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Sri Lanka
Malnutrition in Sri Lanka: Scale, Scope, Causes, and Potential Response

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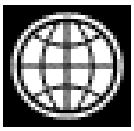

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Scale, Scope, Causes, and Potential Response

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With inputs from Sunethra Atukorala, Dariush Akhavan, Nimal D. Kasturiaratchi, and Nistha Sinha

ABBREVIATIONS AND ACRONYNS

AAA	Analytical and Advisory Activities
ANC	Antenatal care
BMI	Body Mass Index
CED	Chronic Energy Deficiency
CHDR	Child Health Development Record
CSB	Corn-Soya Blend
DALY	Disability-Adjusted Life Year
DHS	Demographic and Health Survey
DDGPHS	Deputy Director General of Health Services-Public Health
DDGET and R	Deputy Director General of Health Services-Education, Training and Research
DCS	Department of Census and Statistics
DS	Department of Statistics
ECCD	Early Childhood Care and Development
FHB	Family Health Bureau
FHW	Family Health Worker
GNI	Gross National Income
GNP	Gross National Product
GOSL	Government of Sri Lanka
HAZ	Height-for-Age Z-Score
IDA	Iron Deficiency Anemia
IDD	Iodine Deficiency Disorders
IEC	Information, Education, Communication
IMR	Infant Mortality Rate
LTTE	Liberation Tigers of Tamil Eelam
LBW	Low Birthweight
M&E	Monitoring and Evaluation
MCH	Maternal and Child Health
MOH	Ministry of Health
MOOH	Medical Officers of Health
MDG	Millennium Development Goal
MRI	Medical Research Institute
MMR	Maternal Mortality Rate
NCD	Noncommunicable Disease
NCHS	National Center for Health Statistics
NGO	Nongovernmental Organization
NHA	National Health Accounts
NNCC	National Nutrition Coordination Committee
OLS	Ordinary Least Squares
PHDT	Plantation Human Development Trust
PHI	Public Health Inspector
PHM	Public Health Midwife
Rs.	Rupees
SLR	Sri Lanka Rupees
UNICEF	United Nations Children's Fund
VAD	Vitamin A Deficiency

WAZ	Weight-for-Age Z-Score
WDI	World Development Indicators
WFP	World Food Program
WHZ	Weight-for-Height Z-Score
WHO	World Health Organization
YLD	Years Lost to Disability
YLL	Years Lives Lost

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The report is dedicated to the hundreds of thousands of malnourished children and women in Sri Lanka whose lives the report's recommendations seek to improve.

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GLOSSARY

Anemia	Low level of hemoglobin in the blood, as evidenced by a reduced quality or quantity of red blood cells; 50 percent of anemia worldwide is caused by iron deficiency.
Body mass index (BMI)	Body weight in kilograms divided by height in meters squared (kg/m^2). This is used as an index of "fatness" among adults. Both high BMI (overweight, BMI greater than 25) and low BMI (thinness, BMI less than 18.5) are considered inadequate.
Iodine deficiency disorders (IDD)	All the ill effects of iodine deficiency in a population that can be prevented by ensuring that the population has an adequate intake of iodine. The spectrum of IDD includes goiter, hypothyroidism, impaired mental function, stillbirths, abortions, congenital anomalies, and neurological cretinism.
Low birthweight	Birthweight less than 2,500 grams.
Malnutrition	Various forms of poor nutrition caused by a complex array of factors including dietary inadequacy, infections, and sociocultural factors. Both underweight or stunting and overweight are forms of malnutrition.
Obesity	Excessive body fat content; commonly measured by BMI. The international reference for classifying an individual as obese is a BMI greater than 30.
Overweight	Excess weight relative to height, commonly measured by BMI among adults (see above). The international reference is as follows: • 25–29.99 for grade I (overweight) • 30–39.99 for grade II (obese) • > 40 for grade III. For children, overweight is measured as weight-for-height two standard deviations above the international reference.
Stunting (measured as height-for-age)	Failure to reach linear growth potential because of inadequate nutrition or poor health. It implies long-term undernutrition and poor health, measured as height-for-age two standard deviations below the international reference. Usually a good indicator of long-term undernutrition among young children. For children under 12 months, recumbent length is used instead of height.
Undernutrition	Poor nutrition: It may occur in association with infection. Three most commonly used indexes for child undernutrition are length-for-age, weight-for-age, and weight-for-height. For adults, undernutrition is measured by a BMI less than 18.5.
Underweight	Low weight-for-age is two standard deviations below the international reference for weight-for-age. It implies stunting or wasting and is an indicator of undernutrition.
Vitamin A deficiency	Tissue concentrations of vitamin A low enough to have adverse health consequences such as increased morbidity and mortality, poor reproductive health, and slowed growth and development, even if there is no clinical deficiency.
Wasting (measured by weight-for-height)	Weight divided by height that is two standard deviations below the international reference. It describes a recent or current severe process leading to significant weight loss, usually a consequence of acute starvation or severe disease. Commonly used as an indicator of undernutrition among children, especially useful in emergency situations such as famine.
Z-score	The deviation of an individual's value from the median value of a reference population, divided by the standard deviation of the reference population.

Background Papers Commissioned for This Report

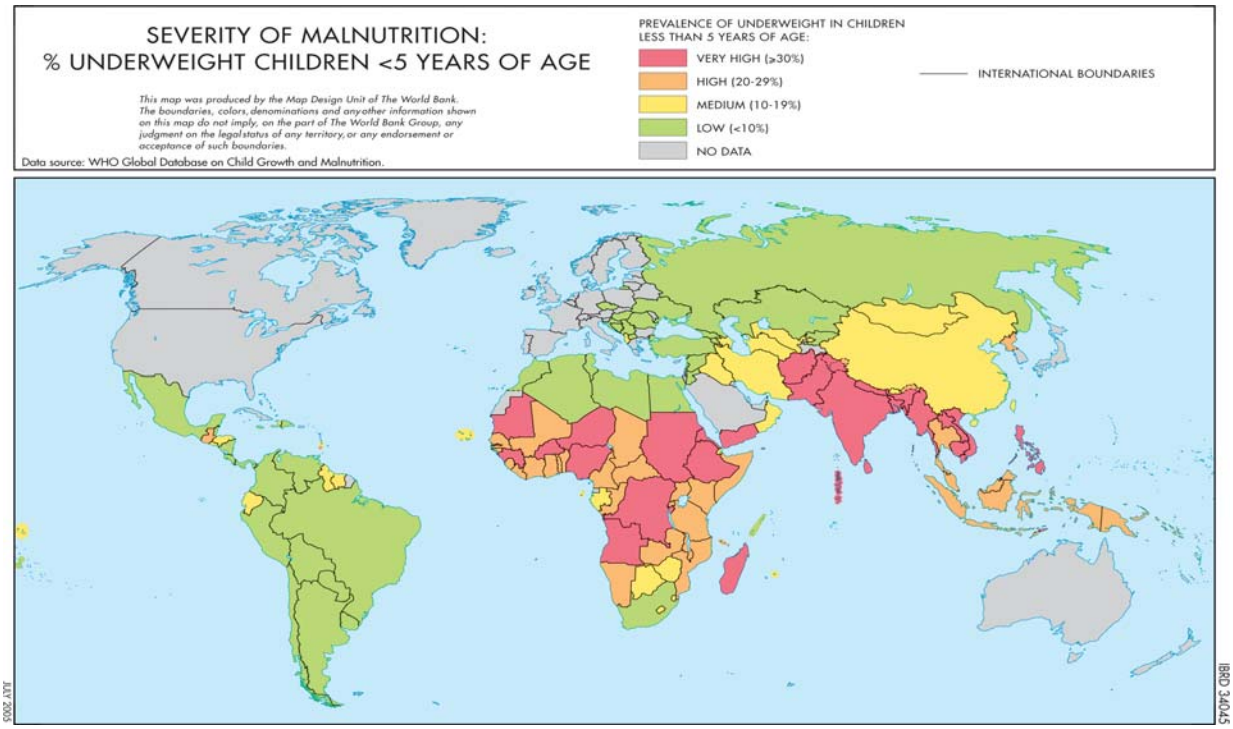
1. The Epidemiology of Malnutrition in Sri Lanka. Lidan Du

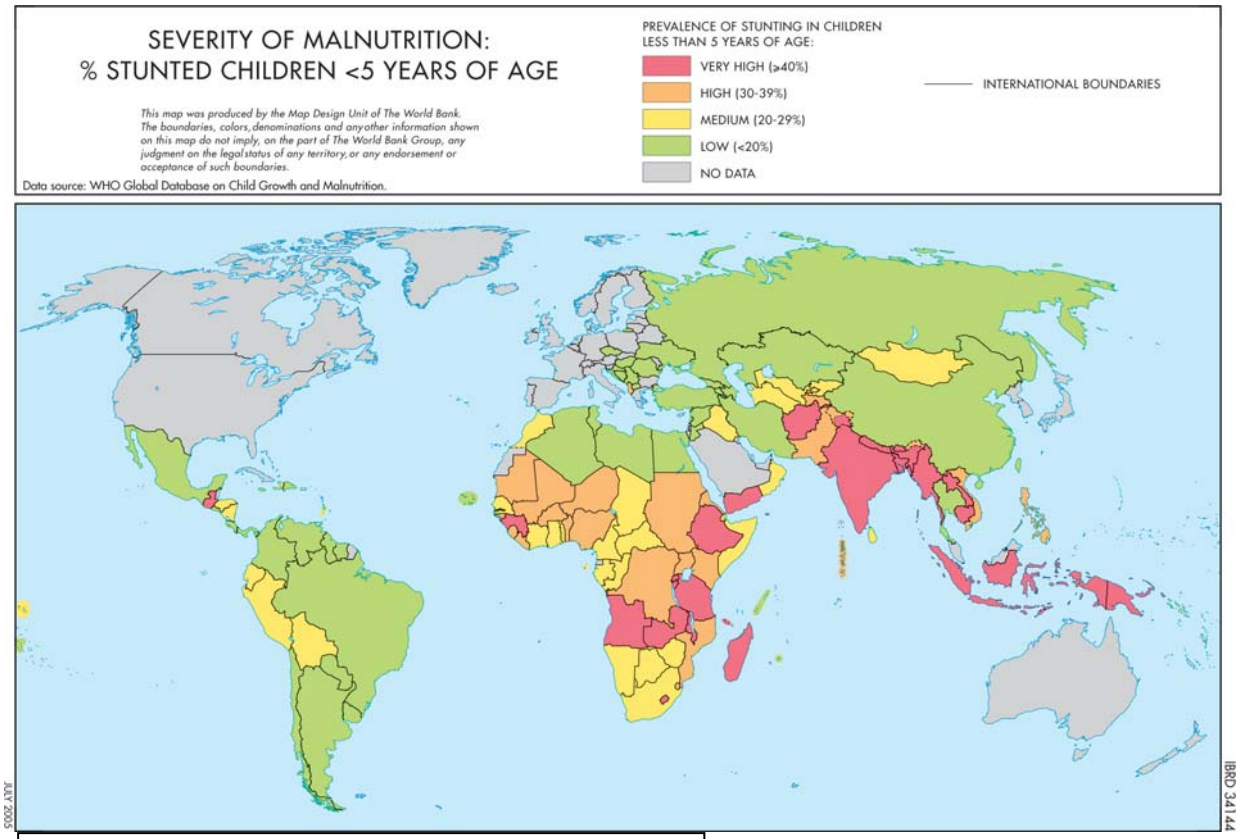
2. Structural and Ideological Gaps that Affect Nutrition Improvement Programs in Sri Lanka. Nimal D. Kasturiaratchi

3. A Review of Previous and Existing Nutrition Programs in Sri Lanka. Sunethra Atukorala

4. The Economic and Health Impact of Undernutrition. Dariush Akhavan

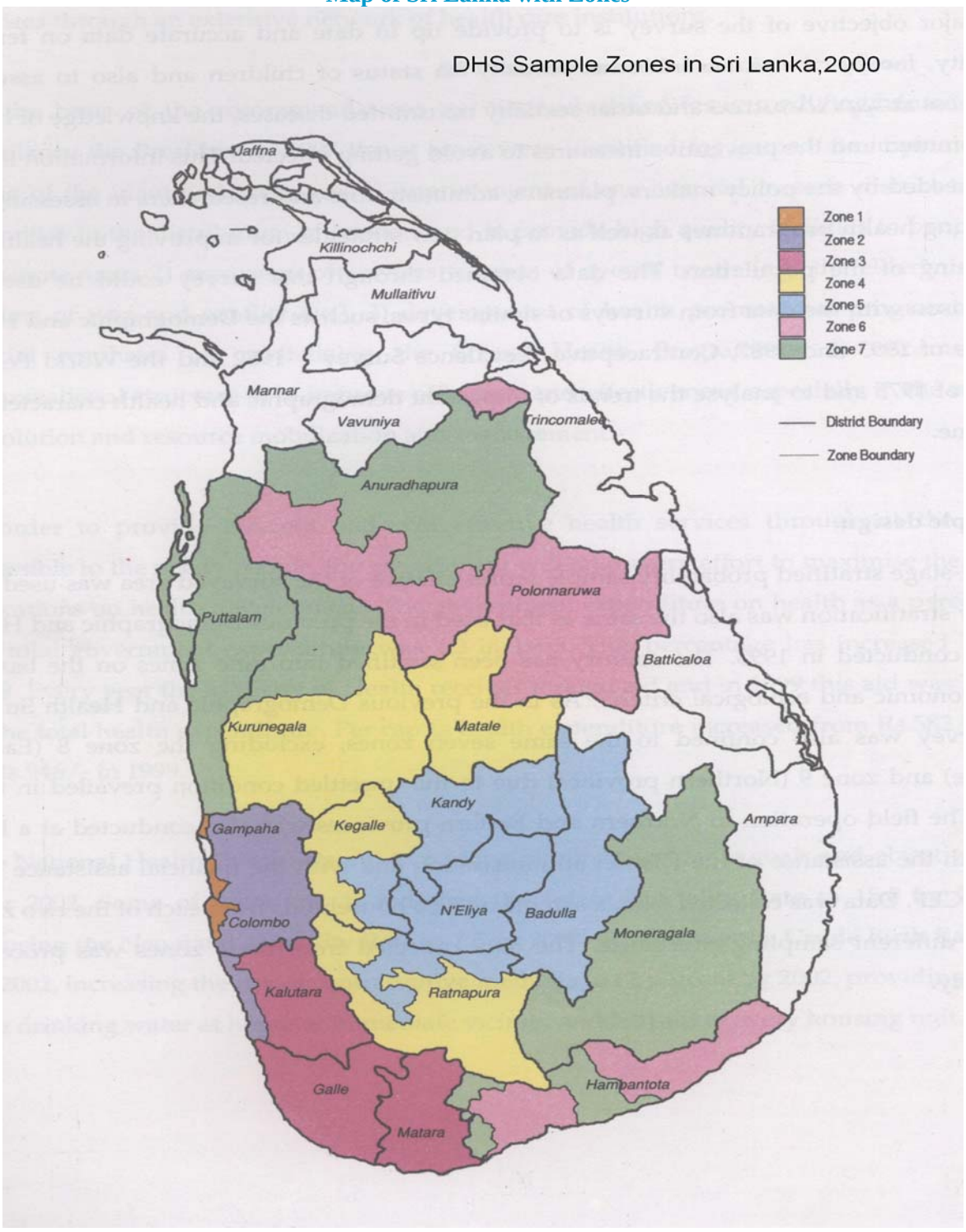
5. Multivariate Analysis of the Causes of Undernutrition in Sri Lanka. Nistha Sinha





Source*:* Repositioning Nutrition, (World Bank 2006).

Map of Sri Lanka with Zones



Nutrition and the MDGs

Goal	Nutrition Effect
Goal 1: Eradicate extreme poverty and hunger.	• Malnutrition represents the "non-income face of poverty."
	• Malnutrition erodes human capital through irreversible and intergenerational effects on cognitive and physical development.
Goal 2: Achieve universal primary education.	• Malnutrition affects the chances that a child will go to school, stay in school, and perform well.
Goal 3: Promote gender equality and empower women.	• Anti-female biases in access to food, health, and care resources may result in malnutrition, possibly reducing women's access to assets.
	• Addressing malnutrition empowers women more than men.
Goal 4: Reduce child mortality.	• Malnutrition is directly or indirectly associated with most child deaths and it is the major contributor to the burden of disease in the developing world.
	• Vitamin A supplementation has the potential to reduce child mortality among deficient populations by as much as 23 percent.
Goal 5: Improve maternal health.	• Maternal health is compromised by malnutrition which is associated with most major risk factors for maternal mortality. Maternal stunting and iron and iodine deficiencies particularly pose serious problems.
Goal 6: Combat HIV/AIDS, malaria, and other diseases.	• Malnutrition may increase risk of HIV transmission, compromise the effectiveness of antiretroviral therapy, and hasten the onset of full-blown AIDS and premature death.
	• It increases the chances of tuberculosis infection resulting in disease, and it also reduces malarial survival rates.

Source: Updated from Repositioning Nutrition (World Bank 2006).

EXECUTIVE SUMMARY

1. The Millennium Development Goals (MDGs) are a set of eight goals that United Nations' member countries have committed to reach by 2015. The first MDG is to eradicate poverty and hunger. Its target is to halve between 1990 and 2015 the proportion of people living on less than $1 a day (a measure of *income poverty*) and the proportion of people who suffer from hunger (a measure of the *non-income face of poverty*). The latter is measured using two indicators: the prevalence of underweight among children under five and the proportion of the population below a minimum level of dietary energy consumption.

2. Although undernutrition represents the "non-income face of poverty," most global and country assessments focus on the income poverty target. Most countries are on track to achieve the poverty goal. A recent MDG study concluded that Sri Lanka may be among the countries to achieve several of the health MDGs, and the income poverty MDG under certain conditions, but not the non-income poverty target (the "nutrition MDG"). Undernutrition in Sri Lanka is very high (29 percent underweight), despite the fact that Sri Lanka has better basic health indicators than most countries with comparable incomes. The maternal mortality rate is 46.9 per 100,000 live births (2001); infant and under-five mortality rates are respectively 13 and 15 per 1,000 live births (2003); and life expectancy at birth is 73 years (2002). These are exceptional achievements for a country with an income level of US$ 930 per capita (2005).

3. The need to address malnutrition has been recognized by the Government of Sri Lanka (GOSL). In 1978, a Food and Nutrition Policy Planning Division was established at the central level, followed later by a Nutrition Coordination Unit. A recent food and nutrition policy for 2004-10 emphasized focusing on the poor and integrating nutrition with other sectoral activities, including health, agriculture, education, economic reform, and rural development. Although the government is developing a new action plan, a coherent programmatic framework is not yet in place.

4. This Analytical and Advisory Activity's (AAA) original goal was to systematically study the complex nutrition situation in Sri Lanka to accomplish three tasks: (1) Inform the GOSL and development partners (including the World Bank) about the causes of the malnutrition enigma and propose strategies to address it; (2) Support the GOSL in preparing an evidence-based programmatic framework to address malnutrition; and (3) Enhance the potential impact of the Bank's current investments in Sri Lanka. Limitations in available data prevented a sufficiently precise analysis of malnutrition's causality. The team did conduct some exploratory analyses which shed some light on these issues and identify potential strategy options. The epidemiological evidence presented in this paper will be useful for GOSL and partners to develop a programmatic framework and enhance the potential impact of current and planned investments in Sri Lankan nutrition. Malnutrition prevention strategies span many sectors, and while this study identifies those sectors, it primarily focuses on developing a programmatic framework for the health sector.

5. The AAA' report structure is as follows:

- Chapter 1 explains the report's background and rationale.
- Chapter 2 documents the levels and trends in Sri Lanka's malnutrition.
- Chapter 3 reviews available data to assess the causes of undernutrition.
- Chapter 4 reviews the characteristics of past and existing nutrition investments.
- Chapter 5 reviews the complex political economy of nutrition in Sri Lanka.
- Chapter 6 explains the costs of undernutrition—both the costs of inaction and the costs of taking action.
- Chapter 7 proposes a way forward based on the reports findings.

6. Sri Lanka is faced with the *double burden of both undernutrition* and *overweight*. Underweight prevalence is still relatively high by global standards (higher than many countries in Sub-Saharan Africa), and Sri Lankan children remain extremely vulnerable during the first two critical years of their lives. At the same time, overweight is on the rise, especially among high-income groups.

7. Stunting and underweight rates among children have fallen between 1993 and 2000 (from 38 to 29 percent for underweight and 24 to 14 percent for stunting). However, *the rates of decline have been greatest among children in wealthy households and those living in Colombo and other urban areas in the Western Province; the unequal rates of decline have increased existing inequities between the rich and the poor. In 1993, a child from the poorest household was 2.8 times more likely to be underweight than a child from the richest household. By 2000, this ratio had increased to 4.1. Increased inequality in stunting is even greater. In 1993, a child from the poorest household was 3.7 times more likely to be stunted. By 2000, this ratio had more than doubled to 7.7.* Undernutrition rates decline steadily with increasing income. However, undernutrition is relatively high even in the third and fourth quintiles. Over 11 percent of children in the highest wealth quintile are underweight, and nearly 20 percent are underweight in the fourth wealth quintile, suggesting that undernutrition continues to plague even the non-poor. Poverty analyses show that as poverty has declined in Sri Lanka, most of the benefits have been concentrated in the Western provinces, leading to a sharp rise in inequities between the Estate sector and other zones/sectors. These important issues need to be carefully considered when designing publicly funded interventions in Sri Lanka.

8. Maternal undernutrition remains high (23 percent) and is a likely cause of child undernutrition; maternal obesity is increasing at the same time. *Inequities are also increasing in this indicator. The difference in the mean BMI (a measure of adult nutrition) between the Estate and urban sectors increased dramatically between 1995 and 2000 from 2.8 to 4.5.*

9. Micronutrient deficiencies, especially anemia (40-60 percent among women and children), and vitamin A deficiency have been identified as problems of public health proportion—especially for a country that has done as well in the health sector. Sri Lanka has achieved high levels of salt iodization (94 percent); the challenge is to sustain these high levels. Collectively, these conditions continue to drain the Sri Lankan economy.

10. Malnutrition includes undernutrition and overweight. Overweight predisposes the population to higher risks of cardiovascular diseases, diabetes, and other noncommunicable diseases (NCDs). Some research, although inconclusive, suggests that children born with low birthweight who show rapid weight gain later in life are more prone to NCDs than those born

with normal weight. Although this report focuses on undernutrition, overweight is identified as an emerging public health problem in Sri Lanka which will impede economic growth if unaddressed. *Over 20 percent of Sri Lankan women are overweight and the trend is increasing*. Unlike undernutrition, overweight is currently concentrated among the relatively well-off.

11. Even with relatively optimistic assumptions about economic growth, it alone is insufficient to meet the MDGs. Projected growth rates for Sri Lanka may not be high enough given low income elasticities of undernutrition. *And because economic growth is not equitable, it is unlikely to benefit those with the worst nutritional outcomes*. Both economic growth and nutritional improvements have benefited the rich households living in urban areas, particularly in the Western province, more than the poor and those living in the Estate areas, increasing inequities sharply. Some evidence indicates that inequalities between ethnic groups are also increasing. *Interventions targeted at these disadvantaged population groups are desirable from an equity and health perspective and also from the perspective of better governance, peace, and political stability.* Without targeted interventions to reduce inequalities within and among the urban, rural, and Estate sectors, economic growth is unlikely to have a significant impact on the poor's nutrition outcomes.

12. Conservative estimates suggest that *undernutrition alone costs Sri Lanka over US$ 1.1 billion in lost productivity and over 230,000 disability-adjusted life years (DALYs) due to undernutrition-related disability and death*. In contrast, the 2005 expenditures on malnutrition-related programs are estimated at a very modest level of *US$ 11.2 million*, over one-third of which is from government resources and the rest from development partners.

13. Many theories have been offered to explain why undernutrition rates remain very high in South Asia compared to Sub-Saharan Africa (the South Asian enigma). These explanations range from the low status of women (and inadequate access/utilization of health services and other resources for women and girls), to low birthweights, high population densities, and poor sanitation. None of these theories have been empirically proven, however. The gender argument is invalid for Sri Lanka since health service utilization and education levels are equally high for both girls and boys. *However, poor sanitation and low birthweights are potential explanations for Sri Lanka* based on available data presented in this study.

14. Undernutrition in Sri Lanka seems to be rooted in household poverty, although it also exists among the non-poor. Poor households are energy deficient, lack dietary diversity, and have limited access to clean water and sanitation. Maternal underweight and household wealth status are the most important predictors of low birthweight, which in turn is the single most important predictor of child stunting and underweight. These effects are amplified by poor child care and feeding practices during the first two years of life, practices which are even worse among the poor.

15. *As is the case in most other countries, undernutrition in Sri Lanka happens in the very early years, and often during pregnancy (leading to low birthweight). This early damage to children's cognitive and growth potential is tragically irreversible.* Interventions must therefore focus on this window of opportunity in a child's life. Health care and access to safe water and sanitation services potentially protect children from disease and undernutrition. High levels of access to health care have helped break this vicious cycle by ensuring that childhood illnesses are treated appropriately. However, access to safe water and sanitation and simple primary health care alone (such as oral re-hydration) are inadequate and could exacerbate the impacts of poverty and poor caring practices on undernutrition.

16. The Government of Sri Lanka's current policy response to malnutrition consists of three broad strategies: direct food assistance programs, poverty reduction programs and the provision of an integrated package of maternal and child health and nutrition services through the Ministry of Healthcare and Nutrition. Smaller programs focused on behavior change and communication also exist. Other national programs aim at reducing micronutrient deficiencies through micronutrient supplementation and food fortification.

17. The political discourse in post-colonial Sri Lanka has led to divergent views about malnutrition, its causes, and potential solutions. Historically, food subsidies, free education and health services, and government employment with social security were the dominant expressions of social justice in post-independent Sri Lanka. *Given this political economy, the policy choices adopted have not always been based on evidence of what works, which has led to several mismatches between policy needs and policy response. For example, the training and skills of health workers focus on a medicalized approach, and success in attaining health goals may have contributed to the adherence to such policies. Similarly, the untargeted food assistance programs may be based on social equity arguments rather than evidence of success*.

18. Though program evaluation data are very limited, a review of the design, implementation, coverage, and potential for impact of the existing programs in Sri Lanka shows that *many programs may not have had significant impact for two reasons. Some programs failed to target the most vulnerable groups in the population* (for example the food supplementation programs aimed at reducing food insecurity such as Thriposha). *Others were under-resourced or ill-equipped to deal with the causes of undernutrition* (for example the Maternal and Child Health Program, which has been unable to address inadequate child care and feeding practices).

19. *The continuing high rates of undernutrition are evidence that new paradigms and policy shifts are necessary now. An improved policy framework for nutrition would involve food assistance and programs to improve child care but would target the four groups to achieve maximal impact: pre-pregnant, pregnant, and lactating women, and children aged 0-3 years*. This will require both changes in the training and skills of front-line workers and program managers, and stronger leadership and political commitment at the highest levels in Sri Lanka. The health sector has followed a medicalized approach combined with hand-outs of supplementary food, a legacy from the social justice era and an unfortunate mismatch. Nevertheless, with the tremendously successful improvements in infant and maternal mortality rates in recent years, *the health system is now poised to maximize a new opportunity to redirect its focus on nutrition. This institutional and political opportunity must be seized.*

20. In defining the way forward, Sri Lanka needs to focus on three key changes to appropriately address malnutrition: (a) Finance a technically correct set of strategies/interventions in an economically justifiable formulation to maximize cost-effectiveness; (b) Ensure a high level of political commitment to sustain these actions; and (c) Identify the appropriate institutional arrangements and develop necessary capacities in these institutions. This study addresses the first issue in some detail. It also touches on the other two issues, but suggests additional strategizing to sustain political commitment and to identify details for institutional arrangements.

21. The study identifies seven key next steps for GOSL and its development partners:

- Addressing undernutrition in Sri Lanka will require sustained efforts from multiple sectors. These efforts must focus on four key issues: (a) *Poverty reduction strategies, specifically designed to reduce income inequalities; (b) Strategies to improve access to safe water and*

sanitation (and good hygiene behaviors): (c) Strategies to reduce food insecurity, especially among the poor in the Estate sector and in rural are;, and (d) Strategies to scale-up direct nutrition interventions in the health sector to fast track achieving the nutrition MDG. These multisectoral inputs need to be coordinated through a National Nutrition Coordination Committee under the prime minister's office with members from relevant ministries, a clear mandate, and a budget to achieve it.

- Complementary strategies to reduce poverty or to improve access to safe water and sanitation must be *specifically designed to reduce inequalities*. Improvements at an aggregate level are insufficient to advance nutrition outcomes in Sri Lanka or to achieve the lagging nutrition MDG. Follow-on work is needed to design such strategies, including potential demand-side innovations such as conditional cash transfers and conditional food transfers which can be implemented as part of community-driven development programs.

- While food assistance programs can act as a social safety net to mitigate the effects of income poverty, the existing food assistance and food supplementation programs must be reviewed through follow-on work to outline *specific next steps for geographic, poverty and age targeting to improve their cost-effectiveness and potential for impact* on nutrition. The cost effectiveness of the Thriposha program, for example, can vary from a low of 9.6 in the metropolitan Colombo area to a high of 23.2 in the Estate sector. The potential for linking some of these food programs with community-driven development programs needs to be explored.

- *For the Estate sector, a special strategy must be implemented to address the high levels of undernutrition*. This strategy should focus on the following key issues: (a) Transfer the delivery of basic social services (including health and nutrition) from the Plantation Human Development Trust to the provincial government in consultation with the line ministry; (b) Design poverty reduction strategies to specifically address the inequities in the Estates; (c) Scale-up the lessons from the Early Childhood Care and Development Project to increase community participation and utilization of health and nutrition services among estate workers; and (d) Prioritize the delivery and quality of priority services (list outlined under Option A in Table 7.2) to populations in the Estate sector.

- In the medium- to short-term, Sri Lanka will benefit from *scaling-up a select set of very carefully targeted direct nutrition interventions via the health sector. Three options are presented in the study for scaling-up a nutrition package through Sri Lanka's health sector,* starting with a very basic intervention package targeted to maximize cost-effectiveness and the potential for impact. The proposed package options aim to strengthen information, education, and communication programs targeted to the entire population. *Enhanced knowledge and information will likely suffice to improve nutrition outcomes among the non-poor, conserving larger public resources to target the poor with more resource-intensive direct nutrition interventions* such as anemia control and targeted supplementary feeding for the poor. Operationalizing these recommendations through the health sector will require an investment of at least US$ 20 million annually, plus costs to develop institutional capacity, monitor and evaluate, and to sustain political will. GOSL needs to adapt and adopt such a programmatic framework for the health sector (with a special strategy for the Estate sector), and development partners need to support the GOSL's plan.

- Whatever GOSL adopts as the final combination of interventions/strategies, they must include a *strong monitoring and evaluation component* to help identify what strategies are working and which may need mid-course corrections. Identifying and documenting the more

successful strategies will further strengthen political commitment for the right interventions and sustain these programs.

- The following *additional studies should be conducted* with support from development partners and the World Bank: design of poverty reduction strategies to reduce inequities; redesign food assistance programs so they are better targeted and more cost-effective; follow-on work for the integration of nutrition interventions in to health sector strategies; and additional analyses on the costs, causes, and strategies to address the emerging epidemic of overweight. In addition, further surveys and studies are needed to strengthen causal inferences about the continuing enigma of malnutrition in Sri Lanka.

1. INTRODUCTION

This chapter explains the rationale for undertaking an analysis of malnutrition in Sri Lanka and outlines the report's structure.

1.1. RATIONALE

The Millennium Development Goals (MDGs) are a set of eight goals which United Nations' member countries are committed to reach by 2015. The first MDG is to eradicate poverty and hunger. Its target is to halve between 1990 and 2015 the proportion of people living on less than $1 a day (a measure of income poverty) and the proportion of people suffering from hunger (a measure of the non-income face of poverty). The latter is measured using two indicators: the prevalence of underweight among children under five and the proportion of the population below a minimum level of dietary energy consumption.

Though undernutrition represents the "non-income face of poverty," (*Repositioning Nutrition*, World Bank 2006) most global and country reports assessing progress toward the MDGs focus on the income poverty target and conclude that most countries are on track to achieve the poverty goal. The MDG report indicated that Sri Lanka may be among those countries that will achieve several of the health MDGs and under certain conditions,[1] potentially the income poverty MDG. It will not, however, reach the non-income poverty target (also referred to as the "nutrition MDG").

A recent report, "Attaining the Millennium Development Goals in Sri Lanka," notes that child undernutrition in Sri Lanka is very high despite Sri Lanka's basic health indicators, which are better than most countries with comparable per capita incomes. The maternal mortality rate is 46.9 per 100,000 live births (2001); infant (under one year of age) and under-five mortality rates in Sri Lanka are respectively 13 and 15 per 1,000 live births (2003); and life expectancy at birth is 73 years (2002). These are exceptional achievements for a country with a per capita income level of US$ 930 (WDI 2005). However, Sri Lanka faces an unfinished agenda of undernutrition. Underweight and stunting rates among children aged 0-5 years are respectively 29 percent and 14 percent. These are much higher rates than those reported for countries with lower gross national product (GNP) per capita. A key underlying factor for these high rates is maternal undernutrition,

[1] The MDG report's simulation predicted that Sri Lanka attainment of the poverty MDG is plausible but only if the country maintains "strong economic growth, continued expansion of male and female schooling, sustained improvement in infrastructure (particularly electricity coverage), and prevents income and consumption inequality from rising, in the years ahead."

which remains intractable despite some efforts to improve the nutritional status of women. Micronutrient deficiencies also are high.

Adults suffer from the double burden of undernutrition and overweight. In 2000, 21.8 percent of married women were undernourished, while 24 percent were overweight (Department of Census and Statistics 2002). The distribution of adult malnutrition also varies widely across urban and rural areas. Diet and obesity-related noncommunicable diseases (NCDs) are quickly emerging. For instance, the number of cases of diabetes tripled between 1980 and 2002. The trend of increasing noncommunicable diseases will likely be aggravated by the anticipated continuous changes in lifestyles and an increasingly aging population.

Malnutrition and income poverty are highly correlated and perpetuate each other. To break this vicious cycle, investing optimally in nutrition is imperative. Income is one of the key determinants influencing a household's decision to adequately invest in its children's nutrition (Behrman and Deolalikar 1988; Strauss and Thomas 1995). Studies show that nutrition is strongly associated with improved cognitive development and physical productivity, both of which enhance an individuals' income earning potential in adulthood. Yet, despite the large private returns associated with improved nutritional status, parents often fail to invest optimally in their children's nutritional status. Parents' inadequate investment in nutrition is possibly due to a lack of information about the magnitude of the return on their investment or knowledge about the types of inputs necessary to promote better nutrition. This market failure argument provides the economic rationale for large-scale public investments to promote health and nutrition. Significant externalities associated with nutritional interventions—such as resource savings for the health sector because of the reduced incidence of noncommunicable diseases—provide an additional rationale for public investments in nutrition.

Public investment in nutrition is further justified because nutrition programs are relatively inexpensive to implement and cost-benefit ratios for many interventions are low. Development partners would see large returns by investing in combating child undernutrition. The recent Copenhagen Consensus ranked investments in micronutrients as producing higher returns than those for trade liberalization, malaria control, or water and sanitation. Only controlling HIV/AIDS produces higher returns than micronutrient investments (Behrman, Alderman and Hoddinott, 2004.) And nutrition programs benefit the poor in particular because the prevalence of undernutrition is often two or three times higher among the poorest income quintile than among the richest quintile. Introducing income-earning opportunities to raise the poor's living standards will result in limited benefits unless the beneficiaries are healthy and well-nourished enough to take advantage of the opportunities.

1.2. REPOSITIONING NUTRITION AS CENTRAL TO DEVELOPMENT: A STRATEGY FOR LARGE-SCALE ACTION

Repositioning Nutrition as Central to Development: A Strategy for Large-Scale Action (World Bank 2006) concludes that governments and development partners must first increase their investments in nutrition in developing countries. Second, those investments must focus on maternal and child programs beginning during pre-pregnancy through the first two years of a child's life, a critical "window of opportunity" to prevent the irreversible damage which contributes to a life of poor nutrition. The case for large-scale action derives from evidence indicating that the scale of the problem is very large, and nutrition interventions are essential to speed poverty reduction. Such action can in fact improve the nutrition of the population much faster than economic growth alone. Improved nutrition can actually drive economic growth.

The Government of Sri Lanka (GOSL) and the World Bank both recognize the need to address malnutrition. The GOSL established the Nutrition Policy Planning Division in 1978, followed by the creation of a Nutrition Coordination Unit. The government recently developed a food and nutrition policy for 2004-2010.[2] However, 30 years later a coherent policy with active programs is not yet in place. The GOSL has implemented several direct activities and interventions targeting women and children but they have not reduced undernutrition. Since the early 1990s, several World Bank-funded projects in Sri Lanka have included nutrition activities (Appendix Table 1). Project documents suggest that the implementation and the results of these earlier investments were mixed, primarily due to implementation, design, and targeting issues.[3]

The original goal of this Analytical and Advisory Activity (AAA) was to systematically study the complex nutrition situation in Sri Lanka to accomplish three tasks: (1) to educate the GOSL and its development partners (including the World Bank) about the enigmatic causes of malnutrition in Sri Lanka and propose strategies to address it; (2) to support the GOSL in preparing an evidence-based programmatic framework to address malnutrition; and (3) enhance the potential impact of the Bank's current investments in Sri Lanka. Although limitations in available data prevented a precise examination of malnutrition's causality, initial exploratory analyses have shed some light on its causes and potential strategies to address it. While this study identifies the many sectors that malnutrition prevention strategies span, it primarily focuses on developing a programmatic framework for the health sector.

This report seeks to assist GOSL in two ways: (1) by providing evidence-based nutrition analysis to incorporate into the design of a new national programmatic framework; and (2) by enhancing current investments in the country by providing information on the dimensions, costs, and causes of undernutrition and examining the effectiveness of existing policies. The Bank commissioned the following four background papers for this study:

1. Scale, Scope, and Causes of Undernutrition in Sri Lanka
2. Cost-Benefit Analysis of Investments in Nutrition in Sri Lanka
3. Review of Nutrition-Relevant Programs in Sri Lanka
4. Review of the Political Economy of Nutrition in Sri Lanka.

The present study builds on two recent reports about the status of child undernutrition in Sri Lanka, one done by the World Bank and the other by the Medical Research Institute of the Ministry of Healthcare and Nutrition in Sri Lanka. The World Bank study, "Attaining the Millennium Development Goals in Sri Lanka (World Bank, 2005a) (the MDG Report), found that child undernutrition in Sri Lanka is very high despite Sri Lanka's basic health indicators which are better than most countries with comparable per capita incomes.

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[2] By the Office of the Advisor to the Prime Minister on Sustainable Development and Chairman of the Inter-Ministerial Committee on Food Security in March 2, 2004.

- [3] The Health and Family Planning Project piloted a special program in nutrition which "achieved no significant impact and was cancelled."
- The Poverty Alleviation Project supported a Nutrition Fund which was successfully implemented and achieved wide coverage and good beneficiary targeting. However, support for the production of supplementary food, known as *Thriposha,* was unsuccessful and was discontinued before the end of the project.
- The Health Services Project aimed to substantially reduce child malnutrition, low birthweight and anemia, and to eliminate iodine deficiency diseases. Overall output was "unsatisfactory."

The report published by the Ministry of Healthcare and Nutrition, "Child Undernutrition in Sri Lanka: a Causal Analysis" (Medical Research Institute 2006, hereafter referred to as the MRI Study), identified low birthweight as the most significant predictor of child undernutrition and parental education, socioeconomic status, and hygiene practices as potential causal variables.
This study goes beyond the existing work by focusing on trends and inequities in nutrition outcomes, including micronutrients. Despite endogeneity problems in the available data sets, the presented multivariate analyses is a considerable improvement over bivariate analyses and some of the multivariate analyses of undernutrition correlates in Sri Lanka. The report attempts to explore the enigma of undernutrition in Sri Lanka and provide an analysis of the mismatch between nutrition goals and existing policies. The last chapter summarizes the findings and proposes recommendations for the next steps and the way forward.

1.3. STRUCTURE OF THIS REPORT

The introduction provides the background and rationale for this work. Chapter 2 assesses the status of undernutrition in Sri Lanka and documents the levels and trends in undernutrition and distribution across socioeconomic status, gender, age, and geographic region. It also provides regional and international comparisons of nutrition indicators. Chapter 3 contains an exploratory analysis of the possible causes and determinants of undernutrition. Chapter 4 reviews the characteristics of past and present undernutrition interventions, assesses their effectiveness, and discusses the mismatch between interventions and causes. Chapter 5 presents the policy interventions described in Chapter 4 in the context of the political economy of nutrition, and provides analysis for future policies in this sector. Chapter 6 focuses on the economic cost of undernutrition relative to the cost of addressing nutrition issues. Chapter 7 includes recommendations for future policy and spending priorities for improving nutrition in Sri Lanka.

2. DIMENSIONS OF MALNUTRITION

This chapter describes the many dimensions of malnutrition in Sri Lanka. Undernutrition remains a problem of public-health proportions, despite lower rates than its South Asian neighbors. While prevalence rates have declined in recent years, the reduction was greater among the population's better-off groups thereby leading to greater inequities. Thus, despite impressive economic growth and improvements in other social sectors, Sri Lanka's inequalities in undernutrition have worsened in the last decade. Undernutrition is highest among rural and Estate-sector populations and among Sri Lankan and Indian Tamils. The prevalence of overweight is also rising among specific population groups. Micronutrient deficiencies are moderately high by regional standards and still represent a public health problem. These issues collectively constrain Sri Lanka's economic growth.

