameworks. To ensure accountability and considering Malaysia's development level, the NNS should appropriately exceed existing global targets for improving maternal, infant and young child nutrition[24] and for NCD risk factor reduction[25].

Effective mechanisms for accountability are essential for ensuring that nutrition strategy commitments are followed through, to track progress, and to enable people to hold duty bearers, policymakers and institutions accountable[26]. The federal government should therefore establish

[22] Held on 19-21 November 2014.

[23] The term 'agriculture' refers to crops and other products of plant cultivation, livestock, forestry and fisheries.

[24] (1) 40% reduction of the number of children under five who are stunted; (2) 50% reduction of anaemia in women of reproductive age; (3) 30% reduction of low birth weight; (4) no increase in childhood overweight; (5) increase in rates of exclusive breastfeeding in the first six months by at least 50%; (6) reduction of childhood wasting to less than 5%.

[25] (1) reduce salt intake by 30%; and (2) stop the increase in obesity prevalence in adolescents and adults.

[26] Monitoring frameworks may be developed based on the Global Monitoring Framework for Maternal, Infant and Young Child Nutrition, the Monitoring Framework for the Global Action Plan on Noncommunicable Diseases, as well as food security monitoring, including FAO indicators for the prevalence of undernourishment, the food insecurity experience scale, and other widely used indicators.

nutrition targets and milestones, consistent with a realistic but ambitious timeframe for implementation, as well as global nutrition and noncommunicable disease targets[27]. These should include – in national monitoring frameworks – agreed international indicators for nutrition outcomes (to track progress in achieving national targets), nutrition programme implementation (including coverage of interventions) and the nutrition policy environment (including institutional arrangements, capacities and investments). Monitoring should be conducted, to the fullest possible extent, through existing mechanisms[28].

7.3. Creating an Enabling Environment for Effective Action

Over the decades, Malaysia has developed and implemented national nutrition strategies, policies, programmes and action plans, reflecting changing priorities and strategies for alleviating hunger and malnutrition. However, implementation and progress have been uneven, patchy and unsatisfactory due to inadequate commitment and leadership, lack of investment, weak human and institutional capacities and limp accountability mechanisms.

Actions to address malnutrition are generally among the most cost-effective, providing very high economic returns in terms of improved productivity and lower healthcare costs. The potential human, social and economic gains from turning commitments into action are substantial, while the costs of inaction are high. Available resources should be used to implement and scale up the most appropriate, cost-effective and evidence-based nutrition interventions. This often requires complementary investments including food and agriculture, health, education, water, sanitation, hygiene as well as trade.

Fulfilling the human right to food and overcoming malnutrition require a sustained enabling policy environment and improved governance mechanisms for food, health and related systems. Key requirements for creating such enabling environment and improved governance mechanisms include:

- political commitment and leadership to prioritise sustainable and equitable nutrition-enhancing approaches and strong national nutrition governance;
- adoption of effective and coherent policies, strategies and programmes, and effective multisectoral cooperation to address the determinants and causes of malnutrition and its effects;
- improved and better alignment of public and private investments to support nutrition goals;

[27] Established by the World Health Assembly.

[28] Reports on implementation of the commitments of the Rome Declaration on Nutrition are being compiled jointly by FAO and WHO, in close collaboration with other United Nations agencies, funds and programmes, and other relevant regional and international organizations, as appropriate, based on country self-assessments as well as information available through other monitoring and accountability mechanisms, e.g., national self-assessments, reports to the FAO Conference and the World Health Assembly, the Global Nutrition Report and other mechanisms related to the United Nations' General Assembly's Decade of Action Against Malnutrition.

- enhanced and sustained human and institutional capacities for effective action, including policy and programme design, management, monitoring and evaluation of nutrition investments and outcomes;
- allocation of national resources to ensure healthy diets for all, focusing on the most nutritionally vulnerable life stages and specific needs;
- engagement of trusted and trusting partners willing to realign their interests, and to create and sustain inclusive interaction;
- regular and systematic public assessments of progress to enhance accountability and effectiveness, and improve resource use;
- international technical support for implementation of national nutrition policies and programmes, as appropriate.

7.4. Policy and Programme Options to Improve Nutrition

Addressing malnutrition is strengthened by a common vision and a multisectoral approach that includes coordinated, coherent, equitable and complementary interventions[29] in food systems and agriculture, health, social protection, education and trade among others, and by addressing not only hunger and malnutrition, but also their multiple burdens efficiently and innovatively.

7.4.1. Sustainable Food Systems Promoting Healthy Diets[30]

The types of foods produced and how they are processed, traded, retailed and marketed impact the conditions and opportunities that influence people's food and beverage choices and dietary practices and behaviour, and consequently, their nutritional status. Information and education concerning dietary practices are vital, but consumers must also be empowered by enabling food environments[31]. Food environments that provide safe, diverse and healthy diets are particularly important for vulnerable groups, as they are generally more constrained by lack of resources.

A food system approach—from production to processing, storage, transportation, marketing, retailing and consumption—is thus key to promoting healthy diets and thus improving nutrition as isolated interventions have limited impact. Since food systems have become increasingly complex and strongly influence people's ability to consume healthy diets, coherent actions and innovative food system solutions are needed to ensure access to sustainable, balanced and healthy

[29] 'Interventions' refer to policies and programmes designed to address immediate and/or underlying determinants of nutrition in individuals and households.

[30] A healthy diet refers to a balanced, diverse and appropriate selection of foods eaten over time. It ensures that the need for essential macronutrients (proteins, fats and carbohydrates including dietary fibres) and micronutrients (vitamins, minerals and trace elements) are met, as these vary with a person's gender, age, physical activity level and physiological state. WHO indicates that for diets to be healthy, (a) daily needs of energy, vitamins and minerals should be met, but energy intake should not significantly exceed needs; (b) daily consumption of fruit and vegetables exceeds 400 g; (c) intake of saturated fats is less than 10% of total energy intake; (d) intake of trans-fats is less than 1% of total energy intake; (e) intake of free sugars is less than 10% of total energy intake or, preferably, less than 5%; (f) daily intake of salt is less than 5 g. For more information, see the WHO Fact Sheet on Healthy Diet (Fact sheet No 394, September 2014. http://www.who.int/mediacentre/factsheets/fs394/en/).

[31] Food environment refers to the conditions and opportunities that influence people's food and beverage choices as well as nutritional status.

diets for all. These solutions should include the production, availability, accessibility and affordability of a variety of cereals, legumes, vegetables, fruits and animal source foods, including fish, meat, eggs and dairy products as well as diets containing adequate macronutrients (carbohydrates, fats and protein), fibre and essential micronutrients (vitamins and minerals) in line with WHO recommendations on healthy diets, with food produced and consumed sustainably. On the other hand, these solutions should include measures to avoid excessive intake of energy, fats, sugars and salt/sodium.

Globally, the food system contains a diverse mix of traditional and modern supply chains, with both offering risks and opportunities for nutrition. Low-income consumers in low- and middle-income countries have a greater tendency to buy food via traditional supply chains, where losses are high, while safety and quality controls are limited. Modern processing and retailing offer more fruits, vegetables and animal-source foods through cold chain storage, improving food quality and safety, but highly processed foods of low nutritional value contribute to rising obesity and diet-related NCDs.

Investing in rural populations is vital for equitable human development. Women subsistence workers or family farmers often have less access to critical inputs and farmer subsidies in Malaysia, but tend to be more involved in meeting family and community nutrition needs, while commercial producers are critical to stabilising national and global supply and prices, and will be crucial for applying sustainable practices at scale.

Raising women's incomes brings great health and nutrition benefits as women often manage household resources for food and nutrition, and greatly influence household food consumption, in particular for infants and young children. Improving agriculture and food technology gives women more time, improves their incomes and nutrition, and generally enhances their own well-being as well as those of their children, especially infants, toddlers and young children. It is therefore important to increase women's control over resources such as income, land, agricultural inputs and technology.

