Multisectoral Nutrition Assessment in Sri Lanka's Estate Sector

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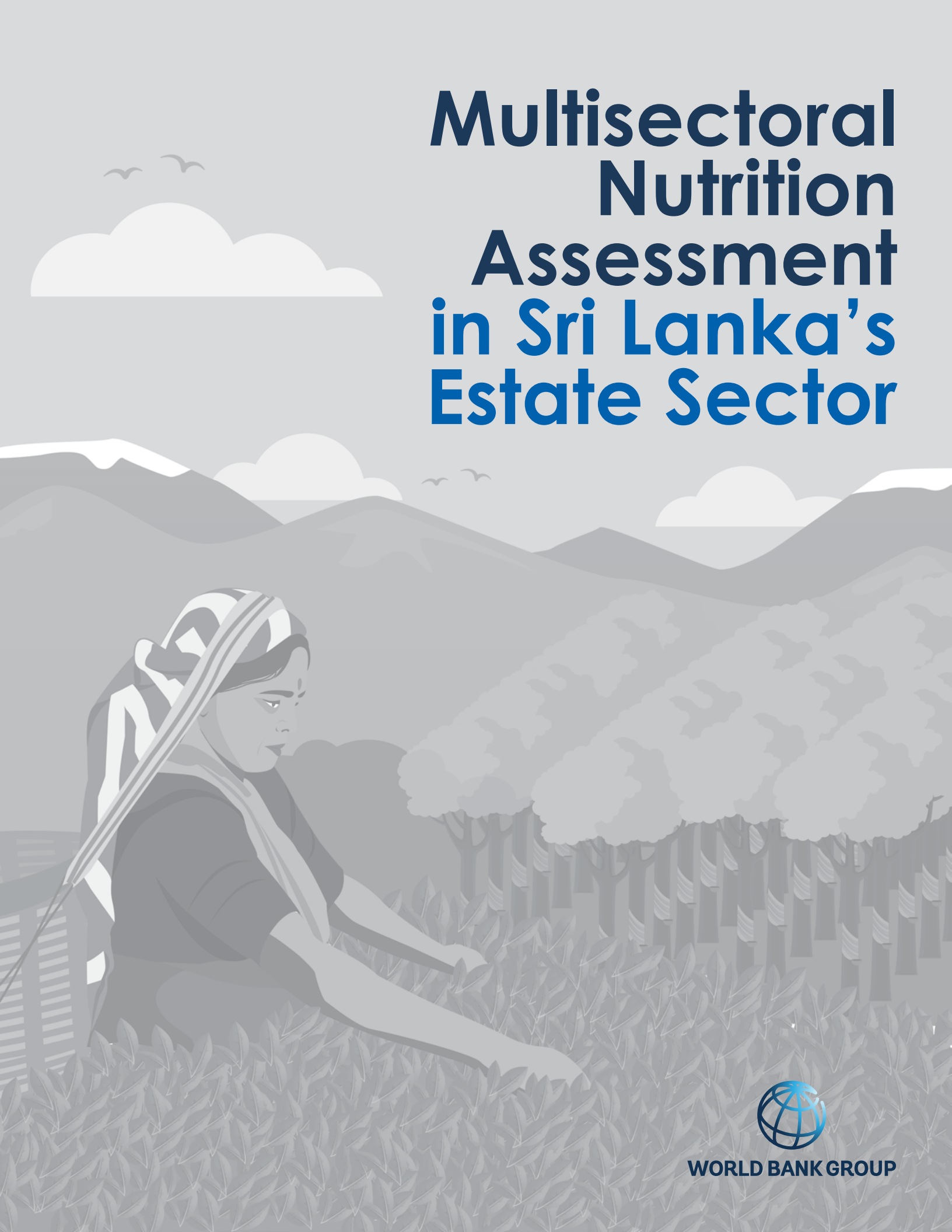

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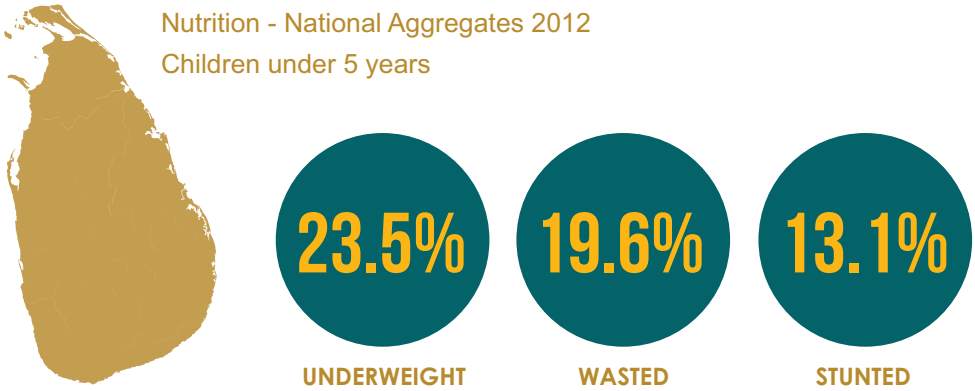
ABBREVIATIONS AND ACRONYMS

BCC	Behavior Change Communication
BFHI	Baby Friendly Hospital Initiative
BMI	Body Mass Index
CDC	Child Development Centers
CDO	Child Development Officers
CHDR	Child Health Development Record
CI	Confidence Interval
DHS	Demographic and Health Survey
EE	Environmental Enteropathy
FAO	Food and Agriculture Organization
FHB	Family Health Bureau
GDP	Gross Domestic Product
GOSL	Government of Sri Lanka
IEC	Information, Education and Communication
IQ	Intelligence Quotient
IYCF	Infant and Young Child Feeding
LBW	Low Birthweight
MCH	Maternal and Child Health
MDG	Millennium Development Goals
MMN	Multiple Micronutrient
MoH	Ministry of Health, Nutrition and Indigenous Medicine
MRI	Medical Research Institute
MsAPN	Multi-sector Action Plan for Nutrition
NCD	Non-Communicable Disease
NGO	Nongovernmental Organization
NNP	National Nutrition Policy
PDHS	Provincial Directors of Health Services
PHDT	Plantation Human Development Trust
PHI	Public Health Inspector
PHM	Public Health Midwife
PHNS	Public Health Nursing Sister
PPP	Purchasing Power Parity
RDHS	Regional Director of Health Services
RPC	Regional Plantation Companies
Rs	Rupees Sri Lankan
SD	Standard Deviation
SHPP	School Health Promotion Program
SMI	School Medical Inspection
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation, and Hygiene
WFP	World Food Program
WHO	World Health Organization
WHZ	Weight-for-Height Z-score

EXECUTIVE SUMMARY

The Problem: Undernutrition as a Persisting Developmental Issue

1. Despite impressive improvements in most health indicators, undernutrition among mothers and children under-five years continues to be a chronic human development issue in Sri Lanka. In 2012, 23.5 percent of children under-five years of age were underweight, 19.6 percent were wasted, and 13.1 percent were stunted.[1] These national aggregates, however, mask wide inequalities between geographical locations. Undernutrition is concentrated in the estate sectors and in some rural and urban areas. Districts with a high percentage of tea estates have the highest rate of stunting among under-fives. For example, in Nuwara Eliya, the stunting rate in 2006-07 was 41 percent [2] (Demographic and Health Survey (DHS) 2006-07). In addition to undernutrition, overall health and socioeconomic indicators in the estate sector population are poorer than the rest of the country (Department of Census and Statistics 2009). Also, poor health due to undernutrition results in reduced economic productivity by workers, particularly through lower wages, lower physical and mental capabilities, and increased absenteeism due to illness. According to the DHS 2006-07, 64 percent of the estate population were in the lowest wealth quintile while only 8.3 percent of the urban dwellers and 19.2 percent of the rural dwellers were in this quintile.



2. Sri Lanka has made significant progress in its socioeconomic development. High growth has translated into shared prosperity, with the national poverty headcount ratio declining from 15.3 percent in 2006–07 to 6.7 percent in 2012–13. However, despite the low levels of extreme poverty in the country, roughly one-quarter of Sri Lankans are nearly poor—defined as living above the official poverty line but below $2.50 per day in 2005 purchasing power parity (PPP) terms. Nonetheless, the country comfortably surpassed most of the Millennium Development Goals (MDGs) set for 2015 and ranked seventy-third in the 2014 Human Development Index (UNDP, 2015).

