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Indonesia's Crisis Causes Considerable Weight Loss among Mothers and Adolescents

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INTRODUCTION

In July 1997, a severe economic and political crisis hit Indonesia. The currency devaluated 3-4 fold, prices of foods and basic commodities increased markedly, and many people lost their jobs. Indonesia was one of many countries in Asia and Latin America that suffered, and still suffers, the consequences of an economic crisis. The impact of such a large reduction of purchasing power on nutrition and health has started to emerge.

It is likely that, due to the crisis, access to food at household level was reduced in almost all socio-economic strata. This may have affected both the quality as well as the quantity of the diet. A poorer quality can lead to micronutrient deficiencies and their consequences, such as more illness, reduced vertical growth, and slower psychomotor and cognitive development. A reduction of the quantity will primarily reduce weight gain, or even cause weight-loss, in children and adolescents, and cause weight-loss in adults, which will lower their BMI (body mass index, kg/m^2). A low BMI is associated with impaired physiological functions, such as poor pregnancy outcome (FAO, 1994) and reduced work capacity (Deolalikar, 1988; Haddad & Bouis, 1991; Durnin, 1994; Van den Boom *et al*., 1996; Untoro *et al*., 1998) while susceptibility to illness, and in case of very low BMI even death, seems to be increased (Garcia & Kennedy, 1994; Naidu & Rao, 1994). The impact of the crisis on micronutrient intake and micronutrient deficiencies is discussed in another publication (Bloem & Darnton-Hill, 2000). Here, we will focus on signs of a reduced quantity of the diet.

The commonly used indicator for assessing the severity of food shortage suffered by a community is childhood wasting (low weight-for-height). However, this is not a very specific indicator for reduced access to food, because children's weight is not only affected by food intake, but also by illness. Furthermore, children are unlikely to be the first to suffer from reduced access to food, because, in Indonesia, mothers will reduce their own food intake before that of their children and their husband. Thus, wasting in mothers is likely to precede wasting in children, and it is a more specific sign of reduced access to food, because mother's weight is less

affected by illness. For adolescents the situation is similar, reduced weight-gain, or even weight-loss, is mainly due to reduced access to food, not so much to illness.

Preliminary analyses of data collected in Central Java one year before and one year after the onset of Indonesia's crisis showed a small increase of wasting among children in two of the six ecological zones (unpublished data). The purpose of this paper is to assess the impact of the crisis on wasting among mothers and adolescents, as indicated by the change of BMI and the change of the prevalence of thinness, or underweight, (BMI<18.5 kg/m^2 (WHO, 1995)) . Data were collected before as well as after the onset of the crisis. Data on mothers were collected by the HKI/GOI (Helen Keller International / Government of Indonesia) Nutrition Surveillance System in Central Java (De Pee *et al*., 1998a) and on adolescents aged 12-15 years old by the GIRLS project in East Java (Soekarjo *et al*., in press).

SUBJECTS AND METHODS

Subjects and sampling design

The data reported in this paper were collected by two projects. The data on mothers from Central Java were collected by the HKI/GOI Nutrition Surveillance System (NSS) (for a more detailed description on the HKI/GOI NSS, see De Pee *et al*., 1998). The data on adolescent boys and girls were collected by the GIRLS-project in East Java.

Central Java – By the end of 1998, eight rounds of data-collection had been conducted by the NSS, rounds 1-5 between Dec '95 - Jan '97 and rounds 6-8 between June - Dec '98. To analyze for changes related to the crisis, the data available from the period after the onset of the crisis, rounds 6-8 (June-Dec '98), were compared to data from the same months before the crisis, that is Dec '95 and June-Dec '96 (rounds 1, 3-5).

Each round of data-collection lasted six weeks and for each round a new random sample of 7200 households was selected, using a multi-stage cluster sampling design. Central Java consists of six ecological zones. From each zone, 30 villages were selected by PPS (probability proportional to size) sampling. Each village provided a list of households with a child ≤ 36 mo old. From this list, 40 households were selected by interval sampling, using a random start.