Agriculture and food systems are the cornerstones for good nutrition and healthy well-being. However, in Malaysia, the impact of agriculture on nutrition has not lead to many 'nutrition sensitive' agricultural interventions. Dorward (2013) suggests agricultural interventions can improve nutrition and health through three main pathways, namely development, own-production and markets. There are various agricultural interventions which can give positive nutrition outcomes, including coordinated actions employing value chain approaches, nutrition-sensitive agriculture, and better linkages between agriculture and food on the one hand, and nutrition and health on the other. Gillespie (2013) has described the impact of agriculture and food systems on nutrition and health through seven pathways:

1) Food production and consumption

2) Income-food expenditure

3) Income-non-food expenditure

4) Food prices-spending: purchasing power

5) Women's time: the changing time used in employment and care work

6) Women's employment-status, intra-household (IHH) decision-making

7) Women's nutrition-health

Natural and manmade disasters, emergencies, conflicts and shocks have increased in recent years, in both frequency and intensity. Resilience is necessary to prevent further deterioration of the nutritional status of crisis-affected populations, while nutrition is critical to strengthening both community and individual resilience. Public authorities should also consider some specific measures in this connection, such as:

- Promoting crop diversification, more fruit and vegetable production, and appropriate production of animal-source products as needed, applying sustainable food production and natural resource management practices.
- Improving storage, preservation, transport and distribution technologies and infrastructure to reduce seasonal food insecurity, food and nutrient loss and waste.
- Encouraging gradual reduction of saturated fat, sugars, salt/sodium and trans-fats from foods and beverages to reduce excessive intake.
- Improving the nutrient content of food consumption and behaviours, including through better public nutrition education and by discouraging consumption of unsafe and unhealthy processed food.
- Introducing regulatory and voluntary instruments – such as marketing, publicity and labelling policies, including economic incentives or disincentives – to promote healthy diets.
- Establishing food or nutrient-based standards to make healthy diets and safe drinking water accessible in public facilities, such as schools, hospitals, childcare facilities, workplaces, universities, food and catering services, government offices and prisons, and encouraging facilities for breastfeeding.
- Food labelling needs to be clear, accurate and comprehensible to consumers, to minimise risk of abuse[32].

7.4.2. International Trade and Investment

Trade and investment have become increasingly important to food systems. Trade and investment agreements affect how the food system functions at global, regional, national and even local levels, influencing food prices, availability, access and consumption as well as nutrition outcomes, food safety and dietary options.

Coherence between trade and nutrition policies are vital. Trade policy should support and provide adequate flexibility to implement effective nutrition policies and programmes. While trade has substantially increased the availability of and sometimes access to food for people, trade policies and agreements should not negatively impact the human right to food. Implementation of the World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property Rights

[32] For example, Malaysian food regulations allow freshly produced milk or reconstituted milk be both labelled as 'fresh', when consumers may be expecting fresh milk to be milk freshly produced on farms and sold to customers, not after reconstitution.

should be supportive of food security and nutrition, and the obligation of Member States to promote, realise and protect the human right to food. The recommendations of Codex Alimentarius are also key to ensuring that international trade promotes health and nutrition.

Governments and, through them, various international organisations should identify opportunities to achieve food and nutrition targets, through trade and investment policies. They should help improve the availability of and access to food supplies through appropriate trade agreements and policies, and ensure that such agreements and policies do not negatively impact achieving the right to adequate food in other countries.[33]

7.4.3. Nutrition Information and Education[34]

Knowledge and education empower people to make better informed, healthy dietary and lifestyle choices, to improve infant and young child feeding practices and care, and to improve hygiene and health promoting behaviour. Lifestyle and behaviour changes are an important objective of nutrition education, which can also help reduce food losses and waste as well as boost sustainable resource use.

Nutrition and health education have always been key to disseminating food and nutrition information for healthy diets through basic services and programmes under the health, agriculture, education, community and rural development ministries. Improvements in maternal and child nutrition were carried out at health centres and at the community level by promoting production and consumption of healthy foods, including supplementary foods for pregnant mothers, breastfeeding, and complementary feeding for infants and young children. School feeding and school milk programmes have benefited both children and communities.

Despite carrying out comprehensive nutrition activities under the National Plan of Action for Nutrition Malaysia II during 2006–2015, major targets have not been achieved, particularly for food intake and dietary practices, protein-energy undernutrition, micronutrient deficiencies, as well as overweight and obesity in children and adults. Among the challenges identified as crucial for delivering better nutrition to targeted populations were:

- Poor intersectoral and multi-stakeholder coordination
- Lack of sustainable financial commitment, causing financing shortfalls
- Inadequate human resource capacities and capabilities
- Weak monitoring and evaluation

Governments, nongovernmental organisations (NGOs), the private sector and nutrition advocates should lead by example. They can help promote desired healthy lifestyle changes. Food and

[33] United Nations General Assembly resolution A/RES/68/177, paragraph 25.

[34] The term 'nutrition education' refers to education and information dissemination efforts including promotion, advocacy, information, communication, counselling, empowerment, consumer education, behavioural change communication and 'social marketing at individual, community, national and international levels to promote voluntary adoption of food choices and other food- and nutrition-related behaviours conducive to health and well-being.

nutrition knowledge should be included in primary and secondary school curricula (e.g., by teaching hygiene, food preparation and healthy culinary practices), public nutrition information, social marketing campaigns, and regulations on nutrient and health claims.

Health services should more actively promote nutrition education; dietary counselling should be part of primary health care, and nutrition counselling part of health workers' training. Pre-natal and post-natal dietary counselling can significantly improve maternal and child nutrition. Adolescent girls and women in particular will benefit from better nutrition education to promote exclusive breastfeeding in the first six months of an infant's life, and appropriate infant and young child feeding. Education outreach should extend to husbands, fathers and other caregivers. People should be informed of the nutrition content of food and meals at the time of purchase through easy-to-understand nutrition labels. Regulations on nutrient and health claims are also needed to safeguard consumers. Some specific measures to be implemented in this connection include:

- Improving nutrition education and information interventions, based on national dietary guidelines and coherent policies relating to food and diets, through improved school curricula, nutrition education in health, agricultural extension and social protection services, community interventions and point-of-sale information, including food labelling.
- Strengthening the Ministry of Health capacity to effectively disseminate nutrition and health information to the population. For example, nutrition information centres (NIC) and online portals, such as myHealth, should strengthen their communication strategy and skills. A unified, centralised and specialised agency may be more effective, online, in schools and through campaigns, in collaboration with the private sector.
- Building nutrition knowledge, related skills and capacity for more effective education activities, particularly for front line workers, social workers, agricultural extension personnel, teachers and health professionals.
- Conducting appropriate social marketing campaigns and lifestyle change communications programmes, taking culture into consideration, to promote dietary diversification, better child and maternal nutrition, adequate breastfeeding, complementary feeding and appropriate care practices, physical activity, consumption of micronutrient-rich foods, such as fruits and vegetables, including traditional local foods, all adapted for different stakeholders in the food system.
- Advertisements for food known to compromise health should be banned from programmes or activities that children watch or attend, such as cartoon shows on television or school sports days. Currently, the guidelines are voluntary and not enforceable by law.
- Misleading advertising of unhealthy food products and unnecessary food supplements can influence consumers. They should instead have adequate, relevant knowledge and good food and dietary behavioural practices to select healthy foods, prepare healthy diets and adopt healthy lifestyles.
- Strengthening mechanisms for multisectoral efforts to be implemented in line with the national development plans.
- Promotion of desirable eating habits should be stressed through food services, nutrition education and communication, social media and mass communication.

- Policy emphases and directions must be appropriate for a country's evolving development and culture. Globalisation, urbanisation and changes in food systems, along with changing eating habits and lifestyles, have transformed demand for food products and services.
- Ensure greater equity in food and nutrition security. Food, nutrition and health education should aim to reach everyone.
- Malaysia should be able to achieve sustainable food security and nutrition while maintaining food production resources, preserving the ecological system, improving people's livelihoods to enable everyone to have a healthy quality of life and nutritional wellbeing.