Objectives and Methodology

3. This Multisectoral Nutrition Assessment was carried out in 2014–15 to assess the status and determinants of maternal and child nutrition among the estate sector population. The focus on the estate sector is based on the recommendation of an earlier World Bank report on

1. Stunting (low-height-for-age) reflects the cumulative effects of undernutrition since and even before birth. This measure can therefore be interpreted as an indication of poor environmental conditions or long-term restriction of a child's growth potential. The percentage of children who have low-weight-for-height (underweight) can reflect 'wasting' (i.e. low weight for height), indicating acute weight loss, 'stunting', or both.
2. Urban areas also stand out; in 2006-07 the highest (17.4 percent) wasting rate, measure of acute undernutrition, was in Colombo- the capital city of Sri Lanka.

malnutrition in Sri Lanka.[3] The estate sector is comprised of tea or rubber plantations managed or owned by the state, Regional Plantation Companies or individuals/families and constitutes 4.3 percent of Sri Lanka's population (approximately 0.9 million people). The analysis aims to provide policymakers with an assessment of the current context, nutrition capacity, and gaps at different administrative levels. The findings are intended to help enable a constructive dialogue and coordination across multiple sectors and present an opportunity to integrate new and existing effective actions to improve the nutrition status in the estate sector.

4. The objectives of this study were to:
   i) Assess the size, severity, and key determinants of undernutrition in Sri Lanka's estate sector.
   ii) Examine residents' access to—and utilization of—nutrition related services and identify the gaps, if any, in institutional and implementation arrangements.

5. To achieve these objectives, a mixed-methods approach, pooling two types of data, was used:
   i) Cross-sectional household survey data, representative of the three different types of estate sector management: regional plantation companies (RPC)-managed, government-managed, and privately managed, from a sample of children (0–59 months old) and pregnant women.
   ii) Qualitative data for gap analysis of the health sector's nutrition service delivery, access to and utilization of the nutrition specific interventions and nutrition-sensitive interventions by other stakeholders.

6. The assessment was carried out in tea and rubber plantation populations in 12 districts spread across the Western, Central, Uva, Sabaragamuwa, and Southern provinces. The targeted provinces are representative of the estate sector population.

7. The methodology and sampling followed by this study was different from that for the DHS 2006-07, and therefore, comparison of estimates between the two for trend analysis should be taken with caution. Notwithstanding this, given that both samples are representative of the estate sector population and the fact that no other reliable data source is available, a trend analysis could be meaningful particularly when the difference is not marginal. This study, as described above, utilized both quantitative and qualitative data to meet its specific objectives, as compared to the DHS data which is for the entire country, and has objectives, not limited to malnutrition.

Nutrition Status in the Estates

8. Malnutrition in the estates is an issue of concern among both children and pregnant women. The rate of stunting among under-five children was 36.4 percent, showing a decline of about 14 percent from the 42.2 percent reported in the last DHS (2006-07)[4]. While the recent trend in the decline of stunting rates is encouraging, progress in improving wasting, underweight, birthweight and anemia is negligible or reversing. Almost 16 percent of the estate sector children were wasted. Compared to the 13.5 percent wasting rate reported in the DHS 2006–07, the study showed an increase rather than a decline in this measure of malnutrition. The reversing trend is also evident with underweight prevalence which stands at 35.9 percent, 6 percentage points higher than what was reported in the DHS survey 2006-07 (30.1%). 53.1

3. World Bank (2007). "Malnutrition in Sri Lanka: Scale, Scope, Causes and Potential Responses"
4. DHS 2006–07 Department of Census and Statistics.

percent of children 6–23 months old and 38.4 percent of children under-five were anemic. Compared to the DHS (2006-07) which reported under-five anemia prevalence rate of 39.3 percent, this shows negligible progress.

9. Based on the WHO classification of public health significance of malnutrition rates, the stunting rate shows a 'high' public health significance while the wasting and underweight rates show a 'very high' public health significance. The latter two particularly require attention since they show a reversing trend in the past 8 years. In the case of anemia, the estate sector has a 'severe' public health problem among younger children (6-23 months) and a 'moderate' public health problem in older children (24-56 months). The findings corroborate the need for an urgent action.

10. Estate sector mothers had lower pre-pregnancy body mass index (BMI) and shorter heights compared to national averages. Anemia prevalence among pregnant women is also substantial and progress in reducing prevalence is insufficient. The prevalence of low birthweight (< 2,500 grams and a key predictor of stunting) was 27.8 percent, substantially higher than the national rate of 16.6 percent, and only 3 percentage points less than the 31 percent reported in DHS 2006–07. The magnitude of low birthweight and anemia among pregnant women reflects a poor maternal nutrition status.

Determinants of Undernutrition[5] : A Multivariate Analysis

11. Low birthweight significantly and substantially increases the chances of being stunted, wasted and underweight. The effect ranged from about 13 percentage points in the case of wasting to 26 percentage points in the case of underweight. This result suggests that addressing child malnutrition requires a greater focus on ensuring the health and nutrition of mothers both before and during pregnancy.

12. Children of working mothers are more likely to be undernourished. In the estate sector, 47.5 percent of mothers worked.[6] Children of these mothers were 11 and 4 percentage points more likely to be stunted and underweight, respectively than children whose mothers stayed at home. This suggests that the reduced child care effect outweighs the income effect of employment. Exclusive breastfeeding rates were significantly lower for working mothers than for non-working mothers, given that the average age of the child (in the sample) by the time the mother returned to work was only seven weeks, much sooner than the government mandate of 84-day period of maternity leave. Moreover, being a child of a working mother was significantly associated with having lower dietary diversity and lower minimum acceptable diet compared to children of non-working mothers.

13. Children of short-stature (<145 cm) mothers have higher probability of being stunted and underweight. For these children the probability of being stunted and underweight increased by 18 and 12 percentage points, respectively. This, and the finding that low birthweight predicts child undernutrition, indicate the need for health and nutrition interventions targeting adolescent girls and young (married) women even before they become pregnant.

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5. The term "malnutrition" refers to a deviation from optimal nutritional status, and includes both undernutrition and over nutrition. Undernutrition refers to a state of nutritional deficiency and presents the most serious risks to health and development when experienced by women during pre-pregnancy/pregnancy/lactation and young children. Undernutrition is the focus of this study. The term "malnutrition" refers to a deviation from optimal nutritional status, and includes both undernutrition and over nutrition. Undernutrition refers to a state of nutritional deficiency and presents the most serious risks to health and development when experienced by women during pre-pregnancy/pregnancy/lactation and young children. Undernutrition is the focus of this study.

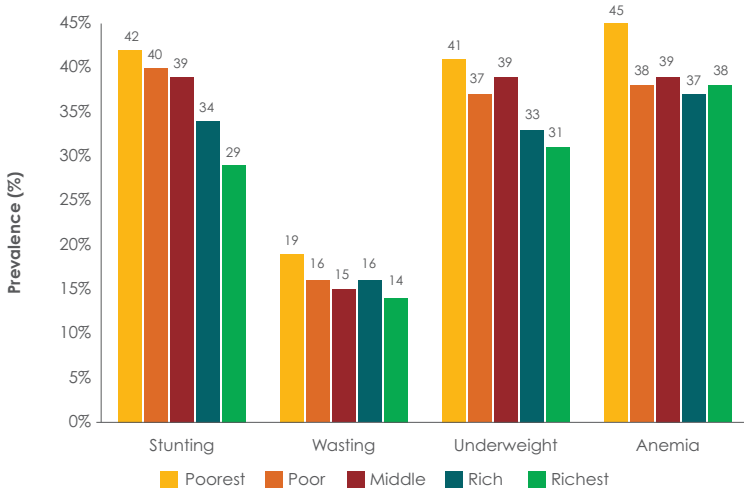
6. 44 percent of those worked away from the home. 28.4 percent work as tea pluckers; 0.9 percent as rubber tappers; 12.2 percent work in the estate factory or did sundry work in the estates; 5.8 percent work in other occupations outside the estates.

14. Prevalence of child undernutrition is higher in less educated parents but the difference is primarily due to its effect on household wealth rather than awareness. Controlling for wealth, parental schooling (i.e. whether or not father/mother had secondary or vocational training) did not significantly predict undernutrition, suggesting that differences in nutrition information between these groups was negligible. A possible explanation is that outreach awareness creation by Public Health Midwives has diluted the nutrition information advantage that better educated parents would otherwise have.