This chapter documents the levels and trends among Sri Lankan women and children in undernutrition (protein-energy malnutrition and micronutrient deficiencies). Sections 2.1 and 2.2 present the evidence on protein energy malnutrition among children and women of reproductive age. Section 2.3 examines the available evidence on micronutrient deficiencies. Section 2.4 discusses whether Sri Lanka can attain the nutrition MDGs by 2015. Section 2.5 presents patterns and trends in overweight, an emerging but critical problem, and discusses Sri Lanka's double nutrition burden.

Data used in this chapter are drawn primarily from the Sri Lanka Demographic and Health Surveys (DHS) conducted in 1987, 1993, and 2000.[4] Each survey reported on three key indicators of child nutritional status based on anthropometric measurements (weight and height).[5] These indicators are used to assess the levels and trends of child undernutrition in the country. Data on micronutrient deficiencies unavailable from the DHS were obtained from other surveys and existing studies.

[4] The authors acknowledge that the available data may not reflect the most current trends. Sri Lanka's DHS 2007 is still in the field, and results are not expected until late 2007. DHS 2000 therefore represents the most current set of available data. The 2003 UNICEF Survey on Child Welfare and Health data were not available.

[5] The terms "underweight," "stunting," and "wasting" are measures of protein-energy undernutrition used to describe children who have weight-for-age Z-score (WAZ), height-for-age Z-score (HAZ), and weight-for-height Z-score (WHZ) greater than two standard deviations (<2SD) below the median value of the reference group (NCHS/WHO 1978). The Z-score is calculated as the deviation of an individual's physical measurement from the median value of a reference population as a ratio of the standard deviation of the reference population. Children whose Z-scores are more than 2SD below the reference median are referred to as having moderate undernutrition; children whose Z-scores are more than 3SD below the reference median are referred as having severe undernutrition. In this report, "undernutrition" refers to combined moderate and severe undernutrition, except where stated otherwise.

2.1. CHILD UNDERNUTRITION

2.1.1. Overview

In 2000, 29.4 percent of Sri Lankan children aged 0-5 years were underweight, a "high" level of prevalence by WHO standards (Table 2.1). The prevalence of wasting among the same age group was 14 percent, also classified as "high" by WHO. Stunting affected 13.5 percent of children, a relatively lower level of prevalence.

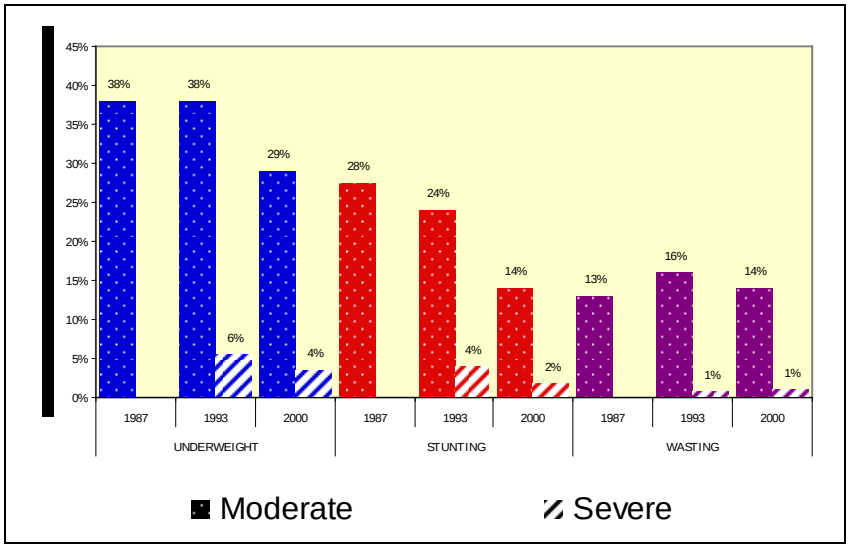
Table 2.1 *Public Health Significance of Undernutrition in Sri Lanka*

WHO Classification *(prevalence %)* **(Global)**				
	Low	**Medium**	**High**	**Very High**
Stunting	<20	20-29	30-39	≥ 40-49
Underweight	<10	10-19	20-29	>30
Wasting	<5	5-9	10-14	>15
Sri Lanka National Data *(prevalence %)*				
Stunting	13.5			
Underweight			29.4	
Wasting			14.0	

Source: WHO and authors' calculations from Sri Lanka DHS 2000.

Between 1987 and 2000, underweight and stunting rates declined significantly, while wasting rates remained relatively unchanged (Figure 2-1). Underweight rates declined by approximately 25 percent from "very high" to "high" according to WHO's classification. More importantly, stunting, a measure of longer term undernutrition, declined by approximately 75 percent, from being classified as "high" to "low." Severe undernutrition among children is rare in Sri Lanka, and the prevalence of severe stunting also declined substantially between 1993 and 2000.[6] The prevalence of severe underweight also fell, but to a lesser extent than severe stunting.

Figure 2.1. Overall Prevalence and Trends in Undernutrition among Children (0-5 years) in Sri Lanka, 1987, 1993, and 2000



Source: Sri Lanka DHS surveys 1987, 1993, and 2000.

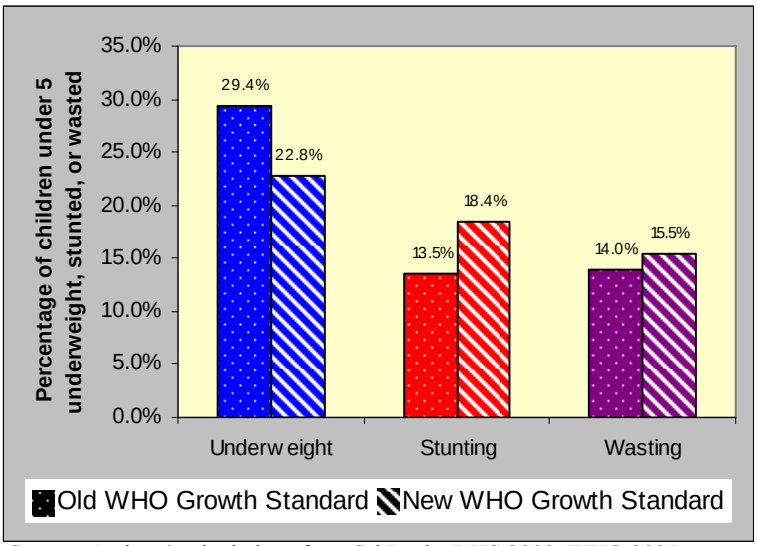
[6] Data on severe stunting were not collected in 1987.

2.1.2. New WHO Growth Standards: How Do They Affect Sri Lanka's Undernutrition Rates?

WHO recently introduced new standards to measure children's growth based on the growth patterns of breast-fed children in five countries: Brazil, Ghana, India, Norway, and the United States (WHO 2006). The new standards are more appropriate for global comparison; the older growth references were based only on the growth of children in the United States.

A revised analysis of undernutrition rates in Sri Lanka using the new standards shows a small difference between the estimation of undernutrition based on the old (NCHS) versus new standards for the year 2000 (Figure 2.2). Applying the new standards to Sri Lanka, stunting rates increase and underweight rates decrease, while wasting rates remain at similar levels; this reflects the results for other countries. The authors were unable to do similar analysis for the previous years (1987 and 1993) or for other countries. Therefore, the remainder of this study uses the old growth standards with the exception of section 2.1.10, in which the authors show similar analyses using the new WHO standards at disaggregated levels.

Figure 2.2. Prevalence of Undernutrition among Children Under Five in Sri Lanka according to New and Old WHO Growth Standards



Source: Authors' calculations from Sri Lanka DHS 2000, WHO 2005.

2.1.2. International Comparisons

Compared to other countries in South Asia (for which comparable data are available), Sri Lanka has the lowest prevalence of underweight (Figure 2-2). This is consistent with the fact that Sri Lanka has the highest gross national income (GNI) per capita in the region, lowest maternal, infant and child mortality rates, and highest life expectancy. However, compared globally to other countries with similar national income levels and performance of health and population indicators, Sri Lanka's nutrition achievements are far less satisfactory.

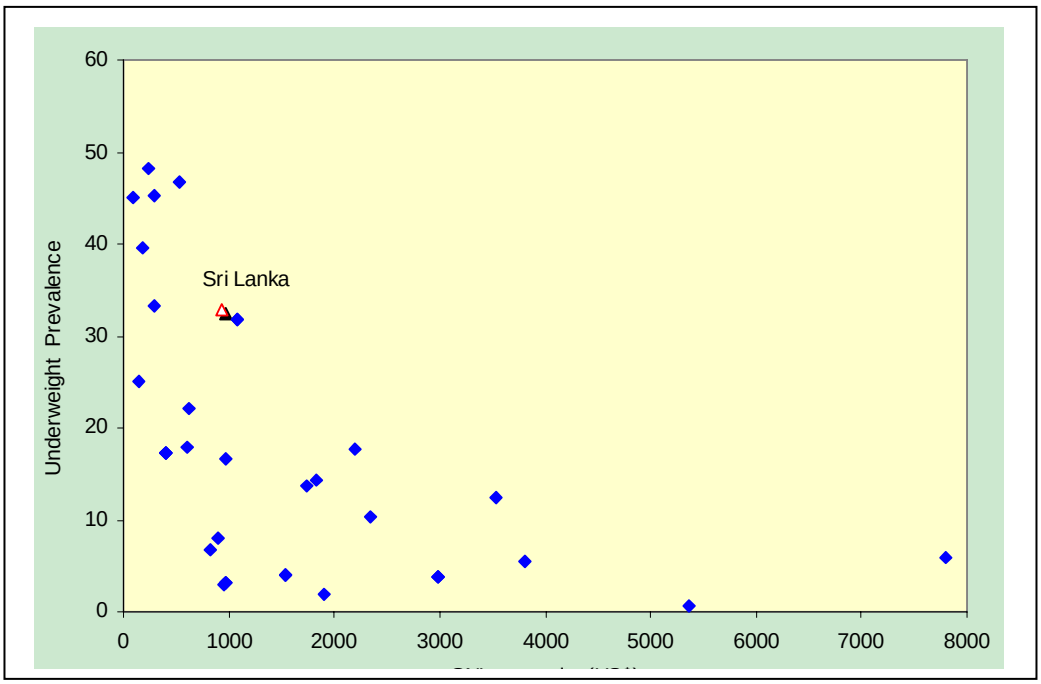
Table 2.2. Health and Nutrition Indicators for South Asia, 2005

Country	*IMR (per 1,000 live births)*	*MMR (per 100,000 live births)*	*GNI per capita (US$)*	*Life Expectancy (years)*	*Adult Literacy (%)*	*LBW (%)*	*Underweight (%)*
Bangladesh	46	380	400	62	40	30	52.2
India	63	540	540	63	57	30	46.7
Nepal	61	740	240	60	42	21	48.3
Pakistan	74	500	520	64	43	25	35.0
Sri Lanka	13	92	930	73	92	22	29.4
South Asia	**66**	**567**	**510**	**63**	**54**	**29**	**48.4**

Source: World Bank, 2005b.
Note: Underweight and stunting rates for Sri Lanka are based on Sri Lanka DHS 2000 (Department of Census and Statistics 2002).

Many countries with a similar level of GNI per capita have significantly lower underweight prevalence than Sri Lanka. While higher per capita incomes among this group generally correlate with better nutritional outcomes among the population, no clear pattern exists in the relationship between national income levels and undernutrition. A range of undernutrition rates exist at any particular level of GNI per capita (Figure 2.3), suggesting that factors beyond income may have a causal role in undernutrition.

Figure 2.3. Child Underweight Prevalence and Per Capita Income in Countries



Source: World Development Indicators 2005.

In most countries, good performance in health and population indicators is generally accompanied by good nutritional outcomes, making Sri Lanka somewhat of an exception and an enigma of sorts. Comparison of health and nutrition indicators among a group of lower-middle and middle-income countries shows that countries that have health indicators similar to Sri Lanka's generally have better nutritional outcomes than Sri Lanka (Table 2.3). The question therefore arises as to how Sri Lanka attained good health outcomes despite low per capita income levels and why nutritional outcomes did not keep pace.

Sri Lanka achieved good health outcomes largely by ensuring the population high levels of access to affordable, quality public sector health services and high education rates which facilitated use of these services. Nutritional outcomes did not improve as rapidly because access to health services is but one of many inputs needed to improve nutrition outcomes (Chapter 3). Table 2.3 shows that countries with health outcomes similar to Sri Lanka's generally have higher national incomes per capita and spend a larger proportion of their national income on health. Countries whose level of health spending is similar to that of Sri Lanka's are characterized by lower levels of GNP per capita and considerably worse infant mortality rates (IMRs) than Sri Lanka. Constant productivity improvements in Sri Lanka's public health sector over the years have made it possible to keep health expenditures low and universal health care coverage affordable, even at relatively low levels of GNP per capita (Hsiao and Institute of Policy Studies, 2001). In the absence of high levels of health care coverage, it is highly likely that Sri Lanka's nutritional outcomes would have been worse because the effects of inadequate dietary intake and poor childcare practices would have been exacerbated by disease. Access to health services helped Sri Lanka avoid the extremely poor nutritional outcomes seen elsewhere in South Asia. However, without other inputs, such as increased nutrition security, good childcare practices, and access to clean water and sanitation necessary to reduce undernutrition, nutrition outcomes could not have kept pace with improvements in health. The next chapter examines the role of the health sector.

Table 2.3. International Comparisons of Health and Nutritional Outcomes, Expenditures, and GNP Per Capita

	GNI per capita (US$)	*Health Expenditure (% of GNI)*	*IMR (per 1000 live births)*	*Underweight (%)*	*Stunting (%)*
Sri Lanka	930	3	13	29.4	13.5
Cambodia	310	11	97	45.2	44.6
Haiti	400	7	76	17.2	22.7
India	540	5	63	46.7	44.9
Cameroon	630	5	95	22.2	29.3
Ukraine	970	6	15	3.2	15.9
Philippines	1100	3	27	31.8	32.1
Bosnia and Herzegovina	1610	10	14	4.1	9.7
Serbia and Montenegro	1930	9	12	1.9	5.1
Jamaica	3090	5	17	3.8	4.4
Botswana	3500	7	82	12.5	23.1

Source: World Bank 2005b, 2006.
Note: Underweight and stunting prevalence (%) are reported for children under-five years of age based on Sri Lanka DHS 2000 (Department of Census and Statistics 2002).

2.1.3. Patterns and Trends in Child Undernutrition in Sri Lanka: Disaggregated Perspective

Overall trends in child undernutrition mask large variations in rates of change between 1987 and 2000, and across regions and different socio-demographic groups. The remainder of this section disaggregates the national levels and trends of undernutrition by age and gender, ethnicity and religion, location of residence, socioeconomic status, and maternal education. This analysis will help to identify the subgroups in the population that have not benefited from the wider, national decline in undernutrition and should therefore be targets for any future interventions in nutrition.

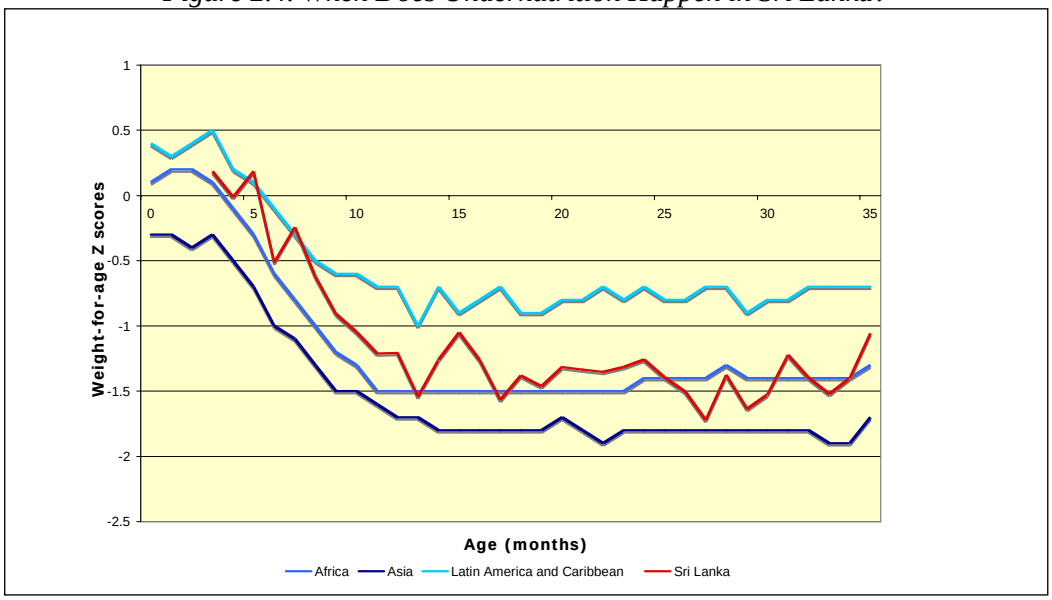
Note on Data for 1987

The 1987 DHS sampled only children aged 3-35 months; while the 1993 and 2000 DHS surveys included children aged 3-59 months. As shown below, the prevalence of undernutrition in all surveys is concentrated among younger children. As a result, data on the prevalence of undernutrition from the 1987 survey and the 1993 and 2000 surveys may not be directly comparable. Comparisons across all three surveys were provided in the section above to provide a sense of the longer term malnutrition trends in Sri Lanka. However, only data from the 1993 and 2000 surveys will be used for the remainder of this study, unless otherwise specified.

2.1.4. Variation by Age: Growth Retardation

The age-wise pattern of undernutrition is an important dimension of the problem in Sri Lanka, as it is elsewhere in the world. Growth retardation begins early in life, and most early damage is irreversible (WHO 1995). Most growth faltering occurs during pregnancy. Nearly 17 percent of Sri Lankan children are born with low birthweights. The rest of the damage happens during the first two years of life. Much of the growth retardation has taken place by 24 months (Figure 2.4). The period from pregnancy through the first two years of life is therefore the "window of opportunity" to target policies and interventions at undernutrition to achieve the greatest impact (World Bank, 2006). Data from Figure 2-4 also reiterates the unusual fact that the growth trajectory of Sri Lankan children is similar to that for children from Africa and is much poorer than that for children from Latin America and the Caribbean.

Figure 2.4. When Does Undernutrition Happen in Sri Lanka?



Source: Updated from *Repositioning Nutrition* (World Bank 2006). Sri Lanka data from DHS 2000.

Stunting rates fell substantially across all age groups between 1993 and 2000 (Figure 2.4). Underweight rates also declined but to a lesser extent. Analysis of data from all three surveys revealed that the height-for-age Z score increased overall by approximately half a standard deviation from one survey to the next, indicating a sizable improvement in children's height over time. Weight-for-age Z scores also improved over that period but by a lesser magnitude, which explains why the mean weight-for-height Z score has remained relatively unchanged.

Table 2.4. Prevalence and Trends in Undernutrition among Children aged 0-5 years by Age Group in Sri Lanka

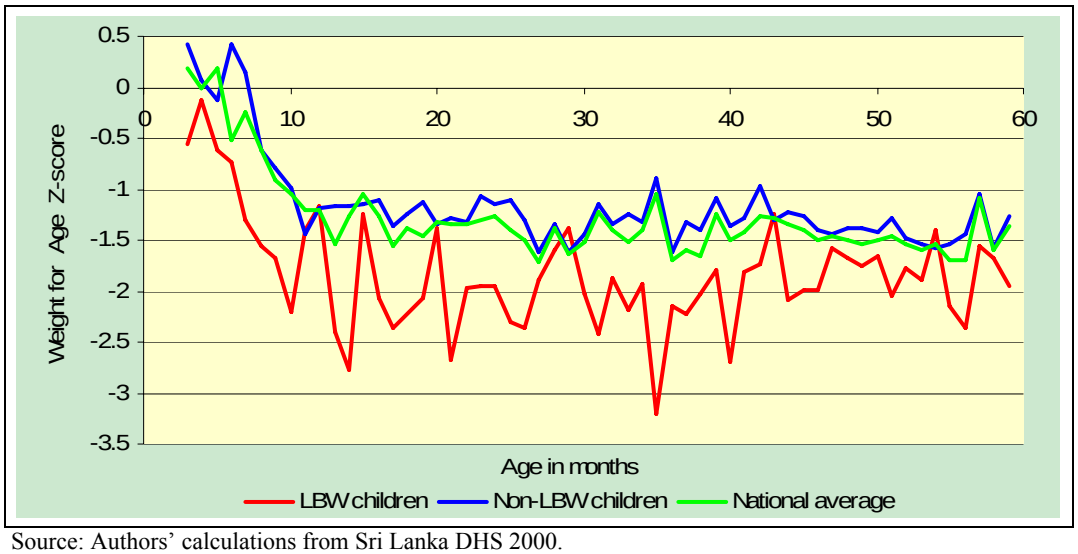
Age Group	*Underweight (%)*		*Stunting (%)*		*Wasting (%)*	
	1993	*2000*	*1993*	*2000*	*1993*	*2000*
3-5 mo	5.8	0.7	4.9	3.9	3.1	1.3
6-11 mo	17.9	20.2	11.8	5.7	6.8	10.3
12-23 mo	36.3	28.8	25.7	16.2	18.2	18.2
24-35 mo	42.4	34.0	23.8	12.4	15.1	13.3
35-47 mo	46.7	30.7	27.5	13.4	18.2	13.9
48-59 mo	43.0	37.9	28.7	19.1	17.6	15.9

Source: Authors' calculations from Sri Lanka DHS 2000 and 1993.

2.1.5. Low Birthweight

The incidence of low birthweight continues to be a major problem in Sri Lanka. In 2003, 16.6 percent of children were born with low birthweight (Medical Research Institute, 2006). Children born with low birthweights continue to grow at lower weights for their age for the rest of their lives. Although the weight-for-age of all children starts to decline at approximately six months of age, low birthweight children never catch up in weight with other children. This suggests that there is a high degree of association between low birthweight and child undernutrition in Sri Lanka.

Figure 2.5. Children Born with Low Birthweights Track Lower for the Rest of Their Lives in Sri Lanka



Source: Authors' calculations from Sri Lanka DHS 2000.

2.1.6. Girls Do Just as Well as Boys in Sri Lanka and Gender Disparities are Declining

Gender disparities in undernutrition rates in Sri Lanka are not as large as elsewhere in South Asia. Furthermore, gender disparities in undernutrition have declined over time and have benefited girls more than boys. In 2000, underweight prevalence was the same among boys and girls, and stunting prevalence was slightly higher among girls than boys (Table 2.5). In India, the national rate of decline in the prevalence of underweight among boys was 2.3 times that of girls (Gragnolati and others, 2006). By comparison, Sri Lanka's rate of decline in underweight for boys was 0.54 times that for girls. However, the decline in stunting has been greater for boys than for girls.

Table 2.5. Prevalence and Trends in Undernutrition among Children Aged 0-5 Years, by Gender in Sri Lanka

	Underweight		*Stunting*		*Wasting*	
	Male	*Female*	*Male*	*Female*	*Male*	*Female*
1993	34.8	40.9	22.7	25.1	15.6	15.4
2000	29.0	29.9	11.9	15.3	15.1	12.6
% change	16.7	26.9	47.6	39.0	3.2	18.2

Source: Authors' calculations from Sri Lanka DHS 2000.

2.1.7. Variation by Geographic Location: Estate Sector Is Not Doing Well

The *region* and *sector* of residence are important determinants of child nutritional status. In Sri Lanka, a distinction is made between Colombo metropolitan and other urban sectors and the rural and Estate sectors. The Estate sector is different from most other parts of the country because its population of plantation workers—most of them descendents of indentured labor brought from India in the early 1900s—is one of the most marginalized groups in the country (World Bank, 2007b). The *region* of residence refers to the nine zones in the DHS surveys.[7] This zonal classification is based on socioeconomic, agro-climatic and geographic criteria and is used to capture relatively homogenous population subgroups. Malnutrition rates by sector and region of residence are presented below.

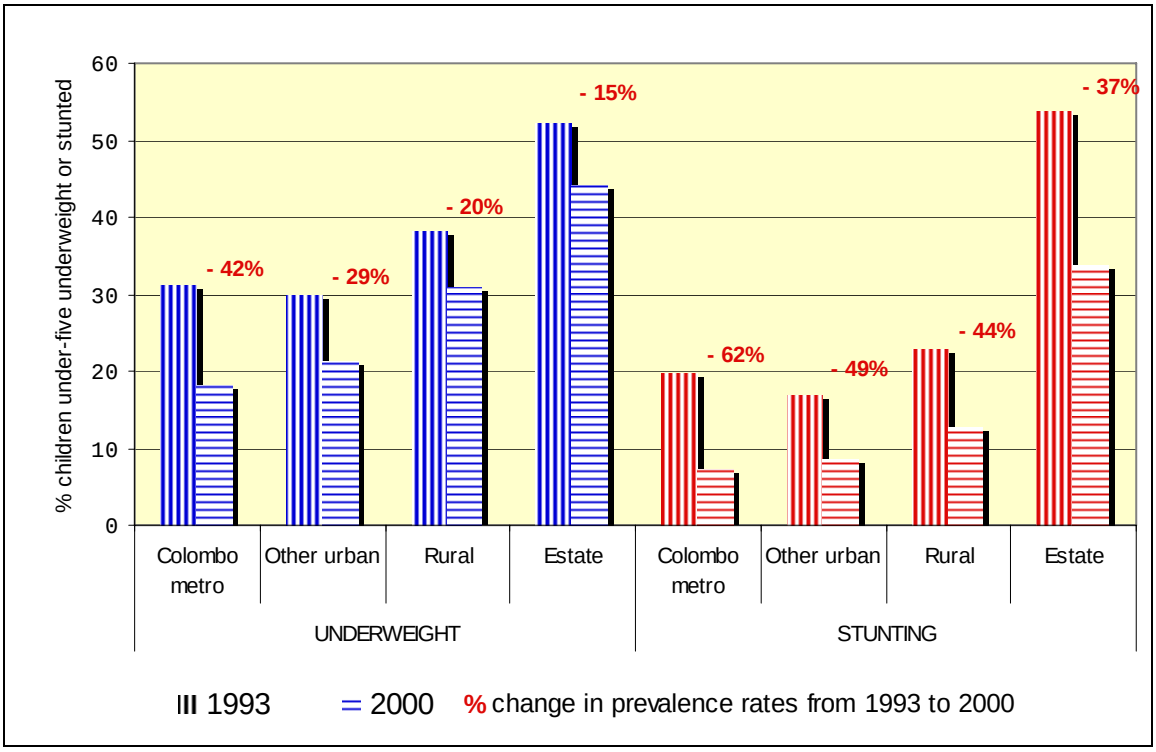
Undernutrition (underweight and stunting) declined across all sectors in Sri Lanka between 1993 and 2000, but by varying degrees in each of the different sectors (Figure 2.6). The greatest relative decline in both underweight and stunting rates occurred in the Colombo Metro sector, the sector with the highest per capita incomes and one that has experienced significant economic growth in recent years. In the Estate sector, stunting rates have declined substantially by 37 percent but still remain much higher than other sectors. Underweight prevalence declined much more slowly in the Estate sector, which explains why wasting rates increased slightly between 1993 and 2000. The performance of the Estate sector in nutrition outcomes is consistent with the performance of this sector in health outcomes. Health and nutrition indicators in the Estate sector, although still relatively poor compared to national levels, have improved in recent years in line with general improvements in income and education levels (Department of Census and Statistics 1996, 2002). This is discussed in greater detail in Chapter 3.

The regional distribution of undernutrition rates mirrors the sector-wise distribution. That is, Zones 4, 5, 6, and 7, in which the rural and Estate populations are concentrated, have the highest rates of both underweight and stunting (Appendix Table 2 and Appendix Table 3). The rate of decline was also relatively high in these four regions, although the largest decline was in Zone 1 (Colombo Metropolitan area). Predictably, child malnutrition is considerably higher in the war-affected Northern and Eastern provinces (underweight prevalence of 46 percent) than in the rest of the country (World Bank, 2005a).[8] Data from these two provinces are not included in (Appendix Table 2).

[7] Zone 1-Colombo Metropolitan area (part of Colombo and Gampaha districts); Zone 2-Colombo feeder areas (part of Colombo, Gampaha, and Kalutara districts); Zone 3-southwestern coastal lowlands (Galle and Matare districts, part of Kalutara district); Zone 4-lower-central hill country (Matale district, part of Kurunegala, Kegalle, and Ratnapura districts); Zone 5-south-central hill country (Badulla, Nuwera Eliya, and Kandy districts, part of Kegale and Ranapura districts); Zone 6-irrigated dry zone (Polonnaruwa district, part of Anuradhapura and Hambantota districts); Zone 7-rain-fed dry zone (Puttalam and Moneragala districts, part of Kurunegala, Anuradhapura, and Hambantota districts).

[8] In 2000, DHS covered districts in the Northern and Eastern provinces for the first time. The six districts covered were Ampara, Batticaloa, Jaffna, Mannar, Trincomalee and Vavuniya. The survey could not be conducted in the two districts of Kilinocchi and Mullaitivu. Levels of malnutrition in these two districts are likely to be the same or

Figure 2.6. Changes in Underweight and Stunting Prevalence (percent) by Sector in Sri Lanka, 1993-2000



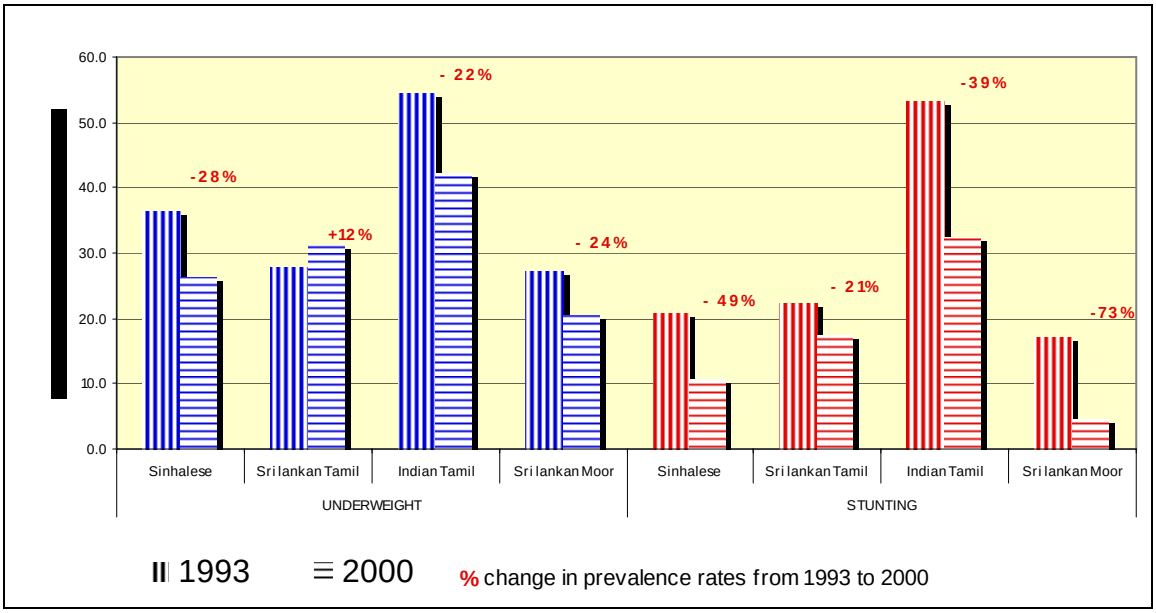
Source: Authors' calculations from Sri Lanka DHS 2000.

2.1.8. Variation by Ethnic Groups

The worse-off groups in the population are the Indian Tamils (the Estate sector population) and the Sri Lankan Tamils (Figure 2.7). Indian Tamils experienced a substantial reduction in underweight rates between 1993 and 2000. However, underweight rates actually increased among Sri Lankan Tamils, which is consistent with evidence shown above for the Estate sector as a whole. These numbers do not include the Northern and Eastern provinces where the majority of Sri Lankan Tamils live. Nevertheless, they do include Tamils who migrated in large numbers from the war-affected north and east to other parts of the country during the 1990s. The Sri Lankan Tamils' poorer performance may reflect the relatively worse health and nutrition status of Tamil refugees and economic migrants fleeing the war. Interventions targeted at these population groups are desirable not only from an equity and health perspective but also from the perspective of better governance, peace, and political stability. However, the relatively small Sri Lankan Tamil population sample sizes in the DHS surveys undermine the reliability of these observed trends.

higher than the rest of the north and east. They are largely under rebel control and, consequently, have very little economic activity and limited access to health and social services.

Figure 2.7. Underweight and Stunting Prevalence (percent) by Ethnic Group in Sri Lanka, 1993-2000



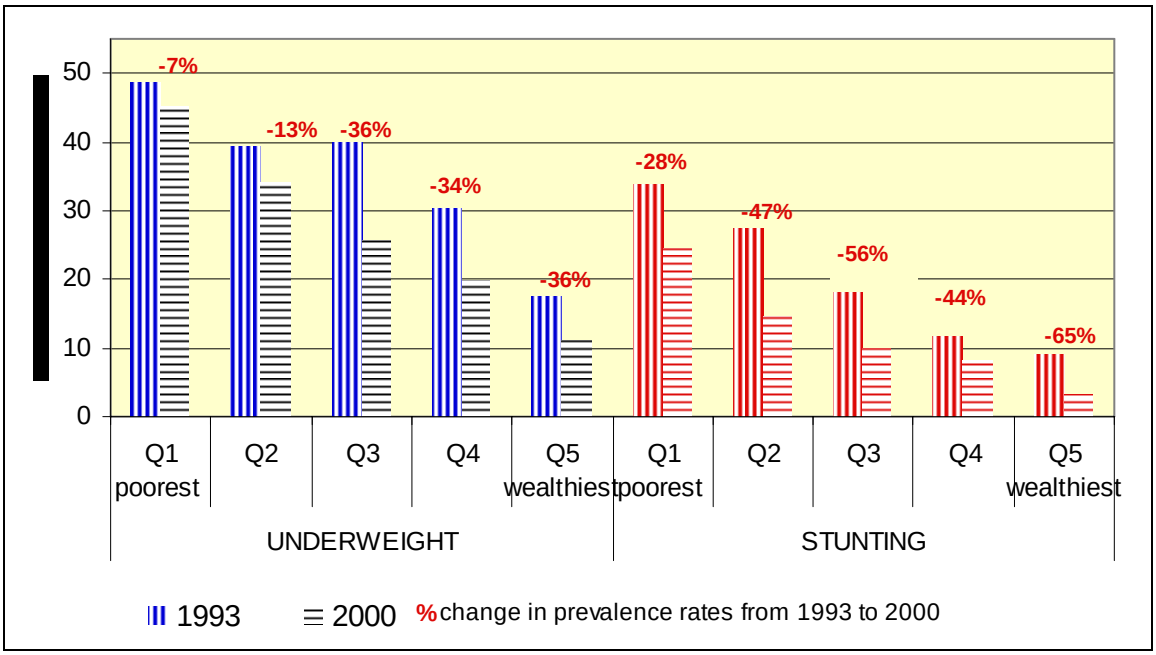
Source: Authors' calculations from Sri Lanka DHS 2000.

2.1.9. Variation by Socioeconomic Status and Education Level

Inequalities across wealth quintiles are large and increasing over time; inequalities across education groups have stayed the same; and undernutrition is not uncommon even among the non-poor.

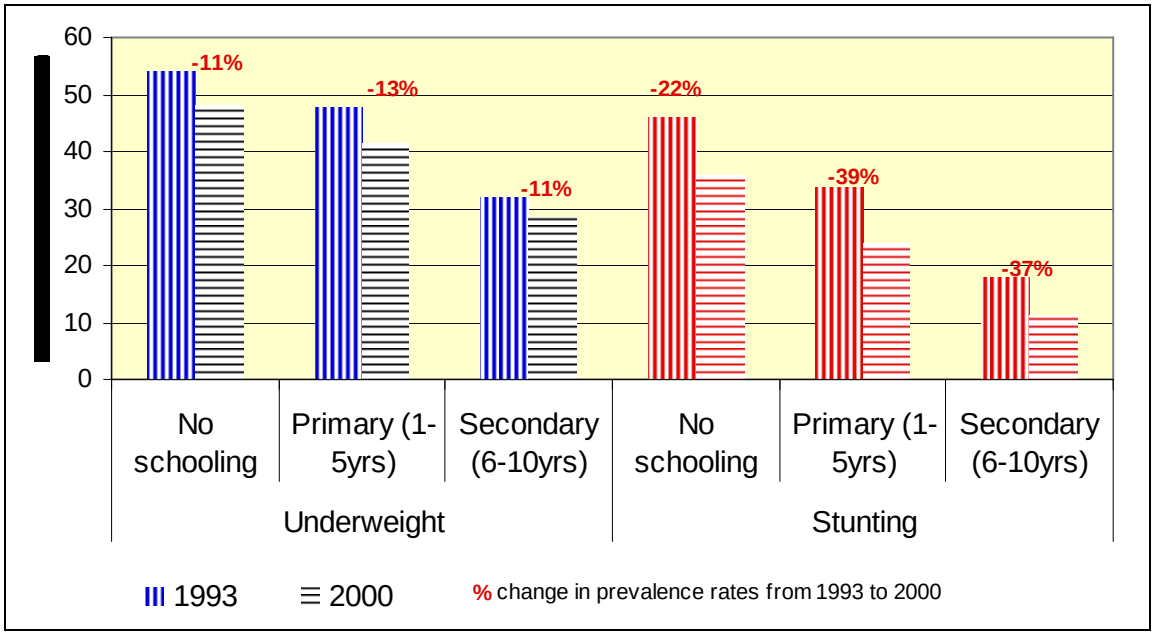
Child undernutrition in Sri Lanka is concentrated among children from poor households. The extent to which undernutrition disproportionately affects poor children has increased over time. Households in the DHS survey were ranked by socioeconomic status using data on asset ownership. Figure 2.8 shows the distribution of underweight and stunting rates by asset quintiles in 2000, and the rate of change in both indicators from 1993 to 2000. In 1993, a child from the poorest households was 2.8 times more likely to be underweight than a child from the richest household. By 2000, this ratio had increased to 4.1. The increase in inequality in stunting is even greater. In 1993, a child from the poorest household was 3.7 times more likely to be stunted. By 2000, this ratio had more than doubled to 7.7. There is a sharp income gradient in undernutrition: with increasing socioeconomic status, undernutrition rates decline steadily. However, undernutrition is relatively high even in the third and fourth quintiles where food security may not be a limiting factor. These important issues need to be carefully considered when designing publicly funded nutrition interventions in Sri Lanka.

Figure 2.8. Underweight and Stunting Prevalence by Asset Quintiles in Sri Lanka, 1993-2000



Source: Authors' calculations from Sri Lanka DHS 2000.

Figure 2.9. Underweight and Stunting Prevalence by Mother's Schooling in Sri Lanka



Source: Authors' calculations from Sri Lanka DHS 2000.

Data show that maternal education is an important determinant of good nutritional status in Sri Lanka. In 2000, children whose mothers had no schooling were twice as likely to be underweight or stunted compared to children whose mothers had secondary schooling or more (Figure 2.9). These differentials have widened over time, particularly for stunting. The rate of decline in stunting prevalence has been almost twice as much for children whose mothers have secondary schooling relative to mothers with no schooling.

Although some of these education differentials may be compounded by income differentials, these findings reinforce the critical importance of the potential role of girls' education to improve nutrition outcomes.

2.1.10. The New WHO Growth Standards: How Do They Affect Undernutrition Rates at Disaggregated Levels?

Table 2-6 below outlines undernutrition rates in Sri Lanka by zones using the new WHO growth standards. As reported earlier, at an aggregate level, the differences between estimations based on old and new references are small and therefore do not change the conclusions/trends reported using the old standards. Based on the new standards—at an aggregate national level—the prevalence rates of stunting rise (though incidence fall), and the rates of underweight decrease, while wasting rates remain at similar levels, which is the case for other countries. The same is true at a geographically disaggregated level by zone or sector, as well as for gender-disaggregated data. The differences between girls and boys do not increase or decrease depending on whether one uses the old references or the new WHO growth standards. However, using age disaggregation, underweight and wasting rates seem much higher among the youngest children (3-5 months of age) than was earlier estimated, and undernutrition rates seem to fall as children get older. These results are consistent with the knowledge that undernutrition happens within the first two years of life.