7.4.4. Social Protection[35]

Given limited and uneven progress in reducing hunger, food insecurity and malnutrition, and the currently dim prospects for sustained economic and employment growth in much of the world, comprehensive social protection is needed to eliminate undernourishment and malnutrition. Social protection measures, such as food and cash transfers, decent job creation and school feeding, can improve human welfare and strengthen resilience.

When combined with relevant health services, well-designed social protection programmes have improved height, reduced anaemia, increased dietary diversity, and raised consumption of nutrient-dense foods, especially in low-income households with infants and children. These measures can substantially enhance small producer resilience by preventing destitution in times of crisis besides raising production and productivity, both on- and off-farm. Other specific initiatives to incorporate nutrition objectives in social protection measures include:

- Incorporating nutrition objectives into social protection and humanitarian assistance programmes.
- Using cash and food transfers, including school feeding programmes and other forms of social protection for vulnerable populations, to ensure healthy diets through improved access to nutritionally adequate food sensitive to beliefs, cultures, traditions, dietary habits and preferences in line with national and international laws and obligations.
- Improving incomes for the most vulnerable by creating decent jobs for all.

[35] In 2012, the UN General Assembly recommended comprehensive universal social protection beginning with basic or minimum 'social protection floors'.

7.4.5. Strong and Resilient Health System

Health systems are increasingly challenged to tackle evolving challenges posed by various types of malnutrition and their health consequences. Strong health systems are needed to prevent and treat malnutrition with evidence-informed nutrition interventions, as well as recurrent infections which can aggravate malnutrition. Health systems also have to deal with the long-term consequences of overweight, obesity and diet-related NCDs and efforts to prevent and control them.

Effective delivery of direct nutrition interventions as well as prevention and treatment of diseases which can aggravate nutrition problems require strong and resilient national health systems. Health systems need to be linked to and complement food systems. Both need to strive for equity, the right to food and the best physical and mental health.

Access to health services for all – including the most marginalised and most vulnerable – is needed. This means universal health coverage (UHC)[36], where Achieving UHC should involve stronger, more efficient and equitable health systems. Besides achieving internationally agreed health care objectives[37], some specific measures to be implemented include:

- Strengthening health systems and promoting universal health coverage[38], particularly through primary health care, to enable national health systems to better address malnutrition.
- Improving the integration of nutrition actions into health systems through appropriate strategies for strengthening human resources, leadership and governance, health system financing and service delivery, as well as for provision of essential medicines, information and monitoring.
- Promoting universal access to all direct nutrition actions and relevant health actions impacting nutrition through health programmes.

7.4.6. Direct Nutrition Interventions

In developing policies and programmes to address nutrition challenges, it is imperative to pay special attention to the nutrition of mothers, infants and young children. Although various demographic groups (e.g., pre-school children, adolescent girls) need differentiated attention over their life course, ensuring appropriate nutrition during the first thousand days of life (from conception until the age of two years) is especially critical, and has a lasting impact on the survival, health and development of the individual.

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[36] All people have access, without discrimination, to nationally determined, needed, promotive, preventive, curative, palliative and rehabilitative essential health services, and essential, safe, affordable, effective and quality medicines, while ensuring that use of these services does not expose users to financial hardship, with a special emphasis on poor, vulnerable and marginalized segments of the population. World Health Assembly Resolution A67.14. Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA67/A67_R14-en.pdf

[37] The most important include implementation of the WHO Global Strategy on Infant and Young Child Feeding, the WHO Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition, 2012-2025, and the WHO Global Action Plan for the Prevention and Control of Noncommunicable Diseases, 2013-2020, through commensurate financing and adequate policies.

[38] In accordance with preambular paragraph 9 of World Health Assembly resolution WHA67.14.

Due to contemporary demographic transitions and resulting changes in the age distributions of populations – ageing, with increased shares of the elderly, and lower shares of the young – measures are also required to provide adequate health and nutrition support to meet the specific needs of the elderly. Direct nutrition interventions need to be integrated and implemented together with (indirect) 'nutrition-sensitive' interventions.

7.4.7. Promote, Protect and Support Breastfeeding

Breastfeeding is one of the most effective ways to improve child survival and to promote healthy child growth and development, and needs to be better promoted, enabled and supported. Exclusive breastfeeding[39] in the first six months of life ensures adequate, affordable, acceptable, appropriate and readily available food security and nutrition on a continuing basis. Breastfeeding contributes to achieving the highest attainable standard of health, as recognised in the Convention on the Rights of the Child. The International Code of Marketing of Breast-milk Substitutes and subsequent relevant World Health Assembly resolutions need to be legislated to protect breastfeeding from false and misleading advertising. The NNS adopts the global target to increase the rate of exclusive breastfeeding in the first six months up to at least half by 2025. Other specific measures needed include the following:

- Implementing policies, programmes and actions to ensure that health services promote, protect and support breastfeeding, including the Baby-Friendly Hospital Initiative.
- Encouraging and promoting – through advocacy, education and capacity building – an enabling environment where men, particularly fathers, participate actively and share responsibilities with mothers in caring for their infants and young children, while empowering women and enhancing their health and nutrition status throughout the life course.
- Implementing appropriate policies and practices, including labour reforms, to protect and enable working mothers to breast-feed their infant children.[40]
- Ensuring that policies and practices in emergency situations and humanitarian crises promote, protect and support breastfeeding.

7.4.8. Wasting

On average, severely wasted children are estimated to be 11 times more likely to die than their healthy counterparts[41]. Malaysia should aim to eliminate childhood wasting within two years. Both moderate and severe wasting can be addressed by community-based management of malnutrition, comprising of treatment and raising community awareness to facilitate early detection and treatment. The authorities should adopt policies and actions, and commit funding, to improve coverage of treatment for wasting, also integrating management of childhood illnesses.

[39] WHO recommends early initiation of breastfeeding (in the first hour), and exclusive breastfeeding for the first six months of life, followed by nutritionally adequate and safe complementary feeding, while breastfeeding continues for up to two years of age or beyond, to achieve optimal growth, development and health.

[40] As specified in the International Labour Organization's Maternity Protection Convention No. 183 and the corresponding Recommendation 191.

[41] WHO. Global Nutrition Targets 2025: Reduce and maintain childhood wasting to less than 5%. WHO Policy Brief, Geneva, 2014.

7.4.9. Stunting

Childhood stunting remains one of the world's most fundamental challenges for improved human development. The NNS should set a national target of halving childhood stunting within five years, exceeding the global target of a 40% reduction in the number of stunted children under five years of age. Stunting results from a complex set of individual, household, environmental, socioeconomic, political and cultural influences.

Direct or 'nutrition-specific' interventions need to be integrated and implemented together with 'nutrition-sensitive' interventions and actions involving social protection, health system strengthening, breastfeeding, prevention and treatment of diarrhoea and other infectious diseases, water, sanitation and hygiene, reproductive health and food safety.

Actions to prevent wasting have direct impacts on stunting, e.g., by enabling early detection and treatment of stunting. Measures to address wasting and stunting should be better coordinated and integrated. Other critical interventions needed to eliminate wasting and rapidly reduce childhood stunting[42] include:

- Establishing policies and strengthening interventions to improve maternal nutrition and health, beginning with adolescent girls and continuing through pregnancy and lactation.
- Health policies, programmes and strategies to promote optimal infant and young child feeding, particularly exclusive breastfeeding for the first six months, followed by adequate complementary feeding until the age of two years (i.e., 6-24 months).
- Strengthening assessment of the burden of stunting to effectively plan, design and monitor the programme.
- Incorporating linear growth assessment (height measurement) into routine child health services to provide critical, real time information for target setting and progress monitoring.
- Integrating nutrition into health-promotion strategies and strengthen service-delivery capacity in primary health systems and community-based care to prevent stunting and acute malnutrition, supported by social protection programmes where appropriate.
- Promoting a holistic view of malnutrition, including recognising that stunting, wasting and micronutrient deficiencies can occur in the same child, family and community, and ensure services to overcome undernutrition are implemented more coherently.

