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Poverty, Malnutrition and Mortality in South Asia: A Review of Issues and Options

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A. Introduction

The contemporary world, in which we live, continues to register substantial progress in economic growth, abundance in production of food grains, and profound breakthrough in medical technology and knowledge on diseases and healthcare. These are no mean achievements and there are reasons to further them, as they play important role in both reducing poverty and hunger and improving the health and nutrition substantially. Despite these progresses and achievement, a number of regressive aspects also continue to plague many parts of the world and blight the lives of men and women in various ways. For instance, economic progress coincides with widespread poverty and hunger in various regions and countries within regions. Similarly, advancements in medical technology and improved knowledge of diseases and healthcare go well along with lack of awareness on elementary aspects of hygiene and preventive measures and non-availability of primary healthcare facilities. Due to these and other such factors, the contemporary world also has widespread, chronic malnutrition and premature mortality of children and adults.

Why do poverty and hunger tend to coexist with substantial economic progress and abundance in production of food grains? Why do chronic malnutrition and premature mortality of children prevail despite the availability of, and access to, ways and means to address them? These are important questions, which no one can afford to ignore. There are no simple answers exist, we believe, for these questions. Rather than addressing these issues explicitly, what we attempt to do here is to examine their association and development consequences. Broadly, we tend to examine the association as well as the interaction between poverty and mortality. Specifically, we try to understand and identify how do poverty is interrelated with malnutrition and mortality of children and the mechanisms through which they operate. South Asia will be our locus of discussion, as despite a reasonably better record in economic growth and alleviation of poverty it tends to suffer from pervasive malnutrition and mortality of children.

The paper is organised as follows. The second part of the paper discusses the associations and interaction between poverty and mortality and their causal connections. To do so, a brief and selected review of literature is also attempted. The experience of South Asia is discussed in the third part. Attempts will also be made, wherever possible, to highlight the

experience of India or states within India. The final part will sum up the arguments and suggest possible areas for further research.

B. Selected review of issues

One of the recent works, which analysed the issues that are relevant to the theme of the present attempt, is by Osmani and Bhargava (1998). In all the indicators of malnutrition, South Asia turns out to be worst off among all the regions in the developing world, including Sub-Saharan Africa. What is so special that explains this phenomenon? It emerges from their cross sectional analysis that child nutrition is positively influenced by urbanisation; female literacy; access to healthcare, safe water, and sanitation. The incidence of low birth weight has a negative impact on child nutrition. In fact, the excessively high incidence of stunting in South Asia is explained almost entirely by the exceptionally high levels of low birth weight observed in this region.

What lies behind the incidence of higher level of low birth weight in South Asia? A cross-country regression on incidence of low birth weight was carried out to shed light on this question. Even after controlling the effects of income, food, non-food inputs, urbanisation, education, and age at marriage, there remains an unexplained excess of low birth weight in South Asia. The low birth weight essentially reflects the quality of maternal nutrition, because women who experience greater nutritional stress during pregnancy tend to bear more low birth weight babies. Why do women in South Asia tend to have lower health and nutrition? Are there any factors that are specific to the region that disadvantage women and affect adversely their health and nutrition?

Osmani and Bhargava (1998) argues that there is something in the culture of this region that leads to the excessive neglect of maternal nutrition, in addition to what can be explained by the usual determinants of health and nutrition. This excessive neglect of maternal nutrition ultimately accounts for excessive child undernutrition in South Asia. In other words, a particularly pernicious kind of intergenerational transmission mechanism seems to be operating there: the neglect of maternal nutrition causes high incidence of low birth weight, which in turn causes poor child nutrition. The excessive stress suffered by South Asian women in their reproductive life has profound implications for the overall nutritional status in this region. Given the socio-cultural norms prevalent in this region, maternal health and nutrition is likely to be influenced by the strength of female agency.

Therefore, female education and female labour force participation is crucial for improving maternal nutrition and hence child nutrition in South Asia.

