

# Young Child and Maternal Nutrition: A Review of the Situation in the SEA Region

Ma. Theresa M. Talavera,<sup>\*1</sup> Maria Antonia G. Tuazon,<sup>2</sup> and Angelina dR. Felix<sup>3</sup>

Information about the nutrition situation in South East Asian (SEA) countries is very critical in determining the magnitude or extent of the problems and in understanding their etiology to identify responsive interventions. This paper aims to describe who are the malnourished, where they are and what are the causes of malnutrition among children under five, and pregnant and lactating women in nine SEA countries. Recent available data from international databases, country surveys at the national, sub-national, and/or regional levels, relevant reports, and published studies were reviewed to come up with a suitable functional classification or description that can identify (1) which countries have high prevalence of stunting, under-nutrition, wasting, and overnutrition among under-five children; (2) where high prevalence of chronic energy deficiency and overnutrition among pregnant and lactating women exist; and (3) what poor infant and young child feeding practices, food insecurity, and inadequate maternal child care are associated with malnutrition in children. It was noted that disparities in the availability of nutrition data across countries limit the full description of the nutrition situation in the region. The conduct of a harmonized and synchronized data collection is recommended. The information to be derived from well-conducted regular monitoring and nutrition surveillance systems is critical not only for determining the magnitude or extent of the nutrition problems but more importantly for understanding their etiology to be able to recommend appropriate or responsive interventions.

*Keywords:* young child nutrition, maternal nutrition, micronutrient deficiencies, overnutrition, low birth weight

## INTRODUCTION

Infants, young children, and pregnant and lactating women are groups most vulnerable to malnutrition in the world including the Southeast Asian (SEA) region. In the UN-SCN's 6<sup>th</sup> report on the world nutrition situation (1), it was reported that while the highest prevalence of

undernourishment is in sub-Saharan Africa, the greatest absolute number of undernourishment is in Asia and the Pacific (578 million). Globally, malnutrition in its several forms is responsible for 35% of child deaths and 11% of the total disease burden (2). Overnutrition is becoming a global challenge because of its association with non-communicable diseases that increasingly confront the 21<sup>st</sup> century. Undernutrition remains to be a persistent challenge worldwide with 195 million, 129 million, and 26 million children under five years of age in developing countries identified as stunted, underweight, and wasted, respectively (3). Around 43 million children under five years (CU5) worldwide are projected to be overweight and obese, assessed as >85% of International Reference Standards, and 92 million at risk of

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\*Corresponding author.

<sup>1</sup>Assistant Professor, Institute of Human Nutrition and Food (IHNF), College of Human Ecology, University of the Philippines, Los Baños, Laguna; Email: mtmtalavera@yahoo.com.

<sup>2</sup>Professor (ret.), IHNF, College of Human Ecology, UP Los Baños.

<sup>3</sup>Assistant Professor, IHNF, College of Human Ecology, UP Los Baños.

overweight (4). Although overnutrition is generally associated with industrialization, it is also becoming a pressing concern in the SEA region regardless of level of economy and urbanization.

The causes of child malnutrition are multi-factorial—immediate, underlying, and basic. They include food, health, and caring strategies (5). Likewise, pregnant and lactating women are suffering from chronic energy deficiency and anaemia. Improving maternal nutrition is critical to prevent the perpetuation of the intergenerational cycle of growth failure wherein small adult women give birth to babies with low birth weight and are more likely to manifest growth failure during childhood (1).

Ensuring adequate nutrition is a significant input to development. Undernutrition affects children's survival, health, growth, and development, hinders productivity, and slows down national progress. It also has an impact at the individual in particular and the society in general. At the national level, its effects may include, but are not limited to, reduced productivity, economic losses, and increased health care costs. At the individual level, a child's chances to reach his/her full potential is reduced when born with low birth weight and extended until adulthood if the cycle of malnutrition and poverty is not arrested. A malnourished child is either unable to go to school or may remain in school but perform poorly, which reduces his/her chances of engaging in gainful employment in adult life. Undernutrition is associated with major risk factors such as maternal mortality, maternal stunting, as well as iron deficiency anaemia and iodine deficiency.

Many Asian countries have limited data to provide nutrition planners with a clear understanding of the malnutrition problems, specifically among infants and young children, as well as pregnant and lactating women. Evidences

show that providing proper nutrition during the 1000 days between a woman's pregnancy and her child's second birthday can provide children with a healthy start at life (1). Hence, availability of data is critical not only to determine the magnitude or extent of the problems, but more importantly, to understand their etiology so that relevant and responsive interventions may be adopted. In different regions and continents of the world, consolidation and harmonization of nutrition data are deemed essential to guide collective efforts toward addressing the problem for sustained regional development and attainment of the Millennium Development Goals (MDGs). This paper provides a functional classification of malnutrition among the most vulnerable groups, i.e., children under 5 years (CU5) and pregnant and lactating women in the SEA region, identifies causal factors, and discusses the existing nutrition surveillance systems as springboard for designing nutrition interventions.

## **METHODS**

This review of the nutritional status of CU5 and pregnant and lactating women was focused on nine countries in Southeast Asia (SEA) and member nations of the Association of Southeast Asian Nations (ASEAN), namely, Cambodia, Indonesia, Malaysia, Lao PDR, Myanmar, Philippines, Singapore, Thailand, and Vietnam. The data used came from surveys, studies, and reports conducted/published from year 2000 to 2010. Due to the absence of data in the period covered, Brunei Darussalam and East Timor were excluded from the review.