[42] Malaysia should develop national wasting and stunting targets in line with, and which contribute to, achievement of World Health Assembly resolution 65.6 that endorsed a comprehensive implementation plan for maternal, infant and young child nutrition (WHO, 2014).

7.4.10. Childhood Overweight and Obesity

Overweight and obese children are at greater risk of developing serious health problems, including type 2 diabetes, high blood pressure, asthma, other respiratory problems, sleep disorders and liver diseases. They may also suffer psychological effects, such as low self-esteem, depression and social isolation. Childhood overweight and obesity also increase the risk of adult obesity, NCDs, premature death and adult disability.

Actions to prevent and address childhood overweight and obesity should start with breastfeeding promotion (recognising its role in reducing the risk of childhood obesity), healthy school feeding programmes (by providing fresh fruits and vegetables in schools and restricting consumption of sugar-sweetened beverages) and other policies and programmes addressing social determinants of health.

Food marketing powerfully influences people's food choices. Aggressive and misleading marketing pressure, particularly towards children, has promoted unhealthy dietary practices. Measures to limit such influences are therefore needed. Stronger national actions are required to reduce and prevent childhood overweight and obesity – in line with the global target of no increase in overweight children by 2025 – alongside actions to address malnutrition problems.

Some other internationally agreed measures to be implemented include:

- Providing prenatal dietary counselling to women during pregnancy for adequate nutrition and healthy weight gain.
- Improving child nutrition and development, particularly by improving maternal exposure and access to complementary foods and supplementary feeding programmes for infants and young children.
- Regulating the marketing of food and beverages to children in line with WHO recommendations.
- Creating a conducive environment to promote physical activity despite otherwise sedentary lifestyles. This includes increasing the number of public parks, ensuring that they are clean and well-maintained besides eliminating unhygienic, unhealthy food stalls.
- Cultivating good eating habits through school feeding programmes that also educate students to eat healthily.

7.4.11. Anaemia in Women of Reproductive Age

Lack of vitamins and minerals poses a global public health problem. Iodine, vitamin A and iron deficiencies are the most important ones globally, posing major threats to health and development. Iron deficiency anaemia, the most common and widespread nutrition disorder in the world, especially impairs the health and wellbeing of women. Anaemia increases the risk of maternal and neonatal health problems. Failure to address anaemia impairs the health and quality of life of generations of children, adversely affecting their development and learning, and reducing their productivity. To achieve the global target of a 50% reduction in anaemia among women of

reproductive age by 2025, direct nutrition interventions need to be implemented together with strategies to promote healthy and diversified diets.

Implementation of recommendations to provide healthy diets in schools and preschools, nutrition education, treatment and prevention of infectious diseases as well as improved hygiene and sanitation are also important. Some targeted nutrition-specific measures are likely to be needed in particular circumstances such as:

- Improving micronutrient intake through consumption of micronutrient-dense foods, especially foods rich in iron, and promoting healthy, diversified diets;
- Where necessary, supplementation strategies may be temporarily needed. Providing daily iron, folic acid and other micronutrient supplementation to pregnant women as part of prenatal care; where needed, e.g., where anaemia prevalence is 20% or higher, intermittent iron and folic acid supplementation to menstruating women, and deworming, may be needed.
- Where appropriate, fortification, especially biofortification strategies in food production may be desirable.

7.4.12. Health Interventions to Improve Nutrition

Besides delivering interventions that directly improve nutrition, health systems also need other interventions that impact nutrition, including promoting health, preventing and treating infections, and improving women's reproductive health. Frequent episodes of infectious diseases, such as acute enteric infections, exacerbate child undernutrition, which is why child undernutrition persists in generally food secure populations. Infectious diseases – such as malaria, HIV/AIDS, tuberculosis and some neglected tropical diseases – also contribute to the high prevalence of iron deficiency anaemia and undernutrition. Worm infestations can impair nutritional status by causing internal bleeding, diarrhoea and poor absorption of nutrients. Infections can also cause loss of appetite which can, in turn, reduce nutrient intake. Breastfeeding is one way to protect infants against infections in conditions of poor sanitation.

Access to integrated health care services that ensure adequate support for safe pregnancy and delivery for all women is critical to improving maternal and child health, and to breaking vicious intergenerational cycles of malnutrition. Adolescent pregnancy is associated with higher risks of maternal mortality and morbidity, stillbirth, neonatal death, preterm birth and low birth weight. Women who have very closely spaced pregnancies are more likely to have maternal anaemia and preterm or low-birth-weight babies. Efforts to discourage adolescent pregnancy and to encourage pregnancy spacing are therefore needed.

Other internationally recommended measures still relevant to Malaysia include:

- Improving health services to prevent and treat infectious diseases.[43]
- Periodic deworming for all school-age children in endemic areas.

[43] Including prevention of mother-to-child transmission of HIV, immunization against measles, and antibiotic treatment for girls with urinary infections.

- Use food processing for micronutrient supplementation, e.g., iodine supplementation in table salt.
- Prohibit or discourage nutrient-reducing food processing.
- Supplementing zinc to reduce the duration and severity of diarrhoea, and to prevent subsequent episodes in children.
- Iron and vitamin A supplementation, among others, for pre-school children to reduce the risk of anaemia.
- Policies and strategies to ensure women have comprehensive information and access to integrated health care services to support safe pregnancies and delivery.

7.4.13. Water, Sanitation and Hygiene (WASH)

WASH typically refers to activities aimed at improving access to and use of safe drinking-water and sanitation besides promoting good hygiene practices (e.g., handwashing with soap at appropriate times). Water is a finite resource essential throughout the food system – from production to consumption. Agriculture and food production account for more than two thirds of freshwater withdrawals[44]. To achieve sustainable, healthy diets, better water use policies will be required, responsive to changing supply and consumption patterns. To meet this challenge, food production systems need to adapt with a combination of appropriate measures. Greater water use conservation, along with other relevant measures to reduce food – including water – waste and loss, are required to achieve water sustainability. Lack of access to WASH can thus adversely affect a child's nutritional status; current evidence identifies three direct pathways: via diarrhoeal diseases, intestinal parasite infections and environmental enteropathy.

Access to safe drinking water and adequate sanitation is now recognised as a human right[45] essential for health, prevention of diarrhoeal disease, and improving nutrition. Diarrhoea is the second leading cause of death among children under five, and lack of safe drinking water – along with inadequate sanitation and hygiene – are major risk factors. Children affected by undernutrition are more likely to die from diarrhoea, which in turn, undermines food utilisation and nutrition by reducing appetites and food absorption.

Everyone in Malaysia should have easy access to safe drinking water, adequate sanitation and knowledge of good hygiene which can be assured by measures to:

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[44] *Water in a changing world*. United Nations World Water Development Report 3. World Water Assessment Programme. UNESCO/Earthscan, 2009.

[45] The main international treaties explicitly recognizing the right to water include the 1979 Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW, Art.14[2]) and the 1989 Convention on the Rights of the Child (CRC, Art. 24). The main political declarations were passed by the UN General Assembly and the UN Human Rights Council, both in 2010.

- achieve universal access to safe drinking water, with appropriate participation by civil society.
- ensure universal access to adequate sanitation[46] and promoting safe hygiene practices, including hand washing with soap.
- install more water coolers in public places, with water safe for drinking. Water should be provided for free in restaurants.

7.4.14. Food Safety and Antimicrobial Resistance

Food safety concerns have grown in recent years, with increasing awareness of dangers posed by the use of agrochemicals, food additives and antibiotics, among others. Morbidity due to diarrhoea, dysentery and other enteric (intestinal) diseases, arising from unsafe food[47], contaminated water and poor sanitation, has not declined much globally over recent decades. Food safety problems threaten the nutritional status of populations, particularly vulnerable groups such as the elderly, pregnant women and children. Besides hygiene issues, food contaminated by chemical or biological hazards, including environmental pollutants, cause many diseases, ranging from diarrhoea to cancer, undermining lives, well-being, health and nutrition, both directly and indirectly.[48]

One emerging food safety issue of global concern is antimicrobial resistance (AMR). While antibiotic drugs are essential for both human and animal health, and are therefore critical to food producers' livelihoods and income, their misuse has led to growing AMR threats to humans, animal foods and agro-ecological environments. Addressing AMR therefore requires a multisectoral 'One Health Approach', but significant challenges in adapting internationally recognised standards and guidelines into appropriate national policies and actions remain.[49]

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[46] Including by implementing effective risk assessment and management practices on safe wastewater use and sanitation.