The analysis and findings of Osmani and Bhargava (1998) not only sheds light on various issues raised by Ramalingaswamy, Jonsson and Rohde (1996), but also seems to reinforce their arguments. The analysis of plausible determinants of higher levels of child undernutrition in South Asia by Ramalingaswamy, Jonsson and Rohde (1996) reveals that poverty and food production are almost same for both the region. In fact, South Asia tends to fare slightly better in these aspects. Socio-economic inequality, which may potentially influence the nutrition of children through various ways, does not appear to be significantly worse in South Asia than in Africa. Nor is malnutrition in South Asia a result of predominantly vegetarian diet. Also, the child malnutrition does not seem to arise nor can be related to governmental inaction. Similarly, theories about the inappropriateness of international growth standards for Asian countries do not seem to explain the problem fully. If these potential factors are ruled out, then, what is the possible reason for such higher levels of child malnutrition?

Herein, the authors seem to converge with the findings of Osmani and Bhargava. It seems that one third of all babies in India are born with low birth weight, whereas in Bangladesh, the proportion is even one half. In Sub-Saharan Africa, on the contrary, the proportion is about one sixth. Low birth weight indicates that the infant was malnourished in the womb and/or that the mother was malnourished during her own infancy, childhood, adolescence and pregnancy. The proportion of babies born with low birth weight, therefore, reflects the condition of women, and particularly their health and nutrition, not only during pregnancy but also over the whole of their childhood and young lives. They argue that girls and women in South Asia are less well cared for than in sub Saharan Africa. Women in both regions, indeed in all regions, may be subordinated, but the demands made in patriarchal South Asian societies on the time and energies of women are visibly more excessive and unfair than in other regions of the world.

The lack of freedom for women in South Asia limits opportunities for interaction even between women themselves. It therefore restricts transmission of new knowledge about health matters and child care, damages the self-esteem of women, and induces a kind of crushed dependency on the husband. Thus, the poor care that is afforded to girls and women by their husbands and by elders is the first major reason for levels of child

malnutrition that are markedly higher in South Asia than anywhere else in the world. The issue of malnutrition should be moved, they argue, from the agenda of welfare to the agenda of rights. It is the right of the child to have adequate care, and to grow to the mental and physical potential with which he or she was born. The right of women—including her right to education, to dignity and respect, to time, to rest, to adequate food and health care, to resources and to special care in pregnancy and childbirth are a priority both in and of themselves and as a fundamental part of any permanent solution to the particular problem of child malnutrition.

But this gives rise to yet another enigma or paradox. If hygiene is markedly worse, and if child malnutrition is excessively high as well as so strongly associated with child deaths, then why are child survival rates considerably low in South Asia than in Sub-Saharan Africa? They argue that South Asia has better access to modern healthcare, and especially to life saving antibiotics. Also, there are larger number of private medical practitioners in South Asia than Sub-Saharan Africa, who possibly save more lives, but they do relatively little for nutrition.

An interesting work that examines the mechanism that transmits the malnutrition and their impacts is Scrimshaw (1996). Nutrition and other factors during pregnancy and infancy influence not only the health of the fetus and the infant, but also that of the individual throughout life. Iron deficiency in the mother during pregnancy increases maternal mortality, prenatal and peri-natal infant loss. Moreover, if the mother is iron deficient, her child is born with poor iron reserves and is at greater risk of morbidity and mortality during infancy. Iron deficiency in the child also inhibits growth, impairs immunity, and increases childhood morbidity from infectious disease. One of the most recent finding, referred to as Barkar hypothesis, is that poor nutrition during fetal development and infancy influences the occurrence of chronic diseases in adulthood.

Fetal growth restriction due to maternal malnutrition and other adverse environmental factors leads to a small-for-gestation baby. Low weight for duration of gestation not only predicts poorer health in early childhood but also more problems of chronic degenerative diseases in adults as they age. In underprivileged children, the synergism of malnutrition and infection commonly impairs growth and development and may lead to both physical and mental stunting. Throughout life, the quality of the diet influences the occurrence of both acute and chronic diseases including hypertension, heart disease, type II diabetes and

some of the most serious forms of cancer. It thus appears from the above discussion that though a number of factors influence child malnutrition, the most important factor seems to be the low birth weight, which in turn is influenced by the maternal nutrition. Lack of maternal nutrition arises from a number of factors, including lower agency of women.