The first step in the review was the identification of relevant published scientific articles and reports. This was followed by a selection of data sources or publications to be included and was done based on a set of criteria, i.e., published in a

reputable journal, clearly defined study objectives and methodology, focus of study are children and women, and whether date of publication is recent. Then an assessment of the quality of each study/report in terms of study design, objective, and sampling design, among others was done. After the article assessment, the findings from each study or report, the interpretation of findings, and summarization of the findings were synthesized.

Specific country nutrition data were sourced from the available (either online or hard copy) and most recent reports of national nutrition surveys; Multiple Indicator Cluster Surveys (MICS); Demographic Health Surveys (DHS); National Health Survey (NHS); and National Nutrition Survey (NNS) for cross-referencing or when there were no available data indicated in the database. Studies reviewed dealt on causes of malnutrition, with emphasis on breastfeeding and complementary feeding practices, and surveillance activities.

The initial summary on the prevalence of malnutrition and causes of malnutrition was prepared and sent to resource persons/experts in the different countries for comments, validation, and additional information. The same summary was provided to the members of the International Life Sciences Institute (ILSI) experts committee. Several experts responded and provided additional data and/or corrected the data presented.

Several issues/concerns were encountered in the initial review. These included: (1) limited/no data for some indicators in several countries; (2) limited/no data for pregnant women and lactating mothers in almost all countries; (3) different methods used in assessment, indicators used, and age groupings; and (4) varied years of when surveys were conducted. For nutrition surveys, differences in the methodology and in the years when the surveys were conducted were the primary drawbacks. As such, databases from

international organizations were used to summarize the general nutrition situation in the region. These databases were sourced from the UNICEF Child Info database-Monitoring the Situation of Children and Women (6), UNICEF Country Statistics (7), WHO Global Database on Body Mass Index (8), and WHO Vitamin and Mineral Nutrition Information System (VMNIS) (9). The summaries included in the UNICEF (2009) publication on Tracking Changes on Child and Maternal Nutrition (3) were also adapted in this review specifically to characterize the health and nutrition status of children under 5 years old (CU5).

## RESULTS AND DISCUSSIONS

### Characteristics of the Nine SEA Countries

The nine SEA countries included in this review differed in terms of population size, geographic, political, and socioeconomic characteristics. Singapore has the highest population density being mainly an urbanized country. The annual population growth rate in the nine countries ranges from 0.9% to 2.5%, while 20% to 100% of the population are estimated to live in urban areas. Adult literacy rate is high in the region, except for the countries of Lao PDR and Cambodia. Estimated average life expectancy rate at birth for the nine countries is 71 years, with longest life expectancy in Singapore (81 years) and shortest in Myanmar (58 years) (10–12).

The gross domestic product (GDP) varies across countries with Malaysia and Singapore being classified as high income countries, while the rest are considered middle income economies (13). The proportion of population living at the international poverty line was highest in Lao PDR and lowest for Malaysia and Thailand. The Human Development Index (HDI), which serves as a composite measure

of three basic dimensions of human development, namely, health, education, and income, also varied in the region. Singapore and Malaysia have HDIs way beyond the global average of 0.62, while the HDIs of Thailand and the Philippines are comparable with the global average. The remaining SEA countries have HDI below the global average, though the HDIs of Indonesia and Vietnam are higher than those of Cambodia, Lao PDR, and Myanmar (13).

The Global Hunger Index (GHI), on the other hand, combines three equally weighted indicators: (1) the proportion of undernourished as a percentage of the population; (2) the prevalence of underweight in children under the age of five; and (3) the mortality rate of children under the age of five (14). The index ranks countries on a 100-point scale, with 0 being the best score (no hunger) and 100 being the worst, though neither of these extremes is achieved in practice. Among those with GHI data, Malaysia has the lowest score while Cambodia has an alarming hunger situation with a GHI of 21.2, which is the highest in the region. The problem of hunger in Lao PDR and Myanmar is also considered serious.

Over a four year period starting from 2005, almost all countries showed an overall decline in infant mortality rates (IMRs). Despite the decline, IMRs for Cambodia, Lao PDR, and Myanmar are still alarmingly high. Malaysia and Singapore consistently have the lowest levels of mortality. For under five mortality rate (U5MR), similar trends were observed. There was a general decline in U5MR except for Singapore, which remained the same from 2005 to 2009. The rates for some countries along the Mekong River, namely, Cambodia, Lao PDR, and Myanmar, remained to be of public health significance.

## **Nutrition Situation in the SEA Region**

The nutrition situation in the SEA region, as represented by the nine countries included in this review, reflects the persistent problem of undernutrition and micronutrient deficiencies, as well as the increasing prevalence of overnutrition. Variation in number of affected people across countries was noted, but overall, malnutrition remains a public health concern in the region.

### **Who are the Malnourished?**

Children under five years of age (CU5) and pregnant and lactating women in the SEA region were found to suffer from different forms of malnutrition.