[47] In some developing countries, children are chronically exposed, through their diets, to aflatoxins, which are not only carcinogenic, but also probably contribute to stunting.

[48] WHO Initiative to Estimate the Global Burden of Foodborne Disease. http://www.who.int/foodsafety/foodborne_disease/FERG2_report.pdf

[49] There have been several initiatives led by FAO, WHO, the World Organization for Animal Health (OIE) and the Codex Alimentarius Commission.
http://www.fao.org/ag/againfo/home/en/news_archive/2011_04_amr.html
http://www.who.int/foodsafety/areas_work/antimicrobial-resistance/en/
http://www.oie.int/for-the-media/amr/ Code of Practice to Minimize and Contain Antimicrobial Resistance, CAC/RCP 61-2005, http://www.codexalimentarius.org/download/standards/10213/CXP_061e.pdf; Guidelines for Risk Analysis of Foodborne Antimicrobial Resistance, CAC/GL 77-2011, http://www.codexalimentarius.org/download/standards/11776/CXG_077e.pdf

Food safety needs to be integrated into the food security and nutrition agenda to improve nutrition. While proposals on what needs to be done are fast growing, the following minimal list of measures most relevant to Malaysia needs to be considered:

- Develop, establish, enforce and strengthen food control systems, as appropriate, including by reviewing and modernising national food safety legislation, regulations, enforcement and practices to ensure that food producers, suppliers and caterers operate responsibly. In particular, the enforcement system should be transparent, accountable and empowered with enough tools and authority to screen food imported, exported and retailed locally. These includes more frequent and thorough checks, building biosafety screening capacity and facilities, and other relevant capacities and capabilities. A farm-to-plate approach can be used to identify control points where useful enforcement and checks can be done (FAO, 2016)[50].
- Implement, as appropriate, internationally adopted standards[51] at the national level. Harmonise current local standards with international standards.
- Participate in and contribute to international networks to exchange food safety information.[52]
- Raise awareness among relevant stakeholders of problems posed by AMR, and implement appropriate measures to address AMR, including prudent use of antibiotics in veterinary and human medicine.
- Develop, implement and enforce national guidelines on prudent use of antibiotics in food-producing animals[53] according to internationally recognised standards adopted by competent multilateral organisations to reduce non-therapeutic use of antibiotics and to phase out the use of antibiotics as ostensible growth promoters[54].

[50] FAO. Influencing food environments for healthy diets. FAO, Rome, 2016

[51] For example, by actively participating in the work of the Codex Alimentarius Commission on nutrition and food safety.

[52] FAO/WHO International Network of Food Safety Authorities (http://www.who.int/foodsafety/areas_work/infosan/en/).

[53] The term refers to animals used for food production.

[54] In the absence of risk analysis, as described in the Codex Code of Practice CAC/RCP61-2005.

APPENDIX 1: SCHOOL FEEDING

This appendix makes the case for extending, transforming and improving school feeding or school meal programmes in Malaysia. It argues that such programmes are feasible interventions to overcome undernutrition among schoolchildren, reduce child overweight and obesity as well as improve overall nutrition in the longer term.

7.5. What is School Feeding?

School feeding involves provision of healthy food and nutrition to children in schools, also improving community nutrition more indirectly through its indirect and longer-term effects. The programmes can deliver in two major ways: 'on-site' school meals or snacks, or 'take-home' rations conditional on school attendance. Some interventions may also involve on-site programmes with take-home rations targeted at specific groups of vulnerable children, or during particular periods such as Muslim fasting months. Such meals are planned by dieticians to ensure healthy, balanced diets, and are typically provided free to ensure universality.

Historically, on-site meals have been the more popular modality for school feeding. There are four main on-site feeding options in terms of timing and size of meal: breakfast, mid-morning snack, lunch and dinner (for boarding schools). The timing and nature of meals depend on the length of the school day, local customs, availability of trained cooks, kitchens, clean water and other factors. To support classroom learning and address classroom hunger, meals may have to be provided early in the school day, especially for those unable to have some food at home before going to school. Providing cooked meals on time is often challenging, as cooks must start their work early. Cooking food in schools involves considerable costs, requiring suitable water and sanitation, cooking facilities, cooks, stoves, firewood, pots, bowls and spoons, among other things.

When facing considerable infrastructure constraints, some school feeding programmes provide processed snacks, instead of cooked meals. Biscuits are usually packed so that they can be easily stored and distributed easily by the school. Some favour this option because it is considered less disruptive to the school day than cooked lunches. To support classroom learning, biscuits tend to be served as snacks early in the school day. School feeding programmes using fortified biscuits may have another major advantage over conventional on-site feeding of cooked meals: a biscuit is regarded as a snack rather than a meal, and is therefore not expected to replace meals for children at home. Such biscuits or drinks are believed by some to be compact sources of needed nutrients, including micronutrients, that are easy to store and distribute, while needing no further preparation in school. However, biscuits are not always preferred by children, and may lead to unhealthy eating practices.

School feeding programmes providing take-home rations are more suitable for targeting individual students, e.g., girls requiring iron or calcium supplements, and less difficult to implement than conventional school meal programmes requiring substantial investments in terms of infrastructure and community inputs. For instance, take-home rations in the form of 4 litre vegetable oil cans are fairly easy to store and distribute, and take-home ration distributions take place only once monthly, or even less frequently, conditional on school attendance rates above a certain threshold, usually set at 80 percent. Take-home rations can provide direct, higher value transfers in kind to

families which are worth more than school meals, providing a strong incentive for increasing school attendance. Each take-home ration provides an immediate benefit in kind, usually worth about 10-20 percentof monthly household income.

7.6. Selected International Experiences

Since the 1930s, the United States and the United Kingdom have had Food for Education programmes (FFEs) to improve children's health. Early programmes took the form of school feeding programmes (SFPs), with participants fed meals or snacks at school. FFE programmes have also been implemented by political leaders and policy makers in developing countries in Asia, Africa and Latin America, including many much poorer than Malaysia.

The 2011 World Food Prize was shared by John Kufuor, former president of Ghana, and Luiz Inácio Lula da Silva, then president of Brazil, for successful social programmes, including school feeding, that their respective governments had initiated. Brazil and India have established school feeding programmes by passing legislation, with Brazil committing to school feeding in its constitution (Bundy, *et al.*, 2009). In India, the Supreme Court mandated in 2001 that all state governments must provide cooked meals in targeted schools (Afridi, 2010). One motivation for establishing targeted school feeding programmes is to provide targeted families and their children, including girls, with incentives to attend school (Jomaa, *et al.*, 2011).

In recent years, the idea of using school feeding programmes for agricultural development has also gained momentum. School feeding programmes using locally-produced food have provided assured demand for nutritious foods, encouraging smallholder farmers to grow them (Sabates-Wheeler, *et al.*, 2009). There are other benefits to using locally-produced food for school feeding, particularly by promoting the production of safe and healthy foods to meet school feeding programme procurement requirements, with excess production likely to be sold in local markets, thus improving diets more generally. Better food safety standards related to food production practices (e.g., use of pesticides, fertilizers and antibiotics) can be more effectively set, implemented and enforced as parents seek to ensure that their children are well fed.