Freedom from premature mortality — a capability central to human life — refers to right to survival. Mortality of children, therefore, implies the curtailment, to some extent even denial, of denial of human right to live. Further, being alive is valuable not only in its own right, but also central to achieve any other functioning (Sen 1998). In certain regions of the world and many countries within regions, children die in far great number during their infancy. The number is excessively large for female children in most of the South Asian countries. Studies suggest that infant or child mortality is an outcome of a complex web of interrelated factors. A number of factors, such as infection and incidence of diseases, lack of immunisation and appropriate care, malnutrition, and so on, contribute both individually and cumulatively to the mortality of children (Scrimshaw 1996; Osmani 1997; Martorell 1999).

It has been argued that five childhood conditions, namely diarrhoea, respiratory infections, malaria, measles and peri-natal conditions, are responsible for 21 percent of all deaths in low-income and middle-income countries (Bloom and Canning 2001, p. 56). Expectedly, the contribution of these childhood conditions on the mortality of children would be substantially high. What forces the children from poor countries to get exposed excessively to these infections is an important issue, which calls for a detailed but separate investigation. Given the focus of the present paper, we do not attempt to address this issue here. Nevertheless, an important interconnected aspect is worthy of discussion here. A crucial mediating factor that not only puts the children vulnerable to frequent infections, ill-health and obviously their death is malnutrition in general and protein energy malnutrition in particular.

Malnutrition seems to deteriorate the life chances of children in synergy with infections. Because, malnutrition is not only a consequence of infections, but also renders the children vulnerable to — in that sense, a cause of — infections. For instance, malnourished children have reduced resistance to infections because of lower humoral and cell-mediated immunity. The result is that they have more frequent and severe infections, particularly diarrhoeal and respiratory diseases. Additionally, infections, even when they

are mild or sub-clinical, can worsen nutrition of children by a variety of ways. These include — but by no means limited to — reduced appetite, metabolic nutrient losses in urine, internal diversion of nutrients, and frequent reduced absorption of nutrients (Scrimshaw 1996). Thus, it appears from the above that adequate nutrition is quintessential to prevent infections as also for an early cure. Since nutrition emerges as an essential ingredient for better health and hence lengthy life, it is important to examine the factors that lead to malnutrition.

It has been argued that ‘malnutrition is associated with a cluster of related, often coexistent, factors that together constitute what may be termed the *poverty syndrome*. The major attributes of it are: 1) income levels that are inadequate to meet basic needs of food, clothing and shelter; 2) diets that are quantitatively and qualitatively deficient; 3) poor environment, poor access to safe water, and poor sanitation; 4) poor access to healthcare; and 5) large family size and high levels of illiteracy, especially female illiteracy’ (Gopalan 1992, p. 18, emphasis added). It is important to state here that these determinants relate to malnutrition in general, rather than to children’s malnutrition. A number of other factors tend to complement these general factors in causing the malnutrition of children. Before discussing these specific complementary factors, it is important to acknowledge that the poverty syndrome referred to above is also applicable for, and hence an important role in, determining the nutritional status of children.

Maternal malnutrition seems to have a lasting effect on the nutritional status of children. For instance, maternal malnutrition, such as lower body mass index and iron-deficiency anaemia especially during pregnancy, can potentially result in intra-uterine growth retardation for the foetus, and can possibly lead to high prevalence of low birth weight. Low birth weight, in turn, may lead to both a high rate of child undernutrition, as well as to higher prevalence of adult ailments, both directly and indirectly through child undernutrition (Scrimshaw 1996; Martorell 1999; Osmani and Sen 2003). Viewed in this sense, child malnutrition is both an outcome and the transmission of maternal malnutrition. Malnourished children not only begets lower nutritional and health status from their birth but also transfer, through their greater propensity to infections and ill-health, malnutrition into next generation. Thus, besides poverty, maternal malnutrition plays an important role on the nutritional status of children.