GIRLS – Data on adolescents were obtained from 24 junior high schools in Surabaya city and Madura island, East-Java that participated in the GIRLS project. Schools were selected to present the middle and lower socio-economic strata. All girls and boys in grades 1-3, aged 12-15 years old, and whose parents gave permission, participated in the data-collection. Data were collected in school year 1, in Dec '96 and in April '97, and in school year 2, in Aug '97 and in March '98. For pupils in grade 1 and 2 in the first school year, the data from the end of the first year (April '97) were also used as baseline-data of the second school year. Thus, in Aug '97, data were only collected from the pupils that had just started in grade 1. A comparison of changes of height and BMI between the school year before and the school year after the onset of the crisis in July '97, could not be done within-subjects, because the time-intervals were too different, 4 months (Dec '96 – Apr '97) as compared to 11 months (Apr '97 – Mar '98). Therefore, the changes among 1st

graders of the first year were compared to the changes among 1st graders of the second year. The time intervals for their changes were 4-5 and 6-7 mo, respectively.

Data-collection: coverage and quality control

Central Java – The target was to obtain data from 7200 households with a child <36 mo old. Coverage was almost 100% in rounds 1-5 and 8, and approximately 85% in rounds 6 and 7. The lower coverage of round 6 was mainly due to the fact that the interview took longer than in previous rounds, while the time allocated for completing all interviews in a village had not been increased. Thus, during the first weeks, not all of the 40 households in a village could be interviewed. For round 7, the problem was similar, because a total of 3600 households with a child aged 36-59 mo had been added to the sample. However, because the interviews to be conducted in a village were not planned in a systematic way, there was no bias regarding which households were selected for an interview. For this paper, only data on households with a child <36 mo old were analyzed.

Data were collected by a total of 40 enumerators who were graduates from Indonesian schools of dietetics. Each team of four was supervised by one field supervisor. For quality control, one team revisited 10% of the households that had already been visited by another team. After data-entry, the performance of each enumerator was evaluated by comparing his data to the quality-control data. This was discussed in the refresher training that was organized before each new round of data collection, in order to maximize enumerators' performance.

GIRLS – More than 95% of the pupils in the schools had their parents' permission to participate in the project. Data were collected by graduates from Indonesian schools of dietetics who had been trained thoroughly and whose performance was frequently evaluated in refresher training sessions between the data-collection periods.

Table 1. Basic characteristics of mothers in Central Java

	Round 1 (Dec '95) (n=6998)	Round 3 (July '96) (n=7167)	Round 4 (Sept '96) (n=7144)	Round 5 (Dec '96) (n=7107)	Round 6 (July '98) (n=5321)	Round 7 (Oct '98) (n=5354)	Round 8 (Dec '98) (n=6873)
Age (y)	27.4±6.0^{ab}	27.3±5.8^{a}	27.2±5.8^{a}	27.3±5.8^{a}	27.7±6.0^{b}	27.3±5.7^{ab}	27.5±5.9^{ab}
Child's age (mo)	15.1±9.6^{a}	15.4±9.8^{a}	15.5±9.8^{ab}	16.0±9.9^{bc}	15.9±10.0^{bc}	16.2±10.2^{c}	16.8±10.1^{d}
Weight (kg)	47.8±7.2^{cd}	48.5±7.5^{f}	48.4±7.6^{ef}	48.1±7.4^{de}	47.4±7.4 ^{bc}	46.7±7.6^{a}	47.0±7.1^{ab}
Height (cm)	150.1±5.5^{bc}	149.9±5.2^{ab}	150.1±5.2^{c}	149.9±5.2^{ab}	149.9±5.1^{abc}	149.9±4.9^{ab}	149.7± 5.1^{a}
BMI (kg/m^2)	21.2±3.0^{c}	21.6±3.1^{e}	21.5±3.1^{de}	21.5±3.0^{d}	21.1±3.0^{bc}	20.8±2.5^{a}	21.0±2.9^{b}
Education (%)[1]							
None	6.1	4.9	3.8	5.0	3.8	3.5	4.4
Primary school	66.5	65.0	64.6	65.5	62.5	62.6	63.6
Junior Secondary school	15.0	15.0	15.8	14.5	16.6	16.8	16.2
Senior Secondary	13.2	13.2	13.7	13.4	14.8	14.4	13.9