15. Ownership of livestock and cultivation of home gardens did not seem to reduce the likelihood of undernutrition; ownership needs to be complemented by utilization of the produce. While owning livestock and keeping home gardens could be important sources of nutritious foods, the extent to which they could affect undernutrition depends on whether or not they are consumed and the frequency of consumption. The study found home gardens were cultivated by about 26 percent of households however, close to one-fifth did not consume their home garden produce and only about 12 percent consumed it on a daily basis. Perhaps due to this low consumption, the study did not find a statistically significant association with undernutrition.

16. Undernutrition is a behavioral and cultural problem as well as an economic one. Relying on wealth quintiles to assess the relevance of purchasing power to nutritional outcomes, the analysis found that children from the richest 20 percent of households were 8 percentage points less likely to be stunted compared to the poorest. Although there was no clear gradient across the wealth quintiles, children from the second and fourth quintile were statistically significantly less likely to be anemic than the poorest. However, even in the richest quintile prevalence of stunting (29%), wasting (14%), underweight (31%) and anemia (38%) was very high (below).

Figure ES .1
Prevalence of Undernutrition by Wealth Quintiles



Service Delivery and Utilization: Gaps in Nutrition Specific and Nutrition-Sensitive Programs

17. Despite overall good breastfeeding practices, complementary feeding practices were far from satisfactory. The exclusive breastfeeding rate was 78 percent, with 85.4 percent of children being breastfed within an hour of birth. However, about two-fifth of children aged 6-23 months did not get the Minimum Meal Frequency as per UNICEF standards. Only about half met the Minimum Dietary Diversity, and even worse, less than one-third got the Minimum Acceptable Diet. Eight percent of children were not given soft or semisolid food until after eight months of age, while 12.5 percent were given before they turned 6 months.

18. The poor dietary practices do not seem to stem from lack of knowledge of the nutritional value of different foods. 76 percent of caregivers were able to identify an energy-rich food from a selection of items listed out to them, and 83 percent were able to identify a common protein-rich food item. Focus group discussions revealed three possible reasons why this knowledge is not translated to practice: an inability to afford or access nutritious foods; mothers were either unsure about the manner in which to introduce complementary foods or did not know the importance of introducing them at six-months of age; and the influence of traditional beliefs, e.g., eggs, which are affordable and available in the estates, were believed to cause "phlegm" in children, and a strong belief that fresh milk causes allergies (skin rashes and shortness of breath). Targeted behavior change communication could address these practice gaps.

19. The bacteriological assessment of water in the estate sector indicates fecal contamination of almost all the sources of water supply. 90 percent of the entire estate sector population reported that they had access to water sources, however, bacteriological analysis of the source of the water revealed that more than 92 percent of the estate sector water supplies was contaminated with fecal E. coli. This points to a development challenge in the estate sector that needs to be addressed. Meanwhile, as a positive observation from the study, satisfactory hygiene and sanitation practices were reported by a majority of households.[7] It is noteworthy that almost all households reported that they treated the water adequately prior to drinking by boiling, or chlorinating and filtering, however, no bacteriological assessments were carried out to verify if the water was free of contamination at the point of consumption.

20. There is significant space for improving nutrition service delivery for women both before and during pregnancy. Only about half of women received advice on nutrition and family planning before pregnancy. A little more than forty percent had their weight checked and received vitamin supplements while more than half received de-worming treatment before pregnancy. Although Thriposha[8] is meant to be provided on a regular basis to all pregnant women, 18 percent of women did not receive it regularly and 10 percent never received it. Moreover, compliance is an issue with about eighty percent of pregnant women always sharing the supplement with other household members. Provision of micronutrients to pregnant women was also not universal — iron (73.6%), folic acid (74.9%), vitamin C (69.3%), calcium (64.6%).

21. Gaps in quality of service provision were noted. Although almost all children in the estate sector (99.1%) were born in a government healthcare facility, and nearly all mothers (98%) could produce their children's Child Health Development Record (CHDR) on request, only 28.4 percent of mothers whose children had poor weight gain received special advice on how to address the problem. Significant deficiencies in children's receipt of micronutrient supplements were also noted—54 percent had never received vitamin A supplements.

22. The estate sector has several nutrition specific and nutrition-sensitive programs implemented by the Ministry of Health or other ministries (Ministry of Education, Ministry of Economic Development, Ministry of Agriculture, and Ministry of Livestock) (Table 5.3). Analyses of these nutrition specific and nutrition-sensitive programs shows a number of gaps:

    i) Uneven targeting/coverage: inability to cover the whole targeted population, poorly targeted or benefits provided on an irregular basis (supply disruption). There is a need to prioritize and target the coverage of programs, so that every beneficiary receives the full package of essential interventions.

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7. Almost all households had improved toilets.

8. The Thriposha program is an island wide supplementary feeding scheme that provides a combination of energy, protein and micronutrients as a "ready-to-eat" cereal based food given to nutritionally-at-risk infants, pre-schoolers and pregnant and lactating women.

ii) Implementation impediments to the Ministry of Health's (MoH) pre-pregnancy health and nutrition package include: difficulties in trying to reach newly married couples because some of them work outside the estates and are unavailable during the day; lack of suitable settings to discuss sensitive matters such as postponing pregnancy and contraceptive use; and an absence of estate-level nutrition-related data on pre-pregnant women.

iii) Ineffective communication: for the illiterate and Tamil-speaking population, communication materials need to be made more appropriate, and practical actions need to be suggested in the messages to circumvent undernutrition.

iv) Inadequate monitoring mechanisms.

v) Lack of coordination, not only among different nutrition programs of the health ministry but also among other ministries with different nutrition-sensitive programs.

The Way Forward and Recommendations

23. Recommendations based on the study findings and analyses are outlined below. These recommendations could benefit from further stakeholder discussions led by the Government of Sri Lanka (GoSL) to plan the responsibility of different ministries/institutions, including short and medium-long term actions:

i) **Design an estate-specific Behavior Change Communication (BCC) strategy and ensure it is an integral part of every nutrition intervention.**

Given the high levels of undernutrition and the significant gaps in knowledge and feeding and caring practices among the estate sector population, it is recommended that the MoH, in consultation with relevant stakeholders, design and implement an estate sector-specific, multipronged comprehensive BCC strategy. The strategy could target mothers and other child care providers, the community, and policymakers. The key focus areas could include: (i) importance of introducing complementary feeding at six months of age, and appropriate foods; (ii) more Tamil-based communication material, and material that would be appropriate for the illiterate population; (iii) hygiene promotion activities such as hand-washing with soap for all household members before preparation of food and feeding of the infant/young child, and after use of the toilet; (iv) encouragement to mothers to utilize the full maternity leave; and (v) awareness of the long-term impact of stunting during the first two years of life.

ii) **Institutionalize capacity building of frontline nutrition workers.**

To address some of the gaps identified the MoH with stakeholders could strengthen the capacity of frontline workers (e.g., Public Health Midwives (PHMs)) to promote good nutrition during the pre-pregnancy phase and for children and prevent, identify, and manage malnutrition among adolescents, pregnant women and children. MoH could also review whether the number of frontline workers, including at the Child Development Centers (CDCs), are sufficient to deal with the population and workload, and develop a human resource strategy if required. Similarly, the Ministry of Agriculture with stakeholders could strengthen the capacity of agricultural extension workers serving the estate population to enable them to facilitate and integrate nutrition promotion messages with activities to improve household food security and child dietary diversity.

iii) **Employ complementary and innovative platforms to better target and reach the underserved.**

The study findings indicate that low birthweight (LBW) significantly and substantially increased the chances of the child being stunted, wasted or underweight. In addition, children of short-stature mothers had a higher probability of being stunted and underweight. This suggests that addressing child malnutrition requires a greater focus on ensuring the health and nutrition of girls/women both before and during pregnancy. The MoH and relevant stakeholders should consider exploring, developing and testing new complementary models of nutrition service delivery that reaches working women who are not available at home during visits by the frontline workers, and adolescent girls, particularly for teenage pregnancies, which have the likelihood to be reported late.