7.7. Objectives of School Feeding

School feeding programmes address three challenges faced by society, particularly children: ensuring food security and food safety, addressing malnutrition in the nation, and improving student academic and physical development, achievements and productivity. Ensuring food security and safety means that hunger among children is prevented, while the food consumed is safe and healthy. Improving nutritional status involves ensuring adequate macro and micronutrient intakes to prevent hunger, 'hidden hunger' (micronutrient deficiencies), stunting and food related problems such as obesity and NCDs. Finally, school feeding improves school attendance, academic performance and student socialization through equal participation and cooperation in eating together.

To ensure the success of school feeding programmes, the programme requires appropriate strategies to improve the education, health, nutrition and agriculture aspects. The programme should be universal, providing for all students and sensitive to the school environment.

School feeding programmes serve as a type of social protection for school children. Improving child nutrition through school feeding is thus an investment to enhance their physical and cognitive development. Sustainable food supplies from local producers and processors will also strengthen such food production, especially with procurement arrangements designed to strengthen farmer cooperatives and associations as well as parental oversight. Parental involvement in school feeding programmes can help improve safety and health in agricultural production and food preparation as well as minimize abuses through such 'peer-monitoring'.

Procurement policy for school feeding programmes can thus become an important means to promote safer and healthier food agriculture and farmer incomes. Food supplies can be secured from farmer cooperatives and associations, for whom appropriate agricultural extension services need to be designed and implemented in order to accelerate the transition, transformation and improvement of food agriculture. Without an 'all of government' approach, education ministries are tempted to simplify their own work by simply contracting out procurement to large, often transnational food (and beverage) companies.

7.8. Implementing School Feeding Programmes

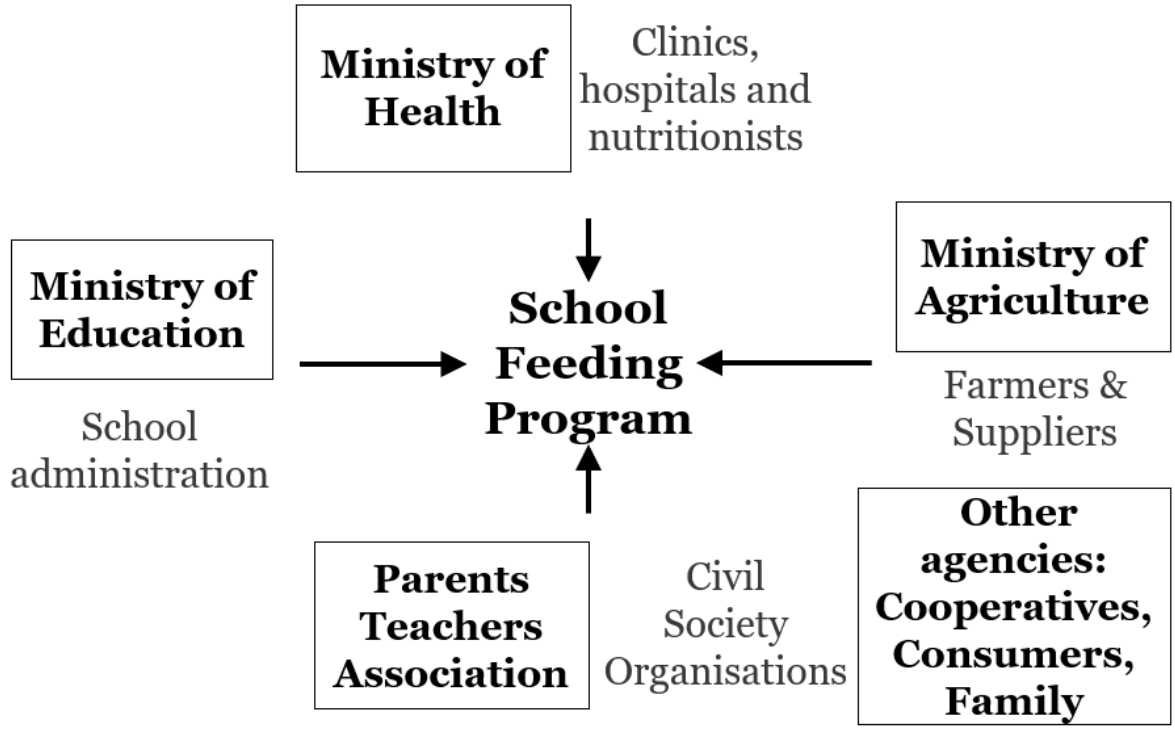
Food is provided to schools, either by cooking on school premises, e.g., in cafeteria or canteen kitchens, or supplied from nearby centralized kitchens, with cooked food delivered to participating schools. Different arrangements have their own advantages and disadvantages. When cooked in schools, food can be freshly cooked for students, with some parental supervision. However, this would require cold storage facilities, hygienic kitchens and good logistics to ensure consistently good quality, which may challenge school administrations and canteen operators. Centralized kitchens can provide economies of scale, but also transport and logistical challenges as food will have to be cooked and delivered in good time.

Effective governance of transformative school feeding programmes will require an 'all-of-government' approach, with different ministries contributing in a cooperative and complementary fashion. The Ministry of Education will need to ensure effective overall management of the feeding programme and nutrition education in schools. The Ministry of Health will need to design food menus to ensure healthy diets and good nutrition, while ensuring high quality, safety and nutrition standards to ensure school feeding programmes comply with appropriate minimal standards and procedural guidelines. The Ministry of Agriculture and Agro-based Industries will need to ensure safe and nutritious food sources, preferably from smallholder farmers, through their cooperatives and associations. The Ministry of Entrepreneur Development will need to mobilize farmer cooperatives as part of this effort. The Ministry of Family, Women and Community Development will need to ensure that school feeding programmes complement their other efforts to improve the welfare of children and families. The Ministry of Domestic Trade and Consumer Affairs will also need to help ensure reasonable food prices and healthy, safe food supplies.

At the school level, administrators will need to involve parents, via Parent-Teacher Associations, to help implement and improve the system. Governance of the school feeding programme should also ensure that food suppliers, especially of fresh food, are responsible for the quality and safety

of their supplies. Effective monitoring of food preparation, to meet hygiene, food safety and standards, will also be crucial in this regard.

Figure 8.1: Cooperation among key stakeholders



To minimize abuses, financial management of school feeding programmes should be subject to transparency and public accountability, especially with other civil society stakeholders. This is especially important as partnerships with transnational food corporations, as in Indonesia, have resulted in abuses and undesirable outcomes. Indeed, there is no 'free lunch' when corporations seem to offer free school feeding.

Cooperation among government, parents and farmers needs to be based on three premises. First, the national policy framework needs to incorporate school feeding as a vital part of national development policies and strategies. Second, the institutional capacities of those involved in implementation need to be strengthened to be more effective, cost-efficient and sustainable. Third, the cooperation needs to support programme sustainability, encouraging long-term school feeding programmes based on local resources. Consultation and cooperation among the ministries, parents and farmers involved need to begin from the start of the programme.

Institutional capacity building is especially important. School feeding programmes can be complex, requiring significant institutional capacity. Governments tend to underestimate the resources, know-how, systems, staff and infrastructure required to run school feeding programmes well. Capacity building also needs to be accountable and transparent, with periodic monitoring and corruption prevention.

School feeding programmes tend to work best when they are locally managed, incorporating some parental or community contribution and participation, e.g., in overseeing, auditing, cooking and safety inspection. Cash or in-kind payment programmes (e.g., through donated food or labour) tend to be strongest. Programmes that incorporate such components from the outset, and maintain stakeholder participation and engagement, have the greatest likelihood of success. Such arrangements should avoid increasing costs to parents.

Schools often put in place canteen or food management committees composed of representatives of parents, teachers and students. Serving as an interface between community and school, the committee should manage school feeding programmes and ensure good food utilisation by schools. Management committees should ensure that teachers do not bear the entire burden of running the programme or get distracted from their other teaching responsibilities. Additional responsibilities for teachers -- especially when school feeding is decentralised, with teachers even involved in purchasing food -- negatively impact children's education. Research in India found that teachers put in charge of school feeding needed an average of two to three hours away from teaching every day. While children's learning improves by providing them with food at school, children would also be disadvantaged if teachers have less time for teaching due to school feeding responsibilities.