school							
Tertiary education	2.0	2.0	2.2	1.6	2.2	2.7	1.9

[a-f] Values with different superscript are significantly different from each other (ANOVA, $p<0.05$ with Bonferroni correction for post-hoc multiple comparisons)

[1] Significant differences between categories, $p<0.05$ Chi-square test

Methods for data collection

General questionnaire - The general questionnaire used in Central Java collected information on household composition, members' education and occupation, sanitary conditions, land and livestock owned, food produced, knowledge about vitamin A, source of eggs, source and consumption of vegetables, and use of oil and coconuts. In addition, from the woman and her youngest child anthropometric measurements were taken and data on vitamin A intake, vitamin A capsule receipt, egg consumption, and morbidity were collected. Starting from round 6, questions were added about changes in the household between July '97 and the time of the interview, such as employment status, expenditure pattern, and prices of certain food items, and about the household's consumption of staples other than rice, loans taken for food in the past six months, poverty indicators, and indicators to assess the impact of the Social Protection Sector Development Program. The questionnaire used in the GIRLS-project was shorter and focused on health and socio-economic background of the pupils.

Anthropometric measurements – Both from women in Central Java and from adolescents in East Java, weight, height and MUAC measurements were taken. Weight was measured to the nearest 0.1 kg, using a UNICEF mother and child weighing scale in Central Java and a Soehnle digital weighing scale in East Java. Height was measured to the nearest 0.1 cm using a microtoise.

Statistics

Differences between the data collected before and after the onset of the crisis were tested with Chi-square test for categorical variables and with analysis of variance (ANOVA) for continuous variables of which the histogram of observations showed a normal distribution (De Pee e*t al*., 1998a).

A p-value <0.05 was considered significant. All analyses were conducted using SPSS for Windows version 7.5 (SPSS Inc, Chicago, Illinois).

RESULTS

Tables 1 and 2 show the basic characteristics before and after the onset of the crisis of mothers in Central Java and of adolescents in East Java, respectively. The differences in age between the two assessment periods were small, for mothers and their children, as well as for boys and girls. After the onset of the crisis, body weight was lower among mothers and among boys. After the onset of the crisis, height was lower among boys and girls, while there was almost no difference among mothers. Among boys, the proportion that had reached puberty at the beginning of the

school year was lower after the onset of the crisis. The BMI of mothers had significantly decreased ($p<0.001$), from 21.42 kg/m^2 before the crisis (average of rounds 1, 3-5) to 20.96 kg/m^2 after the onset of the crisis (average of rounds 6-8). Figure 1 shows that the proportion of mothers with a BMI<18.5 kg/m^2, which is the cut-off for thinness, or underweight, in adults,[10] had increased from 14.9% before the crisis (average of rounds 1, 3-5) to 17.7% one year after the start of the crisis (average of rounds 6-8). Because height of adults is unlikely to be different between two consecutive years (as confirmed by table 1), the reduction of BMI was due to weight-loss. Figure 2 shows that weight-loss occurred across almost all socio-economic strata, as indicated by education level of the mother (De Pee *et al.*, 1998b). The data collected from adolescents before the crisis show that BMI normally increases (figure 3). However, during the first year after the onset of the crisis, BMI did not increase, neither in boys nor in girls. Figure 4 shows that the height gain of the adolescents was slightly higher in the year after the start of the crisis. Multiple analysis of variance was used to check whether the absence of an increase of BMI could be explained by the slightly larger height-gain. However, the year of measurement, that is, before or after the onset of the crisis, was an important factor for explaining the change of BMI (table 3).