The pathways of child malnutrition and the role played by maternal malnutrition are depicted in the following diagrams (appended herewith). The first diagram, which is the framework developed by the UNICEF (Jonsson 1997), disaggregates the causes of child malnutrition into three, such as basic causes, underlying causes and intermediate causes. The basic causes are lack of resources, including material, economic, social and cultural resources. These lack of resources are converted into various deficiencies such as inadequate access to food, care for children and women and insufficient health facilities or services and unhealthy environment. These underlying factors put children into vulnerable situation by leading to inadequate dietary intake and infections to disease, which obviously results in the malnutrition of children.

The first diagram presumes, arguably, that child malnutrition is primarily an outcome of lack of resources (viewed in a broader sense), and hence lays more emphasis on the lack of resources. The second diagram, which tends to differ from the first in some important ways, seems to bring in additional dimensions than resource shortfall. In fact, the second diagram not only portrays the transmission mechanism discussed above, but also clearly begins with the maternal malnutrition. It depicts that malnourished mothers give birth to low birth weight babies. Low birth weight babies, in turn, not only become malnourished but also transmit their malnutrition to adulthood and possibly to later life (a detailed account of malnutrition across life cycle is presented in the Appendix Table). Viewed in that sense, this approach tends to capture the transmission mechanism with the source of origin and also seems to offer a competing framework for analysing child malnutrition.

C. South Asian experience

Table one presents information on the incidence of poverty, defined in terms of people living below \$1 a day per person, in South Asia. To get a comparative picture, incidence of poverty, both in terms of number of people and percentage, in other regions is also given. It appears from the table that substantially large number of poor people, as high as 522 million in 1998, live in South Asia. However, incidence of poverty is relatively higher, in terms of percentage of people living below poverty, in Sub-Saharan Africa (46 percent) than South Asia (40 percent) in 1998. The same pattern holds good for the year 1990 as well. Given the higher incidence of poverty in Sub-Saharan Africa than South Asia, we would expect relatively higher levels of infant and child mortality in the former than the latter, as poverty is known to be one of the potential factors causing the infant and

child mortality. Table two presents information on the levels of infant and child mortality across regions.

Table 1: Incidence of poverty (less than \$1 a day) across region

Regions	1990		1998	
	Millions	Percent	Millions	Percent
South Asia	495.1	44.0	522	40.0
Sub-Saharan Africa	242.3	47.7	290.9	46.3
East Asia and Pacific	452.4	27.6	278.3	15.3
Latin America and the Caribbean	73.8	16.8	78.2	15.6

Source: World Bank, 2001, p. 23

Table two suggests that mortality levels, both infant and child mortality, are relatively higher in Sub-Saharan Africa than South Asia. The differences are substantially large in both infant and child mortality. On the face of it, the larger pattern emerging from the table — relatively higher levels of mortality of children in Sub-Saharan Africa than South Asia— seems to go in line with the pattern emerging from the previous table. For instance, not only is the incidence of poverty relatively lower in South Asia, but also levels of infant and child mortality are relatively lower. Equally, higher incidence of poverty in Sub-Saharan Africa tends to go with relatively higher mortality of children.

Table 2: Mortality of children across regions (1998)

	South Asia	Sub-Saharan Africa	East Asia and Pacific
Infant Mortality	69.8	91.7	43.4
Under Five Mortality	101.6	166.3	71.2

Source: Klasen 2004

As discussed in the previous section, one of the important factors that would significantly influence the health and potentially increase the probability of mortality of children is the extent of their malnutrition. Let us examine, therefore, whether South Asia tends to have lower levels of child malnutrition when compared to Sub-Saharan Africa, as both incidence of poverty and mortality of children are lower in the former region than the latter? Table three gives information regarding the incidence of malnutrition of children

across regions. Three anthropometrical indicators that are used commonly to indicate the nutritional status of children, such as wasting, stunting and underweight, are given in table three. These three indicators refer respectively to weight for height, height for age and weight for age. If an anthropometrical indicator, for instance, height for age, is below 2 or 3 Standard deviation from the norm, it is considered as the incidence of moderate and severe stunting respectively.