iv) **Improve the effectiveness and efficiency of the existing programs.**

GoSL with relevant stakeholders could focus on addressing supply and demand-side bottlenecks to make the existing nutrition-specific and sensitive programs more effective. This could include: (i) improve the regularity and increase the coverage of Thriposha supplementation to children and pregnant women in the estates by identifying causes of its supply disruption; (ii) explore the possibility of changing the packaging of the food supplementation into small single-serving “doses” so that families would treat it more like medicine; (iii) review the existing guidelines for CDCs, and establish, if required, Standard Operating Procedures for optimal child feeding and child care practices; (iv) strengthen monitoring and evaluation practices for school based interventions, including relevant classroom curriculum and school garden programs; (v) assess and plan for improved water and sanitation facilities at schools and CDCs; (vi) the Ministry of Agriculture to take the lead to re-orient their approach to food security beyond the focus on the staple diet (rice and wheat flour) by initiating and/or scaling up programs that focus on the production and consumption of livestock, fruits and vegetables, poultry and poultry products especially by infants and young children; (vii) working with the Ministry of Education (MoE), the National Nutrition Steering Committee could submit appropriate recommendations to include in the Basic Teacher Curriculum which is due to be revised in 2017, focusing on the importance and means to improve undernutrition; and (viii) better targeting, particularly for low income households in the estates, of Divineguma, the safety net program.

v) **Strengthen leadership, coordination and performance monitoring for stronger accountability.**

The 2011 Multi-sector Action Plan for Nutrition (MsAPN) is the guiding instrument to implement nutrition interventions across 17 ministries. The GoSL could consolidate and strengthen the estate multisectoral coordination mechanisms comprising of key stakeholders at the provincial, district, and divisional levels, and make them accountable for results at each level. Although strong awareness exists among stakeholders that effective coordination is necessary at the district and divisional levels, currently, different stakeholders work independently of each other. Further discussions and consensus would be required as to who would be best placed to lead this coordination effort. To facilitate this effort, there needs to be an improvement and institutionalization of the estate sector maternal and child nutrition reporting systems to generate and collect timely data for better nutrition program monitoring. This should include a mechanism for sharing data and analysis across sectors.

CHAPTER 1

INTRODUCTION

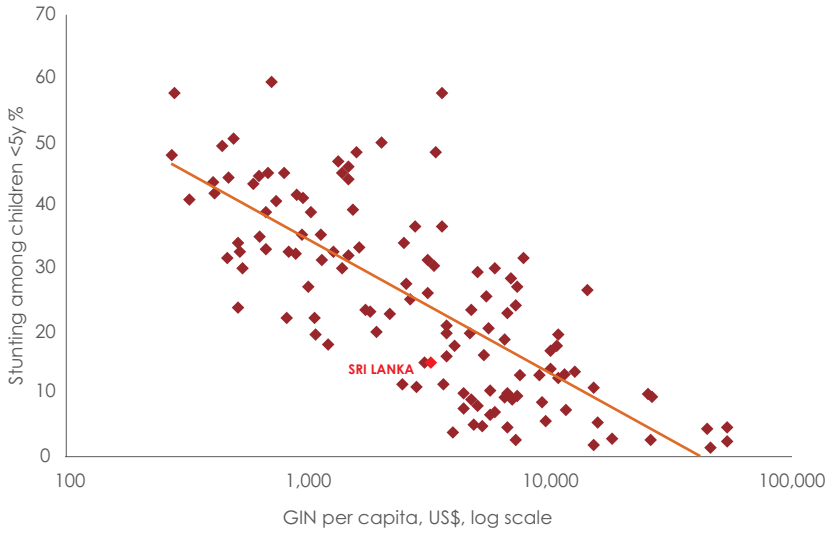
1.1 Sri Lanka: The Country Context

1. Sri Lanka is a lower middle-income country with a population of 20.7 million. Following the end of the 30-year civil war in 2009, Sri Lanka's economy grew an average of 6.7 percent from 2010 to 2014, reflecting a peace dividend and a determined government policy of reconstruction and growth. The economy is also transitioning from a predominantly rural-based economy towards a more urbanized economy oriented around manufacturing and services. In 2014, the service sector accounted for 63.1 percent of Gross Domestic Product (GDP), followed by manufacturing at 28.9 percent, and agriculture at 8 percent. Per capita GDP reached US$3,811 in 2014. The government envisions a globally competitive, export-led economy with an emphasis on inclusion.

2. Sri Lanka has made significant progress in its socioeconomic development. High growth and shared prosperity has resulted in the national poverty headcount ratio declining from 15.3 percent in 2006–07 to 6.7 percent in 2012–13. This poverty reduction was felt across the country although poverty in the estate sector and some concentrated urban areas remains relatively high. Despite the low levels of extreme poverty, roughly one-quarter of Sri Lankans are nearly poor, defined as living above the official poverty line, but below US$2.50 per day in 2005 purchasing power parity.[9]

3. Although the country has comfortably surpassed most of the MDG targets set for 2015, recent progress in nutrition indicators is far from promising. The 2006–07 Demographic Health Survey (DHS) found that 21.0, 17.3 and 14.7 percent of Sri Lankan under-five children continue to be underweight (low weight for their age), stunted (short for their age, reflecting chronic undernutrition), and wasted (low weight for height from acute malnutrition) respectively. The prevalence of low birthweight (16.6%) and maternal malnutrition (16% of women aged 15–49 years) are also of concern.[10] While Sri Lanka has done well on the global platform, there are a few other countries at similar levels of income as Sri Lanka with a lower stunting rate, suggesting a potential for improvement (Figure 1.1).

Figure 1.1
Stunting among Children Under-Five Years, Global (2015)



9. It ranked seventy-third in the 2014 Human Development Index.

8. Maternal undernourishment defined as having Body Mass Index < 18.5.

4. Micronutrient malnutrition is also a problem across Sri Lanka. The 2012 National Micronutrient Survey indicates that about four million Sri Lankans (20% of the population) are affected by anemia. Though little countrywide information is available on other micronutrient deficiencies, data from small studies indicate that vitamin A, folate, and zinc are significant deficiencies as well (de Lanerolle Dias 2012).

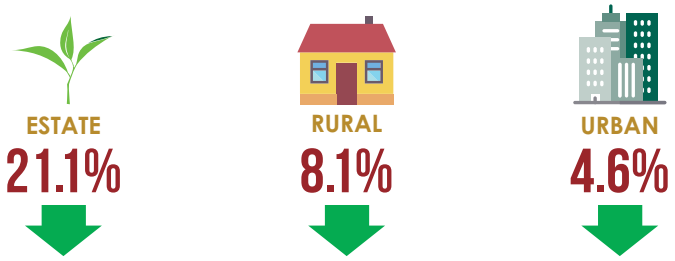
5. A 2007 World Bank study on "Malnutrition in Sri Lanka – Scale, Scope Causes and Potential Response" found that undernutrition in Sri Lanka seems to be rooted in household poverty- even though undernutrition also existed among the non-poor. Poor households were energy deficient, lacked dietary diversity, and had limited access to safe water and sanitation. Maternal nutrition and household wealth status were important predictors of low birthweight, which in turn is one of the key predictors of child stunting and underweight. These effects are amplified by poor child care and feeding practices during the first two years of life, practices that are even worse among the poor. The report recommended additional studies to better understand the scale and causes of undernutrition in high-risk populations, especially in the estates sector. This report attempts to address this recommendation.

1.2 The Estate Sector- a Disadvantaged Group

6. In Sri Lanka, the estate sector is comprised of tea or rubber plantations managed or owned by the state, Regional Plantation Companies, and individuals or families. Approximately 0.9 million people, or 4.3 percent of the Sri Lankan population, live on estates. The Department of Census and Statistics defines the estate sector as including land that is over 20 acres, with 10 or more resident workers. Although large coconut estates exist, the majority of them do not fall into the estate sector category since the resident labor force is small. Approximately 0.69 million (77%) of the estimated 0.9 million of the estate population live in large tea or rubber estates that are managed by Regional Plantation Companies (RPCs) concentrated in the Central and Uva provinces of Sri Lanka. There are also some large government-owned estates. The rest of the estate population is scattered across individually owned large and small private estates, which are mostly in remote areas in the hill country. In addition, there are also smaller family-owned and managed estates ranging from 0.5 to 20 acres. Most family-owned estates are scattered across the low-country districts in the Southern province districts of Galle and Matara.