Table 2. Basic characteristics of boys and girls in grade 1 at the start of the school years before and after the onset of the crisis

	Boys			Girls		
	Before crisis (n=797)	One year after start of crisis (n=927)	p-value for difference between start of years	Before crisis (n=706)	One year after start of crisis (n=758)	p-value for difference between start of years
Age (y)	13.5±0.8	13.3±0.8	p<0.001	13.4±0.8	13.1±0.7	p<0.001
Weight (kg)	36.9±8.3	36.0±8.2	p<0.05	37.3±7.3	37.8±7.8	
Height (m)	1.47±0.09	1.45±0.09	p<0.001	1.46±0.06	1.45±0.06	p<0.05
BMI (kg/m^2)	16.8±2.4	16.8±2.4		17.4±2.7	17.8±2.9	
Already reached puberty (%)	45.9	36.4	p<0.001	61.9	64.2	

Table 3. Multiple analysis of variance for factors related to the change of BMI, including the year before and after the onset of the crisis, for boys and girls

	Boys			Girls		
	Mean Square	F	p-value	Mean Square	F	p-value
Age (y)	0.35	0.57	Ns	4.00	6.93	<0.01
BMI (kg/m^2) at the start of the year	31.90	52.54	<0.001	28.29	49.08	<0.001
Difference of ht^2 at beginning and end of the school year	3.59	5.91	<0.05	38.69	67.12	<0.001
Reached puberty at end of year	8.15	13.42	<0.001	0.87	1.52	Ns
Year before or after onset of crisis	13.00	21.41	<0.001	20.88	36.22	<0.001