Table 2.6. Prevalence of Undernutrition among Children Under Five in Sri Lanka Based on Old and New WHO Growth Standards

	Weight-for-Age (underweight)		*Height-for-Age (stunting)*		*Weight-for-Height (wasting)*	
Categories	*Old*	*New*	*Old*	*New*	*Old*	*New*
National Average	**29.4**	**22.8**	**13.5**	**18.4**	**14**	**15.5**
Sector						
Colombo Metro	18.2	16.4	7.4	9.1	10.1	12.6
Other urban	21.3	15.0	8.6	12.1	6.3	9.4
Rural	30.8	23.7	12.8	18.1	15.9	17
Estate	44.1	34.0	33.8	43.4	11.8	13.3
Zone						
Zone 1	18.2	16.4	7.4	9.1	10.1	12.6
Zone 2	20.2	16.2	10.8	13.6	13.1	15.0
Zone 3	28.9	20.5	14.4	18.3	11.8	12.4
Zone 4	30.6	22.7	12	18.3	16	15.5
Zone 5	37.8	29.4	19	26.8	13.1	17.0
Zone 6	32.2	26.1	13.8	17.8	19.5	22.4
Zone 7	36.9	30.0	15	20.8	19.3	19.6
Age Group						
3-5 mo	0.7	10.1	3.9	5.5	1.3	14.6
6-11 mo	20.2	15.2	5.7	7.8	10.3	13.8
12-23 mo	28.8	18.4	16.2	21.7	18.2	12.5
24-35 mo	34	25.5	12.4	21.9	13.3	14.0
35-47 mo	30.7	24.8	13.4	16.9	13.9	16.0
48-59 mo	37.9	30.9	19.1	22.9	15.9	20.8
Gender						
Male	29	22	11.9	17.0	15.1	16.5
Female	29.9	23.8	15.3	19.9	12.6	14.3

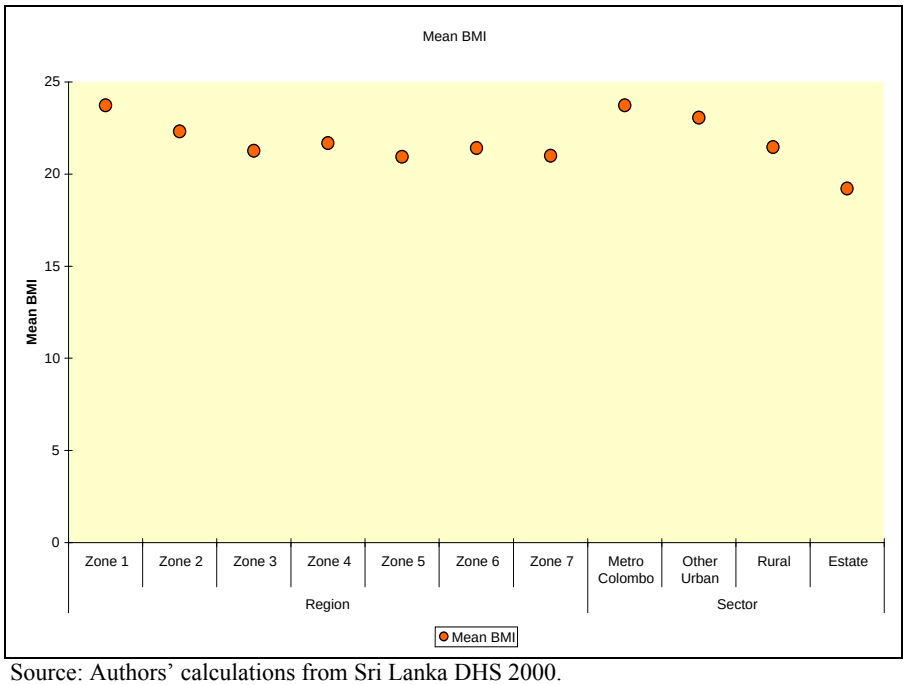
Source: Authors calculations from Sri Lanka DHS 2000; WHO Global Database on Child Growth & Malnutrition.

2.2. MATERNAL UNDERNUTRITION

More than 33 percent of all Sri Lankan women suffer from chronic energy deficiency (CED), which disproportionately affects women living in the Estate sector.[9] CED is measured by body mass index (BMI).[10] DHS data show that women's mean BMI did increase between the early 1990s and 2000, but inequalities in the mean BMI also increased. The difference in the mean BMI between the Estate and urban sectors increased from 2.8 units in 1995 to 4.5 units in 2000.

Maternal undernutrition is one of the major causes of low birthweight and as a consequence, undernutrition among children. The high prevalence of protein-energy malnutrition among women of reproductive age is therefore a major cause for concern. Figure 2-10 shows BMI prevalence among women aged 15-49 years by region/sectors.

Figure 2.10. Women's (15-49 years) BMI and Underweight Prevalence by Region and Sector of Residence in Sri Lanka



Source: Authors' calculations from Sri Lanka DHS 2000.

2.3. MICRONUTRIENT DEFICIENCIES

Three key micronutrient deficiencies in Sri Lanka are of public health significance: iron deficiency anemia (IDA), vitamin A deficiency (VAD), and iodine deficiency disorders (IDD). Though zinc deficiency has been identified as a problem of public health significance in other regions of the world, there are currently no available data on the extent or severity of zinc deficiency in Sri Lanka.

[9] Data from the Fourth National Nutrition and Health Survey, quoted in FAO (FAO 1999).
[10] BMI is calculated as weight (kg)/height^2 (m^2).

2.3.1. Iron Deficiency Anemia

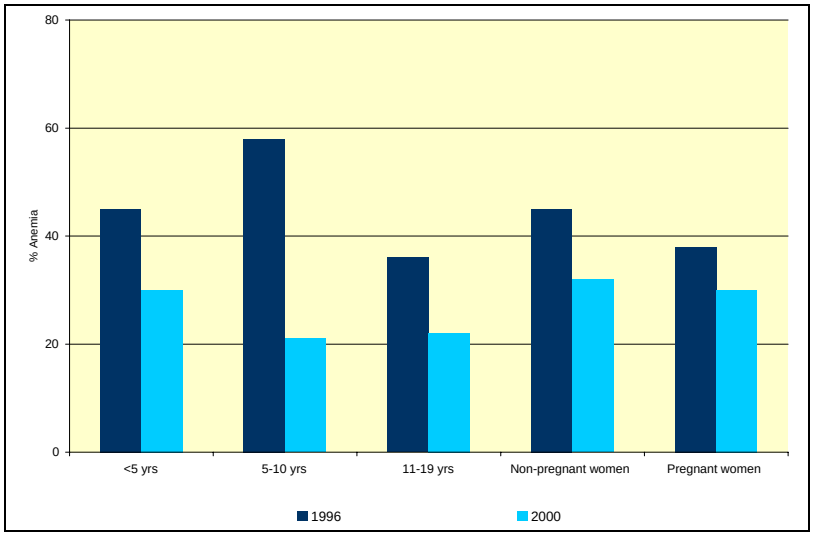
Iron deficiency anemia among Sri Lankan children and women of reproductive age continues to be a significant public health problem, although prevalence rates have declined in recent years. In 1996, prevalence rates among infants aged 6-11 months, children under-five years of age, and women ranged from 40 to 60 percent, a severely "high" anemia rate by WHO standards (Table 2.7 and Figure 2.11).[11] In 2000, prevalence rates among the same groups ranged from 20 to 30 percent, still "moderately high" (Piyasena and Mahamithawa, 2003).[12] Prevalence rates among children aged 6-11 months were around 57%, or severe.

Table 2.7. Identifying the Public Health Significance of Anemia in Countries

Category of Public Health Significance	***Prevalence of Anemia (%)***
Severe	≥40
Moderate	20.0 – 39.9
Mild	5.0 – 19.9
Normal	≤ 4.9

Sources: UNICEF, UNU, WHO, 2001.

Figure 2.11 Anemia Prevalence among High-Risk Groups in Sri Lanka, 1996-2000



Source: Piyasena and Mahamithawa 2003.

[11] In 1973 when the first national survey was carried out, the anemia rate among pregnant women was 77 percent (De Mel and Sood 1973). Whether these results are directly comparable to those of Piyasena and Mahamithawa for 1996-2000 is unclear.

[12] Data on anemia prevalence rates for five high-risk groups are quoted from Piyasena and Mahamithawa 2003. The data are from the Third National Nutrition and Health Survey in 1996 and a study conducted by the Medical Research Institute (MRI) in 2000. Both were national surveys, but the sampling frames may have been different. The MRI study adopted the DHS 2000 sampling frame. The exact age composition of each of the high-risk groups may have been different as well.

Anemia rates for Sri Lankan women and children are generally lower than elsewhere in South Asia (Table 2.8). Prevalence rates among children less than five years of age and pregnant women are less than half that of the South Asian average. Contrary to patterns seen elsewhere in South Asia, anemia rates are lower among children than among adult women in Sri Lanka. One possible explanation for this variation is that hookworm—usually a major cause of anemia among children—is not as critical a factor in Sri Lanka. Data on hookworm prevalence are not available to confirm this. However, the Ministry of Health in Sri Lanka has been providing anthelminthic therapy against hookworm for children since the 1950s (Perera 2007). Government hospitals and clinics routinely provide anthelminthic therapy for children from the age of one. Although national coverage data are not available for older children, mothers regularly seek twice yearly anthelminthic therapy for their children (Navaratne 2007).

Table 2.8. Prevalence and Trends in Iron Deficiency Anemia in South Asia

	Iron Deficiency Anemia		
	Children <5y (%)	*Women 15-49 y (%)*	*Pregnant Women (%)*
Afghanistan	65	61	-
Bangladesh	55	36	74
Bhutan	81	55	68
India	75	51	87
Nepal	65	62	63
Pakistan	56	59	-
Sri Lanka	30	32	30

Source: UNICEF and Micronutrient Initiative 2004; data for Sri Lanka from Piyasena and Mahamutawa 2003.

Anemia prevalence data are limited because the majority of existing studies utilized small samples and focused on particular groups. Estimates of overall prevalence rates presented in this section are obtained from studies based on surveys carried out in 1996 and 2000 (Mason and others 2004; Piyasena and Mahamithawa 2003). These estimates may still underestimate the true national prevalence of anemia because the surveys, from which these estimates are derived, exclude the North Eastern provinces. Those provinces account for more than 13 percent of Sri Lanka's total population and include nutritionally vulnerable groups.

2.3.2. Variation by Age

The prevalence of anemia declines with age among children aged 0-5 years. In 2000, the anemia prevalence rate was nearly 60 percent among 6-11 months olds and 15 percent among 4-5 years old (Table 2-9). Piyasena and Mahamithawa (2003) also report that between 1996 and 2000, the anemia rate increased for 6-11 months old, although it declined for all other age groups. The greater vulnerability of infants to anemia calls attention to the feeding patterns of infants, particularly in relation to feeding iron-rich complementary foods at six-months of age and onward.

Anemia prevalence rates increase with age for women over 25 years of age (Table 2.9) and for pregnant women (Mason and others 2004; Piyasena and Mahamithawa 2003). The prevalence of anemia ranges from 26.1 percent among women who are pregnant with their first child to 71.4 percent among those who were pregnant with their seventh child (data not shown). This trend is consistent with what is known about the physiology of depletion of maternal iron stores as a result of repeated and closely spaced pregnancies.

Table 2.9. Anemia Prevalence among Women and Children by Age Group in Sri Lanka, 2000

	Age Group	*Anemia Rate (%)*
Children	6-11	57.6
(age in months)	12-23	38.3
	24-35	29.7
	36-47	21.4
	48-59	15.1
Women	<19 yrs	28.9
(age in years)	20-24	26.3
	25-29	24.7
	30-34	29.8
	35-39	33.7
	40-44	36.7
	45+	42.5

Source*:* Piyasena and Mahamithawa 2003.

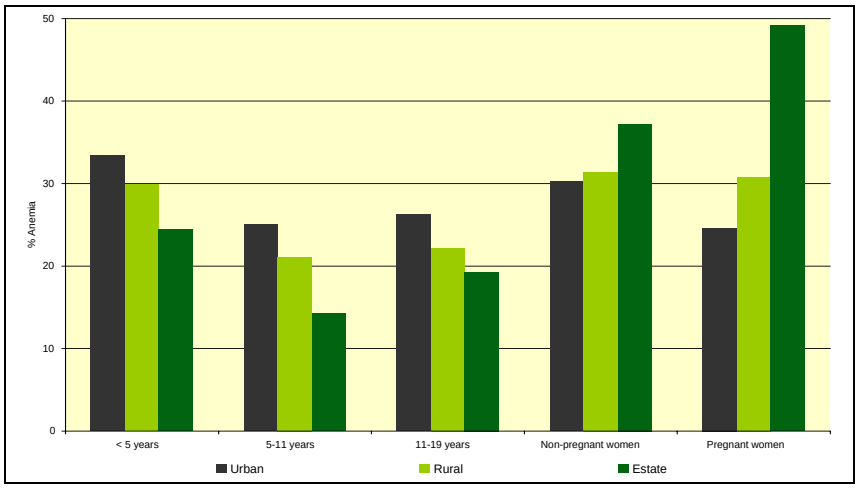
2.3.3. Variation by Location of Residence

The prevalence of anemia for both pregnant and non-pregnant women was highest in the Estate sector, followed by the rural sector (Figure 2.12). The Estate sector's estimates of prevalence (49.1 percent) are somewhat unreliable due to the small sample size for pregnant mothers. However, this pattern is consistent with findings from other nutritional outcomes, such as underweight and stunting, demonstrating that the Estate population is the most disadvantaged group in Sri Lanka.

Because of the pattern, it is thus surprising that anemia rates among children up to 19 years-of-age are lowest in the Estate sector and highest in the urban sector. This reversal in the sector-wise gradient is difficult to explain and may be an artifact of the small sample size.

The only available data on anemia prevalence by sector and zone of residence are from Piyasena and Mahamithawa (2003) (Figure 2.11). However, the small sample sizes within each zone make the estimates by zone of residence somewhat unreliable. Therefore, no results by zone are presented here.

Figure 2.12. Anemia Prevalence Rates by Sector in Sri Lanka



Source*:* Piyasena and Mahamithawa, 2003.

2.3.4. Vitamin A Deficiency

Data are scarce, but the available estimates suggest that the prevalence of sub-clinical vitamin A deficiency (VAD) in Sri Lanka is high and signifies a public health problem. A national survey in 1975-76 showed that the countrywide prevalence of Bitot's spots[13] and night blindness were respectively 1.0 percent and 1.1 percent, far exceeding the WHO cut-off for severity of clinical VAD prevalence of 0.5 percent (Brink and Perera 1979). VAD has declined over the years but is still relatively high in comparison with other countries in South Asia (Table 2-10). A survey of preschool children conducted in 1996 is the only relatively recent national-level data, and it showed that the prevalence of sub-clinical VAD was 36.3 percent (Medical Research Institute 1998). However, clinical VAD was less than 0.5 percent. By WHO standards, prevalence rates of over 20 percent for sub-clinical VAD and over 0.5 percent for clinical VAD indicate a public health problem.

The 1996 survey also found that children in North Central and Sabragamuwa provinces had the highest rate of prevalence of sub-clinical VAD. No other data are available on the incidence of VAD by region of residence or socioeconomic status, making targeted interventions to high-risk groups somewhat difficult. However, VAD is usually found in countries that have high mortality rates. According to WHO/UNICEF guidelines, countries with infant mortality rates above 70 should establish prophylactic vitamin A supplementation programs at nutritional level. Once again, Sri Lanka poses an enigma because although IMR is relatively low, vitamin A deficiency rates seem higher than expected, possibly because of low vitamin A supplementation coverage rates (Chapter 4).

Table 2.10. Prevalence of Vitamin A Deficiency in South Asia

	Vitamin A Deficiency	
	Children <6 w/ sub-clinical VAD (%)	*Children <6 w/ clinical VAD (%)*
Afghanistan	53	-
Bangladesh	28	0.7
Bhutan	32	0.7
India	57	0.7
Nepal	33	1.0
Pakistan	35	-
Sri Lanka [a]	35	0.8

Source: UNICEF and Micronutrient Initiative 2004; data for Sri Lanka from MRI 1998.

National vitamin A supplementation coverage rate is approximately 57 percent in Sri Lanka compared with >80 percent coverage rates in Afghanistan, Bangladesh, Nepal and Pakistan. This may explain why vitamin A deficiency remains high. This topic is discussed further in Chapter 4.

2.3.5. Iodine Deficiency Disorders

Sri Lanka has been successful in addressing iodine deficiency disorders (IDD). As a result, the current IDD rates are lower in Sri Lanka compared with other countries in the region. The overall prevalence rate of goiter, a symptom of IDD, was 20.9 percent among school children (8-10 years) in 2000-01 (Medical Research Institute, 2001). This prevalence is relatively low in comparison with the rest of South Asia

[13] A clinical manifestation of severe VAD occurs on the eyes of an affected individual resulting from the keratinisation of the conjunctiva's surface. This condition is particularly specific for assessment of VAD among children aged 0-6 years.

(Table 2.11). Since then, the rates have declined even further. Sri Lanka made salt iodization mandatory in 1995, and the policy's implementation was more intensive after 2001. The goiter rate of 20.9 percent in 2000-01 changed very little compared to the rate of 18.8 percent reported in a study carried out among school children aged 5-12 years in 1987 (Fernando, Balasuriya, Herath, and Katugampola 1989). The salt iodization program was intensified as a result. In a survey carried out by the MRI in 2005, the prevalence of goiter among school children (6-10 years) was less than 5 percent and the urinary iodine levels were greater than 100 μg/L in all provinces.(Atukorala 2006). The age groups across the three goiter studies were comparable but not identical. Chapter 4 discusses Sri Lanka's salt iodization policies and coverage of iodized salt. Total goiter rates (TGRs) remain low because Sri Lanka's salt iodization rates are among the highest in the region (Chapter 4).

Although some data suggest that goiter was more prevalent in Uva, North-Central, and Central provinces than elsewhere in the country in 2001, very little disaggregated data are available on the prevalence of goiter across sectors and regions.

Table 2.11. Prevalence of Iodine Deficiency Disorders in South Asia

	Total Goiter Rate (TGR) in School Children (%)
Bangladesh	50
Bhutan	14
India	19
Nepal	40
Sri Lanka	21*

Sources: UNICEF and Micronutrient Initiative 2004; data for Sri Lanka from MRI 2001.
*Sri Lanka data has since been updated to 5 percent TGR in 2005 (MRI, 2005).

2.4. CAN SRI LANKA ATTAIN THE NUTRITION MDG—THE NON-INCOME FACE OF POVERTY?

The Millennium Development Goals (MDGs) are a set of eight goals that United Nations' member countries have committed to reach by 2015. The first MDG is to eradicate poverty and hunger. Its target is to halve between 1990 and 2015 the proportion of people living on less than $1 a day (a measure of income poverty) and the proportion of people suffering from hunger (a measure of the non-income face of poverty). Hunger is measured using two indicators: the prevalence of underweight among children under five and the proportion of the population below a minimum level of dietary energy consumption.

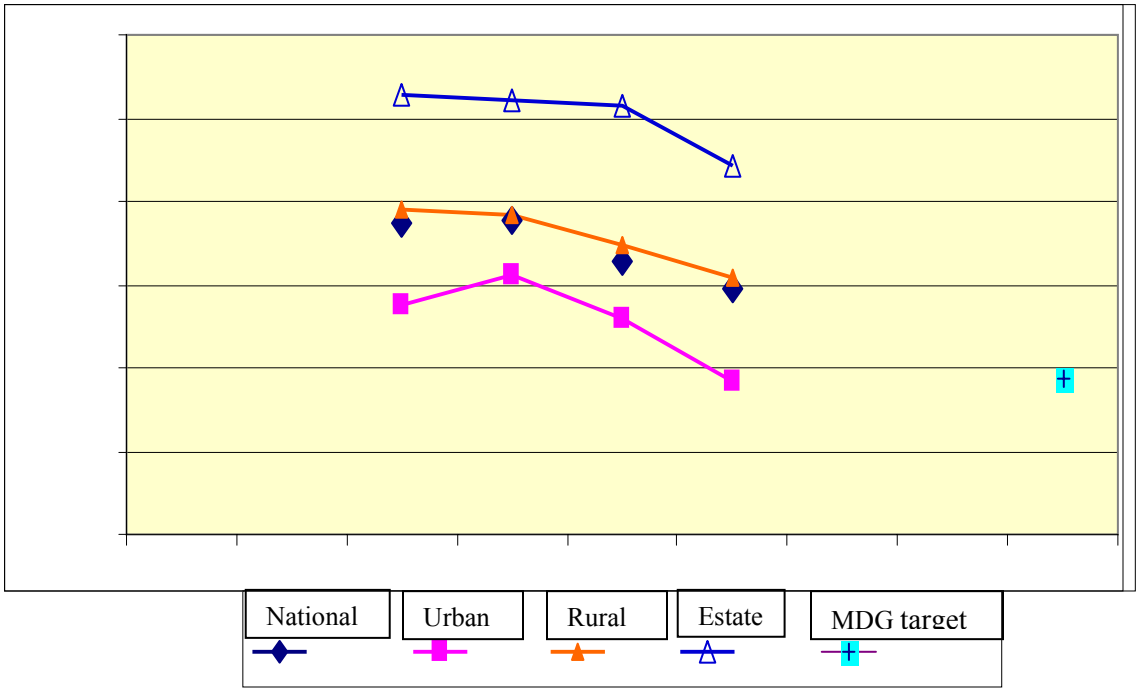
Trends in underweight rates from the 1970s to 2000 show that at an aggregate level Sri Lanka is doing well, but trends among the rural population and the Estate sector are much worse. (Figure 2.13). The Estate population is making the least progress towards achieving the target, while the urban population may reach the goal well before 2015. At an aggregate level the annual rate of change (ARC) in underweight is estimated at 1.9 percent from 1987 to 2000 (based on five data points). Alternative estimations using four data points (excluding the 1987 data point) suggests an ARC of 2.84 (see Table 2.12 below), at which rate Sri Lanka will achieve the MDG target of 19 percent underweight prevalence rate in 2015 (Figure 2.14). Simulations based on assumptions about economic growth rates reveal a less optimistic scenario (Section 2.41 and Figure 2.14 below).

Table 2.12 Sri Lanka: The Likelihood of Achieving the Nutrition MDG by 2015

Year *	Underweight %	ARC 1987 - 2000	ARC 1993 - 2001	ARC 1987 - 2001
1987	37.3	- 1.90%		**- 1.91%**
1993	37.7		- 2.84%	
1995	32.9			
2000	29.4			
2001	29.7			

* Age range of children included in surveys and the types of survey are different.
1987 DHS included children between 0.25 and 2.99 years of age.
1993 DHS included children between 0.25 and 4.99 years of age.
1995 MRI vitamin A survey included children between 0.25 and 4.99 years of age.
2000 DHS included children between 0.25 and 4.99 years of age.
2001 MRI included children between 0.5 and 4.99 years of age, same sampling design as DHS 2000.

Figure 2.13. Time Trends in Underweight Prevalence Rates in Sri Lanka, 1987-2015



Source: WHO Global Database for Child Growth and Malnutrition (as of July 2005, using old growth references).

2.4.1. Effect of Economic Growth

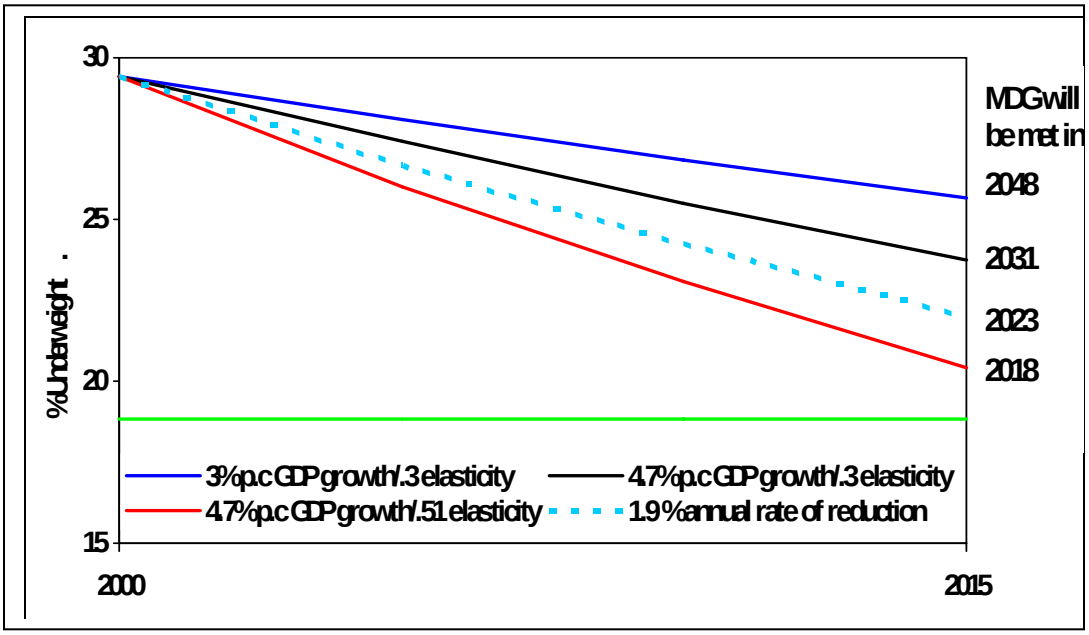
The effect of a country's economic growth rate on underweight rates can be predicted using estimates of the responsiveness (elasticity) of undernutrition to annual economic growth (Gragnolati and others 2006). Without household data to calculate the elasticity, an alternative is to use a rule-of-thumb estimate and test for its sensitivity. The projections presented below assume an income elasticity of underweight of 0.5 percent.

Figure 2.14 provides projections of child underweight rates in Sri Lanka from 1990 to 2015 based on several economic growth scenarios. If the Sri Lankan economy grows at 4.7 percent per capita (the average annual rate of growth of per capita GDP during 1990-93) until 2015, and the income elasticity of underweight is assumed to be 0.5 percent, the underweight goal may be achieved by 2018. With lower

assumed elasticities or lower GDP growth, the goal will be achieved even later (between 2023 and 2048). A much more optimistic scenario is based on recent, higher-than-average economic growth rates of approximately 6 percent, which Sri Lanka has experienced following the ceasefire with the Liberation Tigers of Tamil Eelam (LTTE). Under this overly optimistic scenario, assuming an income elasticity of underweight of 0.5 percent, and assuming that this rate of per capita economic growth is sustained, Sri Lanka will meet the nutrition MDG by 2015.

With slower economic growth and a less optimistic income elasticity of underweight, the decline will be slower. Other interventions, particularly those that target the poorer population groups, will be necessary to enhance the effects produced by GDP growth.

Figure 2.14. Predicted Prevalence of Underweight in 2015 under Various Economic Growth Scenarios in Sri Lanka



Source: Authors' calculations.

2.5. OVERWEIGHT

Malnutrition includes both undernutrition and overweight. Though most of this report is focused on undernutrition, overweight is an emerging public health problem in Sri Lanka which will impede economic growth if left unaddressed. Unlike undernutrition, the prevalence of overweight is currently concentrated among specific population groups, such as the relatively well-off and those living in the urban sector, particularly in the Western province (Zone 1).

2.5.1. Prevalence and Trends

Children

Available evidence suggests that the prevalence of overweight among children under five has increased sharply in recent years, while the prevalence of overweight among older children is an emerging problem. Overweight rates among children under five had risen to 0.6 percent by 2000 (Department of Census and Statistics 2002), although it remained nearly constant at approximately 0.1 percent from 1977-87 (De Onis and Blossner 2000). Two recent studies show that prevalence of overweight among 8-12 year olds ranges from 3 to 4 percent (Pathmeswaran 2005; Wickremasinghe 2004). In 2000, overweight rates among children under five in the richest quintile were double that of the national average in 2000. A study of schoolchildren aged 5-14 years in seven districts showed that overweight prevalence was generally low except in Colombo district, in which more than 10 percent of children were overweight.

2.5.2. Women of Reproductive Age

About 20 percent of all women aged 15-49 years were overweight in 2000 (Department of Census and Statistics 2002 and DHS 2000), which is an increase from an estimated 12.8 percent in 1995 (FAO 1999). Table 2.12 shows that overweight prevalence among women of reproductive age is concentrated among women living in urban areas in Zones 1 and 2 (Western province). Overweight and obesity also are far more likely to occur among women in the wealthiest two quintiles (Figure 2.15). Sri Lanka joins many other countries with the double burden of overweight and underweight. Overweight predisposes the population to higher risks of cardiovascular diseases, diabetes, and other noncommunicable diseases (NCDs). Some research, although inconclusive, indicates that children born with low birthweight who show rapid weight gain later in life are more prone to NCDs than those born with normal weights (Gluckman and Hanson 2004).

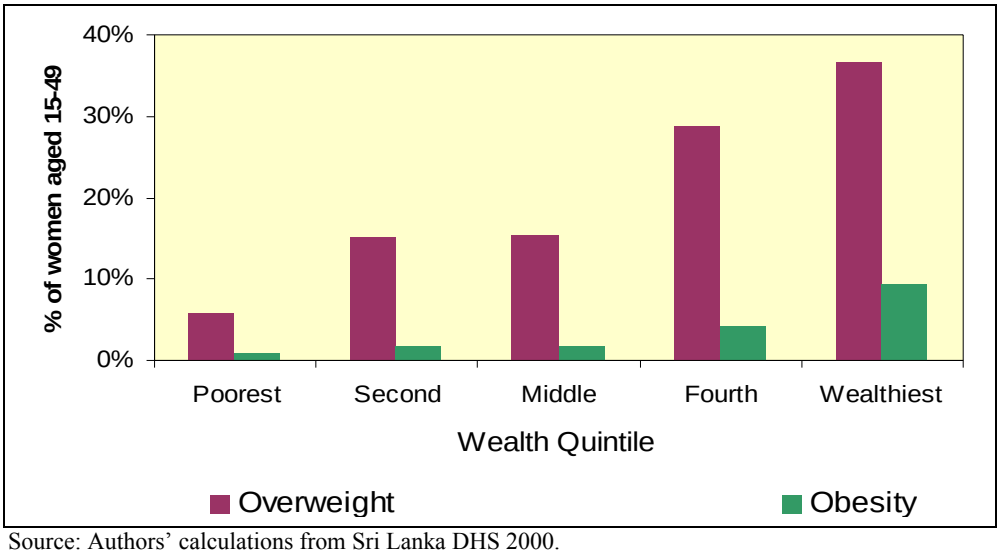
Table 2.13. Prevalence of Overweight among Women 15-49 Years by Zone/Sector in Sri Lanka

Zone	% Overweight	% Underweight
Zone 1	28.5	9.2
Zone 2	19.8	17.8
Zone 3	12.7	19.1
Zone 4	16.7	17.3
Zone 5	10.9	23.7
Zone 6	14.8	16.9
Zone 7	12.5	25.4
Sector		
Colombo Metro	28.5	9.2
Other Urban	24.3	10.4
Rural	14.6	20.1
Estate	3.2	29.7
Average	20.1	22.8

Source: Authors' calculations from Sri Lanka DHS 2000.

About 30-40 percent of women in each zone or sector are malnourished—either underweight or overweight—and in most zones, maternal undernutrition coexists with maternal overweight. The Estate sector has the highest levels of maternal underweight and the lowest levels of overweight. Zone 1 (Colombo Metro) has the highest overweight and lowest underweight rates.

Figure 2.15. Prevalence of Women's Overweight and Obesity by Wealth Quintile in Sri Lanka



Source: Authors' calculations from Sri Lanka DHS 2000.

2.6. CONCLUSIONS

Sri Lanka is faced with the double burden of undernutrition and overweight. Underweight prevalence is still relatively high by global standards, and Sri Lankan children remain extremely vulnerable during the critical first two years of their lives. Overweight is increasing, especially among high income groups. Maternal undernutrition rates remain high. Stunting and underweight rates among children have fallen in recent years, but their declines have been greatest among children in wealthy households and children living in Colombo and other urban areas in the Western Province. Wasting rates, a measure of short-term nutritional status, remain high and have not declined significantly in recent years. The prevalence of micronutrient deficiencies, especially vitamin A and iodine, and anemia, remain high and represent public health problems that need to be addressed.

3. WHAT CAUSES UNDERNUTRITION IN SRI LANKA?

Underlying high levels of undernutrition in Sri Lanka are three factors correlated with household poverty: a lack of food security at the household level, limited access to safe water and sanitation, and poor maternal and child care practices. Meanwhile, high levels of access to health services have helped to break the cycle of undernutrition and disease that is so often found in South Asia and have prevented Sri Lanka's undernutrition levels from rising even higher than they are.

Improving overall food security and living conditions through faster economic growth will not necessarily be sufficient to significantly reduce undernutrition in Sri Lanka because income inequalities are high, particularly among the most nutritionally vulnerable groups. As income inequalities continue to rise in parallel to rising incomes, poverty reduction is hindered. Targeted pro-poor interventions are therefore necessary; otherwise, the nutritional dividend associated with economic growth will be conferred largely upon better-off children. Child underweight and stunting rates have fallen in recent years. However, much of the decline has occurred among children in households from the top two wealth quintiles and those living in urban areas in the Western province. The potential causes of undernutrition in Sri Lanka assessed in this chapter highlight the need for more concerted efforts to reduce inequalities and improve targeting of direct interventions for maternal and child caring practices, as well as to increase nutritional security. It also highlights the need for specific strategy to address the Estate sector's more acute nutritional problems.

This chapter introduces the conceptual framework used to analyze the causes of undernutrition (section 3.1). Sections 3.2 to 3.4 examine the three key underlying causes of undernutrition; assess the strength of the mechanisms linking the underlying causes to undernutrition; and explore the household and individual factors that influence the underlying causes. Section 3.5 presents a multivariate regression analysis based on the three underlying causes of undernutrition: household access to food, health services and a healthy environment, and caring practices.

3.1. FRAMEWORK TO ANALYZE THE CAUSES OF UNDERNUTRITION

Undernutrition is a complex problem generated by factors operating at several levels. The potential causes of undernutrition may be classified as immediate, underlying and basic. They are interrelated within and across levels. Figure 3.1. presents a conceptual framework to assess the causes of child undernutrition; it is adapted from UNICEF (1990) and more recent work in this area (Engle, Menon, and Haddad 1999; Smith and Haddad 2000).

Inadequate dietary intake and disease are often the *immediate* causes of undernutrition and directly affect the individual. Moreover, they form a vicious cycle of inadequate dietary intake which increases the likelihood of illness because of weakened immune levels, and illness leads to a loss of appetite and poor absorption which worsen undernutrition.

The main *underlying* causes of malnutrition are household food insecurity, inadequate care for mothers and children, and poor access to health and environment services. Each one is determined by the social and economic resources available to the individuals and the household as a whole. These include socioeconomic status (income, wealth), educational attainment, urban or rural residence, type of employment, and cultural norms and beliefs.

Household food security implies that the household in which the child lives has the resources to access a sufficient quantity and quality (energy, protein, and micronutrients) of foods needed to lead a healthy life. Dietary diversity is as critical to good nutrition as food energy availability. The resources needed to achieve food security are food production, income for food purchases, and/or in-kind transfers of food.

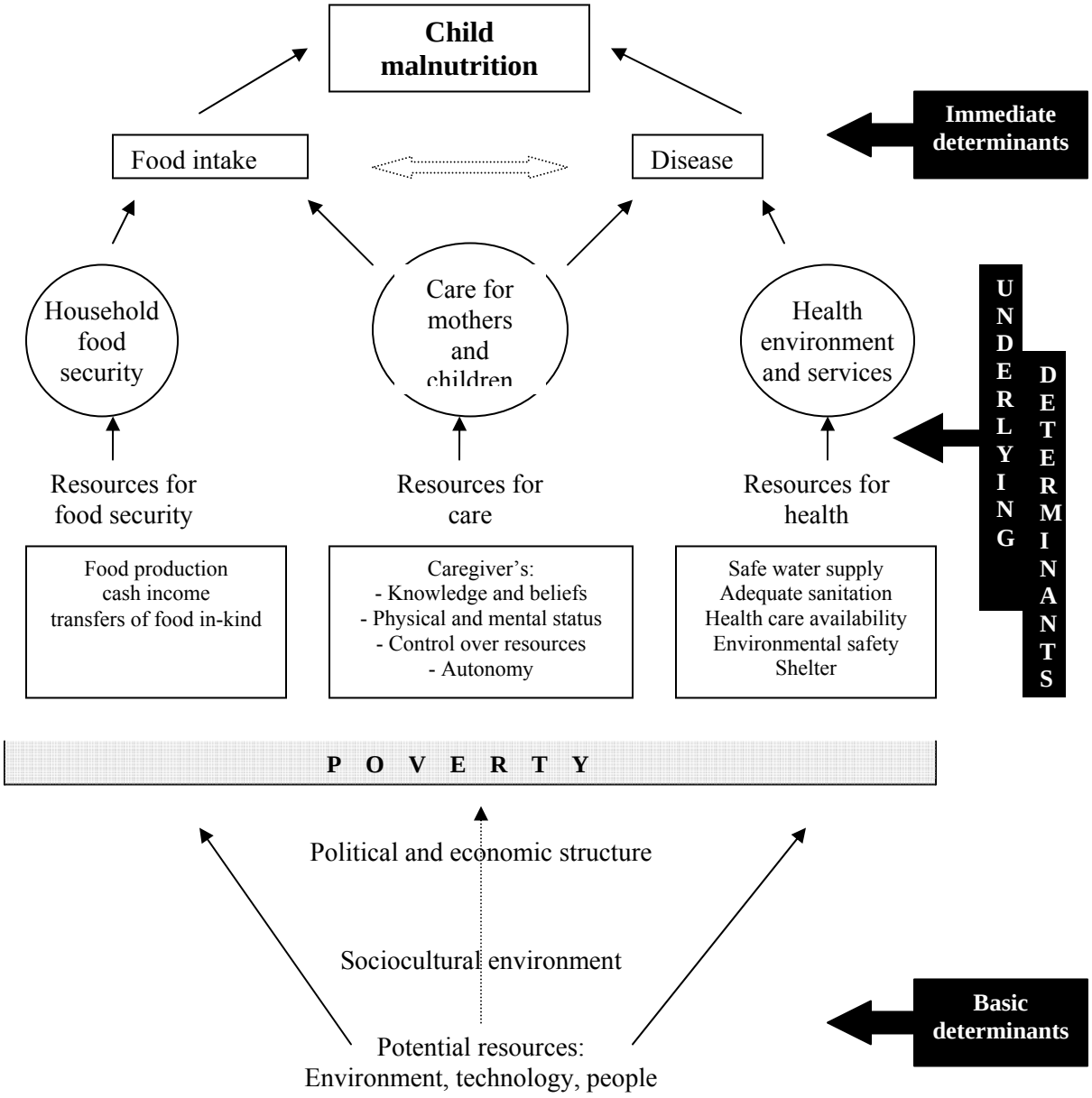
Caring practices include appropriate nutrition and support for mothers during pregnancy and lactation, infant feeding practices (breastfeeding and complementary feeding), health-seeking behaviors and cognitive stimulation. The adequacy of such care practices is determined by the caregiver's control over economic resources, autonomy in decision-making, and physical and mental status (Smith and Haddad 2000). These are all affected by the caregiver's status, relative to other members of the household. The caregiver's knowledge and beliefs also are important resources that influence the types of health services accessed and the caring practices adopted.

Health and environment services include access to health care from affordable, qualified providers, and safe water and sanitation services. Environmental safety, including shelter, is also critical.

Poverty is a key factor affecting all underlying determinants. A person is considered to be in absolute poverty when s/he is unable to adequately satisfy his or her basic needs such as food, health, water, shelter, primary education, and community participation (Frankenberger 1996). Poor households are unable to achieve food security, have inadequate resources for care, and are not able to use or contribute to the creation of resources for health on a sustainable basis (Smith and Haddad 2000).

Insufficient resources available at the country or community level, and the political, social, and economic conditions that govern how these resources are distributed are identified as the *basic* causes of undernutrition in this framework. For instance, the lack of food security at the household level, an underlying cause of undernutrition, is associated with household income poverty. Similarly, a basic cause would be insufficient political commitment to protect the welfare of the poor, which often leads to inequalities in income. Basic causes influence the distribution of food and economic resources as well as the formal institutions providing public sector services such as health and education, and the informal institutions determining the social and cultural norms regarding the rights of women and vulnerable groups in the population.

Figure 3.1. Conceptual Framework for the Causes of Undernutrition



Source*:* Adapted from UNICEF (1990, 1998) and Engle, Menon, and Haddad (1999); Smith and Haddad (2000).

Box 3.1. *Food Security vs. Nutrition Security**?***

Food security and nutrition security are quite different terms often used interchangeably in the literature. *Food security*, an important input for improved nutrition outcomes, is concerned with physical and economic *access* to food of sufficient quality and quantity in a socially and culturally acceptable manner. *Nutrition security* is an *outcome* of good health, a healthy environment, and good caring practices, in addition to household-level food security. For example, a mother may have reliable access to the components of a healthy diet, but because of poor health or improper care, ignorance, or personal preferences, she may be unable or may choose not to use the food in a nutritionally sound manner, thereby becoming nutritionally insecure. A household achieves nutrition security when secure access to food is coupled with a sanitary environment, adequate health services, and knowledgeable care to ensure a healthy life for all household members.

A family (or country) may be food secure, yet have many individuals who are nutritionally insecure. Food security, therefore, is often a necessary but not sufficient condition for nutrition security.

Source: World Bank 2006a.

3.2. EXPLORATORY ANALYSES OF THE CAUSES OF UNDERNUTRITION IN SRI LANKA

To empirically identify all the key determinants of Sri Lanka' undernutrition is impossible due to the interrelatedness of the causal variables, described in Figure 3.1. and because of the limitations of the available data. Many of the causal variables described above are determined by the same factors that affect undernutrition, the variable of primary interest. For instance, child underweight and appropriate caring practices, such as exclusive breastfeeding, are both affected by factors such as maternal schooling, household socioeconomic status, and social norms regarding child care. While maternal schooling and household socioeconomic status are measurable variables, social norms cannot be observed easily. Therefore, they cannot be included as a separate explanatory variable in an empirical model of child underweight. Failure to include this critical causal variable in the model would lead to inaccurate estimates of breastfeeding's effect on child underweight. Solutions to this estimation problem exist but are not feasible with the currently available types of data for Sri Lanka.

Possible solutions to this problem are to include a large number of variables in the model to at least partially control for the unobserved variable; to use panel data to remove the effects of the unobserved variables; or to include an instrumental variable (a variable that is associated only with the explanatory variable, not the outcome variable). However, the available DHS set of variables is not rich enough to control for all unobserved variables or to adopt an instrumental variable approach. Furthermore, the DHS uses cross-sectional surveys which do not include panel data on households over time.

Recognizing the difficulties in establishing causality between the determinant variables and nutritional outcomes, this study takes an exploratory approach. First, the three underlying determinants shown in Figure 3.1—food energy availability and dietary diversity, caring practices for pregnant women and children and, health and environment services—are examined separately in relation to undernutrition. In each case, the household- and individual-level factors that influence the underlying determinants are also explored. Next, all three underlying determinants are included in a multivariate analysis of undernutrition to examine the extent to which each of the three factors explains variations in undernutrition. This analysis uses data from Sri Lanka

DHS 2000. In addition, results from previous analyses, other studies, and qualitative research studies were used, where appropriate, to supplement the data analysis and facilitate the interpretation of the multivariate regression results. The MDG study for Sri Lanka (World Bank 2005a) and the MRI study (Medical Research Institute 2006) provided an important starting point for this analysis.