7. While poverty rates improved significantly in the past decade across the country, residents of the estate sector are still among the poorest in the country. The poverty headcount ratio, measured by the national poverty line, declined in all sectors between 2006–07 and 2012–13: urban 6.7 percent to 2.1 percent; rural 15.7 percent to 7.6 percent; and estate 32 percent to 10.9 percent.[11] Despite their higher rates of poverty, the estates have the lowest percentage of recipients of social safety net benefits compared to the rest of the country (World Bank 2015).

Poverty Headcount

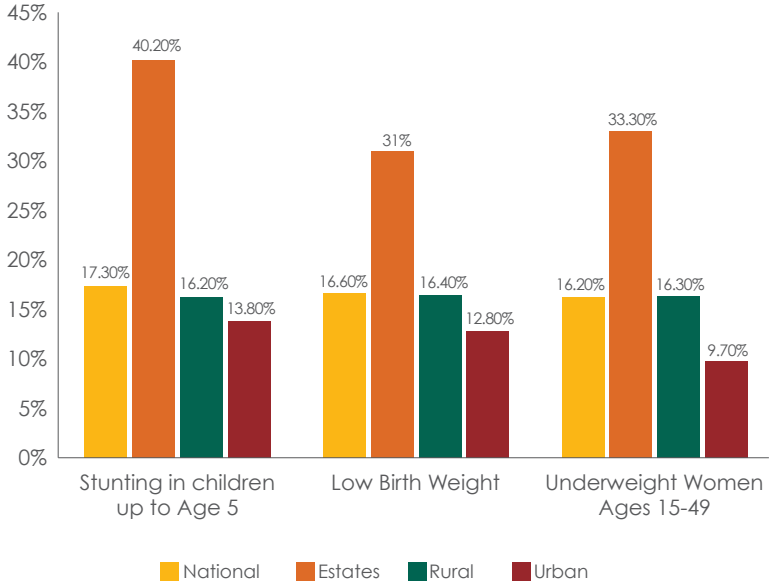


11. 16.5 percent of the plantation population belongs to the poorest 40 percent of the country's population, with food expenditure at 50 percent of their income (Household and Expenditure Survey 2012, Department of Census and Statistics).

8. Although income poverty in the estates has improved, non-income poverty (material and human deprivation, including vulnerability, low achievement in education and health, lack of empowerment and skills, and exposure to risk) remains high (Samaraweera 2009). Almost 44 percent of estate residents live in one-room dwellings, in units of less than 500 square feet.[12] The residents are among the country's most disadvantaged and disempowered groups, with average life expectancy and literacy below the national average, and an infant mortality rate higher than the national average (Department of Census and Statistics 2012). Gaps also exist in access to productive assets (land and safe water), physical infrastructure (power, transport, communications, and markets) and technology. As a result, the estate population lives in isolation and has traditionally been treated as a marginalized group.

9. The estate sector population has the worst nutrition outcomes in Sri Lanka. DHS 2006-7 data indicate large variations in child and maternal undernutrition rates in the rural, urban, and estate populations (Figure 1.2). The rate of stunted children (40%) and underweight adult women (33%) in the estate sector was 2.9 and 3.4 times higher than urban areas, respectively. Similarly, low birthweight incidence in the estate sector was 2.4 times higher than in the urban sector. The poor nutrition status in the estate sector appears to be a key driver of the national malnutrition levels.

Figure 1.2
Nutrition Indicators by Sectors and Ages in Sri Lanka



10. In summary, the estate sector still lags behind in maternal and child nutritional outcomes compared to the rest of the country. Disaggregated data indicates that the worst nutrition outcomes are among the 0.9 million residents of the estates, followed by the approximately 1.5 million residents of the North and East regions affected by conflict, and smaller rural and urban pockets across all districts (UNICEF 2011).

12. http://www.who.int/nutgrowthdb/summary_jme_2013.pdf?ua=.

1.3 Objectives of the Study

11. This Multisectoral Nutrition Assessment assessed the nutrition situation amongst residents of the estate sector, identified the main causes of nutritional deficiencies, as well as gaps in the provision of key nutrition-related services. The findings and recommendations can be used to inform policymakers and planners who are preparing the Estate Health Strategic Policy and Plan, and thereby implement effective multisectoral nutrition and health interventions. To this end, the two main objectives of the study were to:

    i) Assess the size, severity, and key determinants of undernutrition in Sri Lanka's estate sector.

    ii) Examine residents' access to—and utilization of—nutrition related services and identify the gaps, if any, in institutional and implementation arrangements.

1.4 Structure of the Report

12. The report is organized into six chapters. Chapter 2 presents the methodology employed (data and framework), Chapter 3 gives an overview of nutritional status in the estate sector, focusing particularly on maternal and child nutrition. Using a modified UNICEF conceptual framework, Chapter 4 explores the key immediate as well as underlying and basic determinants of undernutrition. Chapter 5 reviews the degree to which nutrition is positioned in the national development agenda and discusses gaps in current nutrition specific and nutrition-sensitive programs, and the last chapter outlines recommendations for the way forward.

CHAPTER 2

METHODOLOGY

2.1 Conceptual Framework for the Determinants of Malnutrition

1. The conceptual framework employed to evaluate the causes that result in malnutrition in the estate sector is based on a framework developed by UNICEF (1990). The UNICEF framework identifies three levels for causes of malnutrition: (i) immediate causes operating at the individual level, (ii) underlying causes influencing households and communities, and (iii) basic causes that center on the structures and processes of societies.

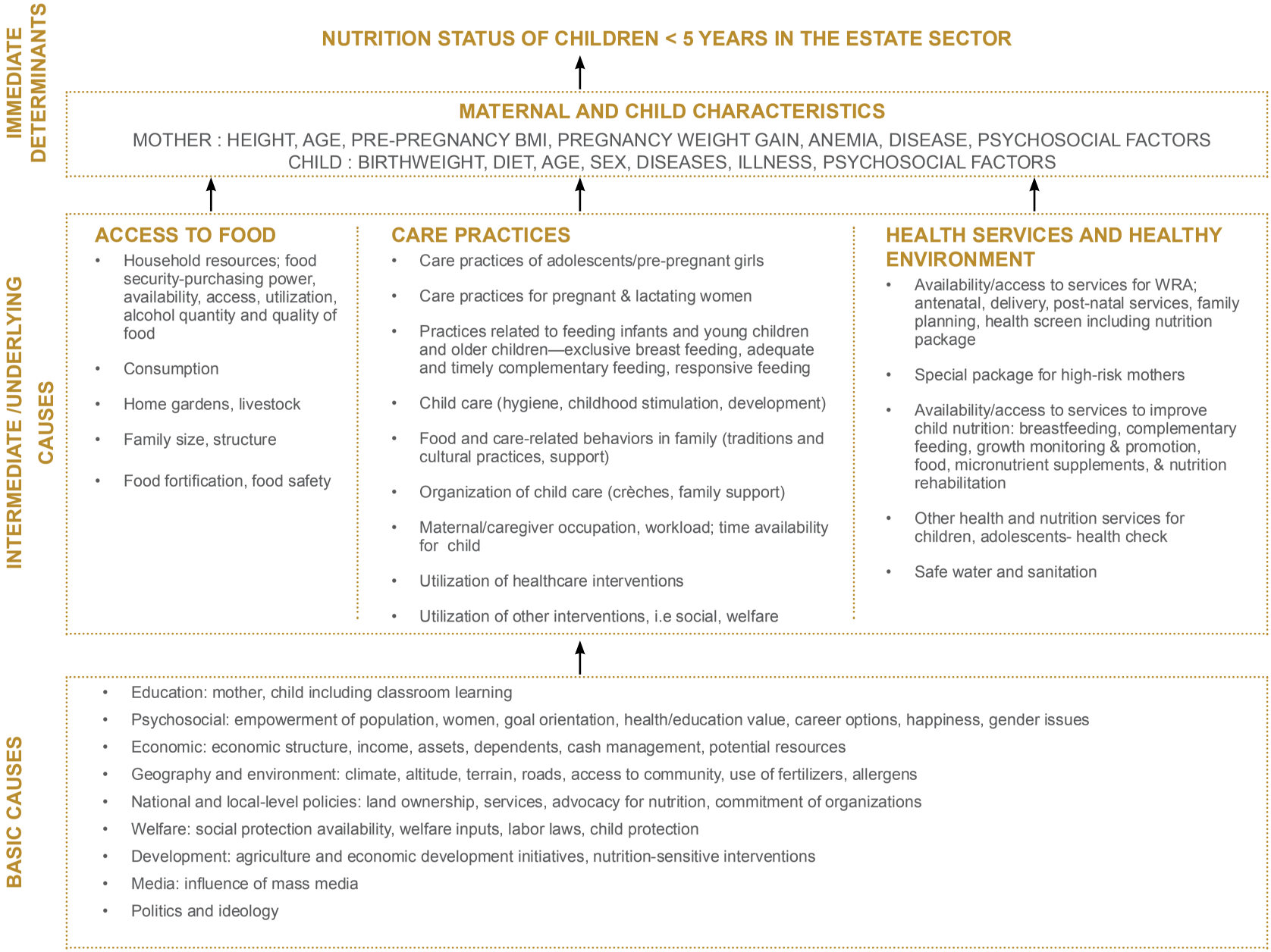
2. The immediate causes of malnutrition are the result of poor dietary intake or disease. Those outcomes can be prompted by consuming inadequate nutrients or by repeated infections that increase nutrient requirements and/or reduce absorption.