School feeding programmes that use food produced and purchased locally, or at least nationally, can generate additional benefits for some children beyond school hours, and also for local farmers, communities and economies. Linking school feeding to local agricultural production can ensure sustainability and related benefits. Governments in many countries are exploring ways to purchase locally, particularly from smallholder farmers practicing ecologically responsible methods, to provide stable markets for their produce and increase their incomes. They are also empowering school-level committees to purchase food closer to schools, so that communities can responsibly make decisions and manage resources.

Such procurement can also supply more diverse and healthy foods, especially of fresh, unprocessed food, in local markets. These efforts include providing indigenous crops, e.g., several types of bananas in Asia, closer to what children may eat at home, thus increasing food diversity and quality. Another method involves introducing biofortified products for children to get needed micronutrients. Many high-income countries already use this approach. However, for school feeding programmes to be successful, various agencies and ministries involved with small-scale farmers need to work better together. Laws on local procurement need to allow small-scale purchases, while key design and implementation issues need to be considered.

Brazil had the best-known and most successful programme, while Ecuador, Honduras, Namibia and Peru have also thus provided stable demand for family farmers to become more viable. In 2003, African countries included locally sourced school feeding programmes in their Comprehensive African Agricultural Development Program (CAADP). Since then, nationally 'home-grown' programmes have been implemented in Côte d'Ivoire, Ghana, Kenya and Mozambique.

7.9. Impact Of School Feeding

School feeding impacts communities in many ways. It improves student education by increasing participation, learning and cognition, particularly if supported by complementary actions, such as deworming and micronutrient fortification or supplementation. The International Food Policy Research Institute (IFPRI) has evaluated the impacts of such programmes (Ahmed, 2004). School feeding programmes have raised gross school enrolment rates by 14.2 percent, with a 10 percent increase in net enrolment rates, reduced the probability of dropping out of school by 7.5 percent, and increased school attendance by about 1.3 days a month. Participation in school feeding programmes increased test scores by 15.7 percentage points, particularly in mathematics tests. A study of a school feeding programme in Johor found better cognitive performances of students in school feeding programmes compared to their peers who were not (Teo, *et al.*, 2019). Food education also indirectly improved nutrition and health as children learn why and how to choose food which is dietarily diverse and nutritionally balanced.

School feeding also directly improves the children's nutrition and health, where all needed micronutrients and much of their dietary energy needs are provided as part of children's daily requirements. Internationally, the average dietary energy intakes of participating primary school students were 11 percent and 19 percent higher in rural areas and urban slums respectively, than of those in corresponding control groups (Ahmed, 2004). Participating students receiving food rations also appeared to share their biscuits with younger siblings at home, with energy from such biscuits accounting for 7% of the total energy intake of children aged 2 to 5 years. The body mass index (BMI) of participating children increased by an average of 0.62 points, a 4.3% increase compared with the average BMI of schoolchildren in control groups. When combined with deworming and fortification (i.e., addition of micronutrients, such as iron or vitamin A, at the food processing stage to enhance its nutritional value), school feeding can reduce micronutrient deficiencies and strengthen children's overall health (Adelman, *et al.*, 2008). In Malaysia, where 11.9% of children and adolescents under 18 years old are obese, children in school feeding programmes maintained their BMIs, while the mean BMI score doubled for non-participating children (Teo, *et al.*, 2019).

School feeding programmes can also improve local food production and empower food agricultural producers. Linking school feeding to local agricultural production can enhance sustainability and related benefits. Countries are exploring ways to purchase locally, particularly from smallholder farmers practicing ecologically responsible methods, to provide stable markets for their produce and to increase their incomes. They are also empowering school-level committees to purchase food closer to schools, so that communities can make responsible decisions and better manage resources. Indeed, school feeding programmes have enhanced local food agricultural production, with related benefits for farmers' incomes and for the local economy (Alderman & Bundy, 2012; Gordon, *et al.*, 2011; Drake, *et al.*, 2012).

Implementing school feeding is not without its challenges. In some contexts, such constraints include poor access because of inadequate road networks, unavailability of those able to manage the programme in remote areas, lack of flexibility for adjusting programme modalities, weak school infrastructure, limited community capacity to implement and manage the programme well, high

costs of logistical operations, and the insecurity of implementing staff and beneficiaries, e.g., when implementing staff are unsure of the future of the school feeding programme while beneficiaries are unsure of the purpose and scope of the programme.

7.10. School Lunch Desirable Option for Malaysia

School lunch programmes are not new, and the school lunch programme in Japan is generally considered part of growing up, promoting education, discipline, care as well as respect for others, food and the environment[55]. Japan currently has one of the most comprehensive school lunch programmes in the world, with about ten million children receiving adequate daily meals at school (Tanaka & Miyoshi, 2012).

School lunches in Japan have increased appreciation for food and its origins, cultural history, varieties, and relationship to the environment and agriculture. School lunches also support and teach principles of 'social meals', where students are educated on the origins, preparation and serving of healthy, economic meals. Food is served in a conducive environment with adequate time for meal service and consumption, increasing socialization and gender equality. School lunch links education with nutrition policy, promoting healthy food choices and providing better understanding of food issues.

7.11. Conclusion

School feeding provides wider socio-economic benefits. In terms of nutrition, school feeding should provide all needed micronutrients and a significant share of needed macronutrients, besides enhancing nutrition and health, improving learning and decreasing morbidity. School enrolments and performance will be enhanced and absenteeism reduced. The transfer of food resources to households will reduce negative coping strategies and encourage investment in and farmer incomes from healthy food production. Past programmes and pilot programmes in Malaysia confirm their viability, feasibility and many benefits.

[55] School lunches in Japan have a long history, dating back to 1889 when monks provided lunches for poor children, in an elementary school in Yamagata Prefecture, who were offered rice balls, grilled fish and pickles. During the Meiji (1868-1912) and Taisho (1912-1926) eras, school lunches were served to impoverished children, incentivising them to attend school. In the 1920s, as knowledge of nutrition became more widespread, school meal programmes began to pay more attention to their nutritional value.

GLOSSARY

anencephaly	A condition that occurs when the neural tube fails to close at the top during foetal development. As a result, most or all of the brain is missing, and parts of the skull may be lacking. Infants with anencephaly are either stillborn or die soon after birth. *Source: https://www.nichd.nih.gov/health/topics/ntds/conditioninfo*
anthropometric value	Anthropometric values are the measurements of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. *Source: https://wwwn.cdc.gov/nchs/data/nhanes3/manuals/anthro.pdf*
antimicrobial resistance (AMR)	The ability of a microorganism (like bacteria, viruses, and some parasites) to stop an antimicrobial (such as antibiotics, antivirals and antimalarials) from working against it. As a result, standard treatments become ineffective, infections persist and may spread to others. *Source: https://www.who.int/antimicrobial-resistance/en/*
Baby-Friendly Hospital Initiative	An initiative by the World Health Organization and UNICEF as a global effort to implement practices that protect, promote and support breastfeeding. *Source: https://www.who.int/nutrition/topics/bfhi/en/*
body mass index (BMI)	A measure for indicating nutritional status in adults. Defined as a person's weight in kilograms divided by the square of the person's height in metres. *Source: http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi*
cardiopulmonary functions	Functions of the heart and lungs. *Source: https://www.medicinenet.com/script/main/art.asp?articlekey=2630#what_is_coronary_heart_disease*
chronic obstructive pulmonary disorder (COPD)	An umbrella term used to describe progressive lung diseases including emphysema, chronic bronchitis, and refractory (non-reversible) asthma. This disease is characterised by increasing breathlessness. *Source: https://www.copdfoundation.org/What-is-COPD/Understanding-COPD/What-is-COPD.aspx*
Codex Alimentarius	The Codex Alimentarius, or "Food Code" is a collection of standards, guidelines and codes of practice adopted by the Codex Alimentarius Commission to protect consumer health and promote fair practices in food trade. *Source: http://www.fao.org/fao-who-codexalimentarius/en/*
Diabetes mellitus	A metabolic condition of having higher than normal blood sugar levels, due to insufficient production of insulin in the pancreas (Type 1) or inefficient use of insulin (Type 2). It may cause serious health complications including heart disease, blindness, kidney failure, and lower-extremity amputations. *Source: https://www.diabetes.co.uk/what-is-diabetes.html*
encephalocele	A condition that occurs when the neural tube fails to close near the brain during foetal development and there is an opening in the skull, resulting in various disabilities and developmental effects. *Source: https://www.nichd.nih.gov/health/topics/ntds/conditioninfo*
'feast-and-famine'	In this context, extreme cycles of times of plentiful food and famine *Source: https://www.merriam-webster.com/dictionary/feast-or-famine*
foetal and neonatal growth	A foetus is the developing young in the uterus, which in humans is from the ninth week after fertilization until birth; The neonatal period is the first 28 days after birth. *Source: https://medical-dictionary.thefreedictionary.com/Fetus*