#### *Children Under Five Years of Age*

Among the CU5, the mean prevalence of the three forms of undernutrition (underweight, stunting, wasting) is comparable to the global average (Table I). The percentage of underweight CU5 above the 20% reference value for public health significance was noted in five countries. These are Cambodia, Lao PDR, Myanmar, Philippines, and Vietnam. Chronic undernutrition or stunting is of far greater magnitude than the problem of underweight. The prevalence of stunting among CU5 in the region ranged from 4% to 48%. Stunting is a public health problem in six out of the nine countries. Four out of these six countries, namely, Indonesia, Philippines, Vietnam, and Myanmar are also among the 24 countries in the world with the largest number of CU5 who are moderately or severely stunted (3). The four countries contributed a total of 14.6% to the total burden of stunting in the developing world. The prevalence of wasting is also high in the region, particularly in the countries of the Philippines,

**Table I. Prevalence of undernutrition (severe and moderate) among CU5 in selected SEA countries (3).**

Country	Underweight (2003–2008), %	Stunting (2003–2008), %	Wasting (2003–2008), %
Cambodia	28	42	9
Indonesia	18	37	14
Lao PDR	31	48	7
Malaysia	8‡	-	-
Myanmar	30	41	11
Philippines	21	34	6
Singapore	3†	4	4†
Thailand	7	16	5
Vietnam	32‡z	36	8‡z
Across nine countries	22	32	8
World	23	34	13

Note: Estimates are calculated according to the WHO Child Growth Standards. Estimates are from surveys conducted in 2003 or later.

†Data refer to years or periods outside 2003–2008; differ from the standard definition or refer to only part of a country. Such data are not included in the calculation of regional and global averages.

‡Estimates according to NCHS/WHO reference population. Such data are not included in the calculation of regional and global averages.

- No data available

Myanmar, and Indonesia. These three countries are also included in the worldwide list of countries with the largest numbers of children under 5 years old who are wasted and contributes to the global wasting burden (3).

In countries with available nutritional status data based on the WHO-CGS, disparity in nutritional status among CU5 were noted in terms of gender, area of residence, and socio-economic status. Based on data from Indonesia, Myanmar, Philippines, and Vietnam, there are more males than females who are stunted, at a prevalence rate of 40% and 35%, respectively. The percentage of CU5 who are wasted is also higher among males (25%) than females (22%). The prevalence of wasting is also slightly higher among males (9%) than females (8%). Meanwhile, more undernourished children were found in the rural

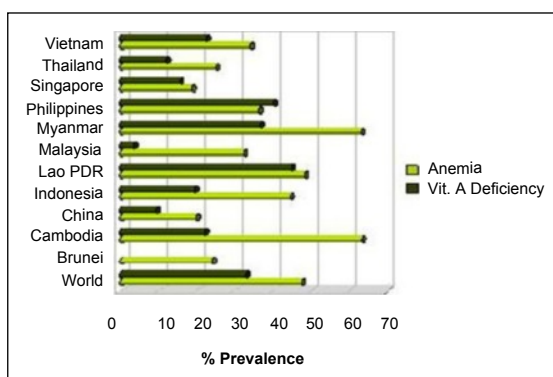
than urban areas based on the information from Cambodia, Indonesia, Myanmar, and Vietnam (data not shown). This trend is consistent with the trend in developing countries (3). In Cambodia and Vietnam, the prevalence of undernutrition decreases with increasing wealth quintile. Country data further reveal a steep increase in stunting and underweight prevalences among the 12–24 months age group. This implies that the age of six to 24 months provides a window of opportunity to address the problem of undernutrition (3).

The review was also able to validate the emerging problem of overnutrition in the SEA region. The prevalence of overnutrition in the nine countries from the period 2000 to 2008 ranged from 1.3% to 11.2% (6). The data for Vietnam and Singapore are based on year 2000 data and prevalence may have been higher if more recent

data have been available, as in the case of Cambodia and Indonesia, where data are from 2008 and 2007 survey results, respectively. Thailand, Malaysia, and Lao PDR have 2006 data, while that of the Philippines is based on the 2003 national survey. Regardless of the year of survey, overnutrition is undeniably a serious problem in Indonesia and Thailand that requires immediate attention. There are also indications that within the country, overnutrition is continuously increasing in urban areas which could be attributed to changing lifestyles.

Micronutrients consisting of vitamins and minerals are essential for child growth and development. Three micronutrients, namely, iron, iodine, and vitamin A are associated with nutritional problems of public health importance. Vitamin A is essential for a well-functioning immune system; its deficiency increases the risk of mortality significantly. On the other hand, "iodine and iron deficiency can undermine children's school performance." Studies show that children from communities that are iodine deficient can lose 13.5 IQ points on average compared with children from communities that are non-deficient, and the intelligence quotients of children suffering iron deficiency in early infancy were reported to be lower than those of their peers who were not deficient. "Iron deficiency makes children tired, slow, and restless, so they do not perform well in school" (3). Deficiencies in these three micronutrients are also prevalent among CU5 in the SEA region. Iron and vitamin A deficiencies account for the largest disease burden among the micronutrient deficiencies in terms of global childhood Daily Adjusted Life Years or DALYs. Around the globe, it is estimated that around 293.1 million children under five are deficient in iron as indicated by the level of anaemia or blood haemoglobin level less than 110 mg/L. In the SEA region, both iron and vitamin A are the most common micronutrients deficient among CU5.

Figure 1 presents the prevalence of anaemia and vitamin A deficiency in the nine countries. Anaemia is a public health concern of moderate (20%–39.9%) to severe (> 40%) magnitude. Three countries, namely, Cambodia, Myanmar, and Lao PDR have prevalence higher than the global average.