It appears from table three that incidence of child malnutrition is relatively higher in South Asia than Sub-Saharan Africa. It seems that in all the three indicators considered here, South Asia fares far poorer than other two regions. The difference, in percentage points, is noticeably large. For instance, severe underweight in South Asia is 25.7 percent, which is around 12 percentage points higher than the incidence of Sub-Saharan Africa. Similarly, incidence of severe underweight in South Asia (17.5 percent) is more than double the incidence in Sub-Saharan Africa (7.4 percent).

Table 3: Malnutrition of children (under 5) across regions (%)

Anthropometrical Indicators	South Asia	Sub-Saharan Africa	East Asia and Pacific
Moderate and Severe Wasting	15.5	8.7	7.7
Severe Stunting	25.7	13.9	12.6
Moderate and Severe Stunting	44.8	32.8	32.9
Severe Underweight	17.5	7.4	5.5
Moderate and Severe Underweight	46.5	25.7	26.3

Source: World Health Organisation (1998) and UNICEF (various years), cited in Klasen 2004, p. 28, Table 1.

We have seen that incidence of poverty is relatively lower in South Asia when compared to Sub-Saharan Africa. However, relatively lower incidence of poverty goes together with relatively higher incidence of undernutrition in South Asia than Sub-Saharan Africa. These contrasting patterns not only tend to go against our expectation, but also seem to raise a number of important questions. Why, for instance, despite lower incidence of poverty malnutrition levels are higher in South Asia? Further, why irrespective of higher levels of malnutrition, mortality levels of children are lower in South Asia? It would seem, then, that besides poverty certain factors are also at work in causing child malnutrition. As mentioned already, infections, especially incidence of diarrhoea and acute respiratory infection, not only influence the nutritional status of the children but also

play an important in leading to the mortality of children. Table four provides information on the incidence of diarrhoea and acute respiratory infection. Since immunisation is also likely to play a significant role on both nutrition and mortality, information related to aspects of immunisation are also given in the table.

Table four suggests that incidence of diarrhoea is relatively higher in Sub-Saharan Africa than South Africa. Though the difference is not significantly large, it is not substantially small as well. As far as incidence of acute respiratory infection is concerned, the incidence is marginally higher in South Asia than Sub-Saharan Africa. However, immunisation aspects are concerned, Sub-Saharan Africa gains a marginal advantage over South Asia. For instance, over 60 percent of the children are immunised against Measles in the former region, it is around 55 percent in the latter. The advantage of the former remains intact on immunisation against DPT3 as well.

Table 4: Other related indicators of child nutrition (%)

Other related indicators	South Asia	Sub-Saharan Africa	East Asia and Pacific
Incidence of Diarrhoea ^a	14.9	22.3	9.3
Acute Respiratory Infection ^a	17.3	16.4	12.2
Immunisation against Measles ^b	54.7	60.4	75.6
Immunisation against DPT3 ^b	54.3	57.1	70.3
Low Birth Weight ^a	33.3	13.3	12.4

Source: a) same as table 3 and b) Demographic and Health Surveys (various years)

The picture emerging from this table remains somewhat inconclusive. While Sub-Saharan Africa tends to have a marginal advantage over South Asia on immunisation, such definite advantage is absent as far as infection of diseases are concerned. At the risk of generalisation, we can infer from the above that the broad pattern seems to favour Sub-Saharan Africa. Admittedly, though the table indicates a broad disadvantage for South Asia, we feel that South Asia does not fare badly enough to cause the undernutrition of such magnitude noted above. This calls for an examination of other relevant but related factors, as the disadvantage arising from the immunisation and infection do not seem to explain fully the higher levels of child malnutrition in South Asia.

As emerges from the above discussion, one of the important factors that would potentially influence the nutritional status of children is their birth weight. Children with low birth weight are not only born with a disadvantageous health but also have the greater

propensity to suffer from malnutrition. Table four also shows that around one third of the children in South Asia have low birth weight (less than 2500 grams), it is around 13 percent for Sub-Saharan Africa. Thus, the difference, around 20 percentage points, is quite large. This huge difference calls for further probing, as low birth weight is supposed to have a definite role on the nutritional status of children and of their later age. As we have mentioned already, low birth weight is essentially a function of maternal undernutrition. Therefore, an examination on maternal nutritional status is of some relevance here. Though data available on these aspects are rather scanty, we will, nevertheless, examine from that limited information whether women from South Asia disproportionately suffer from malnutrition.