3.3. FOOD SECURITY: FOOD ENERGY AVAILABILITY AND DIETARY DIVERSITY

To monitor progress toward the MDG goal of halving the proportion of people suffering from hunger, Sri Lanka adopted one of the two indicators: "the proportion of the population below the minimum level of dietary energy consumption." The other indicator is the prevalence of underweight children under-five years of age. The national average of the proportion of the population below the minimum level of dietary energy consumption has remained relatively unchanged from 1990-91 (50.9 percent) to 2002 (51.3 percent) (Table 3.1).[14] While the proportion of the population that is energy deficient declined among women in urban areas, it increased among both men and women in rural areas.[15] The higher proportion of energy deficiency in urban areas relative to rural and Estate areas is attributable to lower energy requirements in urban areas, where people engage in more sedentary occupations.

Table 3.1. Proportion of Population below Minimum Energy Requirement in Sri Lanka

Sector	*Male*		*Female*	
	1990-91	*2002*	*1990-91*	*2002*
All	50.8	51.1	51.8	52.2
Urban	56.3	58.4	62.4	58.6
Rural	51.3	51.7	48.7	52.1
Estate	30.0	28.6	39.7	31.4

Source: Department of Census and Statistics 2006.

Sri Lankan's calorie intake is highly correlated with household wealth status. The most recent survey data shows that the average daily per capita energy intake for households below the national poverty line is 1,778 kilo calories, while that of non-poor households is 2,185 kilo calories (Department of Census and Statistics 2006).

Sri Lankans are not only energy deficient but also consume relatively undiversified diets. Up to one-third of monthly per capita spending on food is allocated to rice, wheat, and other cereals (Table 3.2). Inadequate dietary intake, one of the two immediate causes of undernutrition, implies food energy deficiency as well as a lack of dietary diversity. A diet that is composed largely of cereals and inadequate quantities of protein and mineral-rich foods can exacerbate undernutrition. For instance, data from other countries show a significant correlation between milk consumption and anthropometric outcomes (World Bank 2007). In Sri Lanka, less than 10 percent of monthly per capita spending is attributable to dairy products, including milk.

[14] Based on data collected in the Household Income and Expenditures Surveys conducted by the Department of Census and Statistics.

[15] As is the case for most countries, Sri Lanka does not conduct surveys to measure food calorie consumption. Thus, due to data limitations, only aggregated food expenditure data are available.

Table 3.2. Expenditure and Distribution of Food Expenditure by Sector in Sri Lanka

	All Sectors	*Urban*	*Rural*	*Estate*
Monthly per capita expenditure on food				
Expenditure (Rupees)	1,355	1,611	1,327	1,162
Annual real growth *(%)*	-0.7	-0.8	-0.6	-2.0
Distribution (Total)	100	100	100	100
Rice	20.1	13.5	21.1	24.1
Wheat and other cereals	13.5	14	13.1	19.2
Meat	4.4	7.0	3.9	3.9
Fish and seafood	12.9	15.0	12.9	6.4
Milk, cheese, egg	9.8	12.2	9.4	8.4
Oils, fats	2.5	2.9	2.4	2.9
Fruits	11.5	11.1	11.6	9.9
Vegetables	8.8	7.8	9.0	9.4
Sugar, jam, confections	4.3	4.3	4.3	3.8
Condiments	9.9	9.5	10.0	9.8
Coffee, tea, cocoa	2.1	2.1	2.1	2.2
Mineral water, soft drinks	0.3	0.7	0.3	0

Source: Department of Census and Statistics, 2006.

Dietary diversity varies considerably across sectors and income groups. Rural and Estate populations spend a far lower proportion of their food budget on meat, fish and dairy products than the urban populations. Likewise, the poorest 20 percent of households spend significantly less on meat, fish and dairy than richer households.

While food energy availability may be relatively less important for very young children given their low caloric needs, energy deficiency among pregnant and lactating women can have a detrimental impact on the nutritional status of their children. The quantity and quality of food consumed during pregnancy is an important determinant of the baby's birthweight. The mother's nutritional status during lactation affects to some extent the quantity and quality of breast milk that the baby receives (although maternal physiology protects the baby to a large extent by prioritizing the baby's needs while depleting maternal stores).

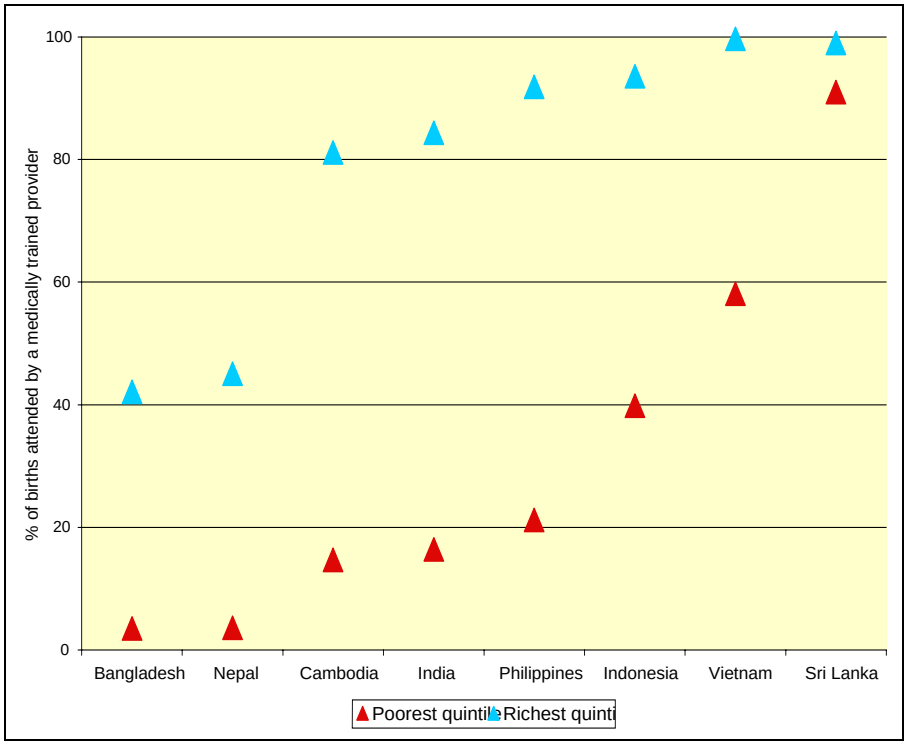
The evidence presented here shows that a large proportion of the Sri Lankan adult population is energy deficient and consumes a relatively undiversified diet. Food energy availability is also critically low and dietary diversity inadequate among the most deprived groups in the population—the poor and the rural and Estate populations. Chapter 2 shows that these groups have the highest prevalence of underweight and stunting, which have improved little in recent years. This suggests that food insecurity may have an important role in causing undernutrition among these marginalized groups. The food security data are derived from aggregated expenditure data and/or food balance sheets, but the data's limitations prevent the authors from drawing firm conclusions about this issue.

3.3. HEALTH CARE AND SAFE WATER AND SANITATION SERVICES

3.3.1. Health Care Use

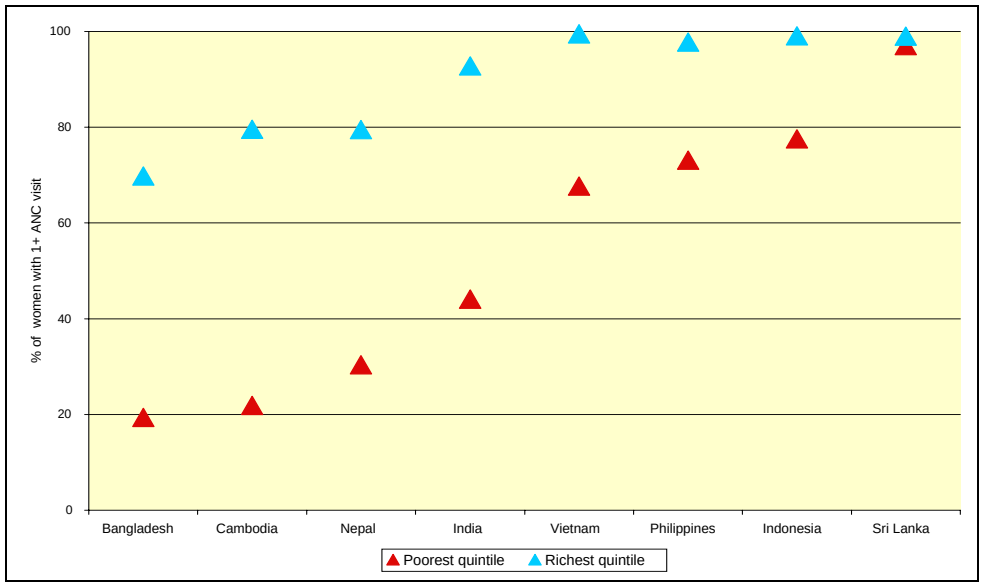
Sri Lankan women have a high propensity to use health services, which has helped to break the vicious cycle of undernutrition and disease. They are more likely to receive antenatal care during pregnancy, deliver at a health facility, and get the full set of vaccinations for their children than their counterparts elsewhere in South or Southeast Asia (Figure 3.2. and Figure 3.4. . In general, illness exacerbates undernutrition by reducing a child's appetite and her capacity to absorb food. In Sri Lanka, childhood illnesses are more likely to be treated early and quickly, preventing serious detrimental effects to a child's nutrition. The high propensity to use health services has also meant that Sri Lankan women have a high degree of contact with qualified health providers, who impart useful information about child health and also help to dispel harmful traditional norms and beliefs which may be detrimental to child health.

Figure 3.2. Rich-Poor Differences in Skilled Assistance at Delivery in South and Southeast Asia



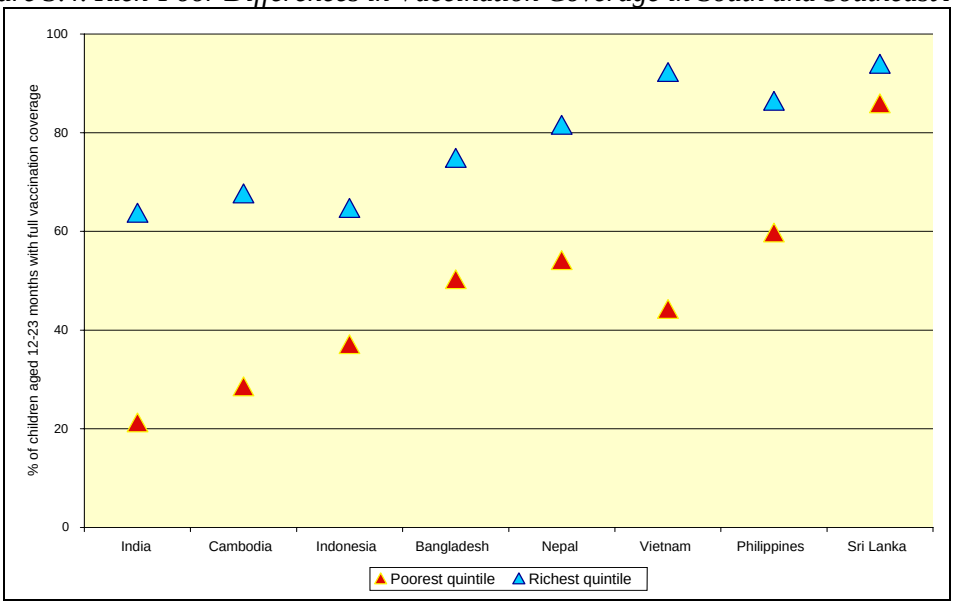
Sources*:* Gwatkin, Rutstein, Johnson, Pande and Wagstaff 2000; Sri Lanka data from Somanathan 2005.
Notes:
a. Delivery assistance is defined as the percentage of births assisted by a medically trained provider.
b. Data are for the years 1998 for the Philippines; 1999 for India; 2000 for Bangladesh, Cambodia and Sri Lanka; 2001 for Nepal; and 2002-03 for Indonesia and Vietnam.

Figure 3.3. Rich-Poor Differences in Antenatal Care Use in South and Southeast Asia



Sources*:* Gwatkin, Rutstein, Johnson, Pande and Wagstaff 2000; Sri Lanka data from Somanathan 2005.
Notes:
a. Antenatal care is defined as two or more antenatal care visits with a medically trained provider during the pregnancy.
b. Data are for the years 1998 for the Philippines; 1999 for India; 2000 for Bangladesh, Cambodia and Sri Lanka; 2001 for Nepal; and 2002-03 for Indonesia and Vietnam.

Figure 3.4. Rich-Poor Differences in Vaccination Coverage in South and Southeast Asia



Sources*:* Gwatkin, Rutstein, Johnson, Pande and Wagstaff 2000; Sri Lanka data from Somanathan 2005.
Notes*:*
Vaccination coverage is defined as the percentage of children aged 12-23 months who have received BCG, measles, and DPT vaccinations.
Data are for the years 1998 for the Philippines; 1999 for India; 2000 for Bangladesh, Cambodia and Sri Lanka; 2001 for Nepal; and 2002-03 for Indonesia and Vietnam.

Underlying this high propensity to use health services are permissive social and cultural norms, high levels of maternal education, and few physical and financial barriers preventing access to public health care services. Education has a positive impact on health care use. Its impact is enhanced by social and cultural norms which allow women a high degree of autonomy over their own and their children's health care. Health care seeking for children in Sri Lanka has been shown to be highly responsive to perceived symptoms and severity but unrelated to socioeconomic status as measured by type of house and maternal education (De Silva, Wijekoon, Hornik, and Martines 2001). Universal coverage of health services that are free at the point of use, and a nationwide network of public health facilities that extends to remote, rural areas have made health care highly accessible to the population.

The absence of large inequalities in the propensity to use health services, particularly public sector services, indicates that household wealth is not a key determinant for health care use in Sri Lanka. Poor-rich ratios shown in Figure 3.2. and Figure 3.3. are much lower than elsewhere in South and Southeast Asia. Previous studies have shown that the use of public sector health services is relatively equally distributed across rich and poor households (O'Donnell, van Doorslaer, Rannan-Eliya, and Somanathan 2005). Large inequalities exist, however, in access and utilization of health services between the Estate population and the rest of the country, as discussed in section 3.7 below.

3.3.2. Access to Safe Water and Sanitation

Having access to clean drinking water and safe sanitation disrupts the vicious cycle of undernutrition and disease by reducing the risk of diarrheal diseases, which diminish nutrient absorption and increase the risk of undernutrition among children. The MDG study for Sri Lanka found a higher prevalence of undernutrition among children living in houses with unsafe sanitation, such as houses with no toilets or merely bucket latrines, or inferior sanitation facilities such as pit latrines (World Bank 2005a). Drinking water from unsafe sources such as rivers, tanks, streams, or unprotected wells was also associated with a higher prevalence of undernutrition.

Compared to other countries in the South and Southeast Asian regions, Sri Lanka fares better on access to safe sanitation services than on access to safe water supply (Table 3.3.). Over 90 percent of Sri Lankans have access to safe sanitation facilities, which is higher than any other country in South Asia. However, only 79 percent of the population has access to a safe water source. Limited access to safe water therefore may be a potentially important causal factor for the high prevalence of undernutrition in Sri Lanka.

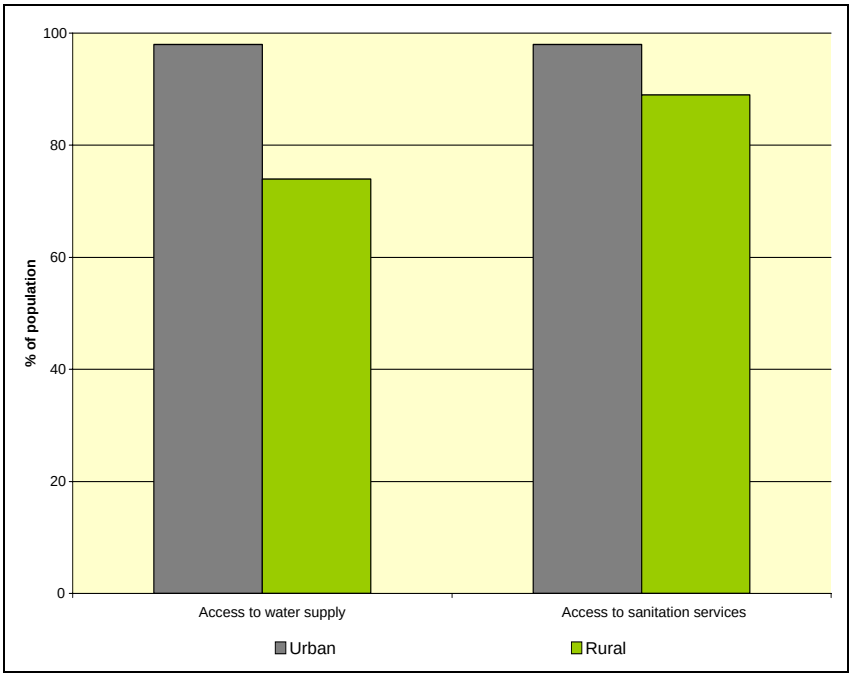
Rural-urban differences in access to safe water and sanitation are not large in Sri Lanka (Figure 3.5.). While data are not available on water supply and sanitation in the Estate sector, the prevalence of diarrhea is higher in that sector (as well as in rural areas and among the poorest 20 percent of the population, Sinha 2006). This suggests that sanitation is poor in those areas.

Table 3.3. Access to Improved Water Supply and Sanitation in Countries in Asia, 2004

Country	*Population with Access to Sanitation Services (%)*	*Population with Access to Water Supply (%)*
Cambodia	17[a]	41[b]
India	33	86
Nepal	35	90
Bangladesh	39	74
China	44	77
Indonesia	55	77
Mongolia	59	62
Maldives	59	83
Pakistan	59	91
Viet Nam	61	85
Philippines	72	85
Sri Lanka	91	79
Malaysia	94	99
Thailand	99	99

Source: WHO-UNICEF Joint Monitoring Program for Water Supply and Sanitation.
Notes*:*
a. Defined as access to improved sanitation, e.g., connection to a public sewer or septic system, pour-flush latrines, simple pit latrines, or ventilated improved pit latrines.
b. Defined as access to at least 20 liters of water per person per day from an "improved" source within one kilometer of the user's dwelling. An "improved" source is one that is likely to provide "safe" water, such as a household connection or a borehole.

Figure 3.5. Access to Improved Water Supply and Sanitation by Sector, 2004



Source*:* WHO-UNICEF Joint Monitoring Program for Water Supply and Sanitation.
Note*:* Definitions for improved sanitation and water supply are the same as for Table 3.1.

3.4. MATERNAL AND CHILD CARING PRACTICES

Three types of caring practices are potentially important underlying causes of undernutrition. They are care and nutrition received by the mother during pregnancy and lactation, as well as before pregnancy, child feeding and health care, and good hygiene. This section first examines the mechanisms that link caring practices to undernutrition to assess the strength of the association between them. Household- and individual-level factors that determine the resources needed to provide care are then examined.

3.4.1. Maternal Care

Low birthweight, a significant predictor of child undernutrition in Sri Lanka, is strongly influenced by the mother's nutritional status during her own childhood, adolescence, and pregnancy (Martorell, Ramakrishnan, Schroeder, Melgar, and Neufeld 1998). Her nutritional status is affected by a broad range of behavioral factors, including: eating a nutritionally adequate diet; getting adequate rest during pregnancy; receiving appropriate antenatal care and iron-folate supplements; seeking treatment early for infections and illness, particularly malaria and sexually transmitted diseases; and taking preventive measures against them. Reducing low birthweight therefore requires a good understanding of those factors that influence maternal care during pregnancy and also the care and nutrition that girls receive throughout their growing years.

A woman who is undernourished and in poor health also provides lower quality care and nutrition to her children *after* they are born (Ramalingaswami 1996). Therefore, adequate maternal care during lactation is important for the nutritional status of the newborn, the mother, and future children.

3.4.2. Child Feeding

Certain practices that benefit the health and nutrition of children are well established, such as ensuring that newborns receive colostrum,[16] exclusive breastfeeding during the first six months and continued breastfeeding thereafter, and the provision of nutritionally adequate complementary foods. Data for Sri Lanka, although limited, provide some evidence of this. Table 3.4 from the MDG Study (Table 3.7, p. 27) shows that the prevalence of undernutrition is higher among children who did not receive colostrum and whose mothers ceased exclusive breastfeeding before the baby was four-months old. Sri Lanka's latest Nutrition Action Plan (Ministry of Health, 2007) suggests that a large proportion of babies receive diluted, unhygienic foods at the incorrect age and in inadequate quantities. Anecdotal evidence also indicates that children are not fed adequately during and after illness.

[16] Colostrum is the milk produced by the mother in the first 2-3 days after delivery.

Table 3.4. Rates of Child Undernutrition among Children Aged 0-59 Month by Infant Feeding Practices, 2000

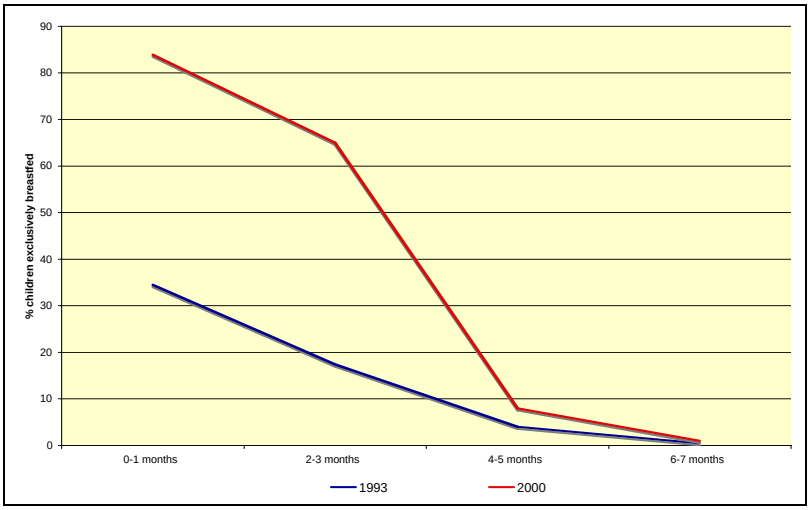
Breastfeeding Practice		*Moderate or Severe Undernutrition*		*Severe Undernutrition*	
		Underweight	*Stunting*	*Underweight*	*Stunting*
Colostrum was:	Given to the baby	27.94	12.58	3.95	2.52
	Discarded	34.49	16.60	6.46	3.70
Breastfeeding was exclusively practiced:	4 months or more	28.40	12.33	3.52	2.32
	< 4 months	32.37	15.42	6.30	3.34

Sources: Sri Lanka MDG study, p. 27, Table 3.7 (World Bank, 2005a); data are from Sri Lanka DHS 2000.

3.4.3. Do Recent Reductions in Undernutrition Reflect Improvements in Child Feeding Practices?

Between 1993 and 2000, child feeding practices improved as evidenced by sharp increases in the proportion of children receiving colostrum and the duration of breastfeeding. The proportion of children that received colostrum increased by 40 percent. The mean duration of exclusive breastfeeding also rose from 1.2 to 2.7 months. According to DHS data, the proportion of children exclusively breastfed for 2-3 months increased almost four times from 17.4 percent in 1993 to 65 percent in 2000 (Figure 3.6). However, the proportion of children exclusively breastfed after three months continues to drop sharply.

Figure 3.6. Exclusive Breastfeeding Rates (Infants Aged 0-3 Months)



Source: Department of Census and Statistics 2002.
Note: Data for youngest living child less than three years of age in the survey.

Overall improvements in breastfeeding practices mask large differences between rural, urban, and in Estate sectors and regions. Exclusive breastfeeding rates are available by location from a survey of seven districts, which excluded the relatively prosperous Western province, and from another survey of districts in the north and east. As Table 3.5 shows, patterns of exclusive breastfeeding mirror patterns in undernutrition rates across sectors, as shown in Figure 2-6. In the urban and rural sectors in these seven districts, 47 percent and 52 percent of all children were

exclusively breastfed for 0-4 months. In contrast, only 23 percent of children in the Estate sector were breastfed for the same duration. A separate study of plantation workers showed that most women do not exclusively breastfeed for longer than one month (Sorenson, Fernando, Hettiarachchi, Durongdej, Podhipak and Skaara 1998).

Table 3.5. Children Exclusively Breastfed for Four Months ***(%)***

	Rest of the Country	*Northern and Eastern Provinces*
Urban	52.8	38.0
Rural	47.3	42.9
Estate	22.7	n/a

Source*:* Department of Census and Statistics and UNICEF, 2003 and 2004.
Note*:* Values for the "rest of the country" are from a sample survey conducted in seven districts: Matale, Nuwara Eliya, Hambantota, Anuradhapura, Badulla, Moneragala and Ratnapura. Values for the Northern and Eastern provinces are from a sample survey in Jaffna, Mannar, Vavuniya, Batticaloa, Ampara and Trincomalee districts.

Establishing causation from the limited data available is difficult. Bivariate analysis carried out in the MRI study and trends presented above suggest that improved child-feeding practices during the 1990s—colostrum intake and breastfeeding in particular—were correlated with large reductions in stunting and underweight rates that occurred during the same time period. The two trends appear to have been correlated both across time and space; the improvements occurred during the same time period, and inequalities in the prevalence of undernutrition and breastfeeding rates across regions and sectors are also correlated. The Maternal and Child Health Program of the Ministry of Health introduced nutrition-related interventions in the early 1990s.

To reduce the prevalence of undernutrition in Sri Lanka, child-feeding practices need to be vastly improved. Less than two-thirds of all children are exclusively breastfed for four months or more. Complementary foods are introduced too early and are inappropriate. These practices severely compromise children's nutrition inputs during the first two critical years of their lives. Most Sri Lankan children's growth retardation begins at approximately six-months of age and most of the damage has already occurred by age two (section 2.1.4).

3.4.4. Good Hygiene

Two positive child care behaviors that can have a positive impact on nutrition are boiling drinking water and hand washing by mothers after defecation and/or cleaning their children after they defecate. Like health care and access to safe water and sanitation, good hygiene behaviors help to break the link between undernutrition and disease. The MDG study showed a strong correlation between lower underweight and stunting rates and drinking boiled water.

3.4.5. Household- and Individual-Level Influences on Maternal and Child Caring Practices

The conceptual framework in Figure 3.1. lists the necessary resources to provide child care; these include the caregiver's mental and physical health, her control over resources and autonomy, and her knowledge and beliefs. The key factors that determine the availability of resources to provide care are maternal education, social and cultural norms that determine women's status in society, and employment.

Maternal education is widely recognized as an important determinant of good maternal and child care practices. Data analyzed for this study show that higher levels of maternal education are strongly associated with higher maternal weight, a lower likelihood of having a low birthweight baby, longer duration of exclusive breastfeeding, and a higher probability of boiling drinking water and hand washing after using the toilet (Table 3.6).

The literature on maternal education identifies several mechanisms influencing maternal and child care practices, including in Sri Lanka (Caldwell 1990; Caldwell 1979; Cleland and van Ginneken 1988). First, education is associated with shifts in norms and beliefs. In Sri Lanka, as elsewhere in South Asia, traditional norms discourage feeding colostrum to the baby. Education encourages women to break away from such norms and is associated with a breakdown of cultural and social barriers which prevent women from seeking maternal and child health care outside the home. Second, education increases women's knowledge of maternal and child care practices such as breastfeeding, preparing nutritionally adequate foods, and recognizing the symptoms of illness. Third, cognitive skills acquired at school enable women to better understand the health and nutrition information they receive from service providers, leading to improved productivity in utilizing health and nutrition inputs (Michael 1973; Rosenzweig and Schultz 1985). Fourth, and finally, education increases women's access to and control over resources by increasing their employment opportunities, thereby enabling them to provide better care for their children and themselves.

Table 3.6. Mother's Education and Caring Practices

Education Level	*Mother's Weight (Kg)*	*Mother's Height (cm)*	*Low Birth-weight (%)*	*Duration of Exclusive Breast-feeding (months)*	*Boil Water for Childre n to Consum e (%)*	*Mothers Wash Hands after Defecatio n (%)*	*Children Had Diarrhea in Past 2 Weeks (%)*	*Under-weight (%)*
No schooling	46.6	148	27.4	1.2	68	78	9.4	48
Primary	49.6	149	19.0	3.7	75	86	7.0	41.4
Secondary	52.2	151	17.7	3.8	85	94	7.8	31.7
O-level or equivalent	54.0	153	13.8	3.1	88	94	5.8	24.8
A-level or equivalent	53.6	152	11.5	4.5	96	100	2.2	13.3
Total	50.5	149.8	16.7	3.7	78	88	7.2	29.4

Source: Authors' calculations from Sri Lanka DHS 2000.

Social and cultural norms that determine women's status within the household and the community strongly influence three of the resources for mother and child care: the mother's physical and mental health, her control over household resources (including her time) and her knowledge and beliefs (Engle, Menon, and Haddad 1999; Smith and Haddad, 2000). The woman's physical condition is closely associated with the quality of care she receives, starting even before pregnancy. Where the status of women is generally low, girls tend to be considerably more undernourished than boys throughout their growing years. The lower status of women means that the quality of nutrition and care they receive during pregnancy is also poor, exacerbating the impact of maternal undernutrition on the child's nutrition outcomes. The less

autonomy and control over resources women have, the less likely they are to allocate marginal resources to their children (Haddad, Hoddinott, and Alderman 1997; Smith and Chavas 1997). Women's ability to acquire knowledge about good caring practices and break away from beliefs that may be detrimental to care are affected by cultural and social norms, which include those that reduce women's interactions with others, limit opportunities for independent behavior, and restrict the transmission of information.

In Sri Lanka, however, a mother's inadequate care and nutrition, either before or during pregnancy, cannot be attributed to social and cultural norms that undermine women's autonomy. Sri Lanka is well known and unique in South Asia for the level of autonomy its women enjoy (Caldwell 1990). They are distinguished by female literacy rates of over 85 percent and are more likely to be excused from work during pregnancy and allocated more food than their Indian counterparts (Caldwell 1990).

Sri Lanka's improvements in the health sector are often attributed to high levels of female education as well as cultural and social norms which allow access to health services. But why have high levels of education helped reduce child mortality but not child undernutrition?

The answer potentially lies in households' differences, particularly mothers' abilities to perceive and respond to illness and also to nutrition. In Sri Lanka, overall low mortality is associated with a high degree of sensitivity to illness and the efficient use of health services (Caldwell 1989). Relatively easy and equitable access to health services and social norms that encourage the use of health services have meant that education and other inputs are used quite effectively to both recognize illness and respond to it appropriately. In contrast, high rates of undernutrition are associated with a lack of sensitivity to growth faltering at early ages and an inability to respond to it. A critical problem is the lack of awareness about undernutrition and the fact that it is often invisible. When the knowledge component is implemented with development programs, child undernutrition can be reduced by one-third (Christiansen and Alderman 2004).

Maternal employment outside the home may have positive or negative effects on maternal and child practices and therefore also on nutrition. Employment raises women's earning potential, thus increasing their autonomy and control over household resources. But a working mother is also less likely to exclusively breastfeed her child or have the additional time for child care and feeding the child complementary foods. Scant evidence exists about the effects of female employment on maternal and child care practices in Sri Lanka. In both the public and private sectors, women are entitled to 84 days of maternity leave.[17] However, private sector employees actually have fewer days leave since Saturday is a work day. In the public sector, labor law provides for women to come to work late and leave early to facilitate breastfeeding. In contrast, women in lower paying jobs in the textile industry or the tea plantations generally have much more restrictive leave entitlements. In the Estate sector, in particular, women are paid on a piece-rate basis; maternal employment would significantly impair the quality of child care with relatively little increase in income as compensation. In fact, the decline in exclusive breastfeeding rates after three months, found by DHS 1993 and 2000, may reflect the fact that low-paid women must return to work after three months and cannot continue to exclusively breastfeed their children.

[17] Eighty-four days for the first two children and 42 days for the third child onward.

3.5. .EXPLAINING VARIATIONS IN UNDERNUTRITION: MULTIVARIATE ANALYSIS

3.5.1. Empirical Strategy

The conceptual framework's premise is that nutritional outcomes result from three major underlying pathways: (1) household-level food security, (2) caring practices, and (3) health and environment services (Figure 3.1). While the framework does not weight the relative importance of each pathway, it varies in each country and can be estimated using multivariate regression analysis. When undertaking such an analysis, however, a number of issues must be addressed.

For many datasets, including the DHS data, no variable directly measures household food security. A proxy may be used in its absence. A commonly used proxy is household wealth or consumption. Household wealth is a good potential proxy because it is a major determinant of household food security in its own right, as implied in the framework. A household's food availability will be the outcome of the food produced by the household, in-kind transfers of food, and the overall purchasing capacity of the household.

In Sri Lanka's case, household wealth or consumption is likely to be a good proxy because 60 percent of household consumption in Sri Lankan households is for food. The ratio is much higher for poorer households.[18] Moreover, consumption of own production is quite limited in Sri Lanka, as most rural households produce food for the market.[19] Additionally, food transfers in relation to overall food consumption are small, even in the poorer households. Thus, household wealth or consumption should be reliable proxies for the level of household calorie consumption. Calorie intake is highly correlated with household wealth status, as shown above.

However, household wealth and economic status also affect nutrition outcomes by their impact on the pathways of care practices and health and environmental conditions (Figure 3.1. If household wealth status were the only explanatory variable in the regression analysis, its estimated coefficient would reflect its net impact on all three pathways. Fortunately, the DHS datasets contain a number of variables which measure the other two pathways.

The variables that measure care practices are hand washing, drinking boiled water, length of time a child was exclusively breastfed, and the age complementary foods were introduced. The variables that measure health and environmental conditions are urban or rural residence, number of doctor visits, and access to piped water and flush toilets. Controlling for these variables in the multivariate analysis, the coefficient of the household wealth variable will essentially pick up factors correlated with household wealth not operating through the second and third pathways. In short, the household wealth variable will pick up the impact of household wealth mediated through the food security pathway. This strategy is used in this study's empirical analysis.[20]

A reduced-form probit regression model was estimated to explain variations in the probability of a child being born with low birthweight. Linear, multivariate regression models were estimated

[18] These findings, with regard to the relative composition of own production and food transfers in total household consumption are from the authors' analysis of Sri Lanka Central Bank Consumer Finance Survey data (1996-97, 2003-04).
[19] Authors' analysis of Central Bank Consumer Finance Survey data (1996-97, 2003-04).
[20] In this study, household wealth is measured using an asset index, a measure of the household's permanent income. The MRI study included a range of asset variables in its model, while the MDG Report used household consumption.

to explain variations in HAZ and WAZ scores[21]. The models perform reasonably well. The results are stable and compare across specifications. The estimated R-squared is acceptable in all three models.

The regression estimates presented in Appendix Tables 4.6 show how the progressive addition of variables for food security, caring practices, and health and environment affected the relationship between undernutrition and the underlying determinants. Coefficient estimates are presented for the HAZ and WAZ models. The estimates shown for the low birthweight model are the marginal effects calculated at the sample means of the variables.

3.5.2. Key Factors Contributing to Undernutrition

Table 3.7 summarizes the marginal effects of the key underlying determinants.

Low Birthweight

- The relationship between low birthweight and maternal-underweight is strong and statistically significant. An underweight mother is more likely to give birth to a low birthweight baby, indicating that dietary intake, rest and care during pregnancy are critical.

- Household wealth status is highly correlated with the probability of being low birthweight. The reference category is the poorest quintile. The coefficients measure the marginal impact on the probability of being underweight relative to the poorest quintile. The relationship is significant for all but the second quintile, suggesting that there may be a threshold below/above which wealth becomes an important determinant of low birthweight.

  It is notable that the household wealth coefficients are relatively stable to adding the (1) health and environment variables, and (2) caring practice variables (Appendix Tables 4-6). As explained above, controlling for the other two pathways, it is reasonable to conclude that the wealth status coefficients largely measure the impact of food insecurity.

- Access to piped water inside the house matters, indicating that, even after controlling for wealth status, living conditions are important.

- Health care *during* pregnancy (visits by a family health worker, iron tablets, blood pressure examination, and tetanus-toxoid injections) is not statistically significant. As noted, receiving antenatal care from health professionals during pregnancy is nearly universal in Sri Lanka. Thus, the variation across the population in health care use was likely too small to have any significant effect in explaining birthweight variations. However, the MRI study found that "good" antenatal care use at clinics protected children from being underweight.

Stunting and Underweight

- Low birthweight is strongly associated with being underweight and stunted, as measured by lower WAZ and HAZ scores. The relationship between low birthweight

[21] Probit models were also estimated for the probability of being underweight and stunted. Results were similar for both the linear regression models and probit models. Only the linear regression models are presented here as they performed slightly better than the probit models.

and underweight or stunting is not affected by the addition of variables to control for other factors such as caring practices for the child.

- Children born to underweight mothers have lower WAZ and HAZ scores and those born to overweight mothers have higher WAZ scores. These relationships are statistically significant. As in the case of low birthweight, maternal nutritional status has an important bearing on a child being underweight or stunted.

- Belonging to a wealthier household is associated with higher HAZ and WAZ scores. The relationship is statistically significant for the third, fourth and fifth quintiles in the WAZ model, and only for the richest quintile in the HAZ model. The poorest quintile is the reference category. Again, this suggests that the relationship between wealth and nutrition status is not linear and that there may be a threshold below/above which wealth becomes an important determinant of child undernutrition.

- The coefficients for wealth quintile remain relatively unchanged even after controlling for caring practices and health and living environment. As in the low birthweight model, this finding suggests that the wealth status variable proxies for food security in this model, not for caring practices or living conditions.

- This proxy relationship is consistent with the multivariate analysis in the MDG study. It found a large, statistically significant, inverse association between per capita household consumption expenditure and the probability of being underweight.

- Unlike many other countries, maternal education is a significant predictor of child underweight only when very high levels of education have been attained. The only coefficient that is statistically significant is completion of secondary schooling in the stunting model. Controlling for wealth status and living conditions, the relationship between maternal education and child stunting is not significant.

- The prior finding is consistent with the MDG study, which found that maternal schooling has an inverse association with underweight rates, but only for schooling levels beyond the O-level (typically grade 10). Children whose mothers have A-level (12 years) or more schooling are more than 50 percent less likely to be underweight than children whose mothers have fewer than 12 years of schooling.

- Whereas the MDG study found that access to flush toilets and piped water were significant predictors of child underweight, the regression analysis for underweight in this study did not. The MDG study also found that access to electricity was highly correlated with underweight. It is worth noting, however, that the MDG study did not control for rural or urban sector of residence in its model. Since electricity is largely related to sector of residence, the electricity variable in the MDG study model may have picked up variations across sectors.

- Once wealth status, living conditions, and health care have been controlled for, caring practices do not appear to be important. The age at which complementary foods were first introduced and whether or not the colostrum was discarded are not significant. The model also included control for twin-birth and the number of people in the households because the child may be competing for attention in a large household.

These variables are not significant either. Good hygiene practices also are not significant.

- Sector of residence—urban, rural, or Estate—is statistically significant in the stunting model but not the in underweight model. Estate is the reference category in both models, so the coefficients for both rural and urban measure the variation in HAZ and WAZ scores relative to being in the Estates.

Table 3.7. Marginal Effects of Key Underlying Determinants Estimated from Probit Regressions on the Probability of Low Birthweight, Underweight and Stunting

	Stunting (HAZ scores)[(a)]	**Underweight (WAZ scores)[(a)]**	**Low Birthweight[(b)]**
Child age	-0.014**	-0.015**	
Child sex	0.083	0.042	
Low birthweight	-0.445**	-0.482**	
Characteristics of the mother			
Mother's education [reference = no education]			
Completed primary school	0.064	0.002	0.005
Some secondary schooling	0.119	-0.047	0.031
Completed secondary school	0.32**	0.195	0.011
Mother underweight	-0.123*	-0.268**	0.093**
Mother overweight	0.006	0.185**	0.02
Mother's age	-0.002	-0.009*	-0.002
Mother watches TV	0.062	-0.013	0.011
Mother reads newspaper regularly	0.051	0.093	0.002
Household wealth (proxy for food security)			
Wealth quintile [reference = poorest quintile]			
2nd quintile	0.02	0.021	-0.049
3rd quintile	0.087	0.178*	-0.07*
4th quintile	0.16	0.288**	-0.103**
5th quintile	0.411**	0.466**	-0.074*
Household size			
Number of people in the household	0.001	0.023	
Number of children under five			-0.007
Twin birth	-0.113	0.263	0.428**
Health and environment conditions			
Access to water			
Pipe inside house	0.231*	0.091	-0.149**
Public tap	0.175	0.028	0
Well inside the house	-0.117	-0.146*	0.029
Access to flush toilet	-0.133	-0.122	0.026
Sector of residence [reference = Estate]			
Urban	0.455**	0.17	-0.05
Rural	0.455**	0.052	-0.043
# Family health worker (FHW) visits			-0.003

	Stunting (HAZ scores)[(a)]	Underweight (WAZ scores)[(a)]	Low Birthweight[(b)]
during pregnancy			
Blood pressure checked during pregnancy			0.089
TT injections during pregnancy			-0.088
Took iron supplements during pregnancy			0.019
Child had diarrhea during the past 2 weeks	-0.04	-0.086	
Number of doctor visits	0.009	0.014	
Maternal and child caring			
Was given colostrum	0.049	0.04	
Age when complementary foods were introduced	-0.004	-0.006	
Drink boiled water	0.077	0.159**	0.008
Mother washes hands after toilet	-0.076	-0.057	0.034
Observations	1,729	1,729	1,354
R-squared	0.18	0.21	
Pseudo R-squared			0.13

Source: Authors' calculations from Sri Lanka DHS 2000.
Note:
* = significant at 5% level; ** = significant at 1% level.
(a) Coefficient estimates from linear regression.
(b) Probit regression. Marginal effects from probit regression are reported.

3.5.3. Income Inequalities, Poverty and Undernutrition in Sri Lanka

Household wealth status is clearly an important determinant of stunting and underweight in Sri Lanka. Low birthweight, the most important predictor of both these types of undernutrition, is also highly influenced by household wealth. As explained in the conceptual framework, the impact of household wealth on nutrition is mediated by the three underlying determinants of undernutrition: food security, caring practices and health and environment. An underlying premise for the multivariate analysis presented in this chapter is that, once caring practices, health care, and living conditions are controlled for, *household wealth is actually a proxy for household food security*. The question then arises as to whether increased economic growth in Sri Lanka would translate into improved household wealth and nutrition outcomes.