	Source: https://medical-dictionary.thefreedictionary.com/neonatal
Goiter, hypothyroidism	The term "goiter" refers to the abnormal enlargement of the thyroid gland. Hypothyroidism occurs in a gland that is producing too little hormone. *Source: https://www.thyroid.org/goiter/*
International Conference on Nutrition (ICN)	A global conference devoted solely to addressing the world's nutrition problems, organised by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO), in Rome in December 1992 and November 2014. *Source: http://www.fao.org/3/v7700t/v7700t02.htm*
keratinisation	Cytoplasmic events that take place in keratinocytes that move through the different layers of the epidermis to finally differentiate into corneocytes. *Source: https://www.sciencedirect.com/topics/medicine-and-dentistry/keratinization*
KOSPEN (Komuniti Sihat Pembina Negara)	An initiative by the Malaysian Ministry of Health in addressing the increasing burden of Non-Communicable Diseases (NCD) in the country. Mainly focused on empowerment and increasing community involvement in public health programmes. *Source: https://www.infosihat.gov.my/index.php/projek-khas/kospen*
lumbar spine and hips	The lumbar spine refers to the lower back, where the spine curves inward toward the abdomen. *Source: https://www.spine-health.com/conditions/spine-anatomy/lumbar-spine-anatomy-and-pain* *Source: https://www.merriam-webster.com/dictionary/hip*
neural tube defects	Abnormalities that can occur in the brain, spinal cord, or spine of a developing foetus, due to failure of the neural tube to close completely. Because they are present at birth, they are categorised as birth defects. *Source: https://www.nichd.nih.gov/health/topics/ntds/conditioninfo*
niacin	A form of vitamin B3. It is found in foods such as yeast, meat, fish, milk, eggs, green vegetables, and cereal grains. Niacin and niacinamide are required for the proper function of fats and sugars in the body and to maintain healthy cells. *Source: https://www.webmd.com/vitamins/ai/ingredientmono-924/niacin-and-niacinamide-vitamin-b3*
oligopsonistic	A market situation in which the demand for a commodity is represented by a small number of purchasers *Source: https://www.collinsdictionary.com/dictionary/english/oligopsony*
osteoarthritis	Also known as degenerative joint disease or "wear and tear" arthritis. Occurs when the cartilage or cushion between joints breaks down, leading to pain, stiffness and swelling. *Source: https://www.arthritis.org/about-arthritis/types/osteoarthritis/*
osteomalacia	Literally means "soft bones". A condition that prevents the bones from mineralising, or hardening, as they should. This makes them weak and more likely to bend and break. *Source: https://www.webmd.com/osteoporosis/what-is-osteomalacia#1*
osteoporosis	Literally means "porous bones". A condition that causes bones to gradually lose mass and weaken, leaving them susceptible to fractures. *Source: https://www.webmd.com/osteoporosis/understanding-osteoporosis-basics*
riboflavin	Riboflavin is a B vitamin. It is involved in many processes in the body and is necessary for normal cell growth and function. It can be found in certain foods such as milk, meat, eggs, nuts, enriched flour, and green vegetables. *Source: https://www.webmd.com/vitamins/ai/ingredientmono-957/riboflavin*

Rome Declaration on Nutrition	The Declaration commits countries to eradicate hunger and prevent all forms of malnutrition worldwide – particularly undernutrition in children, anaemia in women and children, among other micronutrient deficiencies – as well as reverse the trend in obesity. It aims to do this by increasing investments in food systems to improve people's diets and nutrition. The Framework proposes the creation of an enabling environment for effective action and for strengthening sustainable food systems, including through investments in pro-poor agriculture and smallholder agriculture to improve diets and raise levels of nutrition; nutrition education and information; social protection; strengthened health systems for addressing specific conditions; improved water, sanitation and hygiene; and improved food safety. *Source: http://www.fao.org/resources/infographics/infographics-details/en/c/266118/*
serum ferritin	Ferritin is a protein used to store and transfer iron in the body, that is present in cells and in the blood serum. Not to be confused with the oxygen-carrying protein haemoglobin. *Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2893236/*
serum soluble transferrin receptors	Soluble transferrin receptors are proteins found in the blood, the levels of which can be elevated in response to iron deficiency. Cleaved from the surface of cells and enter the blood when transferrin deposits iron into the cell. *Source: https://labtestsonline.org/tests/soluble-transferrin-receptor*
sleep apnoea	A serious sleep disorder that occurs when a person's breathing is interrupted repeatedly during sleep, either due to obstruction of the airway or instability in the respiratory control center of the brain. *Source: https://www.webmd.com/sleep-disorders/sleep-apnea/sleep-apnea*
spina bifida	The most common type of neural tube defect. Spinal nerves below the affected area are usually paralysed, which can cause lifelong problems with walking and other difficulties. *Source: https://www.nichd.nih.gov/health/topics/ntds/conditioninfo*
thiamine	Thiamine is a vitamin, also called vitamin B1. Vitamin B1 is found in many foods including yeast, cereal grains, beans, nuts, and meat. Thiamine is required by our bodies to properly use carbohydrates. *Source: https://www.webmd.com/vitamins/ai/ingredientmono-965/thiamine-vitamin-b1*
transferrin saturation	The ratio of the serum iron concentration and the total iron-binding capacity (TIBC) of the blood. Provides an estimate of how many of transferrin (the main iron transporter protein) sites are occupied. *Source: https://labtestsonline.org/tests/transferrin-and-iron-binding-capacity-tibc-uibc*
tuans and mems	Referencing colonial masters and mistresses
World Declaration and Plan of Action for Nutrition	A guide to the technical issues of nutrition policy and programme development, finalised and adopted unanimously by all governments at the first ICN (1992). Nine priority themes are elaborated in the Plan of Action for Nutrition: • incorporating nutritional objectives, considerations and components into development policies and programmes; • improving household food security; • protecting consumers through improved food quality and safety; • preventing and managing infectious diseases; • promoting breast-feeding;

	• caring for the socio-economically deprived and nutritionally vulnerable; • preventing and controlling specific micronutrient deficiencies; • promoting appropriate diets and healthy lifestyles; • assessing, analysing and monitoring nutrition situations. *Source: http://www.fao.org/3/v7700t/v7700t02.htm*
xerophthalmia	Xerophthalmia is a progressive eye disease caused by vitamin A deficiency, characterised by dry tear ducts and eyes, impaired sensitivity of the retina to light (night blindness), and epithelial disruptions of the cornea and conjunctiva. *Source: https://www.healthline.com/health/eye-health/xerophthalmia* *Source: https://apps.who.int/iris/bitstream/handle/10665/133705/WHO_NMH_NHD_EPG_14.4_eng.pdf*
Z-score designating anthropometric value	The Z-score system expresses the anthropometric value as a number of standard deviations or Z-scores below or above the reference mean or median value. Z-score (or SD-score) = (observed value–median value of the reference population) / standard deviation value of reference population *Source: https://www.who.int/nutgrowthdb/about/introduction/en/index4.html*

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