**Figure 1. Anaemia and vitamin A prevalences among CU5 in selected SEA countries and China (9).**

The magnitude of vitamin A deficiency (based on serum retinol < 70 umol) is from mild to severe. The prevalence is lowest in Malaysia (3.5%) and highest in Lao PDR (44.7%). Lao PDR together with Myanmar and the Philippines have vitamin A deficiency prevalences beyond the global average of 33%. Clinical manifestation of the deficiency, i.e., night blindness, is less severe in the SEA region with countries having 0.1%–3.1% of the CU5 population affected.

The high prevalence of both anaemia and vitamin A deficiency in most SEA countries is also noted. Furthermore, countries with high prevalence of anaemia and vitamin A deficiency are also those who have higher levels of undernutrition among CU5. In a regression estimate made in 2004 by the International Zinc Consultative Group (IZinCG), the countries with public health problems of undernutrition, anaemia, and vitamin A deficiency have more than 30% risk of inadequate zinc intake (15). This scenario underscores the co-existence

and the potential interrelationships of undernutrition and micronutrient deficiencies among CU5 in the SEA region.

More than 10% of the schoolchildren population in each country were found to be iodine deficient; iodine deficiency disorder can be considered a public health problem among CU5. Based on the listing of UNICEF as well, countries such as Indonesia and Philippines are included in the list of high priority countries for IDD control. The criteria of selecting the countries included: (a) high number of unprotected infants; (b) IDD/USI program that is not progressing; and/or (c) the presence of a major regional salt producer in the country.

### *Pregnant and Lactating Women*

Very few data are available on the direct assessment of the nutritional status of pregnant women and lactating women. However, based on the life cycle approach, it is common knowledge that nutritional status during pre-pregnancy approximates maternal nutrition during pregnancy and lactation. As such, in instances where data on pregnant and lactating women were unavailable, data from non-pregnant women of reproductive age are reported and/or included.

Data for five SEA countries, namely, Cambodia, Lao PDR, Myanmar, Philippines, and Singapore, revealed that around 11–16 per 100 women of reproductive age are considered underweight (BMI < 18.5) (8). Severe and moderate thinness (BMI < 17.0) was also noted in Cambodia and Lao PDR, affecting 3.7% and 4.3% of women, respectively. Interestingly, undernutrition among women is also notable in Singapore, a country with higher economic status.

In 2008, 35% of adults aged 20 years and older were reported overweight (BMI  $\geq$  25

kg/m<sup>2</sup>). In terms of obesity, the worldwide prevalence almost doubled in a span of 28 years, whereby 14% of women were obese (BMI >30 kg/m<sup>2</sup>) in 2008, compared with 8% in 1980 (16). The 2008 prevalence is estimated to translate to around 297 million obese women, aged 20 years old and above (8). In the countries reviewed, overweight and obesity are recognized health problems among adult women. The prevalence of overweight was highest in Malaysia (51.2%) and lowest in Vietnam (6.2%), while obesity was lowest in Lao PDR (3.0%). In the five SEA countries where maternal undernutrition exists, overweight and obesity are also prevalent. The problem is most serious in Myanmar where the prevalence of overnutrition exceeded the number of underweight women by around fivefold.

The Vitamin and Mineral Information System that converged with adjustments in country data for the period 1993–2005 identified anaemia as a global public health problem of moderate magnitude among non-pregnant women (including lactating women) and of severe magnitude among pregnant women. Overall, the prevalence of anaemia is higher by 4 to 9 percentile points in pregnant women, possibly indicating limitations in attending to providing for the increased iron requirement during pregnancy. Noticeably, the five SEA countries—Cambodia, Indonesia, Lao PDR, Myanmar, and the Philippines—with high burden of stunting among CU5 also have maternal anaemia prevalence of more than 40% (Table II). This observation supports findings on the correlation of maternal nutrition and infant and child nutritional status, possibly via effect on birth weight.

Vitamin A deficiency is likewise a nutritional concern among pregnant women in the 10 countries included in the review. Using night blindness as indicator, vitamin A deficiency is considered a public health problem in three SEA

**Table II. Prevalence of anaemia among pregnant and non-pregnant women of reproductive age in selected SEA countries, 1993 to 2005 (9).**

Country	Non-pregnant Women of Reproductive Age (15–49.99 years old)		Pregnant Women	
	Prevalence of Hb <120 g/L, %	95% CI	Prevalence of Hb <110 g/L, %	95% CI
Global	30.2	28.7–31.6	41.8	39.9–43.8
Cambodia	57.3	54.9–59.6	66.4	56.8–74.8
Indonesia	33.1	13.1–61.8	44.3	17.3–75.2
Lao PDR	46.1	20.7–73.7	56.4	24.9–83.4
Malaysia	30.1	11.5–58.7	38.3	38.0–38.6
Myanmar	44.9	41.0–48.9	49.6	20.8–78.6
Philippines	42.1	38.2–46.1	43.9	38.3–49.6
Singapore	18.4	16.3–20.7	23.8	7.4–55.1
Thailand	17.8	15.9–19.8	22.3	15.8–30.6
Vietnam	24.3	22.9–25.7	32.2	29.8–34.7

countries, namely, Cambodia, Lao PDR, and the Philippines. The problem of vitamin A deficiency is magnified when using subclinical indicator, i.e., serum retinol below the cutoff level of 70 µmol/l. Subclinical vitamin A deficiency among pregnant women is of severe magnitude in China and Malaysia, where more than 20% of pregnant women have serum retinol levels below 70 µmol/l. Subclinical vitamin A is not a public health problem in Thailand. As a whole, the prevalence of vitamin A deficiency identified through serum retinol was 2 to 18 times more than the prevalence of night blindness, and indicates the higher precision obtained when using biochemical indicators.