While Sri Lanka has experienced modest economic growth in recent years, any gains in improved household wealth, and thus food security and living conditions, have accrued to better-off households living in urban areas and the Western province. A 2007 World Bank poverty assessment for Sri Lanka found that economic growth has been slower and income per capita substantially lower in regions outside the Western Province. Inequality has risen sharply as a consequence. The World Bank report attributes the growing rural-urban gap to concentrated economic growth in the Western province. The urban population living in there is the same group that experienced the largest reduction in child underweight and stunting rates between 1993 and 2000 (Figure 2.6). This trend has been exacerbated by the unequal income growth rates in the urban sector and in the rural and Estate sectors. The Bank's growth incidence analysis of rural incomes shows that there has been limited improvement in rural incomes, especially among agriculture-dependent households (World Bank 2007). The poorest 7 percent of rural and 10

percent of agricultural households experienced a decline in income in real terms between 1995-96 and 2001-02.

Food price policies have not alleviated the impact of falling incomes on food security. Sales taxes are imposed on most food items in Sri Lanka. Given that the bottom 20 percent of the population allocates 70 percent or more of its total household spending to food, imposing sales taxes on food items adversely affects the poor. As a result, Sri Lanka has one of the least progressive distributions of indirect taxes in the Asia-Pacific region (O'Donnell 2003). In addition, no policies exist to improve the poor's consumption of micronutrient-rich foods through price subsidies, fortification of commonly consumed foods (except salt iodization) or other mechanisms.

In short, average incomes have risen in Sri Lanka, but the incomes of the poorest households have fallen with potentially detrimental effects on their nutrition. Government transfers, which have insufficiently compensated for the fall in incomes, have failed to protect the poor in the rural and Estate sectors. Current targeted welfare programs perform well below their potential in protecting the consumption of the vulnerable and the poor because the programs are not well targeted and the transfer amounts are small (World Bank 2007). Overall food security for the poorest groups in the population living in the rural and Estate sectors is unlikely to have improved under these conditions. The sharp increase in inequalities in stunting and underweight rates across regions, sectors, and household wealth quintiles between 1993 and 2000 is undoubtedly linked to the increase in income inequalities.

These findings imply that targeting the poorest, most vulnerable groups in the population will be important components of a nutrition strategy. Direct nutritional interventions to improve caring practices must target these groups. Given the high concentration of energy deficiency and poor diets among poor, rural, and Estate populations, improving their calorie intake and increasing dietary diversity also will be critical. However, this will require a more multisectoral approach to addressing undernutrition.

Raising agricultural productivity is likely to have a positive impact on undernutrition by increasing household incomes and reducing food prices, although no conclusive data are available to support this hypothesis. Fiscal policies to improve income distribution to the poor, particularly in rural areas where the most nutritionally vulnerable populations live, would also be effective. The tax regime should be re-examined and revised to alleviate the impact on the poor of sales taxes on food. Educating the population on what constitutes a balanced diet and promoting livestock husbandry and home gardening are some ways to increase diversity in diets. However, even at a global level, there are few evaluations that have demonstrated the efficacy or effectiveness of home gardens, livestock, and dietary diversification programs. Scaling-up such efforts to a level at which they could impact national indicators through appropriately identified institutional arrangements poses yet another challenge.

The analysis of levels and trends in Chapter 2 and the empirical analysis in this chapter have highlighted the significantly poorer performance of the Estate sector. The next section takes a closer look at it.

3.6. Explaining the Poor Performance of the Estate Sector[22]

The Estate's population is regarded as among the poorest and most vulnerable groups in the country. The sector's social indicators rank lower than the national average, particularly with regard to nutritional indicators. Explanations lie as much in the history of the Estates, as in recent trends in income and employment, access to social services, and living conditions. Each of these factors is discussed below, drawing largely from the 2007 World Bank report focusing on the Estate sector.

Historical Background: a Neglected, Isolated Population

In the 1800s, the British colonial administration brought Tamils from South India to Sri Lanka to work in the tea and rubber estates. The Ceylon Citizenship Act of 1948 made the Tamil workers stateless. The Government of Sri Lanka granted citizenship to the Estate Tamils in the 1980s and made efforts to integrate them into the local communities by extending the public education system to the Estates.

However, the Estates remained isolated from the rest of the country for two reasons. First, the Estate workers are completely dependent on the Estate's management for their basic needs. The plantations are self-sufficient enclaves, which provide rudimentary housing, health, and education for their workers. Second, plantation workers differ culturally and linguistically from the Sinhalese population and are geographically insulated from the rest of the country. Both factors have implications for Estate households' access to good quality, affordable health and nutrition services, as discussed below.

Socioeconomic Trends: Poorer and More Vulnerable to Economic Shocks

In 2002, the poverty headcount rate in the Estate sector was 30 percent, the highest in the country. Unlike in the urban and rural sectors, the headcount poverty rate in the Estate sector rose sharply by 10 percentage points between 1990/91 and 2002 (Table 3.8).

Table 3.8 Poverty Headcount Trends in Sri Lanka[a]

	1990/91	1995/96	2002
National	26.1	28.8	22.7
Urban[b]	16.3	14.0	7.9
Rural	29.4	30.9	24.7
Estate[c]	20.5	38.4	30.0

Source: Table 6.1, World Bank 2007.
Notes:
a. Based on official poverty lines Rs. 1423, Rs. 833 and Rs. 475 respectively for 2002, 1995-96 and 1990-91. The official poverty line is derived using the "cost of basic needs" method on 2002 HIES data, and deflated by Colombo CPI to obtain nominal lines for other years.
b. Urban-rural classification of areas is different between HIES 1990-91 and HIES 1995-96 onward. These do not affect national trends; but the sectoral (urban and rural) trends need to be cautiously interpreted.
c. Comparability of Estate headcount for 1995-96 with that for other years may be affected by the fact that HIES was sampled differently for the Estate sector.
Source: World Bank 2006a.

[22] This section is largely derived from World Bank 2007 and Sinha 2006.

The increase in the poverty rate during 1990s is attributed to a sharp decline in the number of income earners per household. The number of income earners declined from 2.3 per household in 1996/97 to 1.7 per household in 2003/04 in the Estate sector, although it remained unchanged for the country as a whole during the same period (CFSES, 2005).

Estate households are characterized by a high degree of economic vulnerability because they have lower and less diversified sources of income. They are dependent on a narrower base of income derived from agricultural activities compared to the average agricultural household and have limited income from non-agricultural activities. Therefore, not only are Estate households poorer, they are also more vulnerable to economic shocks because of their undiversified income base. These factors are exacerbated by the fact that Estate households benefit the least from social programs such as Samurdhi and pension and disability assistance. All of these factors have negative implications for caloric intakes, the diversity of the diet consumed by Estate households, as well as the workload of women, their time availability for childcare and the potential for adequate rest during pregnancy.

Basic Social Services: Low Levels of Access and Poorer Quality Services

Despite recent improvements in health and social indicators, the Estate sector lags behind the others in most human development indicators (World Bank, 2007). Infant and adult mortality rates have declined steadily in the Estate sector during the past 15 years. The gap in adult literacy rates between the Estate, rural and urban sectors narrowed considerably between 1986/86 and 2003/04. However, child mortality in the Estate sector is more than double the rate for the country as a whole, and the prevalence of low birthweight, maternal and child malnutrition is significantly higher. Moreover, in 2003/04, male and female literacy rates were 6 and 16 percentage points lower than rural averages (Department of Census and Statistics, 2002) (See Table 3.9 below).

Poor health conditions among the Estate population may be attributed to the fact that the health system accessible to Estate workers has not been linked to the national programs since British rule. The government health system—discussed earlier as having played an important role in reducing infant and maternal mortality in the rest of the country—was therefore never accessible to the Estate population. The quality of the Estate-specific services was consistently below those of the national health facilities. They were frequently under-resourced and staff were recruited from outside the plantations and managed by the Regional Plantation Companies on private estates, or by the *Janatha* Estates Development Board and State Plantations Corporation in the nationalized estates. Because the working language was Sinhala, health workers were unable to communicate with the population and therefore establish relations of trust with the majority of the Estate sector families (World Bank 2007).

Access to health services has improved in recent years as government provision of services has expanded into the Estate areas, albeit gradually. But progress in terms of improving health outcomes remains slow.

Public health education and awareness programs implemented in the Estate sector have met with varying degrees of success. The main constraints were low participation and irregular monitoring and follow-up visits to sustain good practices. Furthermore, the relative isolation of the Estate population, low levels of literacy and limited access to mass media have limited the impact of national level awareness-raising campaigns, such as breast feeding.

Living Conditions: Dilapidated Shelters with Poor Hygiene

The majority of Estate workers live in barrack type shelters, which are overcrowded and do not offer a conducive environment for improved hygiene. Access to safe water and sanitation services are generally poor.

To summarize, all three underlying determinants of malnutrition are significantly worse among the Estate population compared to the rest of the country. High levels of income poverty and economic vulnerability have a negative impact on both the quantity and quality of the food intake and increase the workload of women, thereby decreasing their time for childcare and for rest during pregnancy (a risk factor for low birthweight). Limited access to health services has meant that the public health sector has not had the same protective effect on malnutrition among the Estate population that it had in the rest of the country. And Estate sector women have had less exposure to education about caring practices than was provided through the health sector in other parts of the country. Awareness creation about caring practices has been further constrained by the relative historic, cultural and linguistic isolation of the estates.

Table 3.9 Maternal and Child Health and Nutrition Indicators by Sector of Residence and Wealth Quintile

	Estate	**Rural**	**Urban**	**Poorest 20%**	**Richest 20%**	**Population Average**
Use of maternal health services[1]						
% who received tetanus toxoid immunization	91.3%	96.3%	92.8%	93.2%	95.5%	95.1%
% who received drugs to prevent malaria	31.8%	26.0%	12.4%	34.9%	12.5%	23.8%
% who gave birth in an institution	81.2%	98.2%	98.9%	91.4%	99.2%	96.7%
% who gave birth in a private hospital	0.5%	2.6%	17.6%	0.2%	20.0%	5.5%
% who received pre-natal visits by a midwife	41.3%	89.0%	76.8%	75.6%	80.7%	82.9%
% visited facility for pre-natal care	86.5%	94.8%	93.5%	93.1%	94.1%	93.9%
% advised on complicated pregnancy symptoms	36.8%	83.4%	78.7%	65.3%	86.3%	79.0%
% received post-natal visits by midwife or medical officer	52.5%	76.3%	67.2%	69.0%	68.8%	72.6%
Child health indicators[2]						
% of children with child health development record	90.5%	99.2%	99.3%	96.0%	99.6%	98.5%
Number of times weighed	6.1	6.4	5.9	5.7	6.2	6.1
% never weighed	9.9%	1.2%	1.8%	4.9%	1.5%	2.2%
Child nutrition status [3]						
% with low birth weight (<2.5kg)	30.0%	17.3%	13.7%	24.7%	9.2%	17.4%
% of children stunted	37.0%	14.1%	8.3%	29.0%	3.5%	14.6%
% of children wasted	12.5%	16.8%	8.9%	20.1%	9.5%	14.8%
% children underweight	45.7%	31.0%	17.8%	47.4%	11.1%	29.3%

	Estate	Rural	Urban	Poorest 20%	Richest 20%	Population Average
Women's nutritional status [4]						
% of women with low BMI	47.7%	23.1%	12.7%	37.3%	10.0%	22.9%
% of women with high BMI	4.6%	17.7%	37.0%	6.6%	36.9%	20.5%

Notes:
(1) Maternal health services used during pregnancy by women currently aged 19-49 years with births during five years prior to the survey.
(2) Children aged 3-59 months.
(3) Children aged 3-59 months whose heights and weights were measured.
(4) Women aged 15-49 years.
Source: Tables 2, 3, 4 and 5 in Sinha, 2005 – analysis of Sri Lanka DHS 2000.

3.7. The South Asian Enigma– How Does Sri Lanka Fit In?

South Asia has the highest rates of undernutrition in the world—much higher than the poorer region of Sub-Saharan Africa—as well as worse health indicators (Table 3.8). Children aged 0-5 in South Asia are twice as likely to be underweight than their Sub-Saharan Africa counterparts. Yet, maternal and child mortality rates in South Asia are roughly two-thirds of those in Sub-Saharan Africa. This differential performance in health and nutrition has led observers to refer to this as the South Asian enigma (Ramalingaswami 1996). Some discussion in the literature questions why this enigma persists, but supporting empirical evidence is limited.

Table 3.10 *Health and Nutrition Indicators by World Region*

Region	Moderate & Severe Underweight % (under five)	Moderate & Severe Stunting % (under five)	Infant Mortality (per 1,000 births)a	Maternal Mortality (per 100,000 births)b
South Asia	48.4 c	46.1 c	66	567
Sub-Saharan Africa	25.7 e	32.8 e	101	916
East Asia	14.7 b	17 b	32.2	116
Latin America	9.1 d	19.1 d	27.7	193

Notes:
(a) Modeled for 2003; (b) 2000; (c) 1999; (d) 1996 (from WDI); (e) Klasen's calculation (2000) based on UNICEF data in 1998 and previous years.
Source: (Klasen, 2000; World Bank, 2005b).

In comparison to Sub-Saharan Africa, the low status of women, high population density and poor sanitation services in South Asia were identified as potential explanations for the South Asian enigma by Ramalingaswami (1996). They argued that the South Asian enigma cannot be attributed to differences in agricultural performance, income inequalities, plant-based diet etc. Instead, they offer two other potential explanations. The first is related to large regional differences in the incidence of low birthweight and the timing and quality of child feeding. Underlying these differences is the relatively low status of women in South Asia compared to Sub-Saharan Africa, which affects women's ability to adequately feed and care for themselves and their children. The second is related to considerably higher population densities in South Asia relative to Sub-Saharan Africa, leading to overcrowding and consequently to poor sanitation and hygiene. No empirical evidence was provided to support their explanations of the South Asian enigma.

Empirical analyses of cross-country data that have attempted to explain the South Asian enigma have found no major differences in the relative importance of the underlying causes between the regions, except perhaps that gender differences in South Asia are greater than in Africa. They do however confirm that nutrition outcomes in South Asia are systematically different than those in Sub-Saharan Africa.

Osmani (1997) identified low birthweight and factors influencing it—particularly the low status of women in South Asia—as important determinants of stunting. However, the endogeneity of the low birthweight variable[23] in the model has led to the criticism that the OLS estimates are biased, thus weakening Osmani's conclusions (Smith and Haddad, 2000). A similar empirical analysis by Klasen (2000) concluded that the unusually high rates of undernutrition in South Asia were largely related to the inappropriate use of the US-based reference standard for international comparisons. This hypothesis has been subsequently disproved (WHO, 2006: New International Growth Standards).

Smith and Haddad (2000) concluded that the main sources of difference between the two regions were a set of time-invariant, country-specific factors. To support this argument, they estimated how much undernutrition would remain if all of the underlying determinant variables (health environment, national food availability, women's education and women's status) were raised to their desirable levels. They found that while undernutrition would remain at 23.8 percent in South Asia, it would decline to 0.5 percent in Sub-Saharan Africa.

In summary, nutritional outcomes, particularly the incidence of low birthweight in South Asia are systematically different to those in Sub-Saharan Africa. Ramalingaswamy proposes some explanations for this South Asian enigma based on differences in gender roles and sanitation services between the regions. The empirical evidence to support the explanations is limited and not conclusive, but the hypothesis about the South Asian enigma remains valid.

3.7. How Does Sri Lanka Fit In?

Sri Lanka still poses an enigma compared to Sub-Saharan Africa. The incidence of low birthweight and underweight are similar to or marginally higher in Sri Lanka than in Sub-Saharan Africa. Yet, by all other nutrition indicators, Sri Lanka's situation is worse than Sub-Saharan Africa.

The South Asian enigma cannot be explained based on gender inequalities and inadequate access to safe water and sanitation in the case of Sri Lanka. Female literacy rates—a measure of women's status relative to that of men's—is substantially greater in Sri Lanka (90%) than the rest of South Asia (44%) or Sub-Saharan Africa (58%). And gender differences in health service utilization and outcomes are insignificant, as Table 3.11. shows. Population density in Sri Lanka is comparable to the rest of South Asia and higher than in Sub-Saharan Africa. However, access to safe sanitation is much higher in Sri Lanka (91%) than in South Asia (34.6%) or Sub-Saharan Africa (36%). Sri Lanka has less access to safe water than the rest of South Asia, but has greater access than to it than Sub-Saharan Africa. However, Sri Lanka performs about the same as other South Asian countries in primary health care indicators such as immunization rates and provision of ORS during diarrhea, (Appendix Table 9), suggesting there is still some scope for strengthening these basic outreach services beyond the health facility based services.

[23] Low birthweight is included as a causal variable in the model, but is itself determined by per capita income and female literacy, both of which also directly affect undernutrition.

Table 3.11. Differences in Potential Causes of Child Undernutrition between South Asia and Sub-Saharan Africa

Indicators	*South Asia*	*Sub-Saharan Africa*	*Sri Lanka*
Moderate and severe underweight (under 5 years, %)	48.4	25.7	29.1
Moderate and severe stunting (under 5 years, %)	46.1	32.8	14.0
Infant mortality rate (per 1,000 live births) +	66.4 (2004)	100.5 (2004)	12 (2004)
Low birthweight (per 1,000 live births) +	30 (1999)	14 §	22 (2000)
Prevalence of underweight (under 5 years, %) +	48 (1999)	28 §	29.7 (2001)
Exclusive Breastfeeding Rate (<6 month, %) §	38	30	57.6 ^
Immunization, measles (% of children 12-23 months) §	66 (2004)	61 (2004)	96 (2004)
Fertility rate (births per woman) +	3.11 (2004)	5.31 (2004)	1.94 (2004)
Female adult literacy rate (15+, %) *	44 (N/A)	58 (2002)	90 (2002)
Antenatal care coverage (%) §	54	69	95
Skilled attendant at delivery (%) §	36	42	96
Population density (people per sq km) *	298 (2003)	30 (2003)	298 (2003)
Improved sanitation facilities (% of total population with access) +	34.6 (2002)	36 (2002)	91 (2002)
Improved water source (% of population with access) +	83.8 (2002)	58.2 (2002)	78 (2002)

Sources:
+ = WDI online database, http://devdata.worldbank.org/hnpstats/query/default.html, last checked August 11, 2006.
* = World Bank 2005b.
§ = UNICEF (2005) data from most recent year during 1996-2004.
^ = Department of Census and Statistics (2002) for 0-4 month-olds.

3.8. CONCLUSIONS

Current trends in Sri Lanka are such that the benefits of economic growth in terms of incomes accrue largely to the population groups which already have the best nutritional outcomes. Income inequalities between and within regions are rising and are hindering poverty reduction. Yet malnutrition in Sri Lanka is strongly associated with the three key correlates of poverty: inadequate food security, poor living conditions, and inappropriate child care practices. Without policies to improve the socioeconomic status of the poor and reduce inequalities both within and among the urban, rural, and Estate sectors, economic growth is unlikely to significantly reduce malnutrition in the shorter term.

This report's multivariate analysis shows that low birthweight and the mother's nutritional status have a direct and statistically significant effect on child underweight. Among intermediate variables, the most important variables were household wealth status and, to a lesser extent, access to safe water. Although the MRI study's bivariate analysis found that caring and feeding habits and health care were also important, the multivariate analysis found that these variables were no longer significant once household socioeconomic status, maternal weight, and low birthweight were controlled for. While the multivariate analysis is constrained by problems of endogeneity, the results represent a significant improvement on earlier bivariate analysis. By

controlling for all three underlying determinants in the *same* model, the multivariate analysis is a more reliable assessment of the relative importance of the three underlying determinants.[24]

Health care and access to safe water and sanitation services can serve as a barrier between disease and undernutrition. In Sri Lanka, high levels of access to health care have helped to break the vicious cycle of undernutrition and disease among children by ensuring appropriate treatment of childhood illnesses. However access to safe water and sanitation are less adequate and could exacerbate the impact of poverty and poor caring practices on undernutrition.

Many theories have been offered to explain the very high undernutrition in South Asia as compared to Sub-Saharan Africa (the South Asian enigma). These explanations range from the low status of women (and inadequate access/utilization of health services and other resources for women and girls), low birthweights, high population densities, and poor sanitation. None of these theories, however, have been empirically proven. The gender argument is not valid for Sri Lanka since both health service utilization and education levels are equally high for both girls and boys. Sanitation levels in Sri Lanka are higher than in other South Asian countries, though access to safe water still remains an issue, and sanitation is a significant predictor of underweight and stunting. Low birthweight rates in Sri Lanka are higher (17%) than in many countries in Africa and offer a valid explanation for the high underweight rates in Sri Lanka. These potential explanations are borne out by the data presented in Chapter 3, albeit not conclusively (since these were cross-sectional analyses from DHS surveys and causal inferences can only be inferred from more expansive panel data). In addition, the relatively lower coverage of outreach health services such as oral re-hydration therapy in Sri Lanka may offer another explanation.

Given that rising income inequalities, modest economic growth, and limited access to safe water and sanitation will continue to prevent the poor's nutrition outcomes from improving substantially, maternal and child care practices and promotion of hygienic behaviors also have a critical role to play. Large improvements in child feeding and caring practices during the 1990s likely contributed to the recently observed reductions in stunting and underweight rates. However, for nutrition outcomes to continue to improve at a pace sufficient to meet the MDG target, current maternal and child care practices and utilization of basic MCH services, such as the use of ORS during diarrhea, especially during the first two years of the child's life, must continue to improve significantly. Furthermore, these efforts will need to be concentrated and tailored specifically to meet the special needs in the Estate sector.

[24] The team explored several other analytic options such as the possibility of using an index for complementary feeding, instrumentation of variables to correct for endogeneity, and explored options for analyzing smaller panel data sets. These approaches were abandoned because of data unavailability/limitations. The team also explored the possibility of doing the multivariate analyses separately for each sector; the results were no different than those presented. Given the small sample sizes, the results by sector are not presented here.

4. POLICY AND PROGRAMMATIC RESPONSES TO MALNUTRITION: WHAT IS BEING DONE?

The Government of Sri Lanka's policy response to malnutrition consists of three broad strategies: direct food assistance programs, poverty reduction programs, and the Ministry of Health's provision of an integrated package of maternal and child health and nutrition services. Smaller programs focused on behavior change communication also exist. Other programs are aimed at reducing micronutrient deficiencies and food fortification. The programs are largely funded and implemented by the public sector, with the support of international agencies and domestic nongovernmental organizations.

This chapter reviews the design, implementation, coverage, and potential impact of these programs. A key objective is to examine matches and mismatches between policy needs and the policy responses and to identify aspects of the programs that may have undermined or contributed to their effectiveness.

4.1. EVOLUTION OF NUTRITION POLICIES IN SRI LANKA

The Food and Nutrition Policy Division was established in 1978 to coordinate all activities related to food and nutrition. This signaled the beginning of the Government of Sri Lanka's intervention in nutrition. The unit, housed within the Ministry of Plan Implementation, was largely a forum for discussions about nutrition issues until 1986, when it published the National Agriculture, Food and Nutrition Strategy. This document was the first comprehensive national framework for food and nutrition policy. Its action plan consisted mainly of activities relating to agriculture and livestock development.

The National Nutrition Plan of Action of 1997 adopted a more multisectoral approach, reflecting the outcomes of the International Conference on Nutrition held five years earlier (Ministry of Plan Implementation and Parliamentary Affairs 1997). The plan included strategies to achieve household food security, improve maternal and child health services and sanitation, alleviate poverty, and empower women. Developed for the period 1997-2001, this action plan represented the country's first attempt to target nutritional interventions at mothers and children, and integrate the provision of health and nutrition services. The National Nutrition Coordination Committee (NNCC) coordinated these activities. The Nutrition Plan's effectiveness declined over the years, but the integration of maternal care during pregnancy, and lactation and breastfeeding promotion within maternal and child health programs, was institutionalized.

The GOSL has developed a National Food and Nutrition action plan for 2006-10 for Parliamentary review (Ministry of Healthcare and Nutrition 2007). The plan's goal is to address the continuing problem of child undernutrition, regional disparities in nutritional indicators, and emerging nutrition problems. The draft nutrition policy was presented to ministry officials and other contributors for endorsement on November 20, 2007.

4.2. FOOD SUBSIDIES AND POVERTY ALLEVIATION PROGRAMS

Food subsidies were first introduced in response to food scarcities during the Second World War; subsidies continued well into the 1970s. The distribution of free or subsidized food rations (rice) was later targeted to benefit the poor. In 1978, food rations were replaced by a value-based food stamp. This scheme directly targeted low-income groups which were provided with food stamps to purchase rice, flour, sugar, milk powder, and kerosene. In 1989, the food stamp program was folded into *Janasaviya*, the national poverty alleviation program. Under the Janasaviya program, the government provided a food basket worth Rs.1,458 per month and a savings component worth Rs.1,048 per month to selected families for two years (Ratnayake, 2005). The government's current poverty reduction initiative, Samurdhi, provides an income supplement of Rs.500-1000, depending on family size and household poverty levels. The supplement can be used to purchase food items such as grains, cereals, and legumes (Ratnayake, 2005). While 41 percent of the total population receives Samurdhi benefits, an estimated 66 percent of the poorest decile receives the benefits.

Although data on the impact of food subsidies on nutrition outcomes are virtually nonexistent, empirical evidence has previously shown that *as food transfers are monetized into food stamps or cash transfers, they become inefficient at raising food intake*. Monetizing food transfers is associated with less of each rupee being converted into calorie increases. For instance, a recent study showed that poor households in Sri Lanka spent 78 percent of an additional rupee coming from food subsidies on food consumption, while they spent only 59 percent of an additional rupee from their own cash income on food. In terms of caloric intake, the impact of an additional rupee from the food subsidy income was marginally greater than the impact from cash income (Edirisinghe 1998). This finding is consistent with evidence from the United States (Fraker and others 1995), Kerala, India (Kumar 1979), and the Philippines (Garcia and Pinstrup-Andersen 1987). Given rising income inequalities, and consequently high levels of food insecurity among the poorest groups, *an evaluation is needed of the appropriateness of food transfers relative to cash transfers for the extreme poor.*

4.3. DIRECT FOOD ASSISTANCE AND SUPPLEMENTARY FEEDING PROGRAMS

In recent years, direct food assistance has been primarily provided to populations in the Northern and Eastern provinces to mitigate hunger and undernutrition in conflict-affected areas. Other types of government food assistance are school-feeding programs and targeted supplementary feeding programs. Table 4.1 summarizes food assistance and supplementary feeding programs. No information was available on direct food assistance programs in the Northern and Eastern provinces.

4.3.1. School-Feeding and Preschool Feeding Programs

Under the government's school-feeding program, poor children are given a hot meal in school, but the program has limited coverage. The Ministry of Education and the provincial councils

implement the program with the support of NGOs and United Nations' agencies. The twin objectives of the program are to attract poor children to attend school and to provide these children with adequate nutrition to stay in school.

Another type of feeding program is the preschool nutrition program implemented by the *Sarvodaya* movement through community groups. Children aged 3-5 years attending the Sarvodaya preschools are provided with one nutritious meal a day through a community kitchen to which each family makes a contribution. In addition, children are taught about personal hygiene and growth is monitored monthly.

In the absence of any evaluation data, assessing the effectiveness of either program is difficult. Furthermore, the school-feeding and preschool feeding programs are an example of the mismatch between policy needs and programs. The data presented in Chapter 1 showed that children aged 0-2 years are the most vulnerable to undernutrition and in critical need of dietary and behavioral interventions to prevent irreversible growth retardation. School-feeding programs, such as those mentioned, target a much later age group and therefore are unlikely to have an impact on early childhood nutrition outcomes.

4.3.2. Supplementary Feeding Programs Targeted at Young Children

Thriposha is the government's major targeted food supplementation program. A precooked blend of wheat and soya fortified with minerals and vitamins is designed to supplement energy, protein, and micronutrients among pregnant and lactating mothers (for up to six months after delivery), and infants aged 6-11 months. Children aged 12-60 months, identified as nutritionally vulnerable for growth faltering, also receive it. The Nutrition Coordination Division of the Ministry of Healthcare and Nutrition implements the program and the Medical Officers of Health (MOOH) deliver it. In January 2006, the food supplement was being supplied through 815 clinics to approximately 580,000 beneficiaries, out of a target population of approximately 1.1 million children, approximately 53 percent coverage (Ministry of Healthcare and Nutrition and World Food Program 2006). Quite surprisingly, the impact of Thriposha has never been adequately evaluated despite its existence since 1972 and its high coverage and high cost.

Conceptually, Thriposha is an appropriate program intervention. It targets the most vulnerable groups with a mix of foods which address both protein-energy malnutrition and micronutrient deficiencies. It also has a high degree of palatability and acceptability among women and children. However, although 90 percent of pregnant and lactating mothers had received Thriposha, only 57.5 percent consumed it daily, according to a study conducted in13 districts across the country. The major reasons that the targeted recipients did not consume it daily were inadequate supply and the need to share it with the rest of the family (Department of Census and Statistics and UNICEF 2003, 2004). Thriposha's effectiveness therefore appears to be limited because the most vulnerable groups do not consume sufficient amounts, and it is often regarded as a food substitute rather than a supplement as intended. In addition, supply and distribution problems have also been observed.

The World Food Program's (WFP) maternal and child nutrition program is similar to Thriposha. During 2002-06, the WFP distributed a fortified corn soya blend (CSB). The target areas were those where food security was identified as low based on a vulnerability mapping system. The program had two additional objectives: (1) to improve expectant and lactating mothers' knowledge of their nutrition and the health needs of their children; and (2) to encourage community partnerships with local NGOs and health care providers to improve the provision of

nutrition services. CSB was delivered in 33 MOH divisions, covering a beneficiary population of approximately 93,241, which included pregnant and lactating mothers and children aged 6-12 months and 1-3 years (Atukorala 2006). In 2005, Sri Lanka's under-three children were estimated at 908,000 and pregnant and lactating women at 496,000.

The WFP program evaluation showed that the food supplements and behavior change communication interventions had had no significant effect. Unlike Thriposha, the WFP program has built-in monitoring and evaluation (M&E) that included baseline and post-intervention surveys in intervention and control areas. A comparison of baseline and post-intervention surveys found that while breastfeeding and complementary feeding improved, the prevalence of both underweight and stunting declined in *both* intervention and nonintervention areas. No improvement occurred in the population's knowledge of foods rich in micronutrients or other food-related issues. A 12 percent increase was noted in home gardening among CSB beneficiaries relative to the control group (Atukorala 2006).

The low level of effectiveness of both targeted food supplementation programs calls the rationale for this popular nutrition intervention into questions (see Table 4.1). Trends in the prevalence of undernutrition (Chapter 2) highlight the need to target the nutritionally vulnerable (pregnant and lactating mothers and children 0-24 months) and the poor. Both these programs have been doing just that. However, they do not appear to have made a difference in nutritional outcomes or behaviors, especially among the poor and in the rural and Estate sectors. This suggests that the programs may not have targeted the most vulnerable groups. That women tend to share their Thriposha food supplements with the rest of the family, resulting in a lack of additional supplements for themselves, may be another limiting factor. This tendency has also been documented in many programs globally.

Clearly, when a high degree of poverty and hunger exists, expectations that take-home nutritional supplements will only be consumed by their targeted recipients are unrealistic. Alternative strategies could possibly include additional food rations for the entire family, adding tremendously to costs. But evidence of the potential impact of such a strategy is not currently available. Information on the cost of these interventions is included in Table 6.1.

A more recent programme is Posahana Malla, which involves the distribution of a bag of nutritious food to pregnant or lactating women from low income families. The programme began in July 2006 is being implemented in 113 Divisional Secretariats (DS) at present. The Glass of Milk programme initated in October 2006 targets 2-5 year-olds in low income households and is being implemented in 10 DS divisions.

Table 4.1. Summary of Direct Food Assistance and Supplementary Feeding Programs

Program	*Coverage*	*Target Population*	*Time Period*	*Comments on Costs and Impact*
Thriposha: Supplementary feeding program	National; Approximately 53% of target population is covered.	Pregnant and lactating mothers (for first 6 months after delivery), and children aged 6 months to 5 years showing growth faltering.	From 1970 to date	Per capita cost in 2004 = SLR 1,698 per year; limited information on impact; anecdotal evidence that weak targeting and program effectiveness
Fortified corn-soya blend (CSB): supplementary feeding, behavior change, and household food security	33 MOH divisions; 93,241 beneficiaries (<10% of total children 6-36 months age)	Pregnant and lactating mothers and children living in areas in which food security is low	2002-2006	Per capita cost = SLR 1,766 per year; evaluation data showed limited impact on nutrition outcomes and behaviors.
Poshana Malla (bag of nutritious food worth Rs.500 per month)	113 Divisional Secretariats out of a total of 303	Pregnant and lactating mothers from low income households	2006 todate	
Glass of milk programme	10 Divisional Secretariats out of a total of 303	Children aged 2-5 years from low income households	2006 todate	
School feeding program	GOSL: 6124 schools (~520,000 children); WFP: 6125 schools (~390000 children)	GOSL: all children in Grades 1-3; WFP: all children in Grades 1-9 in conflict areas	1970s to date; most recent one in 2000	
Preschool nutrition program	8 districts, total of approx. 1,500 children	Preschool children	2004-06	Total cost = SLR 3,600,000; per capita cost = SLR 750 No data on impact.

Source: Atukorala, 2006.

4.4. INTEGRATED MATERNAL AND CHILD HEALTH AND NUTRITION PROGRAMS

A summary of the integrated maternal and child health and nutrition programs currently operating in Sri Lanka is provided in Table 4.2.

The Maternal and Child Health program, implemented by the Family Health Bureau (FHB) in MOH, is the most comprehensive health and nutrition program in coverage and scope for mothers and children. Detailed data on coverage of MCH services in 2002 and 2003 are provided in the appendix Tables 6 and 7.

Sri Lankan public sector health care provision coverage is universal, including the MCH program, for which no user fees are charged. MCH services are delivered by public health midwives (PHMs) and family health workers (FHWs) through an extensive network of clinics. Field weighing centers exist at the village level.

The MCH program is quite broad in scope. It provides a full range of services from maternal care during pregnancy and lactation to growth monitoring for infants and immunizations. Its interventions with a direct impact on nutrition include midwife-provided nutrition education and counseling at home and at clinics; weight gain monitoring during pregnancy and growth monitoring for children; provision of mineral supplements (iron, folic acid, calcium, vitamin C) during pregnancy; anthelminthic therapy for young children; and provision of Thriposha (discussed above). In addition, nutrition education messages are displayed at antenatal care clinics.

In addition to implementing the MCH program through the clinics, FHB implements several population-level programs to address specific nutrition issues such as child feeding. Programs to promote breastfeeding include public education through the print and electronic media, efforts to extend maternity leave, conducting regular in-service training courses on lactation management for healthcare workers, and implementing the national marketing code for breast milk substitutes. FHB conducts similar programs to improve complementary feeding practices, promote feeding during illness, and increase meal frequency.

Data on services provided are collected through quarterly returns submitted to FHB and published in the Annual Reports on Family Health. The MCH program's performance is not formally evaluated. However, data from the quarterly returns and other surveys are regularly used to track trends in maternal and child health and nutrition outcomes.

A basic weakness of the MCH program is that necessary education and counseling services are not always provided, although nutrition outcomes such as weight gain and growth are monitored effectively for both mothers and children. Jayatissa (1997) found that only 7 percent of mothers received advice on nutrition, although 95 percent were weighed during their pregnancies. Weight gain is not always recorded, and the counseling given to improve weight gain during pregnancy is not adequate. Similarly, while 89 percent of children were weighed at the clinic, only 64 percent of mothers were told their children's weight. Clinics provided nutritional advice in approximately only 75 percent of cases. Another study of field clinics in one district found similar results (Pandiyapathirage 2003). Moreover, growth monitoring focuses only on children up to one year of age. Mothers' visits to clinics also decline one year after they give birth (Ministry of Healthcare and Nutrition, 2007).

Time constraints faced by both the service providers and mothers explain why nutrition education and counseling are not provided effectively. The service providers, PHMs and FHWs, are overburdened and do not have enough time to spend on nutrition education and counseling at the clinics or at the mothers' homes. "Mother support groups" and the use of volunteers to promote breastfeeding practices have been unsuccessful (Ministry of Healthcare and Nutrition 2007). Mothers also are time constrained, particularly if they have to return to work after a three-month maternity leave. A study conducted in seven districts found that only 45 percent of children had been taken to the clinics to be weighed during the previous six months. Two reasons for not having a child weighed were that the mother was too busy or was employed (Department of Census and Statistics and UNICEF 2003).

A second major weakness of the MCH program is the consistency of the messages and quality of IEC materials used for nutrition education and counseling. No continuity in the education messages provided exists because the message imparted changes with each new program (Atukorala 2006). The timeframe for promoting exclusive breastfeeding lacks clarity, and the government weakly enforces the Breastfeeding Code (2007). In some clinics, booklets on iodine and vitamin A deficiencies were not available. Although posters are displayed in most clinics, providers rarely refer to them when counseling clientele.

The greatest strength of the MCH program is the population's acceptance and appreciation of it as a reliable source of health information. In 2000, 72 percent of women surveyed in seven districts reported that they were more likely to get their health and nutrition information from health workers than the television (Department of Census and Statistics and UNICEF 2003). In the same survey, 68 percent of women said they were satisfied with the MCH services they had received.

The MCH program is thus well-placed to continue providing nutrition services. However, its ability to improve nutrition behaviors through counseling and education needs to be significantly improved. More resources may need to be allocated to the MCH program to reduce the workload on midwives and enable them to allocate more time to each woman. Supervision may require improvement to ensure that growth monitoring activities are accompanied by sufficient counseling and education.

Finally, it is necessary to acknowledge that the MCH program played a role in the improvement in breastfeeding practices during the 1990s. While the factors behind the large increases in colostrum feeding and exclusive breastfeeding between 1993 and 2000 remain unknown, the nutrition components of the MCH program were not initiated until the 1990s. Maternal education and changing social norms on child feeding practices, discussed in the previous chapter, may have been strengthened by the interventions introduced by the MCH program.

Sri Lanka's health care system has evolved to provide both preventive and curative health care systems at high levels of efficiency and coverage through an integrated system of facility- and community-based services. Experience shows that the addition of new functions to the intervention package provided through MCH program, such as nutrition interventions, would likely require additional expenditures and investments in the training and counseling skills of primary health care health workers, as discussed in the next chapter.

4.4.1. Integrated Programs in the Estate Sector

The Plantation Human Development Trust (PDHT) implements health care programs in the Estate sector. The trust's MCH program is a parallel program, similar to the MCH program implemented by the FHB in the rest of the country. Services provided include antenatal and postnatal care, nutrition education, distribution of food supplements and micronutrient supplements, training on lactation management, and growth monitoring. The target groups are pregnant and lactating mothers, infants, and children. National programs operating in other sectors, such as the Early Childhood Care and Development (ECCD) program, discussed below, are also carried out in the Estate sector. Routinely collected data are used to evaluate and monitor the performance of the ECCD program.

Health and nutrition outcomes have only recently begun to improve in the Estate sector and improvements are gradual. The MCH program in the Estate sector has made some progress in improving antenatal care use and skilled delivery assistance. In 2003 approximately 96 percent of pregnant women were registered at antenatal clinics, and 97 percent of infants were registered at child welfare clinics. The proportion of institutional deliveries has increased, while the proportion of babies with low birthweight has decreased (Sri Lankan Ministry of Health 1995, 1997, 2000, 2004). However, other nutrition outcomes are still lagging (Chapter 2). The MCH program's overall weaknesses, discussed above, likely affect the Estate's component of the program as well.

4.4.2. Integrated Early Childhood Care and Development (ECCD) Program

This five-year program was integrated in the MCH program in 2002 and focuses on maternal and child care practices. It aims to promote care during pregnancy and lactation and promote positive care with respect to the survival, growth, and development rights of the child. A separate home gardening component was implemented by the Nutrition Coordination Division of MOH together with the Department of Agriculture and local governments. To improve service delivery, IEC materials were prepared to cover care from during pregnancy up to age five. By 2003, the program had been expanded to cover 141 Medical Officer of Health (MOOH) areas.

A mid-term evaluation in the program areas showed that from 2002 to 2005, low birthweight fell from 17.7 percent to 16 percent, and underweight prevalence among 12-23 month olds reduced from 30.7 percent to 25 percent. Post-intervention program evaluations are being planned.

The PHDT implemented the ECCD program in 10 selected estates. PDHT provided the financial support to construct three new Child Development Centers, and the community contributed 10 percent of costs. Innovative approaches introduced by ECCD to enhance access to services included the use of local community facilitators and fostering participation by both male and female heads of households. Local community facilitators who "spoke the same language" as the beneficiaries and were familiar with local socio-cultural constraints proved to be effective in building trust and increasing the participation of a community which had previously been relatively isolated.

Table 4.2. Summary of Integrated Maternal and Child Health and Nutrition Programs

Program	*Coverage*	*Target Population*	*Time Period*	*Comments on costs and impact*
Maternal and child health program	National: in 2002-03, 95%-97% of pregnant mothers were registered and/or under care; 61%-65% of mothers received post-natal visits; 82%-87% of infants registered (see Appendix Tables 8-9	Pregnant and lactating mothers; infants and children aged 1-5 years, including preschoolers	Ongoing: MCH program has been in place since the 1950's and nutrition component since the 1990s.	Costs of providing maternal health care at relatively low cost (US$ 1.50 per capita). (Institute for Health Policy 2007). Impact of interventions is not known.
Estate sector health and nutrition services	68.4% of all pregnant women were registered for ante-natal care within 12 weeks of gestation and 98.3% women delivered in a facility.	Estate sector population	Ongoing	Not known
Integrated Early Childhood Care and Development program (ECCD)	Integrated into the MCH program in 141 MOH areas	Pregnant and lactating mothers; infants and children aged 1-5 years, including preschoolers	2002-06	Per capita costs not known. Mid-term evaluation showed reductions in the prevalence of underweight and low birthweight

Source: Atukorala, 2006.