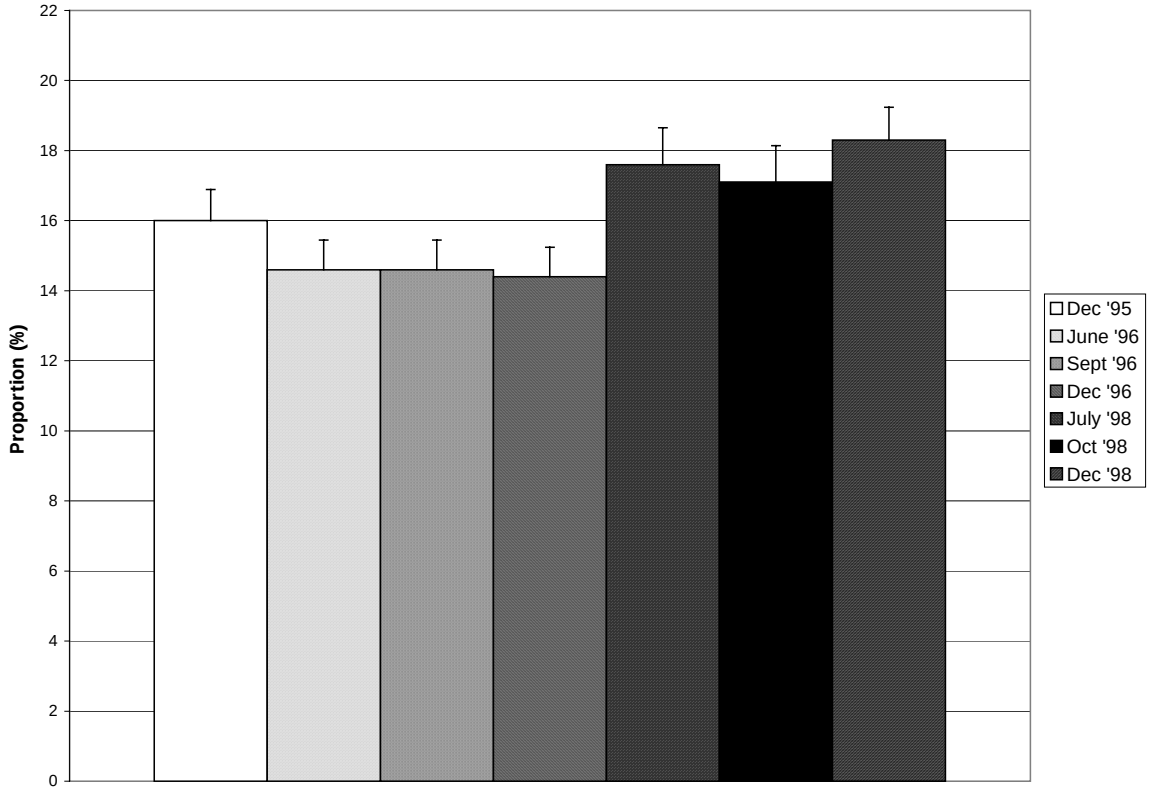

Figure 1. The proportion of mothers with a BMI<18.5 kg/m^2 by survey period.

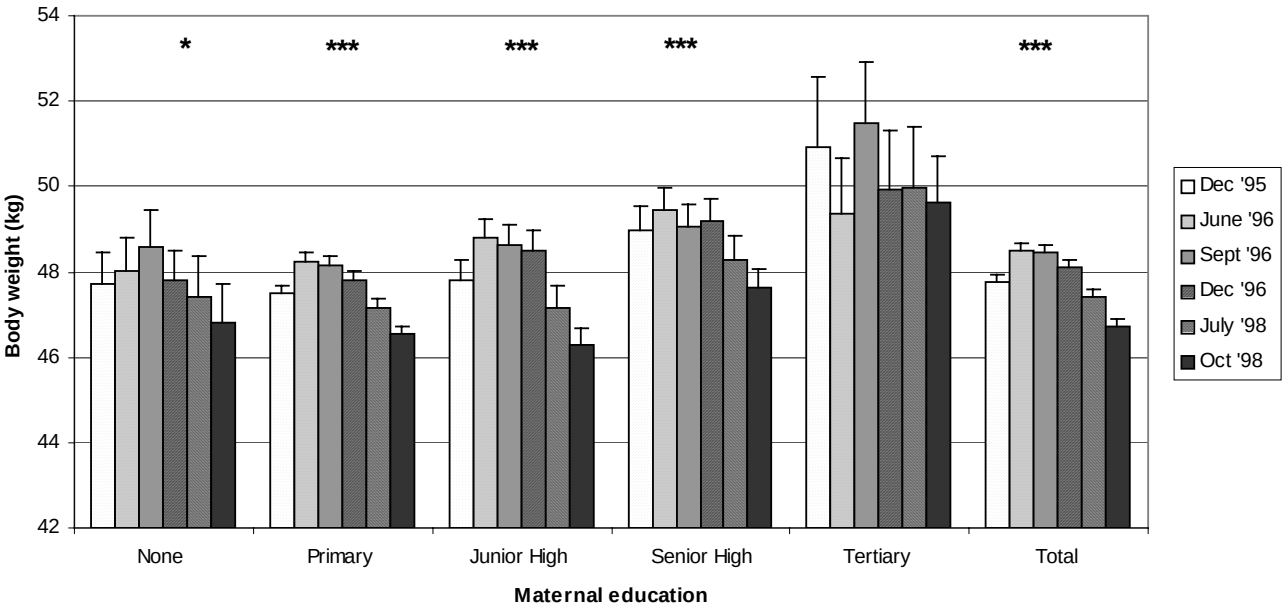

Figure 2. Average weight of mothers by survey period by educational level.