Maternal mortality rate (MMR) indicates the risk of mothers dying during pregnancy and child birth. Improving the status of women, who is the primary care giver of children and family, amplifies the need to stem the intergenerational cycle of malnutrition and improve the human resource required for the overall socio-economic development of populations. The MMR remains to be high particularly in Cambodia, Indonesia, Myanmar, Lao PDR, Philippines, and Vietnam

(Table III). Other indicators used to describe maternal nutrition and health are lifetime risk of maternal death, antenatal care (at least one visit, %), antenatal care (at least four visits, %), skilled attendant at birth (%), low birth weight (< 2,500 g, %), and primary school net enrolment or attendance ratio (% female, % male). In most recent estimates developed by WHO/UNICEF/UNFPA/The World Bank (17), all countries included in this review showed a decline in MMR from 2005 to 2010. Some SEA countries, however, continue to have high MMRs which make them off track as far as attaining the MDGs are concerned. Cambodia, Lao PDR, Indonesia, Myanmar, and Philippines still have high MMRs.

### What Are the Causes of the Malnutrition Problem?

Studies to elucidate the causation of malnutrition in the nine SEA countries have been scant. Hence, a more in-depth comparison cannot be done. For children, the UNICEF conceptual framework (18) has been widely used to identify



**Table III. Maternal health indicators in selected SEA countries (7,17).**

Indicators	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar
Maternal mortality ratio (per 100,000 live births), adjusted†	290 <sup>d</sup>	240 <sup>d</sup>	580 <sup>d</sup>	31 <sup>d</sup>	240 <sup>d</sup>
Maternal mortality ratio (per 100,000 live births), reported†	460 <sup>b</sup>	230 <sup>b</sup>	410 <sup>b</sup>	29 <sup>b</sup>	320 <sup>b</sup>
Total number of maternal deaths‡	790 <sup>e</sup>	9600 <sup>e</sup>	670 <sup>e</sup>	170 <sup>e</sup>	1600 <sup>e</sup>
Lifetime risk of maternal death (1 in:‡)	150 <sup>e</sup>	210 <sup>e</sup>	74 <sup>e</sup>	1300 <sup>e</sup>	250 <sup>e</sup>
Antenatal care (at least one visit, %)†	89 <sup>d</sup>	93 <sup>d</sup>	35 <sup>d</sup>	79 <sup>d</sup>	80 <sup>d</sup>
Antenatal care (at least four visits, %)†	27 <sup>d</sup>	82 <sup>d</sup>	61 <sup>d</sup>	-	73 <sup>d</sup>
Skilled attendant at birth (%urban, %rural)†	95, 67 <sup>b</sup>	84, 76 <sup>b</sup>	68, 11 <sup>b</sup>	-, -	82, 58 <sup>b</sup>
Low birth weight (<2,500g, %)†	9 <sup>d</sup>	9 <sup>d</sup>	11 <sup>d</sup>	9 <sup>d</sup>	9 <sup>d</sup>
Primary school net enrolment or attendance ratio (%female, %male)†	87, 90 <sup>b</sup>	98, 98 <sup>a</sup>	81, 84 <sup>c</sup>	94, 94 <sup>c</sup>	91, 90 <sup>a</sup>

**Table III (continued). Maternal health indicators in selected SEA countries (7,17).**

Indicators	Philippines	Singapore	Thailand	Vietnam
Maternal mortality ratio (per 100,000 live births), adjusted†	94 <sup>d</sup>	-	48 <sup>d</sup>	56 <sup>d</sup>
Maternal mortality ratio (per 100,000 live births), reported†	160 <sup>b</sup>	-	12 <sup>b</sup>	69 <sup>b</sup>
Total number of maternal deaths‡	2300 <sup>e</sup>	2 <sup>e</sup>	400 <sup>e</sup>	860 <sup>e</sup>
Lifetime risk of maternal death (1 in:‡)	300 <sup>e</sup>	25,300 <sup>e</sup>	1400 <sup>e</sup>	870 <sup>e</sup>
Antenatal care (at least one visit, %)†	91 <sup>d</sup>	-	99 <sup>d</sup>	91 <sup>d</sup>
Antenatal care (at least four visits, %)†	78 <sup>d</sup>	-	80 <sup>d</sup>	29 <sup>d</sup>
Skilled attendant at birth (%urban, %rural)†	78, 48 <sup>b</sup>	-	100, 100 <sup>b</sup>	98, 85 <sup>b</sup>
Low birth weight (<2,500g, %)†	21 <sup>d</sup>	-	7 <sup>d</sup>	5 <sup>d</sup>
Primary school net enrolment or attendance ratio (%female, %male)†	93, 91 <sup>c</sup>	-	89, 91 <sup>c</sup>	95, 95 <sup>a</sup>

Note: Estimates are calculated according to the WHO Child Growth Standards. Estimates are from surveys conducted in 2003 or later.