4.5. PROGRAMS TO ADDRESS MICRONUTRIENT DEFICIENCIES AND FOOD FORTIFICATION

4.5.1. Iron Deficiency Anemia Control Program

The anemia control program includes the provision of iron folate and vitamin C supplements during pregnancy and postpartum, and de-worming after the first trimester of pregnancy. In addition, iron and vitamin C tablets are distributed weekly to girls over 10 years of age through FHB's recently initiated School Nutrition Program. Pregnant mothers and school children receive nutrition education promoting the consumption of foods rich in iron and vitamin C and to discouraging the drinking of tea after a meal. The impact of the government's anemia control programs have never been evaluated using biological indicators.

Iron folate supplementation coverage among pregnant women is high. According to one study, the coverage of iron folate and vitamin C supplements among mothers was 92.9 percent (calculated by deducting the number of mothers who did not receive tablets due to non-availability or to insufficient time on the day of the study). Of those who received the tablets, 88 percent said they took the tablets regularly (Medical Research Institute and UNICEF 2004). A separate study in seven districts found that 90 percent of pregnant mothers had received the supplements, and the majority reported taking them (Department of Census and Statistics and UNICEF 2003). In this study, nearly 75 percent of women reported receiving the tablets from government MCH clinics. Postpartum coverage was measured in only one study and was found to be low (Atukorala 2006). However, these high coverage rates seem to be at odds within the continuing high prevalence of anemia.

The anemia control program's counseling and nutrition education components appear to be ineffective for the same reasons that the MCH program as a whole is deficient. The impact of IEC activities on the control of iron deficiency anemia in three provinces assessed the performance of PFM and MOOH. It found that nutrition education performance was unsatisfactory even though the basic program components, such as the issue of iron tablets, were satisfactorily carried out in all sectors (urban, rural, and Estate). The poor performance of the PHMs in the urban and rural areas was attributed in part to inadequate supervision by the MOOHs (Karunaratne, Vargas, and Wikramanayake 1999).

4.5.2. Salt Iodization Program

Since 2001, Sri Lanka has performed relatively well on salt iodization. It achieved iodization coverage of nearly 94 percent by 2005. However, although salt iodization has been mandatory in Sri Lanka since 1995, a survey carried out in 2001 showed no change in the total goiter rate since the 1980s and only 49.5 percent of household salt samples were adequately iodized. Recent reviews suggest several problems. First, the number of public health inspectors (PHIs) is insufficient to monitor the iodine content of salt supplies at the factories and retail outlets. Second, continuous education is necessary to encourage sustainable behavior change in the use of iodized salt, especially in rural areas. Furthermore, while reports on iodized salt in Sri Lanka were showing high rates of coverage, surveys of urinary iodine excretions revealed very high levels in some areas of the country. This suggested problems with the quality of the iodization process which was largely carried out directly by small cottage industry salt processors. In 2006, the Micronutrient Initiative provided equipment and technical assistance to the two largest modern salt processing factories (Lanka Salt Limited and Puttalam Salt) to upgrade their facilities for salt processing and iodization. This has led to consistent quality of iodized salt of an estimated 80,000 MT per year, which is sufficient to supply 80% of Sri Lanka's annual

requirements. Linkages have now been created between the two large plants and the cottage industries whereby the latter further process the salt, package it and market it.

The program was strengthened to control for these deficiencies and more effectively monitor salt iodization. Surveys carried out in 2003 and 2005 showed that the prevalence of goiter had been reduced and that 75 to 94 percent of households adequately used iodized salt (Atukorala 2006; Department of Census and Statistics and UNICEF 2003, 2004).

4.5.3. Vitamin A Deficiency Control Program

The VAD control program involves a combination of food-based approaches, vitamin A supplementation, and training programs. The government has implemented a VAD program since 2001 but it has not yet been evaluated. However, coverage data from Table 4.3 shows that vitamin A supplementation coverage in Sri Lanka (57 percent) is much lower than in most countries in the region (except India). This lower coverage may explain why the deficiency persists. An intensified approach is necessary to correct for this.

Table 4.3. Vitamin A Supplementation and Iodized Salt Consumption Rates in South Asia

Country	*Vitamin A Supplementation*			*Iodized Salt Consumption*
	Vitamin A supplementation coverage rates, 6-59 months, 2004 (%)	*Vitamin A supplementation coverage rates, 6-59 months, dose 1, 2004[2] (%)*	*Vitamin A supplementation coverage rates, 6-59 months, dose 2, 2004 (%)*	*Households consuming iodized salt, 1998-2005[3] (%)*
Afghanistan	96[1]	96	95[2]	28
Bangladesh	83	83	89	70
Bhutan	-	*	*	95
India	51	51[a]	51	57
Nepal	97	97	96	63
Pakistan	95	95	95	17
Sri Lanka	57	57[a]	†	94

[1] % of children aged 6-59 months who received at least one high dose of vitamin A capsules in 2001. Data from UNICEF field offices and WHO. http://www.unicef.org/infobycountry/southasia.html

[2] Data from UNICEF Nutrition Section Report 2004 (UNICEF Vitamin A Program Database). http://www.childinfo.org/areas/vitamina/countrydata.php?cat=1

[3] Data from (Multiple Indicator Cluster Surveys (MICS), DHS, and UNICEF. Data refer to the most recent year available during the period specified in the column heading. http://www.unicef.org/infobycountry/southasia.html

[a] "As targeted" coverage.

* Coverage excluded due to data quality concerns.

† Coverage excluded due to no second round distribution.

- Data unknown.

4.5.4. Food Fortification

Fortified foods, excepting iodized salt, are not readily available in Sri Lanka. While the greater need for food fortification is widely acknowledged, very little has been done to fortify it. Progress on food fortification has been hampered by difficulties in identifying a suitable food vehicle that is consumed by all vulnerable groups. A recent study was initiated to evaluate the feasibility of using rice flour as a vehicle for fortification with iron, zone, and folic acid. Research on conventional plant breeding is underway to develop iron- and zinc-rich varieties of rice, but this technology is decades away from application at scale. The supply of multiple micronutrient sprinkles are being implemented in 4 districts as a pilot, and will be adopted as a national programme.

4.6. CONCLUSIONS

The coverage of food supplementation programs is limited in general, except for the MCH program, which effectively reaches the Sri Lankan population, including the poor and vulnerable groups in rural areas. However, even the MCH program has failed to provide adequate nutrition counseling and education. Its delivery mechanism is effective for providing maternal and child health services and the more routine nutrition services such as the provision of iron folate and vitamin C supplements or growth monitoring. But its nutrition education and counseling services have not been effective because PHMs are overworked and without sufficient time to allocate to counseling pregnant women and mothers.

The MCH program has the potential to substantially improve the quality of nutrition services provided through the public health sector and bring about sustained behavior change. This will require more resources allocated to MCH programs and improving the quality of IEC. Potential improvements to IEC programs include ensuring consistency in the messages delivered from various sources to mothers. Greater resources are also needed to reduce the midwives' workload to enable them to spend more time with each woman, as well as to improve the quality of the supervision the PHMs receive.

The Estate sector, described in Chapter 3, presents a somewhat different challenge because of its excessive deprivation and isolation from the rest of the country. The ECCD approach in the Estate sector has been successful because it enhanced the participation of the local community. Interventions to improve nutrition outcomes in the Estate sector need to be designed separately, in consideration of its unique socio-cultural and economic conditions and using lessons from the ECCD project in the sector.

Salt iodization has been well implemented in Sri Lanka, which is why IDD prevalence rates are low. The major challenge hereon will be to sustain these high levels of coverage. Vitamin A supplementation and anemia control programs have not achieved high coverage, despite the fact that the Ministry of Healthcare and Nutrition implemented the programs and it does have the necessary capacities to do so.

At a macro level, an effective multisectoral approach to implement the national nutrition action plan is likely to yield greater benefits. The health sector and the MCH program play the central role in delivering maternal and child health and nutrition services in Sri Lanka. Given this fact, one option is to mainstream the relevant nutrition actions within the health sector using the country's very effective existing health system to integrate nutrition services in primary health care.

To ensure that this is done effectively, delivery of the additional nutrition services package will need to be supported with adequate retraining/skills development of staff and allocation of resources.

Finally, a key weakness of all of the current nutrition interventions is the almost complete lack of good evaluation data. Better monitoring and evaluation of nutrition interventions is needed to identify successful approaches that improve nutrition security and change behavior. Particular attention should be paid to evaluating the impact on nutritionally vulnerable groups (pregnant women, 0-24 month olds), the poor, and the Estate populations.

5. POLITICAL ECONOMY OF MALNUTRITION IN SRI LANKA

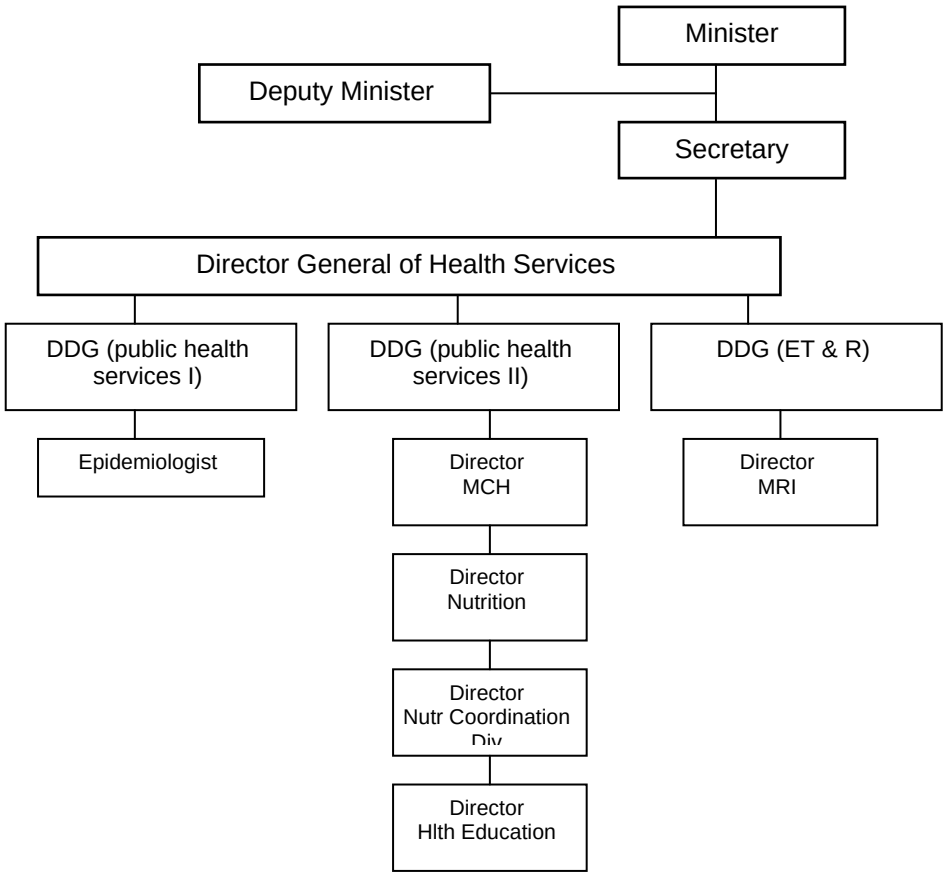
This chapter attempts to outline the complex political economy of nutrition in Sri Lanka. The political discourse in post-colonial Sri Lanka has led to divergent views about nutrition, its causes, and potential solutions. Under the circumstances, the policy choices adopted have not always been based on evidence of what works. Policy-makers and program designers rarely appreciate the multifaceted causes (and potential demand-side solutions) for undernutrition.

Food subsidies, free education and health services, and government employment with social security were the dominant expressions of social justice in post-independent Sri Lanka. The country's predominant paradigm is that malnutrition is caused by food insecurity. Nevertheless, the health sector implements most efforts to address malnutrition and they follow a medicalized approach combined with hand-outs of supplementary food—a legacy from the social justice era. This mismatch may have been unfortunate. However, with the tremendously successful improvements in infant and maternal mortality rates in recent years, the health system is now poised to maximize a new opportunity to redirect its focus on nutrition. This institutional and political opportunity must be seized.

5.1. NATIONAL STAKEHOLDERS AND THE POLICY -MAKING PROCESS

Nutrition in Sri Lanka has traditionally been assigned to the medical profession. After the recent 2001 elections, the government elevated nutrition to a ministerial level and created the Ministry of Healthcare and Nutrition (MOH). Several departments are involved with nutrition in this ministry: the Nutrition Coordination Division, Directorate of Nutrition, Family Health Bureau, Medical Research Institute, Health Education Bureau, and Epidemiology Unit. All but one of these agencies are under the Deputy Director General of Health Services-Public Health (DDGPHS). The Medical Research Institute functions under the Deputy Director General of Health Services-Education, Training and Research (DDGET and R). The primary responsibility for nutrition lies with the Family Health Bureau (FHB), which makes most decisions regarding policy and strategy. The Public Health Midwives (PHMs) are the key implementation agents. The Nutrition Coordination Division coordinates among agencies external to the MOH, and the Directorate of Nutrition coordinates all nutrition-relevant activities within the MOH. However, many agree that there is little functional coordination among these units, as is the case in other countries. In the Estate sector, most service delivery for the social sectors, including health and nutrition, is through the Plantation Human Development Trust which is not linked or accountable to the public sector.

Figure 5.1. Nutrition Stakeholders within the Ministry of Healthcare and Nutrition in Sri Lanka



Source: Adapted from the Annual Health Bulletin 2003.

Several other ministries—Ministry of Livestock, National Water Supply and Drainage Board, Ministry of Agriculture, Department of Agriculture, Department of Fisheries and Aquatic Resources, Ministry of Samurdhi and Poverty Alleviation, Department of Census and Statistics—together with the Medical Research Institute and the Family Health Bureau of the MOH, participate on the steering group of the national nutrition surveillance system, which is implemented by the Nutrition Coordination Division. The surveillance system is supported under the World Bank's Health Sector Development Project, and is expected to contribute to the dissemination and use of the data collected by the system for nutrition-related planning and action.

This analysis included extensive interviews and discussions with academicians, researchers, trainers, government officials, and administrators at central and local levels, nutritionists, and staff in the community. These consultations revealed widely held concerns. First, the views of professionals with field experience and from non-MOH professionals were not sufficiently represented in the nutrition policy-making process. Second, there is no systematic process established to learn from assessing the impacts of existing programs. Policy advisory board selections are often ad hoc, which often leads to contradictions. For example, the nutrition policy document published in 2004 emphasized the need to create stronger implementation structures at the national and village levels, as well as to consider the wider dimensions of Sri Lanka's food

and nutrition issues. In contrast, recent efforts essentially focus on strengthening existing services and structures. The former adopted a "life cycle approach," while the latter focused on a much more medical approach.

5.2. Perceptions of Nutrition Problem and Current Approaches

Poverty and food insecurity are traditionally accepted as the most common causes of undernutrition. However, these assumptions are untested by data, even though poverty and food insecurity maps are available at the Department of Statistics (DS) division level (Department of Census and Statistics, or DCS).

Despite this lack of analysis, a food-centered approach to nutrition has dominated policy-making. In post-independent Sri Lanka, food subsidies, free education and health services, and government employment with social security were the dominant expressions of social justice. The legacy of colonial socialism continues, and food assistance is often provided as a political gift, decades after the country adopted a market-oriented open economy in the late 1970s. This doctrine sustained the Thriposha—the national food supplementation program—through changes of government, because it gained popularity as the only program for the poor and as a response to undernutrition. Demand for Thriposha remains high, and it is used as an incentive to mothers to visit clinics for immunization and growth monitoring and promotion.

Undernourished children are either advised to eat more food, or referred to a clinic if illnesses are detected, and there, Thriposha is prescribed as the remedy. However, irregular supplies and the tendency to share food supplements with the family results in some children and mothers receiving insufficient amounts of the food supplement. Health professionals are not equipped to provide counseling and to assess other potential causes of undernutrition. This deficiency is partially explained by a medical incentive system that rewards medical professionals for treating patients and that dissuades medical students from focusing on preventive health issues. Yet, most medical professionals are unwilling to accept that nutrition issues need to be addressed by other, perhaps non-medical, professionals. As a result of these rigid attitudes, there is little cross-sectoral collaboration at the community level across health, agriculture, education, and poverty reduction/social development sectors.

The adverse effects of undernutrition on children's psychosocial development are not fully appreciated by policy-makers and nutrition practitioners. Many feel (incorrectly) that the use of international growth standards to assess a child's growth inflates the size of the nutrition problem in Sri Lanka.

At the community and household levels, PHMs attribute undernutrition to poor "weaning foods," the practice of sending young children to day-care, and diseases and other causes. Overall, the emphasis has been on service delivery rather than on the demand side of the service, and understanding the causes and consequences of undernutrition is very weak at all levels.

5.3. Family Health Bureau and Public Health Midwife

Nutrition services in Sri Lanka are delivered through the Maternal and Child Health (MCH) package managed by the Family Health Bureau (FHB). The MCH program is responsible for children under-five years of age, mothers, and school children. The frontline MCH service providers are the public health midwives (PHMs). Through the clinics, the system captures approximately 95 percent of children between birth and age one year, approximately 60 percent between one and two years of age, and 50 percent between two and three years of age.

Opinions about the effectiveness of PHMs in addressing nutrition at the community level are mixed, especially vis à vis the behavioral and lifestyle issues. PHMs have weak communication and analytical skills. They lack specific applied nutrition training and have heavy workloads, making them poor counselors for mothers and undernourished children.

Although PHMs have recently been renamed "family health workers,"[25] their training consists of one year of midwifery at a nursing school, since many work as midwives in hospital maternity units, and an additional six months of public health training at the National Institute of Health Science. They receive little training in preventive management of malnutrition at the household level. This medicalized training is unsuitable for their job responsibilities since all childbirths are institutionalized. Nor does their training prepare them for the community-based services they are supposed to deliver. Attempts by the National Institute of Health Sciences to extend the public health training to one year and limit the midwifery training to six months have failed due to trade union pressures. Some curricula changes are being made to incorporate a greater focus on community work, but both the trainers and the supervisors are weak on such topics. After graduation, no continuing education for midwives exists.

Midwives maintain multiple registers and records including a daily activity report, pregnant women and family planning monthly report, records of immunization, eligible new couples' registry, and expectant women's registry. However, they rarely use the collected data to identify issues or to develop action plans because PHMs are only evaluated on the basis of routine procedures only not by their actions or health outcomes. Their supervision is weak and not outcome based. In addition, PHMs have few career enhancement opportunities, and they are increasingly overburdened by additional tasks.

5.4. INSTITUTIONAL OPPORTUNITIES AND CONSTRAINTS TO INTEGRATE NUTRITION INTO EXISTING PUBLIC HEALTH SYSTEM

Nutrition has not been the primary focus of the FHB or the PHMs. However, with the successful improvements in infant and maternal mortality rates, the FHB are afforded a new opportunity to redirect its focus on nutrition. This institutional and political opportunity must be seized.

5.4.1. Potential for Continued Role of PHMs

The existing structure enables the PHMs to reach households in the community. The PHMs are well-respected by the community. Her presence in the village justifies the health ministry's ability to undertake community level programs. There are a total of 7,000 PHMs nationwide The MOH has recently recruited an additional 2,000 PHMs. Nevertheless in the field a PHM commonly serves a population of 5,000, instead of the designated ratio of one PHM for every 3,000 population.

The PHC/MCH system was successful in reducing mortality but is currently unsuitable to improving nutrition. The PHMs' approach is often criticized as not participatory or community oriented, even though they live and work in the villages. The mismatch between the PHMs' training and the nutrition services they are expected to deliver is perhaps one major reason for the continuation of this medicalized approach. PHMs need different skills to identify households

[25] The PHMs trade union wants to continue using the "midwife" designation and wants PHM training to be more "medicalized" so these workers are marketable overseas.

with malnourished women and children and to analyze causes of undernutrition. However, this paradigm change must be supported with appropriate PHM training and supervision changes, a functional management information system (MIS), a monitoring and evaluation system, and appropriate accountability mechanisms.

While there is no denying the need to strengthen and improve the package of nutrition services that PHMs provide, it is also important to recognize the resource constraints faced by the public health sector in Sri Lanka and therefore the MCH program. The discussion in Chapter 2 showed that Sri Lanka spends significantly less on health care as a share of GDP compared to other countries at a similar level of development or with similar health outcomes. The same applies to maternal and child health. In the late 1990s, public sector spending on reproductive health in Sri Lanka as a share of GDP (0.2 percent) was similar to that in Bangladesh (0.2 percent) and lower than that in some Indian states (0.3 percent in Rajasthan and 0.4 percent in Andhra Pradesh) (World Bank 2007). Yet, the volume of services provided by the public health sector in Sri Lanka was substantially larger than in Bangladesh or India. For instance, the public sector accounts for 80-90 percent of all deliveries in Sri Lanka compared to less than 5 percent in Bangladesh. In short, the public health sector in Sri Lanka is quite stretched in the volume of services that it provides with the available resources.

Future programs envisage the PHMs playing a more prominent role in providing nutrition services. To be successful, these programs need to significantly expand their resources to have any impact or the status quo will continue with PHMs tasked with providing a range of nutrition services in addition to the maternal and child health services but falling short due to time and resource constraints. To achieve the envisaged programs, the number of midwives needs to be increased to one PHM per 1,000 population.

5.4.2. A Role for Indigenous Medicine Professionals?

The Ministry of Indigenous Medicine and its provincial departments also provide nutrition services. It is developing a parallel system for its Medical Officer of Health and is targeting preschoolers, a captive audience not covered by other government programs until very recently. Its frontline workers are the Community Health Development Officers, who are trained at the National Institute of Traditional Medicine (NITM), which is Indigenous Medicines' counterpart to the National Institute of Health Services, where PHMs, Medical Officers of Health and all other public health staff under MOH are trained. This group also is experimenting with reaching pregnant women with indigenous medicinal interventions for the undernourished. Their approach to include nutrition within a wider program of "return to tradition and spirituality" may have certain advantages over the MOH's MCH program. Indigenous medicine's service is culturally more acceptable for some and has the potential to be modernized with growth charts etc., to appeal to both politicians and the average citizen. The government supports both these competing and sometimes conflicting programs. For example, some conflicts have arisen with regard to a medical paste *rathe kalke* given to infants which is discouraged by the PHMs and heavily encouraged by the indigenous practitioners. More positively though, there is a general view among biomedical practitioners that the contribution of indigenous medicine could be an asset in curbing non-communicable diseases. But whether the MOH and the indigenous sector can work together on nutrition is yet to be seen.

Two caveats are worth noting with regard to the role of the indigenous medicine sector in promoting good nutrition. They relate to the declining demand for indigenous medicine among Sri Lankan households and to the potential confusion that may arise between the types of messages that are given to the population by the two sectors.

First, although there is a well-established indigenous medicine program in Sri Lanka which includes training institutions and health facilities; the use of these services for health care has declined quite substantially. Health utilization surveys during the 1990s showed a consistent shift by households from indigenous medical providers to Western medical providers (Central Bank Consumer Finance Survey, 1996/97, 2003/04; World Bank Household Health Survey 1991). In addition, older household members are most likely to use these services and not young women and children, who are the target population for nutrition interventions. The indigenous medicine program therefore is an unlikely vehicle for spreading knowledge and information about good nutritional behaviors, though the potential role of older generations in South Asia in promoting nutrition health must not be underestimated.

Second, because nutrition behavior is complex, the health sector must provide one consistent set of messages to provide effective nutrition interventions. Currently, the MCH program's information about the duration of exclusive breastfeeding is inconsistent and causes confusion. Any intervention through the indigenous medicine program must not add to this confusion, as in the *rathe kale* example mentioned above.

5.4.3. Learning Lessons from Small-Scale Experiences?

Small community-based nutrition projects have been piloted at village and district levels to address the various causes of undernutrition. Communities and health workers have often identified the health and socioeconomic problems together and discussed potential actions to address them through participatory approaches. These activities have supposedly lead to more sustainable behavior changes. However, such initiatives have been undertaken at local levels by individual functionaries and are usually completed after they leave. Such local experiences have rarely been recognized by the health system and no mechanism exists to document their impact, learn lessons from these experiences, or to scale them up. A system is needed so these valuable experiences can feed into the basis for evidence-based policies and scaling-up.

5.5. COORDINATION AND COLLABORATION ACROSS SECTORS AND THE NEED FOR CAPACITY STRENGTHENING

Policy makers and practitioners widely express the belief that a strong coordinating body from the central government down to the grassroots level is needed to improve nutrition in Sri Lanka. Several cited the previous model of a high level National Nutrition Council as an effective mechanism to harness commitment from relevant ministries. PHMs could potentially work with extension workers from other sectors such as agriculture and fishery. While PHMs counsel caregivers, the other sectors could provide complementary services such as formation of mothers' clubs and agricultural extension services.

However, the feasibility of such a model at scale will require strong inter-sectoral coordination and a functional information feedback system that depends on extensive data sharing and analysis among the health, agriculture, fishery and *Samurdhi* (to name only a few), potentially in partnership with the Department of Census and Statistics, and a strong monitoring and evaluation data-base.

For the Estate sector, the Plantation Human Development Trust (PHDT) oversees the delivery of health and nutrition services in the estates.

In addition to the above, a clear system of accountability at all levels is necessary. Sri Lanka's health system is not totally decentralized. Therefore, the provincial councils' relative accountability is not always clear. Three factors are important for accountability: policy guidance from the central government, financing by the provincial councils, and the extent to which the districts or provinces are allowed to experiment or deviate from the national plan to respond to contextual issues. The Bank's Health Sector Development Program funds district health plans through the Finance Commission and district level plans are expected to be developed for improvements in health and nutrition. Province or district level capacity will be necessary to innovate and counter politicians' demands for simple solutions such as dispensing food and subsidies.

Based on the above review, it is evident that nutrition training by the Post-Graduate Institute of Medicine (PGIM), which produces high level officials for the Ministry of Healthcare and Nutrition and for the MCH program, also needs to be reviewed and strengthened. Nutrition research is conducted at the PGIM, MRI, FHB and the Nutrition Coordination Division but is not sufficient to meet the needs for evidence-based policymaking. Of a total 1,214 publications[26] only 29 were nutrition related studies, and the word "nutrition" appeared in the titles or in the summarized findings in only six of them. And most of the studies were on the medical aspects of pregnancy and child health. There are reportedly no nutritionists in the MOH, and the managers of nutrition themselves were trained as researchers and have little nutrition or program management skills. All these issues need to be addressed.

5.6. CONCLUSIONS

The political discourse in post-colonial Sri Lanka has lead to divergent views about nutrition, its causes, and potential solutions. Under the circumstances, the adopted policy and programmatic investment choices have not always been based on the evidence of what works. The training and skills of health workers, the focus on a medicalized approach, and the success in attaining health goals may have contributed to the adherence to the policies. However, the continuing high rates of undernutrition are evidence that new paradigms and policy shifts may now be necessary. This will require changes in the institutional mandates, and in the training and skills of frontline workers and program managers, and stronger leadership and political commitment at the highest levels in Sri Lanka. One functionary aptly described the current situation: "*Since nutrition will most likely remain the primary job of the PHMs, the interaction between health professionals and their clients at the grass-root level are of foremost importance for successful improvement of nutrition in the country. We are happy about our past. However, too much emphasis has been placed on the supply side; now we have to focus on the behavioral aspects and the demand side issues of caregivers.*"

[26] PGIM, *Annotated Bibliography of Research, Reports, Dissertations, Theses and Case Reports* (presented to PGIM by graduate trainees) 1985-2004, compiled by D. Gunesekara, PGIM, Colombo 10, 2005.

In the Estate sector, the Plantation Human Development Trust (PDHT) is inadequately positioned and lacks the capacity to provide high quality social services (such as health and nutrition services) to the Sri Lankan populations most in need. Other studies have recommended that these services should be transferred to the provincial government in close coordination with the respective line ministries (World Bank, 2007). Since the MOH has been able to deliver much higher quality and more accessible health services in the rest of the country, the potential for success of this expansion into the Estate sector is relatively high.

6. THE COST OF UNDERNUTRITION IN SRI LANKA

This chapter outlines the costs incurred by Sri Lanka due to persistently high levels of malnutrition in terms of lost productivity, increased health care costs, and indirect costs due to poor cognitive development and lost schooling. The cost being spent on malnutrition control programs is then outlined as well as the cost to establish a well-targeted nutrition package based on cost-benefit analyses from various interventions. The cost effectiveness of the Thriposha program, for example, can vary from a low of 9.6 in the metropolitan Colombo area to a high of 23.2 in the Estate sector.

By conservative estimates, malnutrition costs Sri Lanka over US$ 1.1 billion in lost productivity and over 230,000 DALYs lost due to malnutrition-related disability and death in the 0-3 years' age group. By contrast, 2005 expenditures on malnutrition-related programs are estimated at a very modest level of US$ 11.2 million, over a third financed from government resources and the rest by development partners.

Methods used to Estimate the Health and Economic Impact for Sri Lanka

The primary objective of this chapter is to illustrate the potential costs of undernutrition:

- What will it cost Sri Lanka not to address undernutrition?
- What might addressing undernutrition cost at a reasonable scale?

The goal of this exercise is to provide strategic orientation and advice on cost-effectiveness of interventions to prevent and control malnutrition in Sri Lanka. However, because of data limitations and the limited scope of this analysis, the estimates presented here are approximate and serve to exemplify the scale of the potential costs, but are not meant to be taken as a precise quantification of these costs.

Most estimates in this chapter focus on preventing undernutrition among children under three years of age and are based on analyses in previous chapters. The objective of maximizing cost-effectiveness for the prevention of undernutrition is achieved either by geographic targeting (Estate sector and rural areas where undernutrition rates are highest), targeting the poor (who are more likely to be malnourished), or by targeting certain age groups, e.g., pregnant (and pre-pregnant) and lactating women, children 0-3 years of age, and when appropriate, the larger population groups. Furthermore, the analysis focuses on the following aspects of undernutrition:

- Protein-energy malnutrition (including low birth weight)
- Clinical iodine deficiency
- Vitamin A deficiency
- Iron-deficiency anemia[27]

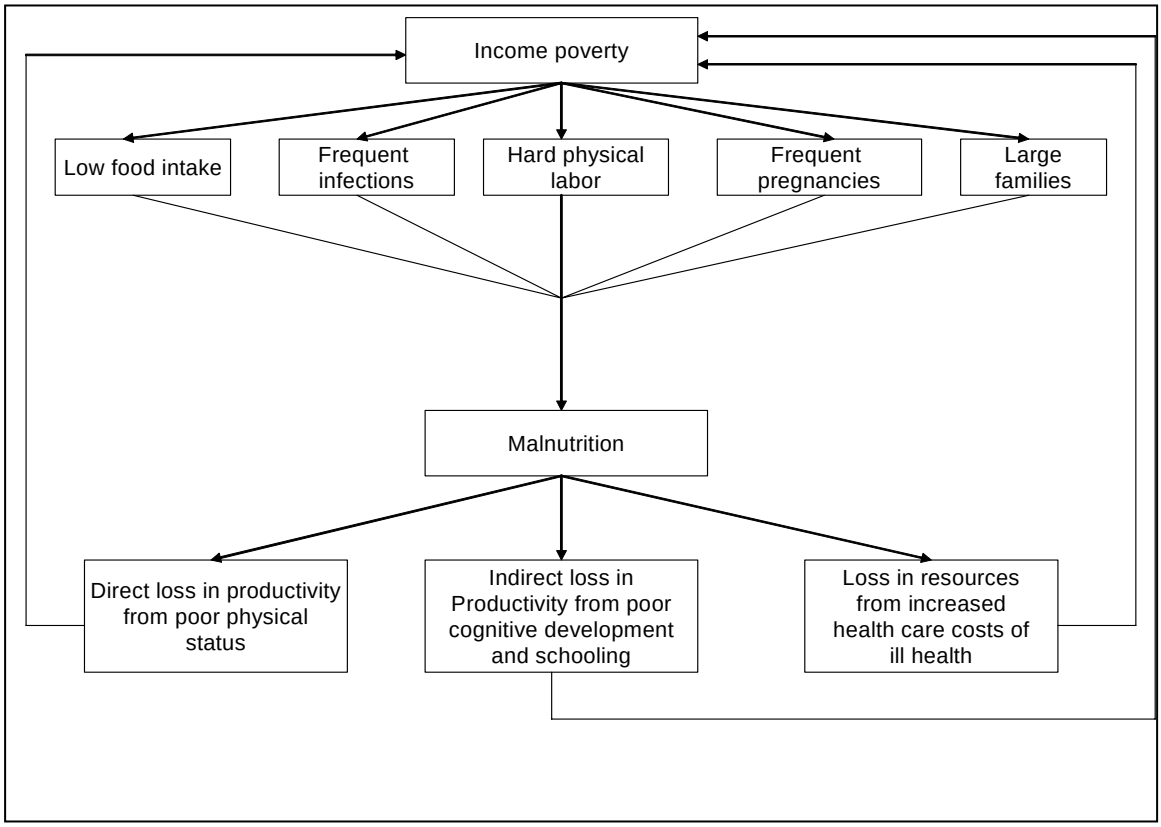
Several sources of data were used to quantify the economic costs of undernutrition. Two of the background papers commissioned for this study provided national data on expenditures, unit costs and effectiveness, and epidemiologic data (Atukorala, 2006; Akhavan, 2007). Estimates from the Global Burden of Disease Study (Murray and Lopez 1996a, 1996b) were used to convert basic epidemiologic data, such as prevalence of certain conditions, into impact measured in deaths and disability adjusted life years (DALYs)[28]. For all disease causes, except iron-deficiency anemia, impact was estimated by separate sequelae.[29] In the case of iodine deficiency, data on the prevalence of goiter grades 1 and 2 were used to infer the prevalence of more severe health consequences.

6.1. LOSSES TO UNDERNUTRITION: WHAT DOES UNDERNUTRITION COST SRI LANKA?

High levels of undernutrition can impede economic development through reduced productivity and increased budgetary outlays for health (Figure 6.1). Undernutrition leads to productivity losses directly and indirectly due to poor cognitive development and schooling. In addition, malnutrition is associated with a higher burden of disease, which places greater demands on the health sector. As a result, higher budgetary outlays needed for addressing ill-health may lead to further GDP losses. The losses due to malnutrition are so large that returns from programs for improving nutrition far outweigh their costs (World Bank 2006). This section examines the evidence on the losses due to undernutrition and estimates using available data the extent of these losses for Sri Lanka.

[27] Zinc deficiency was not included due to lack of available epidemiologic data for Sri Lanka.
[28] Composed of years of life lost to mortality (YLLs) and years of life with disability (YLDs).
[29] For protein-energy malnutrition, these were wasting, stunting, and developmental disabilities. For clinical iodine deficiency, sequelae were goitre grade 1, goitre grade 2, mild developmental disability, cretinoidism, and cretinism. For vitamin A deficiency, they were xerophthalmia and corneal scar (which includes other sequelae of severe deficiency).

Figure 6.1. The Vicious Cycle of Poverty and Malnutrition



Source*:* World Bank, 2006-Repositioning Nutrition.

6.1.1. Direct Losses to Productivity from Poor Physical Status

Protein energy malnutrition as well as micronutrient deficiencies—particularly during the critical period from conception through the first two years of life—have a direct impact on productivity. While this relationship is strongest for manual labor, it also has been found in the manufacturing sector and among white collar workers (Strauss and Thomas, 1998).

Height has been unequivocally shown to be related to productivity (Behrman and Rosenweig, 2001), and final height is determined in large part by nutrition from conception through the first two years of life. A 1 percent loss in adult height as a result of childhood stunting is associated with a 1.4 percent loss in productivity (Hunt, 2005).

Wages, one of the most commonly used measures of productivity, are influenced by nutritional status. The efficiency wage hypothesis (Strauss and Thomas, 1998) posits that there is a direct relationship between caloric intake and work output. While the hypothesis has not been proven, caloric intake has been shown to have a strong effect on farm output and piece rates of agricultural laborers. In Brazil and the United States the adult body-mass index (BMI) has been shown to affect wages, after having controlled for education (Strauss and Thomas, 1998).

The relationship between BMI and productivity decreases as BMI drops below 18.5, showing that adults with extremely low weights relative to their height have lower productivity. Productivity increases at BMIs above 18.5 and then drops again when BMI increases beyond 25 (due to overweight/obesity).

Anemia has direct and immediate effect on adults' productivity, especially for those in physically demanding occupations (World Bank 2006). In Sri Lanka, Selvaratnam (2003) showed that anemia rates in tea estates were correlated to productivity among tea pickers, with higher anemia being associated with lower productivity. In other estimates, eliminating anemia has been estimated to lead to a 5-17 percent increase in adult productivity, which amounts to 2 percent of GDP in the worst affected countries (Strauss and Thomas, 1998; Horton and Ross, 2003).

6.1.2. Indirect Losses from Poor Cognitive Development and Schooling

Undernutrition has been found to have a direct impact on children's cognitive development and schooling attainment. This in turn, has implications for adult productivity as schooling outcomes are linked to wages and productivity (World Bank 2006).

The impact on cognitive development includes effects on children's IQs, general cognitive abilities and attention span. Low birthweight can potentially reduce a person's IQ by 5 percent, stunting may reduce it by 5-11 percent, and iodine deficiency by nearly 10-15 percent (Grantham-McGregor, Fernald and Sethuraman, 1999). Iron deficiency anemia is found to consistently reduce performance on tests of mental abilities, including IQ (Horton and Ross, 2003). Children who were malnourished early do worse on tests of cognitive function, psychomotor function, and fine motor skills, and have reduced attention span. These cognitive skill deficiencies persist into adulthood and have a direct effect on earnings (Behrman, Alderman and Hoddinott, 2004). In short, undernutrition early in life seriously impedes the child's ability to learn at school.

The impact on schooling attainment is associated with when the child begins schooling and how long she or he will stay in school. Height and weight are known to affect the likelihood that children will be enrolled at the right time in school. Small and sickly children often are enrolled too late (or never) and are likely to stay in school for less time.

6.1.3. Direct and Indirect Productivity Losses in Sri Lanka

It was impossible to estimate Sri Lanka's direct and indirect losses to productivity separately with the available data. Instead, the total productivity losses associated with undernutrition were estimated.

Loss of economic productivity is used as a basis to describe the economic impact of undernutrition. Behrman (2004) put estimates of lifetime loss of productivity or earnings for a malnourished person at between 7 percent and 18.6 percent. The figure adopted for the present analysis is 10 percent, a conservative estimate. Based on this estimate and (a) taking only the 31 percent of children 0-3 years of age affected by protein-energy malnutrition (a conservative estimate as it precludes other nutritional conditions), (b) using a 3 percent discount rate, (c) assuming a 12.5 delay before the beginning of productivity at age 15 continuing to age 60, and (d) assuming productivity is to equal to the GDP/capita of Sri Lanka (US$ 1,199 in constant terms), the present lifetime loss of productivity to Sri Lanka is about US$ 1.104 billion. These estimates would be even larger if the increasing problem of overweight and obesity and existing micronutrient deficiencies were factored in.

6.1.4. Losses Due to Increased Morbidity and Mortality

Global Evidence

Undernutrition due to protein energy and micronutrient deficiencies leads to high levels of morbidity and mortality around the world. The effects are seen not only in children but also in adults in the form of a higher incidence of noncommunicable diseases.

Underweight is the single largest risk factor contributing to the global burden of disease in the developing world (Ezzati and others, 2002). In countries with high child mortality, underweight leads to nearly 15 percent of the total DALY losses. Undernutrition is associated with nearly 60 percent of all child mortality and even mildly underweight children face twice as high a risk of death than their better nourished counterparts (World Bank 2006). Low birthweight infants are at two to ten times more at risk of death than normal birthweight infants.

The impact on the global burden of disease of micronutrient deficiencies is no less important (World Bank 2006). Vitamin A deficiency compromises the immune systems of approximately 40 percent of the developing world's children under age five, leading to the deaths of approximately one million young children. Severe iron deficiency anemia is a significant cause of maternal mortality, while maternal folate deficiency leads to a quarter of a million severe birth defects each year. Iodine deficiency in pregnancy causes almost 18 million babies a year to be born mentally impaired.

Poor nutrition in the womb and during childhood also increases susceptibility to chronic, non-communicable diseases (NCD's) in adulthood (World Bank 2006). Diet related NCDs include cardiovascular disease, high blood cholesterol, obesity, adult-onset diabetes, osteoporosis, high blood pressure, and some cancers. Evidence from around the world suggests that about 60 percent of all deaths and 47 percent of the burden of disease can be attributed to diet-related chronic diseases. About two-thirds of deaths related to these diseases occur in the developing world and are strongly associated with low birthweight and stunting.

Evidence for Sri Lanka

The economic costs for Sri Lanka of the four nutritional conditions are calculated separately for males and females in the 0-3 year age group (Table 6.1. and Table 6.2. respectively). The estimated prevalence of the four conditions ranges from 21 to 45 percent. These calculations are not meant to be precise quantifications of the deaths and other burden caused by these diseases because the available data does not support such precision. However, they are illustrative of the scale of the human and economic costs.

Inevitably, there will be a great deal of overlap in the incidence of these conditions, and one person may suffer from two or more deficiencies at the same time. Therefore, the sum of the calculated costs of these conditions would most certainly be an overestimate of the actual impact. This must be kept in mind in estimating the overall costs of undernutrition.

Results presented in Tables 6.1 and 6.2 suggest that iodine deficiency disorders may be responsible for a significant proportion of infant deaths. The four conditions overall potentially underlie more than half of all infant and child mortality. However, closer examination shows that in Sri Lanka, roughly three-quarters of the impact/cost of undernutrition is through disability and not mortality. Of all the DALYs lost, 76 percent are YLDs (due to disability) and only 24 percent are YLLs (due to premature mortality).