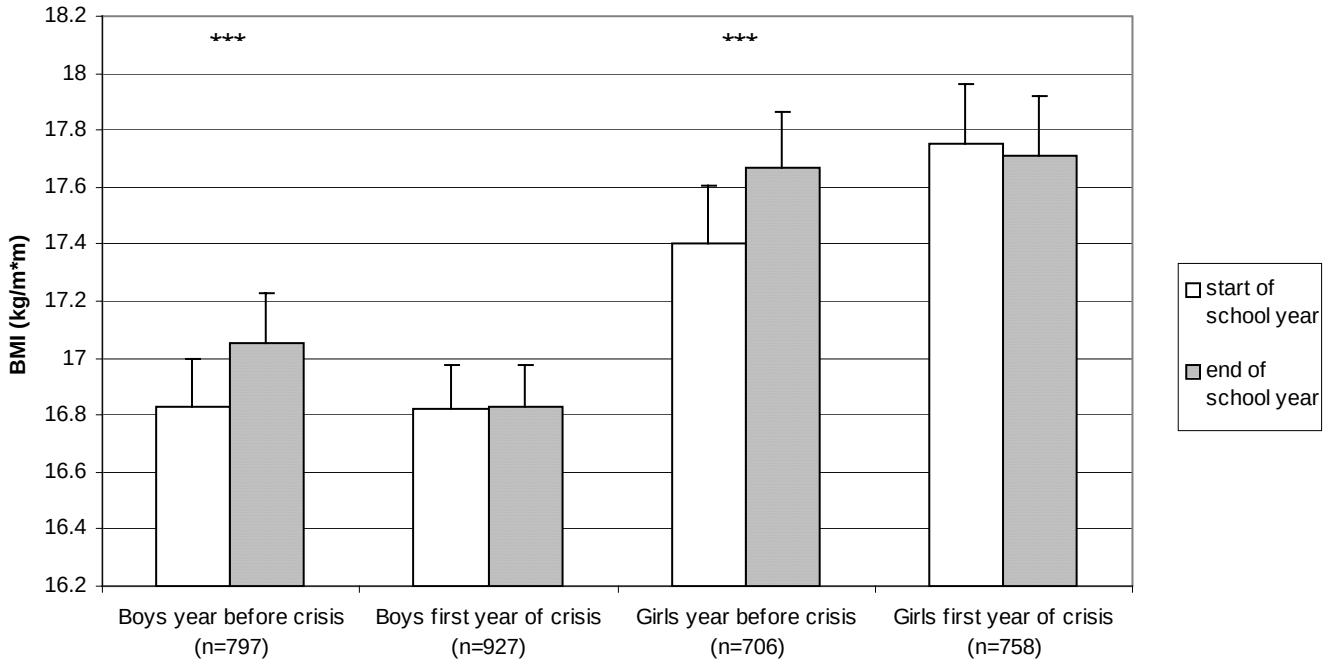

Figure 3. Average BMI of adolescent boys and girls before and 1 year after the crisis.