Two common indicators used to measure the nutritional status of women are Body Mass Index and Iron Deficiency Anaemia. It seems that over 40 percent of women (15-49 years) have Body Mass Index (BMI) lower than 18.5 indicating incidence of undernutrition in South Asia. The percentage varies across countries. For instance, around 28 percent of women in Nepal have BMI less than 18.5 in 1996, the percentage is around 52 percent in Bangladesh in 1996/97. Though the proportion is slightly lower in India (35.8 percent) in 1998/99, there are substantial variations across states within India. For example, around 48 percent of women suffer from lower BMI in Orissa, it is around 17 percent in Punjab and 19 percent in Kerala. Further, around 52 percent of women in India suffer from anaemia (1998/99), within India the incidence is relatively higher in Bihar (63.4 percent) and lower in Kerala (22.7 percent) (see IIPS and ORC Macro 2000). Again, around half of the pregnant women suffer from any anaemia, 25 percent of them suffer from moderate anaemia in India.

Studies suggest that maternal malnutrition of this magnitude is not only one of the highest in the world, but also detrimental to the health and nutrition of the children (Ramalingaswami, Jonsson and Rohde 1996; Osmani and Bhargava 1998; Osmani and Sen 2003). Thus, maternal malnutrition seems to have a definite role on the higher malnutrition of the children in South Asia. Chronic undernutrition in childhood is linked to slower cognitive development and serious health impairments later in life that reduce the quality life and also the economic productivity of people (Scrimshaw 1996). Not with standing the influence of maternal nutrition on child malnutrition on the one hand, and child malnutrition on the health and development of children on the other, it may be

relevant to discuss briefly yet another issue mentioned earlier. That is, why higher incidence of child malnutrition go along with lower levels of mortality?

Studies indicate that timely healthcare intervention can potentially attenuate the effects of malnutrition and possibly halt the consequences that would arise from such malnutrition (Osmani 1997; Martorell 1999; Osmani and Sen 2003). This may be partly responsible for the lower levels of mortality found in South Asia despite the higher incidence of child malnutrition. Yet another line of reasoning suggests that the high rates of anthropometric shortfall in South Asia is partly the results of statistical artefacts: that is, use of a US based reference standard, which may not be fully suitable for Asia, appears to generate misleading estimates of undernutrition and overestimate the incidence of undernutrition in South Asia (Klasen 2004). Notwithstanding the merits of these competing claims, a detailed examination on the potential role of child malnutrition on infant mortality in South Asia is called for.