The reference impact values from the Global Burden of Disease Study show that roughly half the impact of iodine deficiency comes from disability. In contrast, the results of this analysis show that in Sri Lanka, about 80 percent of this impact is due to disability. These results are consistent with the overall low infant and child mortality and high undernutrition rates in Sri Lanka. While many of the acute and more dramatic consequences of undernutrition and infectious diseases are being prevented and treated, the chronic, more insidious, and often sub-clinical effects of nutritional deficiencies continue to impact on human development outcomes. These have important implications for the strategic approach to addressing malnutrition in the country.

At the present time, there are no available data on the effect of undernutrition induced morbidity and mortality on health care costs. This would include not only the costs of providing clinical care for severely malnourished children, but also the costs of chronic diseases in adulthood that are a consequence of poor childhood nutrition. On-going work to estimate a set of disease-specific expenditure accounts in Sri Lanka is likely to provide information that can be used to estimate the impact of malnutrition on health care costs (Forthcoming WHO).

Table 6.1. Burden of Major Nutrition-Related Conditions, Males 0-36 Months of Age (Sri Lanka)

Condition	Prevalence	Total Mortality	Total YLLs	Total YLDs	Total DALYs
Protein-Energy Malnutrition	30.5%[30]	130	4,515	11,046	15,561
Clinical Iodine Deficiency*	21%[31]	479	16,586	66,246	82,832
Vitamin A Deficiency	36%[32]	76	2,621	199	2,820
Iron-Deficiency Anemia	45%[33]	20	578	2,172	2,750

*(1) Excludes Goiter Grade 0, thus estimate for prevalence may be significantly lower than overall iodine deficiency in the population. (2) Goiter prevalence has since declined to 5% after intensification of the salt iodization program but we use these higher prevalence figures to estimate disease burden because the burden would be this high without the program.

[30] Data from Chapter 2, adding the effect of developmental disability using estimates from Murray & Lopez 1996B, includes low birthweight, estimated at 16.6% for 2003, Medical Research Institute 2006.
[31] Piyasena 2004.
[32] Ibid.
[33] Ibid.

Table 6.2. Burden of Major Nutrition-Related Conditions, Females 0-36 Months of Age (Sri Lanka)

Condition	Prevalence	Total Mortality	Total YLLs	Total YLDs	Total DALYs
Protein-Energy Malnutrition	30.5%[34]	171	5,985	10,583	16,567
Clinical Iodine Deficiency*	21%[35]	640	22,371	81,337	103,708
Vitamin A Deficiency	36%[36]	66	2,304	195	2,499
Iron-Deficiency Anemia	45%[37]	20	582	2,079	2,661
Total					125,435

*(1) Excludes goiter grade 0, thus estimate for prevalence may be significantly lower than overall iodine deficiency in the population. (2) Goiter prevalence has since declined to 5% after intensification of the salt iodization program but we use these higher prevalence figures to estimate disease burden because the burden would be this high without the iodization program.

6.2. HOW MUCH DOES SRI LANKA SPEND ON NUTRITION PROGRAMS?

6.2.1. Tracking Nutrition-Related Expenditures

National health accounts (NHA) are estimated annually in Sri Lanka, using standardized methodology to enable the government and development partners to track health expenditures over time and across geographic regions. At present, nutrition-related expenditures are not included as a separate category in Sri Lanka NHA. Instead, they are counted under various categories such as maternal and child health, health education and communicable disease expenditures. In the interests of systematically tracking nutrition expenditures over time, a separate subcategory for nutrition should be added to the Sri Lanka NHA functional classification system.

In Sri Lanka, as is the case in most other countries, some interventions and programs are exclusively classified as "nutrition interventions," while others are integrated within the maternal and child health program, as described in Chapter 4. As a result, it is not possible to accurately estimate government and other outlays on nutrition in the country. This study aims to provide rough estimates of current investments in nutrition and serves as a baseline against which shifts in strategy or incremental investments can be evaluated. These are presented in Tables 6.3 and 6.4.

The Thriposha program (Sri Lanka Rs. 508 million) financed and delivery by GOSL comprises the largest nutrition investment in the country, followed by the Maternal and Child Health Program (Sri Lanka Rs.222 million) (Table 6.3). As already noted, only a relatively small share of MCH program expenditures is attributable to direct nutrition interventions. This includes the provision of iron-folate supplements for control of anemia during pregnancy, the cost of vitamin supplements, etc. Other large inputs include World Food Program Assisted Maternal and Child Nutrition Program (Rs.220 million, most of which is in the form of direct food assistance rather than cash) and the ECCD, Integrated Early Childhood Care and Development Program (Rs.137 million from UNICEF sources). In contrast, a relatively small amount is accounted for by

[34] Data from Chapter 2, adding the effect of developmental disability using estimates from Murray & Lopez 1996B; includes low birthweight, estimated at 16.6% for 2003, Medical Research Institute 2006.
[35] Piyasena 2004.
[36] Ibid.
[37] Ibid.

programs to address micronutrient deficiencies such as IDD and IDA, even though these contribute heavily to the total DALY's lost. No information was available on expenditures for the vitamin A supplementation program. Further, many of the donor-support estimates included above are extra-budgetary allocations which adds further uncertainty to these estimates. With all of these caveats, these estimates suggest that the overall nutrition-related investment for 2005 is Sri Lanka Rs.1.12 billion, equivalent to US$ 11.2 million. On average, this represents an allocation of Rs.57 (US$ 0.57) per capita across the population and US$ 0.80 if targeted only to pregnant and lactating women and children less than three years of age.

The government is largest source of funding for nutrition; it is responsible for over two-thirds of the resources (Table 6.4). UN agencies are responsible for most of the rest (30 percent), primarily through extra-budgetary allocations, including the World Bank's strategic investment in the Health Sector Development Project which allocates a very modest sum of Rs. 15.8m ($135,000) for nutrition.

Table 6.3. Nutrition-Related Expenditures by Program, Sri Lanka 2005

Program	Source	Amount (Rs.)	Comments
Nutrition programs implemented by *Sarvodaya* movement	NORAD	1,200,000	Assumption: resources divided equally 2004-2006
Thriposha Program	GOSL	507,550,000	
World Food Program (WFP) assisted maternal and child nutrition program	WFP	165,000,000	Primarily as food aid (not cash)
	GOSL	55,000,000	
Maternal and Child Health Program	GOSL	216,835,640	Recurrent expenditure
	GOSL	70,481	Capital expenditure, linear depreciation over assumed useful lifetime of 10 years, attributed to one year only
	WHO	1,219,694	
	UNICEF	3,766,597	
ECCD Program	UNICEF	136,902,990	
Iodine Control Deficiency Program	UNICEF	503,125	Assumption: resources divided equally 2004-2007
	WHO	402,360	
	WHO/SEARO	326,918	
Micronutrient Supplements (Non-Estate Sector Clinics)	UNICEF/ USAID/MOH	17,066,667	No funds released by treasury in 2005, therefore average expenditure over 2004-2006 attributed to 2005.
Anemia Control Activities (Estate Sector)	GOSL	2,733,948	
Health Sector Development Project	World Bank	15,807,000	Assumption: resources divided equally 2004-2010

Table 6.4. Nutrition-Related Expenditures by Program, Sri Lanka 2005

Source	Amount (Rs.)	Percentage of Total
GOSL	782,190,069	70
UNICEF	141,172,712	13
World Bank	15,807,000	1
WHO	1,622,054	0
WFP	165,000,000	15
SEARO	326,918	0
NORAD	1,200,000	0
Joint UNICEF/ USAID/MOH	17,066,667	2

6.3. COST-BENEFIT ANALYSES OF VARIOUS INTERVENTIONS IN SRI LANKA AND POTENTIAL FOR COST-EFFETIVENESS OF INTERVENTIONS

The burden of a disease is the measure of its negative effect on the population's health. "Cost-effectiveness," is the cost of preventing a unit of disease burden, the selected unit here being disability-adjusted life years.[38] Thus, cost-effectiveness is measured in US dollars per DALY. "Cost-benefit" has the classic definition of the proportion of prevented costs to incurred costs, being stated as a ratio. As an example, a vitamin A supplementation program costing US$ 10,000 and preventing US$ 30,000 in health care costs and lost household productivity, would have a cost-benefit ratio of three.

Cost-effectiveness considerations are useful when attempting to allocate scarce resources among a large number of potentially beneficial interventions. The objective then is to identify a package of health or nutrition interventions that maximizes outcomes across a given population for a given level of costs. The disadvantage of this approach is that it does not take into account distributional issues such as whether a particular intervention is more pro-poor than another intervention. Another disadvantage is that it reflects allocative, but not technical efficiencies in service provision. Further, it does not consider key programming issues such as institutional capacity for implementation, feasibility for scaling-up, etc.

Methods Used to Estimate Cost-Benefit Ratios of Nutrition Interventions in Sri Lanka

Numerous sources were reviewed to search for appropriate data. A great majority of the data on interventions and programs described in the literature cannot be used for this type of analysis because of inadequate documentation of costs and effectiveness, very different programming contexts precluding extrapolation of results, and vague descriptions of the intervention itself. Some potentially useful studies cannot be utilized simply because they use different indicators. One example is a cost-effectiveness analysis of double fortified salt in Kenya, comparing double fortification with supplementation and anthelminthic treatment.[39] The study uses heamoglobin levels an outcome indicator, and is not comparable to the DALY approach used here since anemia reduction is not directly comparable to improvements in DALYs.

Contrary to a commonly held belief, even with similar indicators, cost-effectiveness results cannot be easily quoted across time and space. A simple change in prevalence of a condition, for example, can have dramatic effects on such figures. However, due to a lack of sufficient data on issues such as worker absenteeism, and health care costs, cost-benefit ratios for this estimation have been taken from the literature. They should therefore be interpreted with caution and great care. Indeed, in many cases, the ratios quoted in the literature seem optimistic and work is currently ongoing on improving cost-estimates of nutrition interventions at global and country levels (World Bank, internal communications). Follow-on work on this issue may be needed in Sri Lanka.

Appropriate interventions, for which data were available, have been selected here for the cost-effectiveness and cost-benefit analyses that follow. An especially important caveat for applying past cost-effectiveness results to such analyses is that poor results (which could be a result of implementation failure rather than failure of an intervention) could be seen as a "fact" rather than

[38] The term "cost-effectiveness" is used here in a generic and all-inclusive sense, as described above and inter-changeably with "cost-impact."

[39] Update from an unpublished analysis by Jessica Blankenship and James Levinson (Tufts University) prepared as part of MI's DFS internal review document, February 2004.

a "variable." Therefore, poorly implemented examples of potentially cost-effective interventions may lead to their being excluded for the wrong reasons. For example, there is no solid evidence for the effectiveness of Sri Lanka's Thriposha program. This might lead to calls for it being abolished or replaced. Alternatively, it may lead to questions on how it could be modified or better targeted to those population groups (e.g., Estate sector, pregnant and lactating women) where it could be more effective, especially if complemented with strategies to improve maternal and child care practices. Therefore, cost-effectiveness results are only an indication of the specific circumstances of a study and have to be interpreted in light of experience and common sense.

For this same reason, some interventions have been analyzed assuming different levels of assumed effectiveness. Instead of asking whether an intervention is cost-effective or not, the question that may be asked is: how effective does an intervention have to be in Sri Lanka for it to be a worthwhile investment? The cost-effectiveness and cost-benefit results of the selected interventions are demonstrated in Tables 6.5 and 6.6.

One of the most effective ways of increasing cost-effectiveness, even without significant operational improvements, is better targeting. This may include age targeting (focusing on children 0-3 years of age or pregnant lactating women vs. the larger population), or geographic targeting, as exemplified in Table 5.9. It presents a theoretical demonstration of how two malnutrition interventions can widely vary in cost-effectiveness and cost-benefit due to variations of malnutrition prevalence from one region of the country to another. The Thriposha program, for example, can vary from a low cost-effectiveness of 9.6 in the metropolitan Colombo area to a high of 23.2 in the Estate sector. Similarly, the cost-benefit of vitamin A supplementation is increased by nearly 1.5 times when moving from a nation-wide program to a more targeted program in the Estate sector. However, targeting also carries a cost; in some situations, the cost of the systems or tools for targeting may exceed the savings. In such cases, the value of targeting needs to be carefully judged.

How Can the Effectiveness of Interventions be Improved?

Cost-effectiveness can be improved by:

- Choosing interventions that respond to the epidemiology of the problem.
- Improving program effectiveness/implementation quality (through stronger political commitment, better training, stronger institutional and management capacities, stronger M & E, etc.), or by
- Reducing costs through improved technologies and better targeting to reach those most in need of the program and are therefore likely to respond to the intervention.

The first two issues of epidemiology and political commitment and institutional capacities have been dealt with in previous chapters.

Table 6.9 is a theoretical demonstration of how two nutrition interventions can broadly vary in cost-effectiveness and cost-benefit due purely to variations in the prevalence of underweight (in this case from one region of the country to another. This is just one factor—albeit an important one—of the many issues that need to be considered to maximize cost effectiveness to address undernutrition in Sri Lanka.

6.4. SELECTING THE RIGHT PACKAGE OF INTERVENTIONS FOR SRI LANKA

In general, micronutrient supplementation and fortification interventions in Sri Lanka seem to have the highest cost-effectiveness levels (dollars spent per DALY averted) as expected and compared with other direct nutrition interventions. Vitamin A supplementation does not seem to be nearly as cost-effective as often cited in the literature, primarily because this intervention has very high cost-effectiveness in country settings that have high child mortality. Unlike other countries, Sri Lanka has already been very successful in lowering child mortality, and therefore vitamin A supplementation is estimated to be less cost-effective, a seemingly paradoxical but in fact logical finding. Among interventions targeted at reducing protein-energy malnutrition, even if effectiveness levels are assumed to be low, breastfeeding support shows higher cost-effectiveness, because it costs less.

Cost-effectiveness and cost-benefit are only two criteria to consider in selecting interventions. The overall costs, impact, and benefits of some of the potential interventions are summarized in Tables 6.7 and 6.8. This information needs to be weighed in the context of the country's epidemiology and the available resources to address the nutrition problem (including financial, institutional and human resources). Likewise, total impact (which is based on the epidemiology of the problem) and benefits may influence allocation decisions in different ways. For example, an intervention with highly favorable cost-effectiveness but limited total impact may not be preferable to another intervention with lower cost-impact but a bigger overall impact in the population.

6.5. CONCLUSIONS

By conservative estimates, undernutrition costs Sri Lanka each year over US$ 1.1 billion in lost productivity and over 230,000 DALYs lost due to undernutrition-related disability and death. In contrast, the current expenditures on malnutrition-related programs are estimated at a very modest level of US$ 11.2 million, a third of which is from government resources and the rest from development partners.

In general, micronutrient supplementation and fortification interventions in Sri Lanka have the highest cost-effectiveness levels (dollars spent per DALY averted) compared with other direct nutrition interventions. Better targeting is one of the most effective ways of increasing cost-effectiveness of programs, even without significant operational improvements. This may include age targeting (focusing on children 0-3 years of age or pregnant lactating women vs. the larger population), or geographic targeting. For example, the cost effectiveness of the Thriposha program can vary from a low of 9.6 in the metropolitan Colombo area to a high of 23.2 in the Estate sector. Sri Lanka needs to outline a package of services that is cost-effective given the country's epidemiological profile. It must also maximize the package's targeting to the population groups that can benefit the most from such services. In so doing, investments will be needed to finance the package of services, to build the relevant institutional capacities, and to improve collaboration, competence, skills, knowledge of field workers and of other sectors at the local, district, provincial and central levels.

Table 6.5. Cost-Effectiveness and Cost-Benefit of Interventions for Protein-Energy Undernutrition in Sri Lanka

Intervention	Annual Cost/Capita (US$)[40]	Impact %[41]	Cost-Effectiveness (US$/DALY)[42]	Cost-Benefit Ratio[43]
Iron and Folic Acid Supplementation during Pregnancy (for Low Birth Weight)	6.27[44]	16%[45]	604[46]	10.1[47]
Treatments for Asymptomatic Bacterial Infections in Women with High Probability of LBW	1,100[48]	-[49]	-[50]	2.8[51]
Treatment for Presumptive STD in Women with High Probability of LBW	276[52]	-[53]	-[54]	6.0[55]
Food Supplementation 1000kcal/day				
Assumed Effectiveness 25%	36[56]	25%	4,082	3.6[57]
Assumed Effectiveness 50%	36[58]	50%	2,041	7.2[59]
Assumed Effectiveness 75%	36[60]	75%	1,361	10.9[61]
Thriposha program (Targeted to under-three children, pregnant/lactating women)				
Assumed Effectiveness 25%	17[62]	25%	1,914	7.7[63]
Assumed Effectiveness 50%	17[64]	50%	957	15.5[65]

[40] It is assumed that the incremental unit cost remains constant at different levels of coverage.
[41] Impact in percent is the proportion of disease prevalence that the intervention prevents or eliminates.
[42] "Cost-impact" is the cost of preventing a unit of disease impact, the selected unit here being disability-adjusted life years. It is calculated by dividing cost per capita by average DALYs per case of the disease (authors' derivations from Murray et al., 1996A and 1996B) multiplied by prevalence. In the text, cost impact is referred to as "cost effectiveness."
[43] Cost-Benefit Ratio is the proportion of prevented costs to incurred costs.
[44] Atukorala 2006, citing Somaratne 2000.
[45] From World Bank 2006A, p. 70. Compares to a result of 17% from data in the mid-term evaluation of the Participatory Nutrition Improvement Project (PNIP), Atukorala 2006.
[46] Adjusted for estimated prevalence of 16.6% for 2003, Medical Research Institute 2006.
[47] Behrman et al., 2004, p. 42, median value of estimated range. This is a figure given for iron supplementation only; therefore it is probably an underestimate to some degree.
[48] Behrman et al., 2004, p. 42, median value of estimated range.
[49] Suitable data not available.
[50] Ibid..
[51] Behrman et al., 2004, p. 42, median value of estimated range.
[52] Ibid.
[53] Suitable data not available.
[54] Ibid..
[55] Behrman et al., 2004, p. 42, median value of estimated range.
[56] Lower limit of price range US$ 36-172, World Bank 2006A, p. 28.
[57] Savings per case prevented adapted from Behrman et al., 2004.
[58] Lower limit of price range US$ 36-172, World Bank 2006A, p.28.
[59] Savings per case prevented adapted from Behrman et al., 2004.
[60] Lower limit of price range US$ 36-172, World Bank 2006A, p. 28.
[61] Savings per case prevented adapted from Behrman et al., 2004.
[62] Costs based on inferior limit of price range US$ 36-172, World Bank 2006A, p. 28.
[63] Savings per case prevented adapted from Behrman et al., 2004.
[64] Costs based on inferior limit of price range US$ 36-172, World Bank 2006A, p. 28.
[65] Savings per case prevented adapted from Behrman et al., 2004.

Intervention	Annual Cost/Capita (US$)[40]	Impact %[41]	Cost-Effectiveness (US$/DALY)[42]	Cost-Benefit Ratio[43]
Assumed Effectiveness 75%	17[66]	75%	638	23.2[67]
Breastfeeding Support				
Assumed Effectiveness 10%	0.35[68]	10%	99	149[69]
Assumed Effectiveness 25%	0.35[70]	25%	40	373[71]
Assumed Effectiveness 50%	0.35[72]	50%	20	745[73]
Integrated Child Care Programs	40[74]	-[75]	-[76]	16.2[77]

[66] Costs based on lower limit of price range US$ 36-172, World Bank 2006A, p. 28.
[67] Savings per case prevented adapted from Behrman et al., 2004.
[68] Costs from Atukorala 2006. Also comparable to per capita cost of Rs 1,600 for the WFP-assisted Maternal and Child Nutrition Program.
[69] Savings per case prevented adapted from Behrman et al., 2004.
[70] Costs from Atukorala 2006. Also comparable to per capita cost of Rs 1,600 for the WFP-assisted Maternal and Child Nutrition Program.
[71] Savings per case prevented adapted from Behrman et al., 2004.
[72] Costs from Atukorala 2006. Also comparable to per capita cost of Rs 1,600 for the WFP-assisted Maternal and Child Nutrition Program.
[73] Savings per case prevented adapted from Behrman et al., 2004.
[74] Behrman et al. 2004, Table 9.
[75] Suitable data not available.
[76] Ibid.
[77] Behrman et al., 2004, Table 9.

Table 6.6 Cost-Effectiveness and Cost-Benefit of Interventions for Micronutrient Deficiencies in Sri Lanka

Intervention	Annual Cost/Capita (US$)[78]	Impact %[79]	Cost-Effectiveness (US$/DALY)[80]	Cost-Benefit Ratio[81]
IODINE DEFICIENCY				
Salt Iodization[82]	0.35[83]	77%[84]	18[85]	11.8[86]
Iodized Oil Capsules for Women of Child-Bearing Age	2.63[87]	90%[88]	14	268[89]
Oil Injections	0.25[90]	90%[91]	7	13.8[92]
VITAMIN A DEFICIENCY				
High-Dose Vitamin A Supplementation	1.08[93]	90%[94]	394[95]	75.7[96]
SUGAR FORTIFICATION WITH VITAMIN A[97]				
Assumed Effect. 10% of Supplementation	0.10[98]	9%	1,661[99]	7.6[100]
Assumed Effect. 25% of Supplementation	0.10[101]	23%	664[102]	18.9[103]

[78] It is assumed that the incremental unit cost remains constant at different levels of coverage.
[79] Impact in percent is the proportion of disease prevalence that the intervention prevents or eliminates.
[80] "Cost-impact" is the cost of preventing a unit of disease impact, the selected unit here being disability-adjusted life years. It is calculated by dividing cost per capita by average DALYs per case of the disease (author's derivations from Murray et al., 1996A and 1996B.) multiplied by prevalence. Cost-effectiveness is used interchangeably with cost-impact here.
[81] Cost-Benefit Ratio is the proportion of prevented costs to incurred costs.
[82] Piyasena 2004, 49.5% of household salt is inadequately iodized.
[83] Atukorala 2006, citing Lanka Salt Corporation, 2006. Compares to range of US$ 0.20-0.50 cited in World Bank 2006A.
[84] Reduction of Goiter prevalence to <5% (Jayatissa et al., unpublished observations), assumed to be 4%. Comparable to Reduction of Goiter prevalence to 7% as seen in the case of Madagascar, Center for Global Development 2004.
[85] Adjusted for prevalence in overall population.
[86] Assuming oil injections have an effectiveness of 90% and benefits of one case prevented by salt iodization is equal to that of a case prevented by oil injections.
[87] Median value of US$ 0.25 to 5.00 range. Behrman et al., 2004, Table 9.
[88] Assumed effectiveness.
[89] Median value of US$ 15 to 520. Behrman et al., 2004, Table 9.
[90] Using middle figure of US$ 0.80, 1.25, and 2.75. World Bank 2006C, Table 28.4. Cost is divided over a probable period of effectiveness of five years, Behrman et al., 2004, p. 29.
[91] Assumed effectiveness.
[92] Behrman et al., 2004, p. 29.
[93] Median of price range US$ 0.9-1.25 World Bank 2006A, p. 28.
[94] Assumed effectiveness of 90%. Basing calculations on reduction in overall mortality (according to Beaton et al., 1993, quoted in World Bank, 2006C, and other sources), in a setting of already low mortality such as Sri Lanka would distort the true effectiveness of this intervention.
[95] Behrman et al., 2004.
[96] Ibid.
[97] These costs are usually borne by consumers, and should not be interpreted as public sector costs.
[98] World Bank 2006C, Table 28.4.
[99] Adjusted for prevalence in overall population.
[100] Behrman et al., 2004.
[101] World Bank 2006C, Table 28.4.
[102] Adjusted for prevalence in overall population.
[103] Behrman et al., 2004.

Assumed Effect. 50% of Supplementation	0.10[104]	45%	332[105]	37.8[106]
IRON-DEFICIENCY ANEMIA				
Iron, Folic Acid, Vitamin C, 5 days a week, with initial dose of Mebendazole	9.04[107]	62%[108]	92	-[109]
Iron, Folic Acid, Vitamin C, 5 days a week, with Mebendazole, and Cereal Fortification	9.13[110]	93%[111]	68	-[112]

[104] World Bank 2006C, Table 28.4.
[105] Adjusted for prevalence in overall population.
[106] Behrman et al., 2004.
[107] Atukorala 2006, citing Somaratne 2000.
[108] Piyasena 2004.
[109] Suitable data not available.
[110] Atukorala 2006, citing Somaratne 2000, and World Bank 2006C Table 28.4.
[111] Added to supplementation, cereal fortification with iron confers an additional 50% effect on anemia rates, Le et al., 2006.
[112] Suitable data not available.

Table 6.7 Total Cost, Impact, and Benefits of Interventions for Protein-Energy Malnutrition in Sri Lanka

Intervention	Approximate Cost for 80% Coverage[113]	Health Impact at 80% Coverage (DALYs)[114]	Benefits at 80% Coverage (US$)[115]
Iron and Folic Acid Supplementation During Pregnancy (For Low Birth Weight)	1,572,697[116]	898[117]	5,453,837[118]
Treatments for Asymptomatic Bacterial Infections in Women with High Probability of LBW	275,714,560[119]	-[120]	262,103,297[121]
Treatment for Presumptive STD in Women with High Probability of LBW	69,179,290[122]	-[123]	142,866,838[124]
Food Supplementation 1000kcal/day			
Assumed Effectiveness 25%	26,150,400	6,407	94,732,076
Assumed Effectiveness 50%	26,150,400	12,813	189,464,152
Assumed Effectiveness 75%	26,150,400	19,220	284,196,228
Thriposha Program			
Assumed Effectiveness 25%	12,261,927	6,407	94,732,076
Assumed Effectiveness 50%	12,261,927	12,813	189,464,152
Assumed Effectiveness 75%	12,261,927	19,220	284,196,228
Breastfeeding Support			
Assumed Effectiveness 10%	254,240	2,563	37,892,830
Assumed Effectiveness 25%	254,240	6,407	94,732,076
Assumed Effectiveness 50%	254,240	12,813	189,464,152
Integrated Child Care Programs	29,056,000	-[125]	470,707,200

[113] Product of multiplication of per capita cost by 80% of population in age group. Assumes incremental unit costs are constant.
[114] Product of multiplication of approximate costs for 80% coverage and cost-impact (US$/DALY).
[115] Product of multiplication of approximate costs for 80% coverage and cost-benefit ratio.
[116] Based on Crude Birth Rate of 16/1000 for the year 2005, downloaded April 3, 2007 at http://www.unicef.org/infobycountry/sri_lanka_sri_lanka_statistics.html.
[117] Ibid.
[118] Ibid.
[119] Ibid.
[120] Suitable data not available for calculations.
[121] Based on Crude Birth Rate of 16/1000 for the year 2005, downloaded April 3, 2007 at http://www.unicef.org/infobycountry/sri_lanka_sri_lanka_statistics.html.
[122] Ibid.
[123] Suitable data not available for calculations.
[124] Based on Crude Birth Rate of 16/1000 for the year 2005, downloaded April 3, 2007 at http://www.unicef.org/infobycountry/sri_lanka_sri_lanka_statistics.html.
[125] Suitable data not available for calculations.

Table 6.8. Total Cost, Impact, and Benefits of Interventions for Micronutrient Deficiencies in Sri Lanka

Intervention	Approximate Cost for 80% Coverage[126]	Health Impact at 80% Coverage (DALYs)[127]	Benefits at 80% Coverage (US$)[128]
IODINE DEFICIENCY			
Salt Iodization	5,450,800	162,937	64,475,180
Iodine for Child-Bearing Women	657,955[129]	45,502	176,003,016
Oil Injections	62,662[130]	45,502	864,741
VITAMIN A DEFICIENCY			
High-Dose Vitamin A Supplementation	780,888	1,980	58,743,149
Sugar Fortification with Vitamin A[131]			
Assumed Effect. 10% of Supplementation	1,566,560[132]	509	11,784,739
Assumed Effect. 25% of Supplementation	1,566,56[133]	1,272	29,461,847
Assumed Effect. 50% of Supplementation	1,566,560[134]	2,543	58,923,693
IRON-DEFICIENCY ANEMIA			
Iron, Folic Acid, Vitamin C, 5 days a week, with initial dose of Mebendazol	6,569,199	5,964	-[135]
Iron, Folic Acid, Vitamin C, 5 days a week, with initial dose of Mebendazol, and Cereal Fortification	6,634,575	8,946	-[136]

[126] Product of multiplication of per capita cost by 80% of population in age group. Assumes incremental unit costs are constant.
[127] Product of multiplication of approximate costs for 80% coverage and cost-impact (US$/DALY).
[128] Product of multiplication of approximate costs for 80% coverage and cost-benefit ratio.
[129] Based on Crude Birth Rate of 16/1000 for the year 2005, http://www.unicef.org/infobycountry/sri_lanka_sri_lanka_statistics.html
[130] This intervention is implemented in early childhood; therefore numbers are based approximately on Crude Birth Rate of 16/1000 for the year 2005, http://www.unicef.org/infobycountry/sri_lanka_sri_lanka_statistics.html.
[131] As these costs are usually borne by consumers, the results should be seen as societal costs, cost-impact, and cost-benefit.
[132] Adjusted for coverage of overall population.
[133] Ibid.
[134] Ibid.
[135] Suitable data not available for calculations.
[136] Ibid.

Table 6.9. Influence of Targeting on Cost-Effectiveness and Cost-Benefit in Sri Lanka

	percent Prevalence Underweight[137]	Cost-Effectiveness (US$/DALY)		Cost-Benefit Ratio	
		Thriposha Program	High-Dose Vitamin A Supplementation	Thriposha Program	High-Dose Vitamin A Supplementation
National Average	29.4[138]	957	394	15.5	75
Colombo Metro	18.2	1,546	637	9.6	47
Other Urban	21.3	1,321	544	11.2	55
Rural	30.8	913	376	16.2	79
Estate	44.1	638	263	23.2	113

Authors' calculations are adjusted for difference in prevalence from national to local level. It is assumed that the prevalence of vitamin A deficiency varies in proportion to the prevalence of protein-energy malnutrition.

[137] From Chapter 2.

[138] This figure is taken directly from national studies and differs slightly from the adjusted prevalence figures used in earlier calculations in this analysis.

7. NEXT STEPS AND THE WAY FORWARD

This chapter draws conclusions from each of the previous chapters and summarizes those to suggest a way forward to address the continuing scourge of malnutrition in Sri Lanka. At a macro level, an effective multisectoral approach to improving nutrition would include a combination of the following strategies: (a) Poverty reduction strategies specifically designed to reduce income inequalities; (b) Strategies to improve access to safe water and sanitation (and good hygiene behaviors); (c) Strategies to reduce food insecurity, especially among the poor in the Estate sector and in rural areas; and (d) Strategies to scale-up direct nutrition interventions through the health sector that would help to fast-track the improvements in nutrition outcomes. This chapter identifies the need for the first two strategies, suggests some ways forward for the third, and focuses on laying out options for a programmatic framework for mainstreaming nutrition through the health sector. A very basic, well-targeted package of nutrition services through the health sector may cost Sri Lanka an estimated US$ 20 million annually, plus costs to develop institutional capacity, monitor and evaluate, and sustain political will. This package of services may be implemented either through a health project or in collaboration with a CDD-type intervention. The chapter lays out six key next steps for moving ahead.

Chapter 1 laid out the background and the rationale for this study. Child undernutrition in Sri Lanka is very high despite the fact that it has better basic health indicators than most countries with comparable per capita incomes. Undernutrition represents the "non-income face of poverty." The MDG study has highlighted that Sri Lanka may be among the countries to achieve several of the health MDGs, and potentially the income poverty MDG under certain conditions, but not the non-income poverty target (also referred to as the "nutrition MDG"). The original goal of this Analytical and Advisory Activity (AAA) was to systematically study the complex nutrition situation in Sri Lanka to accomplish three tasks: (1) inform the GOSL and development partners in Sri Lanka (including the World Bank) about the causes of the malnutrition enigma and strategies to address it; (2) support the GOSL in preparing an evidence-based programmatic framework to address malnutrition; and (3) enhance the potential impact of the Bank's current investments in Sri Lanka. Due to limited available data, issues of causality could not be addressed with sufficient precision. However, some exploratory analyses shed some light on these issues and identify potential strategy options. The epidemiological evidence presented in this paper will aid the GOSL and its partners to develop a programmatic framework and to enhance the potential impact of current and planned investments in nutrition. While malnutrition prevention strategies span many sectors, and this study identifies those sectors, its primary focus is developing a programmatic framework for the health sector.

Chapter 2 documented the levels and trends in undernutrition. Sri Lanka bears the double burden of undernutrition and overweight. Maternal undernutrition remains high, and maternal obesity is increasing at the same time, albeit primarily among the rich. Inequities are also increasing. The difference in the mean BMI (a measure of adult nutrition) between the Estate and urban sectors increased dramatically between 1995 and 2000 from 2.8 to 4.5. Underweight

prevalence among children (29%) is still relatively high by global standards and Sri Lankan children remain extremely vulnerable during the first two critical years of their lives. Concurrently, overweight is on the rise especially among high-income groups.

Stunting and underweight rates among children have fallen in recent years (from 38% to 29% for underweight and 24% to 14% for stunting between 1993 and 2000). However, the rates of decline have been greatest among children in wealthy households and children living in Colombo and other urban areas in the Western province, thereby increasing existing inequities between the rich and the poor. In 1993 a child from the poorest households was 2.8 times more likely to be underweight than a child from the richest household. By 2000, this ratio had increased to 4.1. The increase in inequality in stunting is even greater. In 1993, a child from the poorest household was 3.7 times more likely to be stunted. By 2000, this ratio had more than doubled to 7.7. It is clear that there is a sharp income gradient with respect to undernutrition in Sri Lanka: undernutrition rates decline steadily with increasing socioeconomic status. However, it is notable that undernutrition is relatively high even in the third and fourth quintiles, wherein food security may not be a limiting factor. Simultaneously, undernutrition continues to exist even among the non-poor—11% of children in the highest wealth quintile are underweight (3% are stunted), and nearly 20% are underweight (and 8.2% are stunted) in the fourth wealth quintile, suggesting that undernutrition continues to plague even the non-poor. These important issues need to be carefully considered when designing publicly funded nutrition interventions in Sri Lanka.

The WHO has identified micronutrient deficiencies, especially anemia (40-60% among women and children), and vitamin A deficiency as problems of public health proportions. These deficiencies remain high, especially for a country that has performed well in the health sector. Economic growth alone is insufficient to reduce Sri Lanka's undernutrition by 2015 to meet the MDG: First, projected growth rates may not be high enough given low income elasticities of undernutrition; and second, because economic growth is not equitable across the population groups, improved economic growth is unlikely to benefit the groups in the population with the worst nutritional outcomes.

Chapter 3 reviews available data to assess the causes of undernutrition in Sri Lanka. Undernutrition in Sri Lanka seems to be rooted in household poverty, although it is not limited to the poor. Poor households are food energy deficient, lack dietary diversity and have limited access to clean water and sanitation. All have negative implications for the households nutritional outcomes, particularly maternal malnutrition. In the multivariate analysis, maternal underweight and household wealth status are the most important predictors of low birthweight, which in turn is the single most important predictor of child stunting and underweight. These effects are further exacerbated by poor child caring practices, which are also worse among the poor, during the first two years of life. Among intermediate variables, the most important were household socioeconomic status and, to a lesser extent, access to piped water. Although the bivariate analysis in the MRI study found that caring and feeding habits and health care were also important, this analysis found that these variables were no longer significant once household socioeconomic status, maternal weight, and low birthweight were controlled for in the multivariate analysis.

Health care and access to safe water and sanitation services can potentially serve as a barrier between disease and undernutrition. In Sri Lanka, high levels of access to health care have helped break this vicious cycle by ensuring that childhood illnesses are treated appropriately. Access to safe water and sanitation, however, are less adequate and could potentially be exacerbating the impact of poverty and poor caring practices on undernutrition.

Many theories have been offered to explain why undernutrition rates remain very high in South Asia as compared to Sub-Saharan Africa (the South Asian enigma). These explanations range from the low status of women (and inadequate access/utilization of health services and other resources for women and girls), to low birthweights, high population densities, and poor sanitation. None of these theories, however, have been empirically proven. The gender argument is not valid for Sri Lanka since both health service utilization and education levels are equally high for both girls and boys. Sanitation levels in Sri Lanka are higher than in other South Asian countries, though access to safe water still remains an issue, and sanitation is a significant predictor of underweight and stunting. Low birthweight rates in Sri Lanka are higher (17%) than in many countries in Africa and offer a valid explanation for the high underweight rates in Sri Lanka. Furthermore, utilization of primary health care services (such as oral re-hydration packages during diarrhea episodes) is lower in Sri Lanka compared with other countries in the region. These potential explanations are borne out by the data presented in Chapter 3, albeit not conclusively (since these were cross-sectional analyses from DHS surveys and causal inferences can only be inferred from more expansive panel data).

Given that rising income inequalities, modest economic growth and limited access to safe water and sanitation will continue to prevent the nutrition outcomes of the poor from improving substantially, maternal and child care practices have a critical role to play in improving nutrition outcomes. Current maternal and child care practices (such as utilization of oral re-hydration packages during diarrhea) have to improve significantly, especially during the first two years of a child's life, for nutrition outcomes to continue to improve over time. A combination of economic growth, reduction of inequalities and improvements in care practices are necessary for child nutrition outcomes to improve at a pace sufficient to meet the MDG target. Furthermore, special efforts are required for the Estate sector where the problems are most acute.

Chapter 4 reviews the characteristics of past and existing nutrition investments. The Government of Sri Lanka's current policy response to malnutrition consists of four broad strategies: direct food assistance programs, poverty reduction programs, and the provision of an integrated package of maternal and child health and nutrition services through the Ministry of Healthcare and Nutrition. Smaller programs focused on behavior change communication also exist. In addition, there are national programs that aim to reduce micronutrient deficiencies.

The coverage of food supplementation programs is limited, except for the MCH program which is effective at reaching the Sri Lankan population, including the poor and the vulnerable groups in rural areas. However, even this program has failed to provide adequate nutrition counseling and education. It has an effective delivery mechanism for providing maternal and child health services and the more routine nutrition services, such as the provision of iron-folate and vitamin supplements or growth monitoring. It has not been effective in providing nutrition education and counseling services perhaps because PHMs may have insufficient time and skills to allocate to counseling. The MCH program has the potential to substantially improve the quality of nutrition services if more resources are allocated to it and the quality of IEC is improved. Greater resources are needed to reduce the midwives' workload and allow them to spend more time with each woman, and to improve the quality of the supervision the midwives' receive. Potential improvements to IEC programs include additional use of mass media, folk media, and other channels, as well as ensuring consistency in the messages delivered to mothers from these various sources.

At a more macro level, an effective multisectoral approach to implementing the national nutrition action plan is likely to yield greater benefits. Given the central role played by the health sector and the MCH program in delivering maternal and child health and nutrition services in Sri Lanka,

one option is to mainstream the relevant nutrition actions within the health sector by using the very effective existing health system in the country to integrate nutrition services into primary health care. In order to ensure that this is done effectively, delivery of the additional nutrition services package will need to be supported with adequate retraining / skills development of staff and allocation of resources for the purpose. A key weakness of all of the current nutrition interventions is the almost complete lack of good evaluation data. Better monitoring and evaluation is critical for the future.

The Estate sector presents a somewhat different challenge because of its excessively high degree of deprivation and isolation from the rest of the country. The ECCD approach in the Estate sector seems to have been successful because it delivered focused services and found ways to enhance the participation of the local community. Interventions to improve nutrition outcomes in the Estate sector will need to be designed separately, taking into account its unique socio-cultural and economic conditions and making use of lessons learnt from the ECCD project in the sector.

Chapter 5 attempts to review the complex political economy of nutrition in Sri Lanka. The political discourse in post-colonial Sri Lanka has lead to divergent views about nutrition, its causes, and potential solutions. Under the circumstances, the policy choices adopted have not always been based on evidence of what works. Policy-makers and program managers rarely appreciate the multi-faceted causes (and potential demand-side solutions) for undernutrition, and are even less likely to make the connection between early undernutrition and later productivity. Historically, food subsidies, free education and health services, and government employment with social security were the dominant expressions of social justice in post-independent Sri Lanka. Though the predominant paradigm in the country is that undernutrition is caused by food insecurity, most of the efforts to address malnutrition are implemented by the health sector and follow a medicalized approach combined with hand-outs of supplementary food (a legacy from the social justice era). While this mismatch may have been unfortunate, with the tremendously successful improvements in infant and maternal mortality rates in recent years, the health system is now poised to maximize a new opportunity to redirect its focus on nutrition. This institutional and political opportunity must be seized.

Chapter 6 lists the costs of undernutrition, the cost of inaction, and the cost of action. By conservative estimates, undernutrition costs Sri Lanka over US$ 1.1 billion in lost productivity and over 230,000 DALYs lost due to undernutrition-related disability and death in the 0-3 year age group. By contrast, the 2005 expenditures on malnutrition-related programs are estimated at a very modest US$ 11.2 million, over a third of which is from government resources and the rest is financed by development partners.

This chapter also shows that one of the most effective ways of increasing cost-effectiveness, even without significant operational improvements, is better targeting. This may include age targeting (focusing on children 0-3 years of age or pregnant lactating women vs. the larger population), or geographic targeting. The Thriposha program, for example, can vary from a low cost-effectiveness of 9.6 in the metropolitan Colombo area to a high of 23.2 when targeted to the Estate sector.

Next Steps

This concluding chapter proposes a way forward. In the shorter term, rising income inequalities, modest economic growth and limited access to safe water and sanitation will continue to prevent the poor's nutrition outcomes from improving substantially. Therefore, Sri Lanka needs to outline a series of options to achieve the nutrition MDG by 2015.