3. The adequacy of food or the risk of infections that an individual is subjected to is a result of the underlying factors operating at the household and community level. Caring practices such as breastfeeding and appropriate complementary infant and young child feeding, as well as hygiene and health-seeking behaviors, are vital to health and nutrition, and to support adequate growth. These factors are grouped into three broad categories: household food insecurity, inadequate care practices, and unhealthy household environment (including a lack of or inadequate health services).

4. Basic causes of malnutrition are the deeper causes that govern the amount, control, and use of human, economic, and organizational resources that are available to households and communities. These center on the structure and processes of societies and include factors such as poverty, political and economic insecurity, lack of resources, or empowerment of women.

5. The adapted framework used for this analysis takes into account the specific issues faced by estate populations, is shown as Figure 2.1. The framework served as a reference point for the questionnaire and qualitative data collection. A set of characteristics from those depicted in Figure 2.1 were selected for the multivariate regression analysis of the determinants of undernutrition for this study.

Figure 2.1 Conceptual Framework to Assess the Determinants of Malnutrition in the Estate Sector (adapted from the UNICEF Framework)



2.2 Data and Sampling

6. The study utilized the following two types of data that were collected from tea and rubber plantation populations in 12 districts spread across the Western, Central, Uva, Sabaragamuwa, and Southern provinces.[13,14]

   i) Cross-sectional household survey data from a sample of children (0–59 months old) and pregnant women. This survey was representative of the three different types of estate sector management: RPC-managed, government-managed, and privately managed.

   ii) Qualitative data for gap analysis of the health sector's nutrition service delivery, access to and utilization of the nutrition specific interventions, and nutrition-sensitive interventions by other stakeholders.

2.2.1 The Household Survey Data

7. A cross-sectional, stratified, three-stage clustered survey of the estate sector was conducted from September 2014 to April 2015. Stratification was performed by estate management category since it had been hypothesized that service delivery and nutrition outcomes may differ according to category. Three strata were defined based on the types of estates.

8. The sample size was determined separately for two age categories of children (i.e., 0–23 and 24–59 months) and pregnant mothers, considering the key indicators relevant for the respective group. The estimated sample size was 3,400 children under-five years and 1,190 pregnant women from 170 clusters, and the actual study sample was 3489 and 1105 respectively.

9. The questionnaire, designed according to the conceptual framework in Figure 2.1, covered data pertaining to the immediate, underlying, and basic determinants of maternal and child undernutrition, and included questions about: (i) household socioeconomic information, (ii) caregivers' knowledge and practices about infant and young child feeding, care and sanitation practices, and (iii) diet and access to services. Furthermore, the surveyors gathered data on anthropometry and hemoglobin status.

10. In addition to this data, three water samples from each of the 170 clusters were collected, giving a total of 510 water samples. The three water samples in each cluster were taken from the point of water distribution to the community (water tanks, spring, etc.), randomly selected households, and the CDC of the estate or division.

11. Nutritional status of children was assessed using height and weight measured under standard conditions with standard anthropometric equipment recommended by UNICEF.[15] Stunting, wasting, and underweight were defined as respectively height-for-age, weight-for-height and weight-for-age of more than two standard deviations below the WHO Child Growth Standards median.

12. Hemoglobin status was assessed by measuring hemoglobin using a hemocue.[16,17] All sample children aged six to 59 months, with parental consent for a finger prick blood sample, and all pregnant women, had their hemoglobin status assessed through hemocue testing at the

13. This represents approximately 0.9 million residents of the estate sector.
14. Ethical approval was received from the Sri Lanka Medical Association Ethics Review Committee, that reviews the validity and justification for the survey, minimization of harm, privacy and confidentiality, cultural and social responsibility, and informed consent prior to carrying out the survey.
15. UNICEF. www.childinfo.org/files/MICS4_Manual-Anthropometry.doc.
16. http://pdf.usaid.gov/pdf_docs/PNACW824.pdf.
17. How to assess iron deficiency anaemia and use the hemocue. HK International 2002.

site. Children less than six-months old were not included in anemia surveys since standard cutoff values for hemoglobin concentration are not well established for infants younger than six months. Results of hemoglobin status were categorized using WHO guidelines with corrections made for altitude.[18]

13. A validation study was conducted to compare hemoglobin assessment by hemocue—the technique used in this survey—with venous blood assessment of hemoglobin, which is the gold standard for testing hemoglobin. In a subsample of women (n = 47), two milliliters of venous blood was collected concomitantly under aseptic conditions by medical personnel for comparison of hemoglobin from venous blood assessed by the Drabkins Method using a semi-automated analyzer.

2.2.2 Data for Gap Analyses

14. The gap analysis reviewed the capacities of national and local level entities to identify gaps in policy, institutions, capacity, structures, programming and monitoring in health and other related sectors (for example, agriculture, education, WASH, etc.). This would enable the identification of interventions that would have the potential to improve nutrition outcomes in the estate sector. The study relied on the following four data sources for this.

    i) A literature review of national nutrition policies, systems, and structures used in service delivery to understand the current status of nutrition programming in Sri Lanka, especially in the estate sector. Data on important nutrition indicators for the urban, rural, and estate sectors, and a list of ongoing nutrition-related interventions in Sri Lanka was prepared to discuss with relevant experts.

    ii) Key informant discussions were held with policymakers and program planners from key ministries and relevant sectors including the ministries of health, estate infrastructure, education, social services, fisheries and economic development, Plantation Human Development Trust (PHDT), and other agencies and grass roots workers (Planters Association, non-governmental organizations (NGOs), district secretaries, estate management and workers, public health midwives, development officers, and hospital staff). These discussions served as sources of data on the policies, systems and structures, programs, capacity and tools available for planning, implementation and monitoring and evaluation of nutrition interventions in the estate sector.

    iii) Stakeholder consultations with experts from the central and provincial Ministry of Health (MoH) were held to validate the nutrition data findings and results, and discuss the strengths and weaknesses of nutrition-sensitive and nutrition-specific interventions.

    iv) Focus group discussions with high-level health and non-health sector government officials (at the central, regional, and local levels), as well as with the estate managers, program implementers in the health sector, mothers/caregivers, and crèche workers. Issues regarding Infant and Young Child Feeding (IYCF) practices, use of supplementation (diet and micronutrients), use and understanding of child health records, housing conditions, water and sanitation practices, food and alcohol habits were analyzed in these discussions.

18. Iron Deficiency Anaemia. Assessment, Prevention and Control. A guide for programme managers. WHO/NHD/01.3 WHO2001 http://www.who.int/vmnis/indicators/haemoglobin.pdf.