†Data refer to years or periods outside 2003–2008; differ from the standard definition or refer to only part of a country. Such data are not included in the calculation of regional and global averages.

‡Estimates according to NCHS/WHO reference population. Such data are not included in the calculation of regional and global averages.

<sup>a</sup>2005–2010

<sup>b</sup>2006–2010

<sup>c</sup>2007–2010

<sup>d</sup>2008

<sup>e</sup>2010

- No data available

the factors affecting the nutritional status of CU5. Accordingly, a hierarchy of causes ranging from

immediate, underlying, and basic factors was acknowledged risk factors for child malnutrition.

**Table IV. Summary of causes of malnutrition.**

Country	Immediate Causes/ Individual Level	Underlying Causes/ Community Level	Basic Causes/ National Level
Lao PDR	<ul style="list-style-type: none"> <li>Inadequate nutrient intake due to inappropriate nutritional knowledge, belief, and practices</li> <li>High frequency of vector and food borne diseases which are impending food utilization and increase nutritional needs</li> </ul>	<ul style="list-style-type: none"> <li>Unstable household food security coupled with decreased levels of self-help capacity, limited access to land, and sudden livelihood changes</li> <li>Poor mother and child care practices, inappropriate nutritional knowledge, and cultural adherence to stark food avoidance behavior</li> <li>Poor environmental health including limited access to safe water, poor hygiene/sanitation, together with limited access, provision, and usage of health services</li> </ul>	<ul style="list-style-type: none"> <li>Lack of policy and legislation on nutrition</li> <li>Lack of Nutrition Program</li> <li>Limited national and international investments in nutrition coupled with low support from the private sector</li> <li>Lack of institutionalization in nutrition within the Lao Government</li> <li>Lack of scientific research and understanding of the central role of nutrition in development</li> </ul>
Myanmar	<ul style="list-style-type: none"> <li>Inadequate dietary intake</li> </ul>	<ul style="list-style-type: none"> <li>Insufficient access to food</li> </ul>	<ul style="list-style-type: none"> <li>Quantity and quality of resources available</li> </ul>
Philippines	<ul style="list-style-type: none"> <li>Inadequate dietary intake</li> <li>Diseases like diarrhea, acute respiratory infections, and measles</li> </ul>	<ul style="list-style-type: none"> <li>Household food security</li> <li>Care practices</li> <li>Health services and environmental quality</li> </ul>	<ul style="list-style-type: none"> <li>Formal and informal institutions</li> <li>Economic structure</li> </ul>
Cambodia*	<ul style="list-style-type: none"> <li>Inadequate dietary intake</li> <li>Disease</li> </ul>	<ul style="list-style-type: none"> <li>Inadequate access to food</li> <li>Inadequate care to children and women</li> <li>Insufficient health services and unhealthy environment</li> <li>Inadequate education</li> </ul>	<ul style="list-style-type: none"> <li>Resource and control (human, economic, and organization)</li> <li>Political and ideological factors</li> <li>Economic structure</li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>Food intake</li> <li>Infectious Diseases</li> </ul>	<ul style="list-style-type: none"> <li>Food availability</li> <li>Mother and child caring</li> <li>Health services</li> </ul>	<ul style="list-style-type: none"> <li>Poor family and education</li> <li>Food stuffs and job opportunity</li> <li>Economic structure</li> </ul>

Inadequate dietary intake and ill health comprised the immediate causes of malnutrition among children. Dietary intake, on the other hand, is linked to feeding practices which are measured

using the indicators related to breastfeeding and proper complementary feeding such as initiation of breastfeeding within one hour of birth; exclusive breastfeeding for the first six months of the child's

Table IV (continued). Summary of causes of malnutrition.

Country	Immediate Causes/ Individual Level	Underlying Causes/ Community Level	Basic Causes/ National Level
Brunei	<ul style="list-style-type: none"> <li>• Nutrient intake</li> <li>• Energy intake</li> <li>• Health status (food utilization by the body)</li> </ul>	<ul style="list-style-type: none"> <li>• Care practices</li> <li>• Health and sanitation</li> <li>• Access to food (purchasing power, market integration)</li> <li>• Stability of food supplies and access (food production, incomes, markets)</li> <li>• Food availability (production, imports, utilization)</li> </ul>	<ul style="list-style-type: none"> <li>• Socio-economic and political environment</li> </ul>
Malaysia	<ul style="list-style-type: none"> <li>• Inadequate food intake</li> <li>• Disease</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient household food security</li> <li>• Care practices</li> </ul>	<ul style="list-style-type: none"> <li>• Socio-economic</li> </ul>
Thailand	<ul style="list-style-type: none"> <li>• Inadequate nutrient intake</li> <li>• Disease</li> </ul>	<ul style="list-style-type: none"> <li>• Not indicated</li> </ul>	<ul style="list-style-type: none"> <li>• Not indicated</li> </ul>
Singapore	<ul style="list-style-type: none"> <li>• Disease</li> <li>• Inadequate dietary intake</li> </ul>	<ul style="list-style-type: none"> <li>• Poor environmental health and sanitation</li> <li>• Care practices</li> </ul>	<ul style="list-style-type: none"> <li>• Not indicated</li> </ul>
Vietnam	<ul style="list-style-type: none"> <li>• Low average energy intake</li> <li>• Disease</li> </ul>	<ul style="list-style-type: none"> <li>• Not indicated</li> </ul>	<ul style="list-style-type: none"> <li>• Not indicated</li> </ul>

life, and continued breastfeeding for two years or more, together with safe, age-appropriate feeding of solid, semi-solid, and soft foods starting at 6 months of age (19). As a whole, the feeding practices in the SEA region is generally poor, which may contribute to the increased risk for undernutrition.