At a more macro level, an effective multisectoral approach to improving nutrition would include a combination of the following strategies:

- **Poverty reduction strategies**, specifically designed to reduce income inequalities,
- **Strategies to improve access to safe water and sanitation** (and good hygiene behaviors),
- **Strategies to reduce food insecurity,** especially among the poor in the Estate sector and in rural areas,
- **Strategies to scale-up direct nutrition interventions through the health sector** that would help to fast-track the improvements in nutrition outcomes, and
- **A strategy specific to the Estate sector,** taking into account its different socio-economic and developmental status and the unique institutional arrangements and capacities to deliver social services through the Plantation Human Development Trust.

7.1. Poverty reduction strategies and strategies to improve water and sanitation. This study has not analyzed the potential ways to move forward on options (i) and (ii) above. However, guidance on these issues is available in the Sri Lanka MDG study (World Bank 2005), the recent Poverty Assessment for Sri Lanka (World Bank 2007a), as well as other available studies and reports. *This study's key additional recommendation is that whatever strategies are adopted to reduce poverty or to improve access to safe water and sanitation must be designed specifically to reduce inequalities and must place a special emphasis on the Estate sector. Improvements at an aggregate level are insufficient to advance nutrition outcomes or to achieve the lagging nutrition MDG*. In this context, Sri Lanka may wish to explore new strategies such as conditional cash transfers (CCTs) and/or conditional food transfers which have been implemented in several Latin American countries such as Mexico. However, follow-on research and studies are needed to explore the replicability and applicability of the Latin American experience in the Sri Lankan context.

7.2. Food security programs. Sri Lanka has many decades of experience with programs to reduce food insecurity. However, the lack of targeting of food subsidies and hand-outs has resulted in ineffective programs with high costs and little impact. The cost-effectiveness and impact of these programs on nutrition outcomes can be substantially enhanced by better targeting (to the poorest households in the Estate sector and in rural areas and to younger children and pregnant/lactating women), and by enhancing the chances that food outs are added to the family's total calories consumption. The danger of these programs is that many poor families may substitute family foods with food hand-outs. *This study recommends that the current gamut of food assistance programs be reviewed by a follow-on study to specifically outline strategies for geographic, poverty and age targeting of those programs*. Once again, the Estate sector, rural areas, the poorest and the youngest (as well as pregnant/lactating women) must be the key

beneficiaries of the programs. Furthermore, in designing these strategies, the potential for linking food assistance programs with nutrition outcomes (such as through conditional food transfers or CCTs), and the potential synergies with the agriculture sector should be maximized.

The rest of this chapter focuses on recommendations for mainstreaming nutrition actions through the health sector, which seems both politically and technically poised to take on the nutrition challenge.

7.3. A programmatic framework to improve nutrition through the health sector. The health sector in Sri Lanka offers a very special political and institutional window of opportunity to address malnutrition which must be seized. The sector has the mandate to do so; it has performed extremely well on the delivery of health services, and with some capacity strengthening, it could be very well poised to deliver on health sector interventions to improve nutrition outcomes.

The health sector and the MCH program play a central role in delivering maternal and child health and nutrition services in Sri Lanka. It is essential to mainstream the appropriate direct nutrition interventions within the health sector by maximizing the potential of the very effective existing health system in the country to integrate nutrition services into primary health care. To do so, Sri Lanka needs to identify a package of direct nutrition services that is cost-effective and that responds to the country's epidemiological profile. To be cost-effective and affordable, this package of services needs to be targeted to the population groups that can benefit the most.

An ideal health-sector package may be one that is built progressively based on available resources and capacities, starting with addressing urgent needs such as anemia and vitamin A deficiency control and sustaining salt iodization. Upon this base, services could be added such as information education communication through the mass media, and strengthened counseling through the existing MCH program. In addition, as more knowledge becomes available on nutrition in Sri Lanka, the package can be further enhanced. This progressive approach will also help to build the institutional and field-level capacities necessary to deliver additional services. As outlined in Figure 7.1, achieving sustainable improvements in nutrition is dependent on three sets of factors:

- **Financing and implementing the technically correct strategies/interventions in an economically justifiable formulation that improves cost-effectiveness**. This will require the right kinds of strategies that respond to the issues of poor water and sanitation services, poor caring practices for young children and mothers, and addressing household food security among the poorest groups. In doing so, it must avoid the policy mismatches that are common in many countries (Box 7.1). For these strategies to be cost-effective, they must target the right age groups (children under three and pre-pregnant and lactating women), especially in rural areas and in the Estate sector.

- **Ensuring a high level of political commitment to sustain these** actions for a reasonable period of time (through stronger monitoring and evaluation that reports on successes and dissuades further investments in less successful strategies).

- **Identifying the appropriate institutional arrangements and developing the appropriate capacities** in the institutions for planning, management, and implementation, and for monitoring and evaluation.

Sustained and substantive investments are needed to finance a package of services and also to sustain political interest and commitment. A "nutrition champion" needs to be identified in

government, relevant institutional capacities must be rebuilt and the competence, skills, knowledge and motivation of program personnel improved at the local, district, provincial and central levels. Furthermore, these health-sector approaches must be closely linked with complementary approaches through other sectors as proposed above.

Box 7.1. **Common Policy and Programmatic Mismatches**

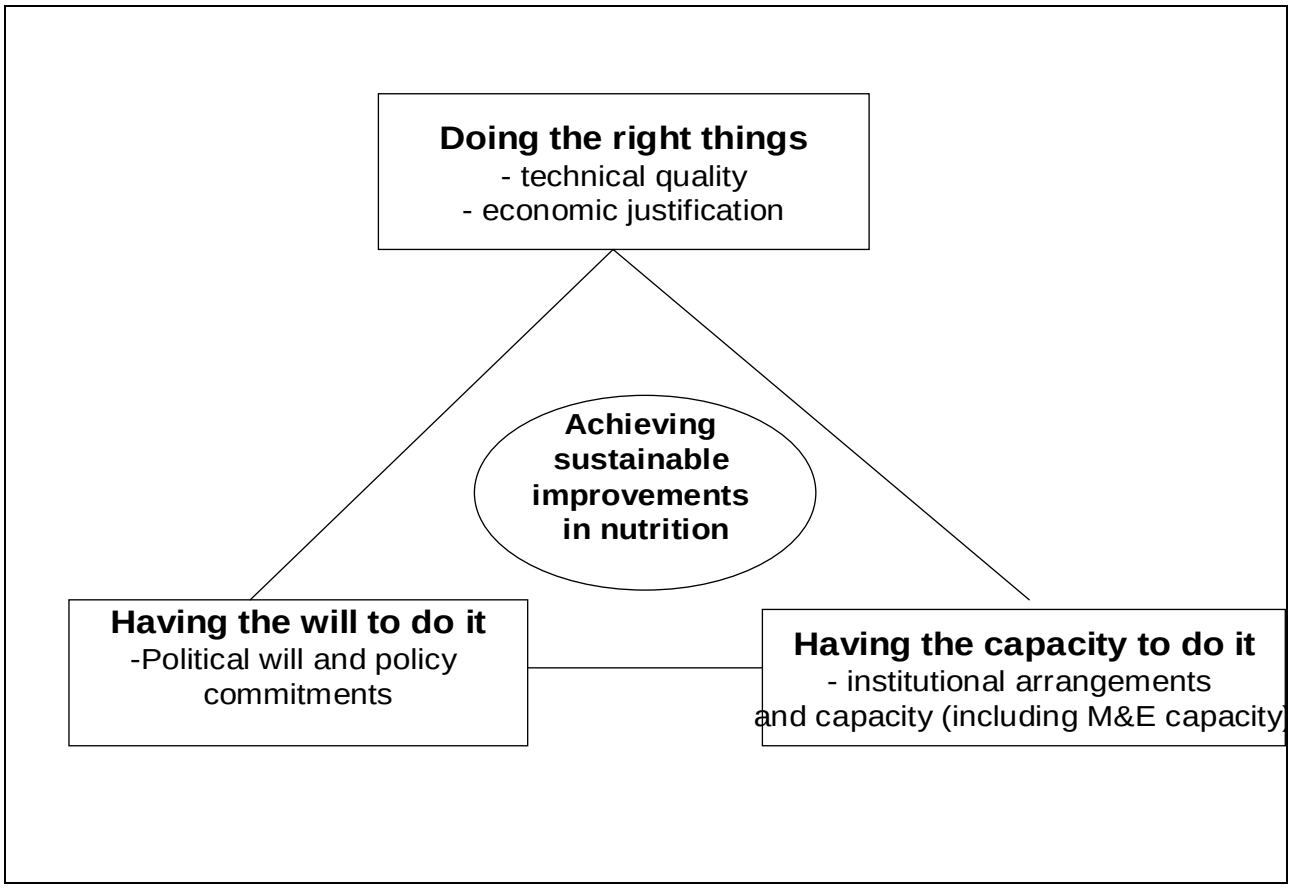
While most countries do not scale-up nutrition programs to any reasonable level, many scale-up the wrong kinds of programs or interventions. Three mismatches between the need or cause of malnutrition and the programs' design have been identified in many countries.

- *The "food first" mismatch*: Many nutrition programs focus on food security and untargeted food supplementation where unhealthy living conditions and poor child-care practices may be the main causes of malnutrition.

- *The age-targeting mismatch*: Most undernutrition happens during pregnancy and the first two years of life, and most of this early damage cannot be reversed (Chapter 2). Yet many programs continue to expend large resources (especially food) on older age groups (children age three to six years, school children). The recent push for school feeding programs is an example of inappropriately targeted resources that are unlikely to improve nutrition outcomes.

- *The poverty-targeting mismatch*: It is widely believed that undernutrition is strongly correlated with income poverty, and that improving income poverty in itself will improve nutrition outcomes. Many countries therefore do not include direct nutrition interventions in their poverty reduction strategies (Shekar and Lee, 2007).

Figure 7.1 *Achieving Sustainable Improvements in Nutrition in Sri Lanka*



7.3.1. Doing the Right Things through the Health Sector in Sri Lanka

Table 7.1 lists some of the key interventions that match the epidemiology of the nutrition problem in Sri Lanka and estimates costs for scaling-up either nation-wide or in selected areas (Estate sector and rural areas) based on the analyses in the preceding chapters. The costs for each intervention are very approximate and will need to be updated. They serve the purpose of giving an estimate of the scale of financing that may be needed annually for each of the options:

Based on these analyses, Table 7.2 proposes three different options to moving this agenda forward in the health sector. In addition to this basic package, additional interventions must be considered in the near future such as zinc supplements, as the extent of zinc deficiency in Sri Lanka becomes available, the evidence base grows and delivery systems for these interventions are identified. Current evidence does not suggest a need for either zinc treatment during diarrhea, or for prophylactic zinc supplementation.

Table 7.1 Programmatic Options for Mainstreaming Direct Nutrition Interventions through the Health Sector in Sri Lanka

Interventions	Option A	Option B	Option C
Salt iodization *(costs are for sustaining this successful effort)*	Targeted to entire Sri Lankan population (US$ 6.7 m)	Targeted to entire Sri Lankan population (US$ 6.7 m)	Targeted to entire Sri Lankan population (US$ 6.7 m)
Vitamin A supplementation (twice annual doses for children and single post-partum dose for mothers)	Targeted to all children under five and post-partum women in (US$ 1.9 m)	Targeted to all children under five and post-partum women (US$ 1.9 m)	Targeted to all children under five and post-partum women (US$ 1.9 m)
Anemia Control interventions (iron-folate supplements estimated at US$ 0.84/capita excluding delivery costs)	Targeted to women of reproductive ages, adolescent girls, and children 0-3 years of age in Estate sector and rural areas only (US$ 6.3 m)	Targeted to all women of reproductive ages, adolescent girls, and children 0-3 years of age in Sri Lanka (US% 7.5 m)	Targeted to all women of reproductive ages, adolescent girls, and children 0-3 years of age in Sri Lanka (US$ 7.5 m)
Infant-feeding and care promotion efforts through Information, Education and Communication (health sector inputs supplemented with mass media)	Targeted to all adults in Sri Lanka (US$ 4.7 m)	Targeted to all adults in Sri Lanka (US$ 4.7 m)	Targeted to all adults in Sri Lanka (US$ 4.7 m)
Strengthened MCH program (with additional cost of counseling and growth promotion @ US$ 5/capita; but no food costs estimated here)	Targeted to Estate sector only without additional cost of food supplement (US$ 0.3 m) and with additional cost of food supplement (Thriposha) targeted to the under three year old children only (US$ 0.6 m)	Targeted to Estate sector and rural areas only without food supplement (US$ 5.0 m) and with food supplement (US$ 10.0 m)	Targeted to entire Sri Lanka without food supplements (US$ 6 m) and with food supplements (US$ 12 m)
Integrated Child Care Programs/interventions		Targeted to Estate sector only (1.8 m US$)	Targeted to Estate sector and rural areas (US$ 30.4 m)
Total estimated cost/year	**US$ 19.9 to 20.2 m** ✸	**US$ 27.6 to 32.6 m** ✸	**US$ 56.2 to 62.2 m** ✸

Note: Figures in parentheses represent estimated costs in millions of US$; calculations are based on an assumption of 496,000 pregnant/lactating women and 908,000 children under three-years of age.

✸ Range indicates cost with and without food supplement (Thriposha) targeted at children less than three-years old. Costs for maternal food supplementation for pregnant/lactating women would be an additional US$ 3.0 m if targeted only in Estate areas.

Option A seems to be the most cost-effective option at about US$ 20 million/year that prioritizes interventions in the Estate sector where the problem is most acute. This is a very conservative estimate of the proposed costs and is also mindful of the need to scale-up capacities and the time it may take to realign the institutional mandate of the Ministry of Healthcare and Nutrition. It aims to maximize cost-effectiveness and the potential for impact. The package's overall formulation is based on the strategy that the country would aim to target information and behavior-change interventions such as infant-feeding promotion, and certain other interventions such as salt iodization, to the entire Sri Lankan population. These interventions are relatively inexpensive and cost-effective and need to be implemented at large scale in order to impact on national indicators. The non-poor who can respond to the call for better caring practices and improved hygiene or the consumption of iodized salt could potentially successfully improve nutrition outcomes through this approach. Larger public resources would then be conserved to target the poor and the vulnerable in rural areas and the Estate sector with more resource-intensive direct nutrition interventions such as iron-folate supplementation and a strengthened MCH program targeted to the rural and Estate sector.

Options B and C are more inclusive and less well-targeted and should only be followed if resources allow. As additional resources become available, the GOSL may wish to expand this package to include additional interventions, such as those to address obesity prevention programs. Additionally, all of the above investments will be complementary to the proposed investments for poverty reduction (to reduce inequities) and to improve water and sanitation, hygiene practices, and food security interventions.

Once again, the above cost estimates are simply an example of the scale of resources that may be needed. These costs are the basic costs of the intervention for achieving 100% coverage. However, in many cases, programs already exist to address some of these issues. For example, the salt iodization agenda is already doing well: 94% Sri Lanka's consume iodized salt, so the major cost for the future will be toward sustaining the program. The vitamin A supplementation program already covers about 57% of the children in Sri Lanka (Chapter 4). Therefore, the additional costs that will be required may be less than what is indicated above. At the same time, the cost of reaching the last 43% of children, who are likely to be the most vulnerable and most likely to benefit, are expected to be higher than those for reaching the first 57%. These issues must be considered carefully when estimating total investment needs for nutrition in Sri Lanka.

Innovations in the delivery of this package also need to be explored. They may include, for example, conditional cash transfers (such as in Mexico), and new tools such as the recently used Rapid Results Initiatives in Eritrea and Kenya. The aim of the initiative was to achieve specific objectives within a very limited period of time (such as the first 100 days of a new program or a new government) by laying out a very clear set of steps. Additionally, investments will be required for institutional strengthening, capacity development, and for sustaining political commitment through advocacy and strong monitoring and evaluation.

7.3.2. The Institutional Home and the Capacity to Deliver

Based on the current analysis of both the epidemiology and the political economy of nutrition at the central level, the Ministry of Healthcare and Nutrition is best positioned to take on the challenge of improving nutrition. The ministry will be charged with providing support to the provinces to strengthen the existing MCH program and to undertake many of the additional strategies and interventions outlined in Table 6.9 in Chapter 6. If the MOH is selected as the appropriate institution to move this agenda forward within the health sector, appropriate capacities will need to be developed at all levels of the MOH, and each directorate must be

assigned a clear mandate for nutrition based on their comparative advantages. Provincial responsibilities and roles will need to be clarified, and existing medical officers and field personnel will need to be oriented and retrained to develop the necessary skills and competencies in nutrition. Such a plan can only be implemented if additional financial resources are allocated at all levels to take on this wider mandate.

MOH's efforts will need to be complemented with a National Nutrition Coordination Committee set up in the Prime Minister's office with membership from other relevant ministries such as agriculture, finance, water and sanitation, gender and others. However, for this arrangement to be functional, this committee must have a clearly defined mandate (to coordinate complementary efforts from other sectors), a budget and the authority to implement the programs it is accountable for. Many countries have experimented with such committee and coordinating bodies but have often not identified a clear mandate, or have failed to allocate adequate budgets and authority.

For the Estate sector, social services, including health and nutrition services, are currently delivered by the Plantation Human Development Trust (PHDT). The sector would benefit by service delivery being transferred to the provincial government, working in close collaboration with the MOH.

7.2.3. Sustaining Political Will

Though few countries have made conscious investments in developing and sustaining political commitment to nutrition, evidence shows that countries that have been successful in reducing undernutrition have sustained high-level political commitment to keep nutrition high on the development agenda. Some countries (such as Mexico) have done so by building strong monitoring and evaluation systems that feed into policies and programs. Others, such as Brazil and Bangladesh, have done so by raising the issue at the highest levels of government, and some have done so with the help of "nutrition champions." Sri Lanka could potentially benefit from a combination of these strategies.

7.4. Six Key Next Steps:

This study concludes by proposing the six key next steps to address undernutrition.

- Addressing undernutrition in Sri Lanka will require sustained efforts from multiple sectors. These must focus on four key issues: (a) *Poverty reduction strategies, specifically designed to reduce income inequalities; (b) Strategies to improve access to safe water and sanitation (and good hygiene behaviors); (c) Strategies to reduce food insecurity, especially among the poor in the Estate sector and in rural areas; and (d) Strategies to scale-up direct nutrition interventions through the health sector to fast track the achievement of the nutrition MDG.* These multisectoral inputs will need to be coordinated through a National Nutrition Coordination Committee set up in the prime minister's office with membership from relevant ministries, a clear mandate, and a budget to achieve it.

- Complementary strategies to reduce poverty or to improve access to safe water and sanitation must be *designed specifically to reduce inequalities, especially in the Estate sector*. Improvements at an aggregate level are insufficient to advance nutrition outcomes in Sri Lanka or to achieve the lagging nutrition MDG. Follow-on work is needed to design such strategies, including potential demand-side innovations such as conditional cash transfers and conditional food transfers which can be implemented as part of community driven development programs.

- While food assistance programs can act as a social safety net to mitigate the effects of income poverty, the existing food assistance and food supplementation programs must be reviewed through follow-on work to outline *specific next-steps for geographic, poverty and age targeting to improve their cost-effectiveness and potential for impact* on nutrition. The cost effectiveness of the Thriposha program, for example, can vary from a low of 9.6 in the Metropolitan Colombo area to a high of 23.2 in the Estate sector. The potential for linking some of these food programs with community driven development programs needs to be explored.

- For the Estate sector, a special strategy is needed to address the high levels of undernutrition. This strategy should focus on the following key issues: (a) transfer the delivery of basic social services (including health and nutrition) from the PHDT to the provincial government in consultation with the line ministry; (b) design poverty-reduction strategies specifically to address the inequities in the Estates; (c) scale-up the lessons from the ECCD approach to increase community participation and utilization of services among estate workers; and (d) strengthen the delivery and quality of priority services to populations in the Estate sector (see Option A in Table 7.2).

- In the medium- to short-term, Sri Lanka will benefit from *scaling-up a selected set of very carefully targeted direct nutrition interventions through the health sector. Three options are presented in this study for scaling-up a nutrition package through the health sector in Sri Lanka,* starting with a very basic intervention package targeted to maximize cost-effectiveness and the potential for impact, especially in the Estate sector. The proposed package options aim to provide strengthened information, education, and communication programs targeted to the entire population. *Enhanced knowledge and information will likely suffice to improve nutrition outcomes among the non-poor, thereby conserving larger public resources to target the poor and the neediest with more resource-intensive direct nutrition interventions,* such as anemia control and supplementary feeding. Operationalizing these recommendations through the health sector will require an investment of at least US$ 20 million annually, plus costs to develop institutional capacity, monitor and evaluate, and to sustain political will. The GOSL needs to adapt and adopt such a programmatic framework for the health sector, and development partners need to support the GOSL's plan.

- Whatever the final combination of interventions/strategies adopted by the GOSL, they must include a *strong monitoring and evaluation component* which will help to identify what strategies are working and which may need mid-course corrections. Identifying and documenting the more successful strategies will further strengthen political commitment for the right interventions and to sustain these programs.

- The following *additional studies should be conducted* with support from development partners and the World Bank: design of poverty reduction strategies to reduce inequities, redesign food assistance programs so they are better targeted and more cost-effective, follow-on costing work for the health sector strategies, and additional analyses on the costs, causes and strategies to address the emerging epidemic of overweight. In addition, further surveys and studies are needed to strengthen causal inferences about the continuing enigma of malnutrition in Sri Lanka.

Table 7.2 Cost of Scaling-Up Priority Nutrition Interventions in Sri Lanka

Interventions	Target Group(s)	Delivery Strategy	Cost/Capita (US$)	Total Cost[3] (urban & rural) (thousands US$)	Cost for Targeting only Estate Sector[4] (thousands US$)	Cost for Targeting only Rural Areas[4] (thousands US$)
Salt Iodization	Total population	Fortification	0.35	6,692	335	5,280
Vitamin A Supplementation	Children (under-5 yrs)	Supplementation	1.08	1,623	81	1,281
	Post-partum Women[1]		1.08	322	16	254
Anemia Control Program	Children (0-3 yrs)	Iron-folate supplementation costs only (*Costs estimated as a range between 0.75 to 0.84 US$/capita; does not include delivery costs for supplements*)	0.75	681	34	537
	Women of reproductive age (15-49 years)		0.75	3,977	199	3,137
	Adolescent girls (13-19 yrs)		0.75	2,014	101	1,589
	Children (0-3 yrs)		0.84	763	38	602
	Women of reproductive age (15-49 years)		0.84	4,454	223	3,514
	Adolescent girls (13-19 yrs)		0.84	2,255	113	1,780
Breast-Feeding Promotion	Entire adult population	IEC	0.35	4,713	236	3,719
"Integrated Child Care Programs"	Children (0-3 yrs)	Package of services	40.00	36,320	1,816	28,656
Strengthened MCH Program with Additional Cost of "Counseling and Growth Promotion"	Children (0-3 yrs) & Pregnant/lactating women[2]	Package of services (Less intense)	2.00-5.00[a]	2,412 - 6,030	121 - 302	1,903 - 4,758
		Package of services (More intense)	5.00-10.00[a,b]	6,030 - 12,062	302 - 603	4,758 - 9,515

Notes: a. Source*:* Caulfield and others (2004); b. For example, with paid workers or food supplements.

1. Number of post-partum women was estimated using the number of births in 2005 (WPP 2006 Data) = 298,000.

2. Number of pregnant/lactating mothers was estimated using the number of births in 2005 (WPP 2006 Data) = 298,000.

Please note that this may be an underestimate since all pregnancies may not result in live births.

3. Total cost calculated for scaling-up using estimated size of target populations.

4. Target population estimates from United Nations Population Division. *World Population Prospects: The 2006 Revision* (2005 Data); Target populations in estate sector and rural areas were estimated using estate and urban-rural percentages derived from total population data (i.e., United Nations Population Division WPP 2006: Urban = 21.1%; Rural = 78.9%. World Bank 2006 Sri Lanka Poverty Assessment: Estate Sector = 5%).

APPENDICES

Appendix Tables 1-3

Appendix Table 1 *Nutrition—Relevant Components in World Bank Investments in Sri Lanka (1989-2010)*

Year	Project	Investment	Focus of Activities
1989-1995	Health and Family Planning Project	N/A	On-site supplementary feeding for pregnant and lactating women and children aged 6-35 months (cancelled by mid-term review)
1991-1997	Poverty Alleviation Project	US$ 14.2 M (US$5.9 M disbursed)	Awareness of nutrition; improving feeding and care practices; counseling and training
1997-2002	Health Services Project	US$ 2.84 M (US$ 2.23 M disbursed)	Improvement in the nutritional status of mothers and children under-3 years in areas served by NGOs; in-service training (revised goal)
2004-2010	Health Sector Development Project	~US$ 1.1 M	Strengthening service delivery of existing interventions for young children and women; introduction of a preventive, life cycle approach for school children. Nutrition interventions are eligible for financing to improve maternal and child health, especially among poor and disadvantaged

Appendix Table 2 *Levels and Trends in Underweight Prevalence (percent) by Zone, 1993-2000*

	1993	*2000*	*Percent Change*
Zone 1	31.2	18.2	41.7
Zone 2	25.2	20.2	19.8
Zone 3	34.6	28.9	16.5
Zone 4	38.1	30.6	19.7
Zone 5	43.7	37.8	13.5
Zone 6	44.9	32.2	28.3
Zone 7	48.0	36.9	23.1

Appendix Table 3 Levels and Trends in Stunting Prevalence (percent) by Zone, 1993-2000

	1993	*2000*	*Percent Change*
Zone 1	19.7	7.4	62.4
Zone 2	14.5	10.8	25.5
Zone 3	18.1	14.4	20.4
Zone 4	25.2	12.0	52.4
Zone 5	32.2	19.0	41.0
Zone 6	24.4	13.8	43.4
Zone 7	30.2	15.0	50.3

Appendix Tables 4-6

Empirical Analysis of Undernutrition Outcomes in Sri Lanka

Data
The analysis was based on data from the Sri Lanka DHS 2000 on children aged 0-60 months.

Method
The analysis carried out for this report is based on a model on demand for child well being (health), which is widely used in the literature, as described in Behrman and Deolalikar (1988). In this model the demand for child's nutrition or health is a function of parental characteristics (including education and height), individual characteristics (age and sex), households' socioeconomic status and living conditions. This model was adapted to the conceptual framework in the report.

The following is estimated as a reduced form model:
Probability (child is low birthweight or undernourished) =
f (child age and sex, maternal characteristics, household size and wealth status, health care access, access to clean water and sanitation, maternal and child caring practices)

The full models are presented in Appendix Tables 4-6 below.

Appendix Table 4 *Probit Regressions of Low Birthweight – Marginal Effects*

Dependent Variable:	**Whether or Not Child is Low Birthweight**			
mum_primsch	-0.037	-0.001	0.007	0.005
	(1.32)	(0.03)	(0.23)	(0.18)
mum_secsch	-0.027	0.031	0.036	0.031
	(0.85)	(0.84)	(0.97)	(0.85)
mum_secsch_full	-0.043	0.018	0.017	0.011
	(1.25)	(0.46)	(0.41)	(0.28)
mum_underweight	0.109	0.101	0.093	0.093
	(4.27)**	(3.97)**	(3.75)**	(3.78)**
mum_overweight	-0.004	0.017	0.021	0.02
	(0.13)	(0.56)	(0.73)	(0.71)
Mumage	-0.002	-0.002	-0.002	-0.002
	(1.16)	(0.92)	(1.13)	(1.00)
2nd wealth quintile		-0.051	-0.043	-0.049
		(1.90)	(1.64)	(1.89)
3rd wealth quintile		-0.069	-0.061	-0.07
		(2.45)*	(2.21)*	(2.43)*
4th wealth quintile		-0.107	-0.094	-0.103
		(3.69)**	(3.18)**	(3.32)**
5th wealth quintile		-0.087	-0.061	-0.074
		(2.80)**	(1.73)	(2.00)*
More than 5 children in household		-0.007	-0.007	-0.007
		(0.39)	(0.42)	(0.42)
Twin		0.422	0.421	0.428
		(3.03)**	(3.07)**	(3.08)**

Dependent Variable:	**Whether or Not Child is Low Birthweight**			
Piped water_inside house			-0.148	-0.149
			(2.84)**	(2.88)**
Piped water_outside house			-0.001	0
			(0.02)	(0.01)
well_inside house			0.028	0.029
			(1.06)	(1.09)
Flushing toilet			0.029	0.026
			(0.64)	(0.57)
urban			-0.052	-0.05
			(1.04)	(0.98)
rural			-0.047	-0.043
			(0.93)	(0.83)
Fhw visits			-0.003	-0.003
			(0.98)	(0.98)
Blood pressure tested during pregnancy			0.088	0.089
			(1.05)	(1.07)
TT obtained during pregnancy			-0.092	-0.088
			(1.68)	(1.62)
Took iron tablets during pregnancy			0.022	0.019
			(0.44)	(0.37)
Mother watches TV				0.011
				(0.49)
Mother reads newspaper				0.002
				(0.10)
Household drinks boiled water				0.008
				(0.40)
Mother washes hands after cleaning children				0.034
				(1.22)
Observations	1354	1354	1354	1354

Robust z statistics in parentheses
** significant at 5%; ** significant at 1%*

Appendix Table 5 *Linear Regression of Child WAZ Scores*

Dependent Variable:	**Child WAZ Scores**			
Child age	-0.016	-0.015	-0.016	-0.015
	(9.66)**	(9.58)**	(9.92)**	(9.17)**
Child sex	0.04	0.046	0.047	0.042
	(0.82)	(0.98)	(1.00)	(0.89)
Low birthweight	-0.542	-0.497	-0.478	-0.482
	(9.07)**	(8.19)**	(7.91)**	(7.94)**
mum_primsch	0.131	0.034	0.032	0.002
	(1.97)*	(0.51)	(0.46)	(0.04)
mum_secsch	0.223	0.018	0.017	-0.047
	(2.88)**	(0.21)	(0.19)	(0.53)
mum_secsch_full	0.53	0.264	0.279	0.195

Dependent Variable:	**Child WAZ Scores**			
	(5.82)**	(2.71)**	(2.80)**	(1.89)
mum_underweight	-0.305	-0.272	-0.263	-0.268
	(5.33)**	(4.79)**	(4.70)**	(4.77)**
mum_overweight	0.306	0.219	0.194	0.185
	(4.34)**	(3.19)**	(2.86)**	(2.74)**
Mumage	-0.006	-0.009	-0.009	-0.009
	(1.35)	(2.12)*	(1.97)*	(2.07)*
2nd wealth quintile		0.039	0.032	0.021
		(0.58)	(0.47)	(0.30)
3rd wealth quintile		0.217	0.206	0.178
		(3.02)**	(2.75)**	(2.26)*
4th wealth quintile		0.319	0.315	0.288
		(3.95)**	(3.60)**	(3.07)**
5th wealth quintile		0.58	0.512	0.466
		(6.71)**	(5.28)**	(4.43)**
Number of people in household		0.022	0.02	0.023
		(1.70)	(1.54)	(1.72)
Twin		0.292	0.307	0.263
		(0.88)	(0.91)	(0.80)
Piped water_inside house			0.107	0.091
			(0.97)	(0.83)
Piped water_outside house			0.027	0.028
			(0.34)	(0.35)
well_inside house			-0.15	-0.146
			(2.26)*	(2.21)*
Flushing toilet			-0.121	-0.122
			(1.36)	(1.38)
urban			0.132	0.17
			(1.24)	(1.58)
rural			0.007	0.052
			(0.08)	(0.57)
Child had diarrhea during past 2 weeks			-0.109	-0.086
			(1.18)	(0.93)
Doctor visits			0.015	0.014
			(1.80)	(1.68)
Mother watches TV				-0.013
				(0.24)
Mother reads newspaper				0.093
				(1.66)
Colostrum intake				0.04
				(0.73)
Age at which complementary foods were given				-0.006
				(1.36)
Boiled water for drinking				0.159
				(2.86)**
Mother washes hands after cleaning children				-0.057

Dependent Variable:	**Child WAZ Scores**			
				(0.79)
Constant	-0.79	-0.91	-1	-1.018
	(5.17)**	(5.68)**	(5.66)**	(4.70)**
Observations	1729	1729	1729	1729
R-squared	0.16	0.19	0.2	0.21

Robust z statistics in parentheses
** significant at 5%; ** significant at 1%*

Appendix Table 6 *Linear Regression of Child HAZ Scores*

Dependent Variable:	**Child HAZ Scores**			
Child age	-0.013	-0.013	-0.014	-0.014
	(8.14)**	(8.29)**	(8.84)**	(8.39)**
Child sex	0.077	0.083	0.086	0.083
	(1.54)	(1.67)	(1.75)	(1.68)
Low birthweight	-0.512	-0.47	-0.441	-0.445
	(8.20)**	(7.33)**	(6.92)**	(6.95)**
mum_primsch	0.253	0.152	0.089	0.064
	(3.66)**	(2.16)*	(1.22)	(0.88)
mum_secsch	0.451	0.231	0.163	0.119
	(5.27)**	(2.52)*	(1.72)	(1.21)
mum_secsch_full	0.71	0.429	0.377	0.32
	(7.54)**	(4.19)**	(3.62)**	(2.94)**
mum_underweight	-0.175	-0.145	-0.124	-0.123
	(2.79)**	(2.32)*	(2.03)*	(2.01)*
mum_overweight	0.122	0.037	0.013	0.006
	(1.77)	(0.54)	(0.19)	(0.09)
Mumage	0	-0.002	-0.002	-0.002
	(0.08)	(0.44)	(0.47)	(0.44)
2nd wealth quintile		0.08	0.029	0.02
		(1.06)	(0.38)	(0.27)
3rd wealth quintile		0.182	0.118	0.087
		(2.35)*	(1.49)	(1.05)
4th wealth quintile		0.278	0.201	0.16
		(3.15)**	(2.12)*	(1.59)
5th wealth quintile		0.594	0.467	0.411
		(6.59)**	(4.56)**	(3.75)**
Number of people in household		-0.002	0	0.001
		(0.18)	(0.04)	(0.07)
Twin		-0.079	-0.087	-0.113
		(0.31)	(0.34)	(0.44)
Piped water_inside house			0.231	0.231
			(1.99)*	(1.97)*
Piped water_outside house			0.172	0.175
			(1.90)	(1.93)
well_inside house			-0.122	-0.117
			(1.82)	(1.75)
Flushing toilet			-0.129	-0.133

Dependent Variable:	**Child HAZ Scores**			
			(1.34)	(1.38)
Urban			0.428	0.455
			(3.71)**	(3.89)**
Rural			0.422	0.455
			(4.39)**	(4.62)**
Child had diarrhea during past 2 weeks			-0.051	-0.04
			(0.54)	(0.42)
Doctor visits			0.01	0.009
			(1.17)	(1.10)
Mother watches TV				0.062
				(1.06)
Mother reads newspaper				0.051
				(0.84)
Colostrum intake				0.049
				(0.82)
Age at which complementary foods were given				-0.004
				(0.97)
Boiled water for drinking				0.077
				(1.31)
Mother washes hands after cleaning children				-0.076
				(0.96)
Constant	-0.541	-0.56	-0.902	-0.907
	(3.52)**	(3.42)**	(4.96)**	(4.11)**
Observations	1729	1729	1729	1729
R-squared	0.13	0.15	0.17	0.18

Robust z statistics in parentheses
** significant at 5%; ** significant at 1%*

Appendix 7

Food Beliefs and Practices in Sri Lanka

Food is a culturally charged entity in the Sri Lankan society. Food is shared both inside households and with close relatives. Food sharing, offering and exchanging draws upon the meaning of social interrelationship and religious morality.

There are several classification systems of foods, the *hot* and *cold*, the *pili* foods, and a superseding classification based on traditional medicine. The *hot* and *cold* is very much a lay classification and almost all food are classified into either hot or cold or neutral. Rice is neutral, sweet potatoes are cold and manioc or cassava or bread fruit (*del*) are hot. Meat is hot while pork is cooling. Tuna fish, crab and shrimp are hot foods and cucumber, ladies fingers (moringa) are cooling. *Pili* foods are those to which demons are attracted and those that should be avoided when participating in demonic ritual and when one is subjected to diseases such as chicken pox or measles caused by the wrath of deities. The traditional medicine defines that the human body consists of three humors (*dosha)*: phlegm (*sema*), air (*vata*) and bile (*pita*), and that health of a person as essentially a particular status (*tatva*) maintained with the balancing of the three *dosha*s. If any of the *dosha*s are in excess, ill health results. Thus the particular *dosha* in excess has to be brought down through the administration of a combination of medicines and a particular dietary and behavior regime (known as *pattiyam veema*) to enable the medicines to work and the person to return to the state of proper balance of humors.

Breastfeeding is considered a sacred demonstration of the mother's love for her child. Exclusive breastfeeding is well accepted and adhered to except the principle of not giving water, which even family health workers do not necessarily enforce. This could explain why the diarrhea incidence remained nearly unchanged in the three DHS surveys from 1987 to 2000(REF). Cow milk in general is considered good, nutritious and "pure." People from all walks of life demonstrate a desire to drink milk. Milk is not only a symbol for purity but also of abundance. All good activities that may bring prosperity are commenced after a "milk boiling" ceremony. Powdered milk, on the other hand, is generally considered phlegm-inducing. Buffalo milk is cooling and yoghurt made from buffalo milk is therefore not given to children who have coughs or colds.

Gender bias exists in intra-family food distribution. The practice is not believed due to coercion or outright discrimination against women. Women also eat less purposefully and they voluntarily give more foods to the male family members, particularly their husband, out of respect. Women wait and are usually the last to eat. As a result, when food is not sufficient they do not get enough. There is no woman-centered culture even during pregnancy. Women often are busy with household chores and other work, and it is not uncommon during home visits for PHMs to find that women have not eaten at 10 o'clock in the morning. Although PHMs advise pregnant women to take two hours of rest after lunch in the second and third trimesters, this extra rest never really happens due to the women's workload. Food taboos in diarrhea, measles, and pregnancy still exist. For instance, a kind of chili curry sometimes is the only food that is offered to women during the postpartum period. A reported practice is giving women a kind of small grain (similar to millet) which is filling but without much energy to help women have a small baby.

Appendix Tables 8-9

Appendix Table 8 *Antenatal, Postnatal and Infant Care Provided by Public Health Midwives*

Indicator	*2002*		*2003*	
	N	*percent*	*N*	*percent*
Antenatal care				
Pregnant mothers registered by PHMs	347,455	95.6	355,358	97.8
Mothers registered at home <12 weeks	245,407	75.9	257,948	78.5
>20 weeks	13,577	4.2	11,954	3.6
Mothers registered at clinic	24,204	7.0	26,696	7.5
Mothers under care (Average for each month)	174,743	96.0	178,000	98.0
Teenage pregnancies under care	12,648	7.2	11,963	6.7
Primi under care	68,722	39.3	70,164	39.4
Postnatal care				
At least one visit by PHM during 1st 10 days	222717	61.3 (of estimated deliveries)	236430	65.0 (of estimated deliveries)
Infant care				
Infants registered by PHMs	298453	82.1	314867	86.6
Infant deaths reported by PHMs	3605	78.0	3571	840

Source*:* (Family Health Bureau, 2003).

Appendix Table 9 *Maternal and Child Health Care Provided Through Field Clinics and Clinics Conducted in Smaller Medical Institutions*

Indicator	Performance			
	2002		2003	
Pregnant mothers receiving antenatal care at least once	331,339	95.4	341,711	96.2
Infant receiving care at clinics at least once	285,105	96.9	297,015	96.6
Preschool children receiving care at clinics at least once	247,126	84.0	237,482	77.3
Average monthly weighing of infants at clinics and weighing centers*	239,738	84.0	238,326	80.2
Infants weighing below 3rd centile	34,178	14.2	27,870	11.7
Infants with growth faltering	21,923	9.1	18,917	8.0
Average monthly weighing of preschoolers (1-3 years) at clinics and weighing centers	352,784	NA	345,155	
Preschoolers (1-3 years) weighing below 3rd centile for age	110,311	31.3	101,953	29.5
Preschoolers (1-3 years) with growth faltering	41,971	13.8	38,423	13.6

Source*:* (Family Health Bureau, 2003; Ministry of Health (Sri Lanka), 2003).

Appendix Table 10: *Data from DHS Surveys*

	Year of DHS survey	Percentage of children with diarrhea [1]	Percentage of children who received ORS packets [2]	Percentage of children who did not receive treatment for diarrhea [2]	Immunization coverage measles [3]	Immunization coverage all [3]
Bangladesh	2004	7.5	67.2	10.7	75.7	73.1
India	1998/9	19.2	28.8	27.4	50.7	42.0
Nepal	2006	11.9	18.4	33.6	85	82.8
Pakistan	1990/91	14.5	38.8	-	50.2	35.1
Sri Lanka	2000	6.7	36.1	24 [a]	81.2 [b]	80.7 [b]

Source: http://www.measuredhs.com/.
Data for Bangladesh: "Bangladesh: DHS, 2004 - Final Report (English)"
http://www.measuredhs.com/pubs/pub_details.cfm?ID=526&srchTp=advanced;
India: India: "DHS, 1998/99 - Final Report (English)"
http://www.measuredhs.com/pubs/pub_details.cfm?ID=297&srchTp=advanced; Pakistan: "Pakistan: DHS, 1990/91 - Final Report (English)"http://www.measuredhs.com/pubs/pub_details.cfm?ID=77&srchTp=advanced;
and Sri Lanka: Department of Census and Statistics, Sri Lanka Demographic and Health Survey 2000.

1. Percentage of children who had diarrhea in the two weeks preceding the survey.
2. Among children who had diarrhea in the two weeks preceding the survey, percentage who did not receive treatment for diarrhea or ORS packets.
3. Percentage of children age 12-23 months who received specific vaccines at any time before the survey (according to either an immunization card or mother's report).
a. Not receiving treatment from a government hospital or dispensary, a Western doctor or an Ayurvedic doctor.
b. Percent of children under five years of age with a health card.

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