CHAPTER 3

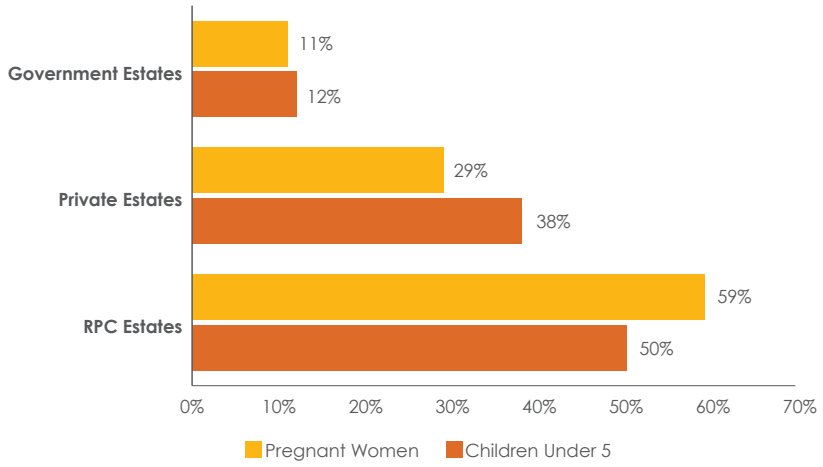
NUTRITION STATUS OF THE ESTATE POPULATION

3.1 Sample features

1. The number of children and pregnant women in the study sample was 3489 and 1105 respectively. These individuals belonged to a total of 4489 households. The average household size was 4.7. Nearly half (47.5%) of mothers were working.[19] The average age of a child by the time the mother returned to work was only 49 days, much sooner than the government mandate of 84-day period of maternity leave. Children of working mothers were fed most commonly by Child Development Center (CDC) workers (46.6%).[20] Only 13 percent of working mothers were able to return during the lunch break to feed their children. Besides, estate work starts as early as seven a.m., making it all the more difficult to provide the much needed care babies require.

Figure 3.1
Sample Distribution by Estate Type

Sample distribution (%)



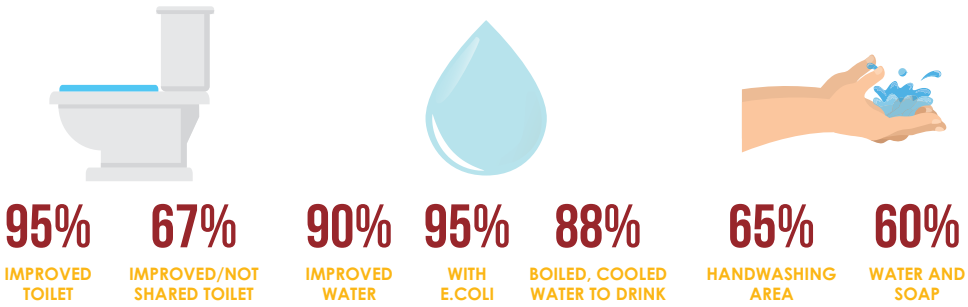
2. A vast majority of the sample of both children and pregnant women were from the RPC estates, followed by the private estates (Figure 3.1). Households in this type of estates were better off. 42 percent of them were sole owners of the house they lived in while the corresponding figure for private and government estates was 28 and 21 percent, respectively. RPCs were also better with reference to electrification and sanitation facilities. Only a third of the households owned the house they lived in, and access to electricity was 87 percent. Nearly all households used firewood for cooking. Weighing posts, dispensaries and maternal and child health (MCH) clinics appeared to be accessible, located on average half an hour walk away from their home. The mean household income per month (Rs 20,911) was similar across estate types. Only two-fifths of the monthly consumption expenditure was spent on food.

19. 44 percent of them work away from the home: 28.4 percent work as tea pluckers; 0.9 percent as rubber tappers; 12.2 percent work in the estate factory or did sundry work in the estates; 5.8 percent work in other occupations outside the estates.

20. 31 percent of them were fed by an adult family member.

3. A vast majority of households had improved water (>90%) and toilets (95%).[21] Almost all households reported that they treated the water adequately prior to drinking—boiling and cooling it or chlorinating and filtering it.[22] Satisfactory sanitation practices were reported by a majority of households. Open defecation by children was practiced in only 3.4 percent of the households.[23] Children in a vast majority (84%) of households either used a toilet or had their feces safely disposed into the toilet. Most households reported regularly washing their hands with soap after using or cleaning the toilet, cleaning a child's bottom or before preparing and eating food. Observation by enumerators indicate that 65 percent of households had an area for handwashing with running water within ten meters of the toilet; but water and soap were not available in roughly two-fifth of the toilets. Garbage disposal practices were satisfactory, with only nine percent (and five percent) reportedly throwing all garbage in the premises (by the side of the road).

Household sanitation



4. About 25 percent of the sample households had livestock and home gardens. These are important factors for diversifying diets but their presence was not widespread in any of the estates, although RPC estates had a slightly higher proportion of home gardens. Home gardens were cultivated by about 26 percent of households. Of those, nearly half grew roots and tubers, while 29 percent grew dark green leafy vegetables. However, 18.3 percent did not consume their home garden produce and only about 12 percent consumed it on a daily basis.

21. Two-third had improved toilets that was not shared with other families.
22. Nearly 88 percent reported using boiled cooled water to drink.
23. Open defecation at work-site was minimal (3.1 percent of households).

Table 3.1
Household characteristics by category of estate

Characteristic	RPC Estates	Private Estates	Government Estates	Total
Sole owner of house (%)	41.9	28.4	20.7	34.5
Households with electricity (%)	88.2	84.9	82.7	86.4
Cooking with firewood (%)	96.5	98.1	98.0	97.3
Household has no method of smoke elimination	30.3	27.8	29.6	29.3
Improved and non-shared toilet (%)	71.3	64.6	56.5	67.1
Ownership of agricultural land (%)	15.7	10.3	7.5	12.8
Ownership of livestock (%)	24.2	24.4	25.0	24.4
Cultivation of a home garden (%)	29.6	21.7	20.2	25.7
Mean household income per month (LKR)	20,812	21,152	20,611	20,912
Total expenditure per month (%)				
Medical and health needs	9.3	10.1	9.4	9.6
Food	38.7	37.6	39.0	38.4
Alcohol and tobacco	6.5	6.6	6.8	6.6
Have savings (%)	64.9	66.0	50.1	63.6
Taken loans (%)	63.6	71.5	73.7	67.6
Covered by any insurance (%)	22.2	19.4	16.3	20.5
Time from home to nearest…(minutes)				
Public access road	19	18	17	18
Dispensary	30	38	37	34
MCH clinic	26	32	32	29
Weighing post	17	18	16	17
Preschool	20	23	21	21

3.2 Nutrition Status in the Estate Population

Stunting

5. The rate of stunting among under-five children was 36.4 percent, showing a decline from the 40.2 percent reported in the last DHS (2006-07) of the estate sector.[24] Larger improvement is evident for severe stunting (from 14.2% to 9.6%).

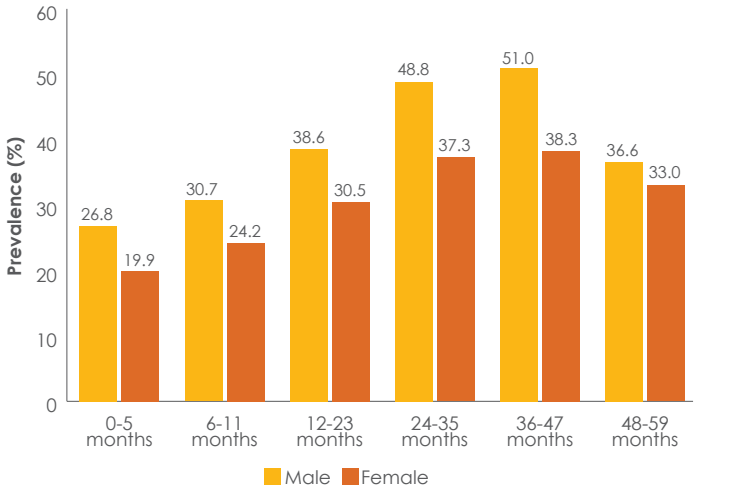
6. The prevalence of stunting was higher in the older age group, peaking at 36–47 months (Figure 3.2). Stunting prevalence was similar across estate types (ranging between 35.2% in private estates to 37.5% in government estates).[25] Stunting was significantly lower among girls at all ages, possibly reflecting a biological variation (Wamani et al. 2007). This difference has also been reported in previous surveys in Sri Lanka,[26] and in some African countries (Espo et al. 2002; Zere et al. 2003).