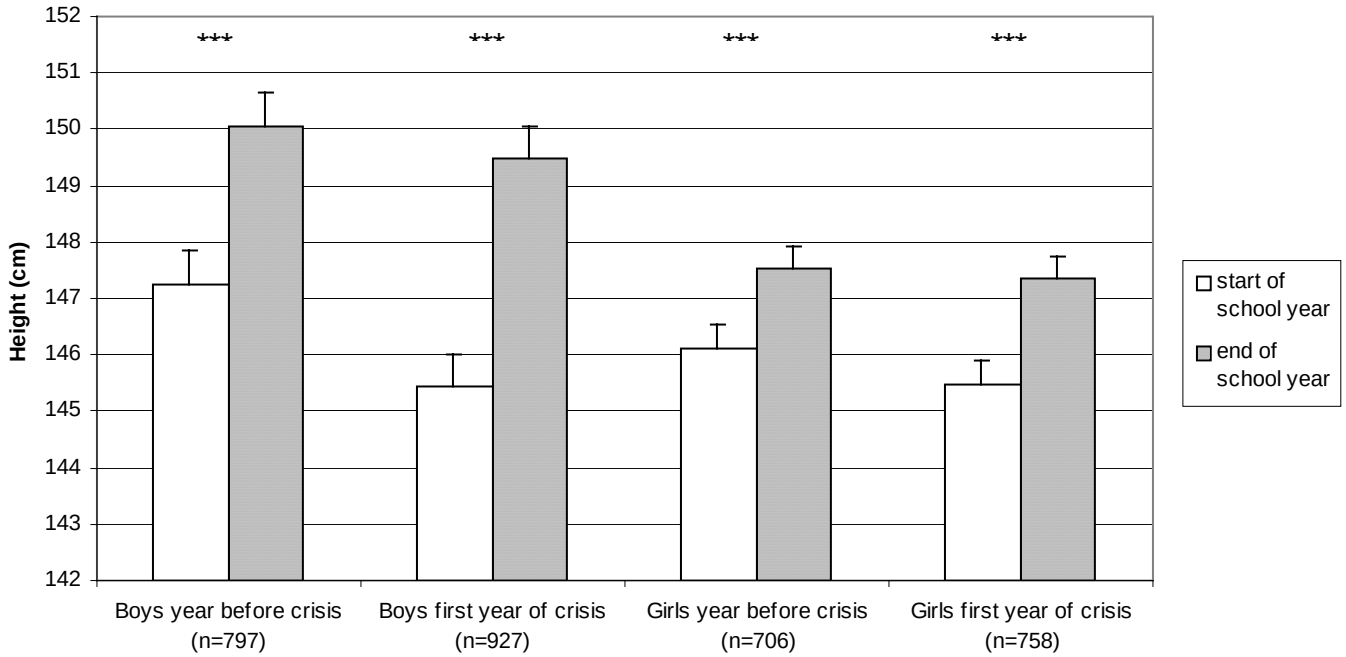

Figure 4. Average height of adolescent boys and girls before and 1 year aster the crisis.

DISCUSSION

After one year of Indonesia's economic and political crisis, the BMI of mothers in Central Java was 0.46 kg/m^2 lower than before the crisis, and among adolescents in East-Java the expected increase of BMI had not occurred. The reduction of the BMI among mothers was almost as large as the 0.50 kg/m^2 increase among women in South and Southeast Asian countries between 1960 and 1990 (Pelletier & Rahn, 1998). In almost all socio-economic strata, mothers' weight was lower after the onset of the crisis.

Because the design and methods of data-collection were the same before and after the onset of the crisis, in the HKI/GOI Nutrition Surveillance System as well as in the GIRLS-project, it is unlikely that differences observed would be due to methodological differences. A paper on women from Purworejo district, Central Java, using data collected in Jan – March '96, reported an average BMI of 21.2 kg/m^2 (Nurdiati *et al.*, 1998), which is the same as we observed in November 1995–January 1996.

The increase of prices and loss of jobs caused by the economic crisis affected access to food at household level. At the market, not all basic and luxury foods were available anymore, and food prices had increased markedly. For example, by June-Aug '98, the price of rice had almost doubled, while the price of milk (powdered and condensed) was almost five-fold higher. The first strategy to cope with the reduced purchasing-power and higher food-prices would be to replace relatively expensive foods, such as animal products, with cheaper foods, such as soy-based products, and to reduce the size and number of side-dishes of the rice-based meal. This will primarily lead to a reduction of the quality of the diet. A second coping strategy would be to consume smaller and/or fewer meals, which affects both the quantity as well as the quality of the diet. Both coping strategies are used, depending on the economic situation of the household. In the case of acute food shortages, such as those due to severe draught or flooding, the quality and the quantity of the diet are affected simultaneously and affect all households equally.