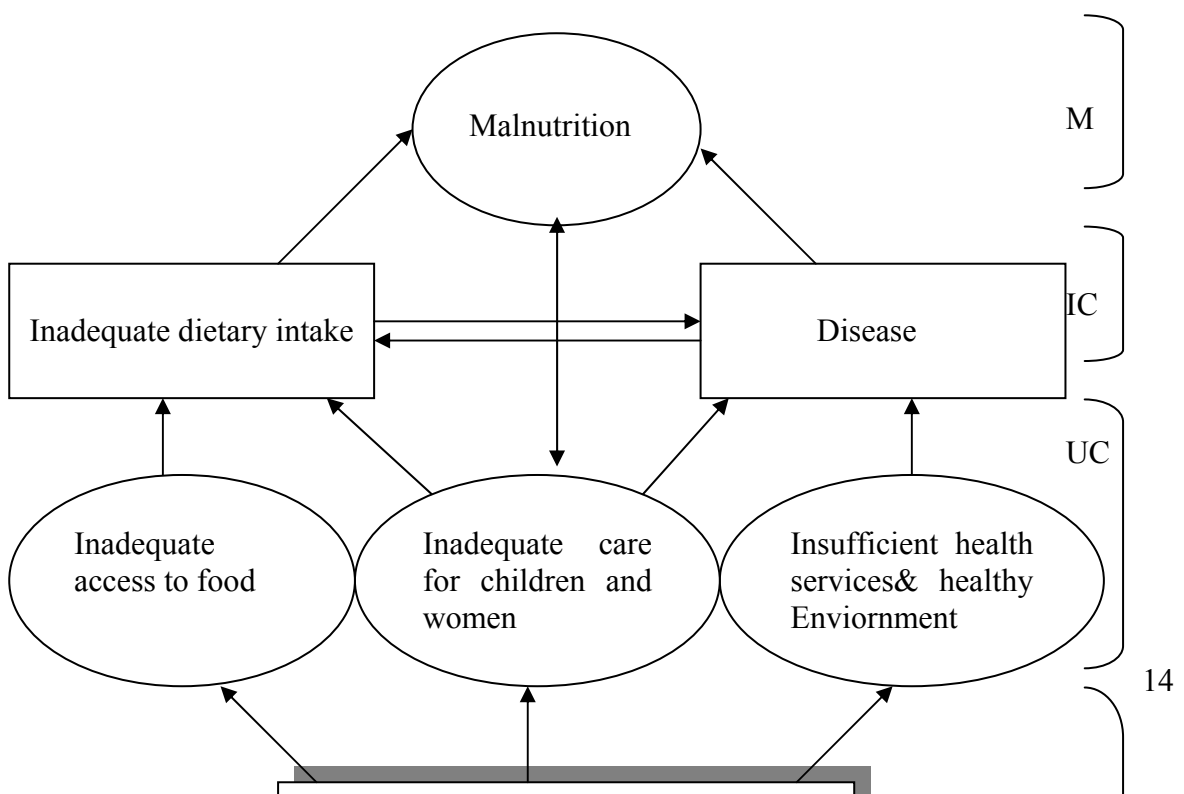
D. Discussion

The preceding discussion suggests that incidence of poverty and levels of mortality are relatively lower in South Asia when compared to Sub-Saharan Africa. While this is one the expected lines, further examination on other related aspects makes this association less definite. The analysis suggests that levels of child undernutrition are excessively large in South Asia than Sub-Saharan Africa. The coexistence of higher levels of child undernutrition and lower levels of poverty and mortality of children remains somewhat counterintuitive and raises a number of issues. Further analysis on aspects associated with malnutrition of children, such as infections of diseases and immunisation, indicates that though South Asia does seem to have a disadvantage on these aspects, the disadvantage is not substantially large enough to cause the child malnutrition of such magnitude.

However, the situation undergoes a rapid change when we look at the incidence of low birth weight. It appears that one third of the children in South suffer from low birth weight. Low birth weight is inextricably intertwined with, and is indeed a manifestation of, maternal undernutrition. Available information, though quite limited, suggests that maternal undernutrition in South Asia is one of the highest in the world. Such higher levels of maternal undernutrition may have a significant role on the malnutrition of children in South Asia. A number of reasons are postulated to explain the lower maternal undernutrition. It is reasonably agreed that female agency can play an important role in

enhancing the health and nutrition of women and through that the nutrition of children on the one hand, and health and nutrition of children independently as well on the other. That being the case, studies also indicate that proper and timely healthcare intervention can possibly arrest the ill-effects of child malnutrition and reduce the mortality of children substantially. This may be one of the possible reasons for low levels of infant and child mortality in South Asia despite higher levels of child undernutrition.

The discussion raises a number of substantive aspects for consideration. For instance, why does South Asia tend to have such higher levels of child undernutrition despite the relatively lower incidence of poverty and hunger? Why does maternal malnutrition is so low in South Asia and how does it interact with the levels of child malnutrition? Despite higher levels of child undernutrition and other such factors, why does mortality levels are relatively lower in South Asia? What are the factors that attenuate the role of child undernutrition and possibly prevent the mortality of children in South Asia? What is the role of women’s agency on child nutrition and survival? How does it influence these aspects in South Asia? Do countries within South Asia provide a different picture on these aspects? These aspects call for a detailed examination, as they tend to have a greater bearing on policy and development.