Exclusive breastfeeding is generally less of a practice in the region. Only Cambodia has more than 50% of less than 6 months old infants being exclusively breastfed, while the prevalence of exclusive breastfeeding in the seven countries are below the global average as well as the average for developing countries. Prevalence of

breastfeeding with complementary food among 6–9 months old children is higher in the SEA region countries (except Thailand) relative to the global average, but available data are less clear on the type, amount, and when complementary food is started. These are crucial in ensuring adequate childhood nutrition (20). Meanwhile, sub-optimal breastfeeding was estimated to be responsible for 1.4 million child deaths and 44 million in DALYs (2).

CU5 mortality rates in the SEA region ranged from 3% to 88% in 2009. High income countries like Malaysia and Singapore have mortality rates of less than 10%. Meanwhile,

countries with low per capita GDP like Myanmar, Cambodia, and Lao PDR and where undernutrition, anaemia, and vitamin A deficiency are public health problems also have the highest under five mortality rate in the region. Diseases of infectious origin like acute respiratory infections, diarrhea, and measles are identified leading causes of child mortality worldwide (21).

Poor dietary intake and disease conditions in turn result from household food insecurity, inadequate maternal and child care, and insufficient health services and unhealthy environment. Accordingly, prevalence of stunting and underweight tends to increase with increasing hunger index (14).

### **Nutrition Surveillance: Data Synchronization and Harmonization**

A review of surveillance systems in the nine countries shows that some countries either lack or are in the process of developing a nutrition surveillance system. The nutrition surveillance systems are mainly lodged in a government agency, usually in the Ministry/Department of Health as lead. Other agencies, such as agriculture and statistics, are also involved in the collection and analysis of the data. In general, the data collected are used for policy formulation, program planning, program monitoring, and evaluation. Surveys such as the Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) use nationally represented data on nutritional outcomes and contextual factors. The DHS collects data on population health and socio-economic status, while MICS was designed to measure outcomes reflecting the goals of the World Summit on Children (22). Other surveys such as Family Income and Expenditure Survey (FIES) and Socio-Economic Survey are used in the Philippines and Cambodia, respectively. These kinds of surveys

provide data on income and expenditure and are useful for analyzing household food security and its causes. Nationally representative special surveys, i.e., National Nutrition Surveys, are focused on malnutrition (undernutrition, overnutrition, micronutrient deficiencies) and other indicators such as program participation, household consumption of iodized salt. Using the national nutrition surveys, some countries such as the Philippines and Thailand are able to regularly and reliably monitor changes or trends in nutritional status and other nutritional outcomes. In countries such as Lao PDR and Cambodia, the MICS has the potential of being institutionalized. As such, repeated surveys can be done.

Data derived from growth monitoring and promotion programs are also used to monitor nutritional status particularly of children. In the Philippines, an Operation Timbang (mass weighing) covering all preschool children is done annually. In Vietnam, growth monitoring is a component of primary health care and the protein-energy malnutrition prevention and control program where data collected are used to target supplementary food and nutrition counseling beneficiaries (22).

Several countries, i.e., Philippines, Cambodia, and Lao PDR, are also implementing FIVIMS. It is a system or network of systems that consolidates, manages, analyses, and disseminates information about population groups who are food insecure and/or malnourished, or are at risk of becoming food insecure and malnourished. It helps identify, locate, and estimate the number of the food insecure and vulnerable, and identifies the causes of food insecurity and vulnerability, being built on the information systems and databases already existing in the country (23). In the Philippines, 12 core indicators are used to identify provinces that are food insecure and vulnerable. Using these indicators, food insecurity in varying degrees was found to be prevalent in 49 provinces

**Table V. Types of surveillance system implemented per country.**

Country	Surveillance Systems	Responsible institution/agency	Year established
Brunei	Health, Food and Nutrition Surveillance System	Community Nutrition Division, Ministry of Health	1995–1996
	• Food supply, distribution, accessibility	Department of Statistics	
	• Dietary intake and health risks	Department of Economic Planning and Development	
	• Growth monitoring and screening	Prime Minister's Office	
	• Health status of schoolchildren		
	• Health status of antenatal women		
	• Health status of adults and elderly		
	Household Expenditure Surveys		
	National Nutrition Status Surveys		
Cambodia	Food insecurity and vulnerability information and mapping system (FIVIMS)	National Institute of Statistics	FIVIMS launched in 1999
	Cambodian Demographic Health Survey		
	Cambodia Socio-Economic Survey		
Indonesia	Food and Nutrition Surveillance System	Government of Indonesia	1994
	Early Warning System for Interventions		
Lao PDR	Multi-indicator cluster survey (MICS)	Institute of Maternal and Child Health, Ministry of Health	Not yet established
	Health survey		
	Lao expenditure and consumption survey		
	FIVIMS		
	Lao Info/MDG monitoring		

(63.6%), with 38 provinces as Vulnerable (cluster 3), 8 provinces as Very Vulnerable (cluster 4), and 3 provinces as Very Very Vulnerable (cluster 5).