A reduced quality of the diet means a lower content of essential vitamins and minerals. This can lead to micronutrient deficiencies and their consequences, including reduced vertical growth, increased susceptibility to disease, anemia and nightblindness. A reduced quantity of the diet will reduce its quality and also lead to slower weight-gain, or even weight-loss, in children and adolescents, and to weight-loss in adults. UNICEF's conceptual framework of immediate, underlying and basic causes of malnutrition is a very useful tool for identifying what specific causes of malnutrition are prevailing in a certain situation, because different manifestations of malnutrition are due to a different set of causes (Johnsson, 1995). For example, anemia among children reflects inadequate access to good-quality food and illness such as parasitic infestation, while anemia among mothers reflects these two factors as well as inadequate access to health care (i.e. distribution of iron pills in pregnancy).

Using the UNICEF framework, it can be derived that a reduction of maternal BMI indicates inadequate 'access to food' at household level, because adult's weight is mainly affected by 'dietary intake', one of the immediate causes of malnutrition, and not much by the other immediate cause 'illness'. Furthermore, a reduction of maternal BMI is a relatively early indicator, because mothers will reduce their own food intake before that of their children and

their husbands (note the interaction between two underlying causes, 'access to food' and 'care'). The same is true for the BMI of adolescents, it is primarily affected by 'access to food'. Thus, the observed decrease of the BMI among mothers, the associated increase of the prevalence of underweight, and the lack of an increase of the BMI among adolescents indicates that Indonesia's crisis has affected the population's access to food.

While the BMI of adolescents had not increased during the school year after the onset of the crisis, their height-gain had not been less than during the year before. The fact that the crisis had not yet affected vertical growth may be due to the fact that vertical growth is affected relatively late by micronutrient deficiencies, as opposed to for example hemoglobin synthesis, as well as to the possibility that the body stores of micronutrients, although being sub-optimal in this population from the start, were not yet depleted. For details about changes of micronutrient status of mothers and underfives are found in the study by Bloem and Darnton-Hill (2000).

The lower BMI among mothers and the lack of an increase of the BMI among adolescents, within a year after the onset of Indonesia's economic crisis, is worrisome. A low BMI is associated with reduced work capacity and less energy available for other activities (2-6, 10), increased morbidity and mortality (Garcia & Kennedy, 1994; Naidu & Roa, 1994), and poorer reproductive health, including a greater risk of pregnancy complications and a reduced quality of breastmilk (WHO, 1995). Observing a reduction of the BMI also means that other consequences of reduced access to food, such as an increase of prevalence and severity of micronutrient deficiencies, due to reduced quality of the diet, also occurs. Thus, the crisis' consequences for nutrition and health of the population were severe, and the worsening of physical health makes it harder to break the economic crisis' self-perpetuating cycle of a reduction of purchasing power, causing a reduced quality and quantity of the diet, leading to a poor nutritional status and increased morbidity and mortality, which reduces productivity and income, which in turn further reduces purchasing power.

The decrease of the BMI among mothers was almost as large as the increase during the previous 30 years in South and Southeast Asia (Snedecor & Cochran, 1980). However, that increase was a combination of an increase of height and an increase of weight, while the decrease of BMI reported in this paper is only due to a loss of weight. Therefore, regaining the proportion of the BMI that was lost due to the crisis requires a smaller weight-gain than the weight that was gained by women in South and Southeast Asia over the past 30 years. But the magnitude of weight-loss observed among mothers calls for specific action directed towards women, especially to pregnant and lactating women, such as the free provision of health care currently provided to specific individuals in specific communities by the Safety Net Program.

The observed consequences of the economic crisis are not unique for Indonesia, they are likely to occur in most countries in Asia and Latin America that are currently experiencing an economic crisis. Monitoring the crisis' consequences for access to food, nutritional status and health among different target groups in different areas of a country will enable policy makers to undertake appropriate and specific action in order to limit the crisis' devastating impact on the population's health and productivity.

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