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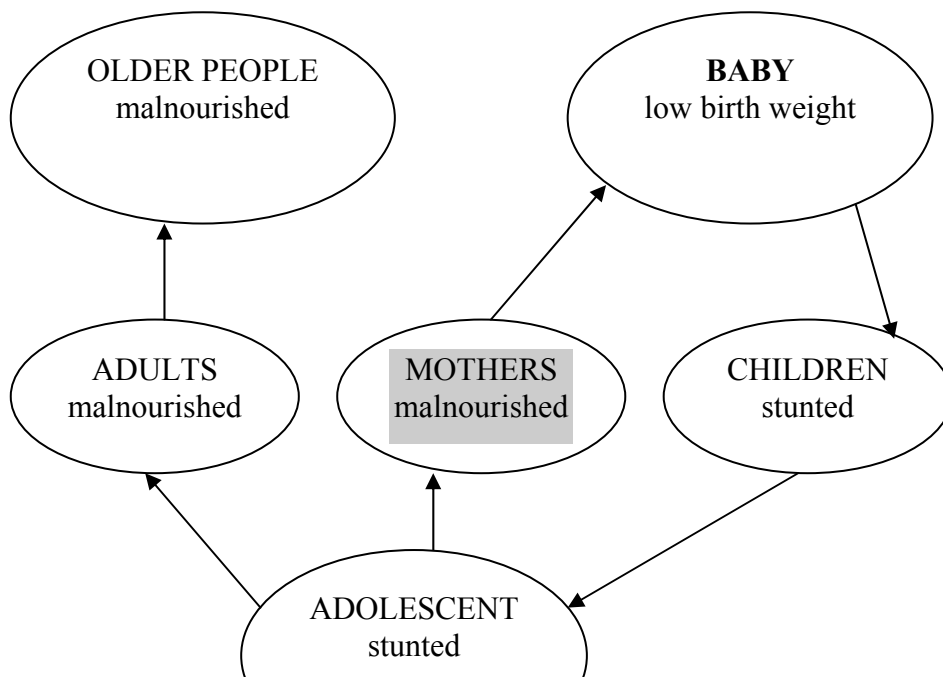
Inadequate Education

Political and ideological factors
Economic structure

BC

Diagram1: Conceptual Framework: Causes of Malnutrition
M: Manifestation; IC: Immediate Causes; BC: Basic Causes
Source: Jonsson, 1997.

Diagram 2: Nutrition throughout the life cycle



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Appendix 1: Malnutrition across the life span, by disorder and consequence

Life stage	Common nutritional disorders	Main consequences
Embryo/fetus	Intrauterine growth retardation Iodine deficiency disorders (IDD) Folate deficiency	Low birth weight Brain damage Neural tube defects Stillbirths
Neonate	Low birth weight IDD	Growth retardation Developmental retardation Brain damage Early anaemia
Infant and young child	Protein-energy malnutrition (PEM) IDD Vitamin A deficiency (VAD) Iron deficiency and anaemia (ID&A)	Continuing malnutrition Developmental retardation Increased risk of infection High risk of death Goitre Blindness Anaemia
Adolescent	PEM, IDD, ID&A Folate deficiency Calcium deficiency	Delayed growth spurt Stunted height Delayed/retarded intellectual development Goitre Increased risk of infection

		Blindness Anaemia Inadequate bone mineralization
Pregnant and lactating women	PEM, IDD, VAD, ID&A Folate deficiency Calcium deficiency	Insufficient weight gain in Pregnancy Maternal anaemia Maternal mortality Increased risk of infection Night blindness Low birth weight/high-risk death rate for fetus
Adults	PEM, ID&A Obesity Diet-related diseases	Thinness Lethargy Obesity Heart disease Diabetes Cancer Hypertension/stroke Anaemia
Older persons	PEM, ID&A Obesity Osteoporosis Diet-related diseases	Obesity Spine/hip fractures, accidents Heart disease Diabetes Cancer

Source: Nutrition for Health and Development, WHO, 2000, p. 10