Indonesia and Philippines have implemented early warning systems. The objectives are to forecast food and nutrition

**Table V (continued). Types of surveillance system implemented per country.**

Country	Surveillance Systems	Responsible institution/agency	Year established
Malaysia	Nutrition Surveillance under the Health Management Information System for Family Health  Malaysian Adult Nutrition Survey  MOH National Health and Morbidity Survey	Health Information Center, Ministry of Health	Late 1980s
Myanmar	National Nutrition Surveillance  Health Management Information System  Multi-indicator cluster survey (MICS)	National Nutrition Center, Department of Health Planning	1987, 1990, 1991, 1994, 1997, 2000, and 2003 (MICS)
Thailand	Nutrition Surveillance System	Ministry of Public Health  Ministry of Agriculture and Cooperatives  National Statistical Office  Ministry of Education  Ministry of Interior  Institute of Nutrition, Mahidol University	1982
Philippines	Philippine Food and Nutrition Surveillance System  National Nutrition Survey  Operation Timbang  Food Insecurity and Vulnerability Information and Mapping System  National Demographic and Health Survey  Family Income and Expenditure Survey  Local Nutrition Early Warning System	PFNSS – National Nutrition Council  NNS – Food and Nutrition Research Institute  NDHS/FIES – National Statistics Office	PFNSS 1974 to present NNS 1978 to present

**Table V (continued). Types of surveillance system implemented per country.**

Country	Surveillance Systems	Responsible institution/agency	Year established
Singapore	National Health Survey	Health Promotion Board, Ministry of Health	NHS 1992
	National Nutrition Survey		NNS 1993
	National Health Surveillance Survey		NHSS 2001
Vietnam	Nutritional Surveillance	Ministry of Health	1990

Source: Country reports, 2008; Chunming (n.d.)

situations, early detection of changes in a population's food and nutrition situation, provide information and recommendations for local government for preventive measures, and rapid response to prevent the situation from worsening. Indonesia has rice centers wherein indicators for forecasting the food situation are collected, i.e., percentage crop acreage, percent damage acreage, percent harvest acreage, and percentage decrease in productivity. The forecasting of the nutrition situation involves regular weighing of children under five years of age at Posyandu, and the indicators include percentage of children who are below the red line on the growth monitoring card and number of children identified with malnutrition at monthly weighing, among others.

## CONCLUSION

Malnutrition continues to be a problem for CU5 and women (pregnant and lactating women) in the SEA region. While there is a predominance of various forms of undernutrition like underweight, stunting, and wasting, micronutrient deficiencies are also prevalent among the groups reviewed. The countries with high prevalences are Cambodia, Lao PDR, Myanmar, and Vietnam for underweight; and Indonesia, Philippines, Vietnam, and Myanmar for stunting. Lao PDR and Cambodia also have high

stunting rates but the number of children is smaller compared to the four countries mentioned. For vitamin A deficiency and anaemia, Cambodia, Myanmar, and Lao PDR have prevalence rates higher than the global average.

The countries that have high prevalence of undernutrition among children are the also the countries with the same problem of undernutrition among women of reproductive age and include Cambodia, Lao PDR, Myanmar, and Philippines. Severe and moderate thinness (BMI < 17.0) were also noted in Cambodia and Lao PDR. The prevalence of overnutrition is highest in Malaysia (a developed country) and lowest in Vietnam (6.2%) and Lao PDR (3.0%). The prevalence of overnutrition in Myanmar exceeded the rate of underweight women by around fivefold. A similar trend for anaemia was noted in Cambodia, Indonesia, Lao PDR, Myanmar, and the Philippines. These are the same countries with a high burden of stunting among CU5 plus maternal anaemia prevalence of more than 40%.

Majority of the countries included in this review have shown substantial progress towards achieving the MDG target in reducing the percentage of underweight children from around 1990 to around 2008. The average percentage reduction per country ranges from 0.9 to 7.6. Malaysia has the highest percentage reduction and only three countries (Lao PDR, Myanmar, and the

Philippines) were rated to have insufficient progress in meeting the MDGs.

In conducting a review like this, it must be noted that some countries do not conduct regular data collection or surveys, and if they do, the interval between surveys is far in between. Hence, there is a need to synchronize the conduct of surveys in the region. Data/indicators collected to identify the nutritional problems and the causes of malnutrition, as well as the reference standards used for evaluating parameters, need to be harmonized.

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- Dr. Endang Dewi Lestari  
Epidemiologist  
Pediatric Consultant for Nutrition  
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Department of Pediatrics  
Sebelas Maret University  
Muwardi Hospital  
Kol Soetarto 132, Surakarta
- Dr. Zaiton Binti Daud  
Senior Principal Assistant Director  
Nutrition Division  
Ministry of Health Malaysia

Tel: 03-8883 4089

Fax: 03-8888 4647

- Dr. Siti Muslimatun  
Deputy Director for Program Development  
and Consultancy  
and Acting Deputy Director for Education  
SEAMEO TROPED/Indonesia  
RCCN-UI Building, Jl. Salemba Raya No. 6  
Jakarta, Pusat-10430 Indonesia
- Dr. Corazon VC. Barba  
Professor Emeritus  
Institute of Human Nutrition and Food  
College of Human Ecology  
University of the Philippines Los Baños  
College, Los Baños, Laguna

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