24. DHS 2006–07 Department of Census and Statistics.
25. See annex Table A1 for disaggregation by estate type.
26. Nutrition and Food Security Survey MRI, UNICEF Sri Lanka 2009.

7. Children from the poorest quintile had the highest burden of stunting (42%). Although the prevalence declined with higher quintiles, it was still very high in the richest quintile (29%) (Figure 3.3). The high level of stunting in the better off population suggests that the problem of undernutrition is more than a question of affordability of food. The next chapter examines this.

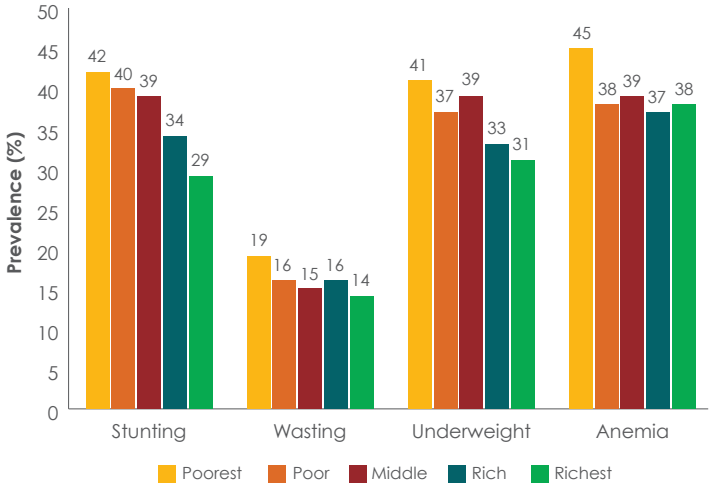
Figure 3.2
Prevalence of Stunting In Children 0–59 Months

Stunting by Age and Gender



*P<0.05 in age categories 12–23 months, 24–35 months, and 36–47 months

Figure 3.3
Prevalence of Undernutrition by Wealth Quintiles

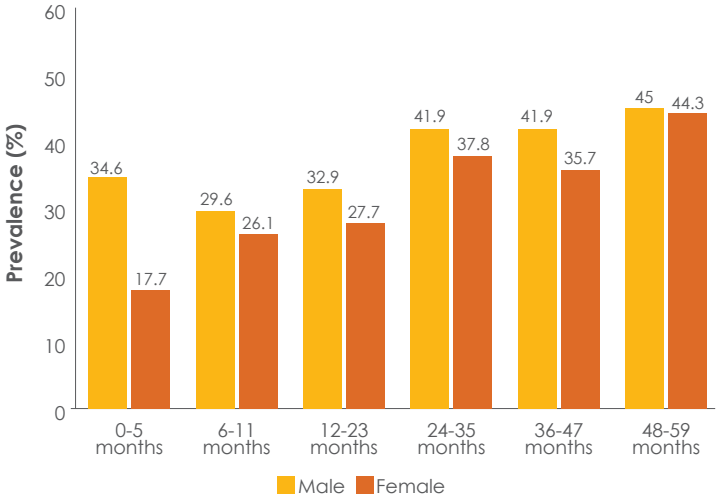


Underweight

8. Underweight prevalence has, however, increased to 35.9 percent from 30.1 percent reported in the DHS 2006-07. While on average prevalence increased with age group (Figure 3.4), there was no significant difference between estate types. The burden is concentrated in the poorest quintile (41%), but is still alarmingly high in the top quintile (31%) (Figure 3.3).

Figure 3.4
Prevalence of Underweight in Children 0–59 Months

Underweight by Age and Gender



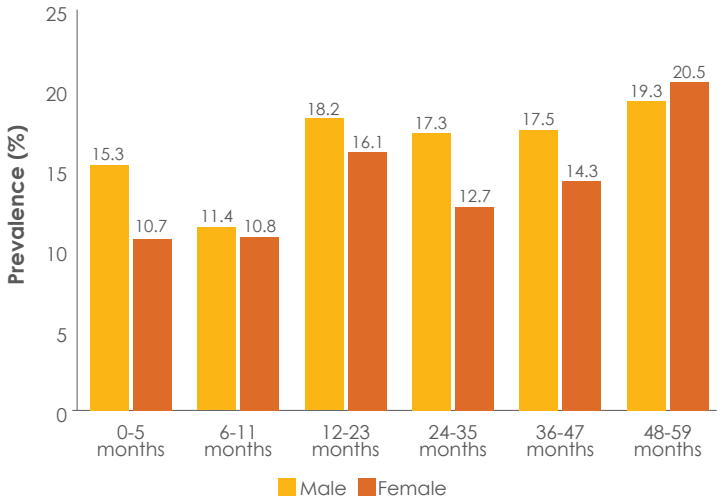
*P<0.05 Gender difference in the age category 0-5 months

Wasting

9. Almost 16 percent of the estate sector children were wasted and suffered from acute malnutrition (WHZ<-2SD); with 2.6 percent suffering from severe acute malnutrition (WHZ <-3SD). Wasting increased by 2.5 percentage point compared to the 13.5 percent reported in the DHS 2006–07. On average, wasting, like stunting, appears to be higher among older children but there was no statistically significant difference by gender in any of the age groups (Figure 3.5). Results were also similar across estate types and wealth quintiles (Figure 3.3).

Figure 3.5
Prevalence of Wasting in Children 0–59 months

Wasting by Age and Gender



10. Based on the WHO classification of public health significance of malnutrition rates (see Table 3.2), the stunting rate shows a 'high' public health significance while the wasting and underweight rates show a 'very high' public health significance. The latter two particularly require attention since they are showing a reversing trend in the past eight years.

Table 3.2
Public Health Significance of Child Undernutrition and Anemia (Based on WHO 2010)

	Levels of public health significance by prevalence (%) of undernutrition			
	Low	Medium	High	Very high
Stunting	<20	20–29	30–39	>=40
Wasting	<5	5–9	10–14	>=15
Underweight	<10	10–19	20–29	>=30
	Levels of public health problem by prevalence of Anemia (%)			
	No problem	Mild problem	Moderate problem	Severe problem
Anemia	<=4.9%	5.0–19.9	20.0–39.9	>=40.0

Note: The highlighted cells indicate the level of public health significance for the estate's malnutrition levels. Two cells are highlighted in the case of Anemia which anemia is a severe public health problem for children under 2 and a moderate public health problem for children between 2 and 5 years.

3.3 Anemia

11. 38.4 percent of children were anemic and the prevalence was even higher among the younger age group of 6–23 months old (53.1% compared to 30.4% for 24-59 months old).[27] The lower prevalence of anemia in the older age group was likely because the dietary diversity of children usually improves as they get older. This is also confirmed in the dietary recall of older children in the sample. While there was no substantial difference in anemia prevalence between the RPC estates (39.6%) and private estates (37.5%), it was much lower (23.6%) in the government estates.

12. Compared to anemia prevalence rate of 39.3 percent in DHS 2006-07, there was only a marginal reduction in anemia prevalence among children. Using the typology proposed by WHO, the estate sector has a 'severe' public health problem of anemia among younger children and a 'moderate' public health problem in older children (see Table 3.2), corroborating the need for urgent action. What is more striking is that the prevalence of anemia even among the richest quintile (38%) is alarmingly high and not substantially lower than the prevalence in the poorest quintile (45%) (Figure 3.3).

13. Anemia prevalence among pregnant women was also substantial, with a third of them being anemic (Table 3.3). Eight years ago this figure stood at 36.4 percent as reported by the DHS 2006–07, further indicating insufficient improvement.

27. Similar findings were reported in the DHS 2006–07 (49.1 percent anaemia among children 6–23 months).

Table 3.3
Anemia in Children and Pregnant Women

	Prevalence (%)	95 % CI	N
Age 6-23 months			
Mild Anemia	24.9	[22.4,27.5]	1467
Moderate Anemia	26.6	[24.2,29.3]	1467
Severe Anemia	1.6	[1.0,2.5]	1467
Anemia	53.1	[50.2,56.0]	1467
Age 24–59 months			
Mild Anemia	18.7	[16.3,21.3]	1437
Moderate Anemia	11.5	[9.7,13.5]	1437
Severe Anemia	0.2*	[0.1,0.5]	1437
Anemia	30.4	[27.6,33.3]	1437
All children 6–59 months			
Mild Anemia	20.8	[19.1,22.7]	2904
Moderate Anemia	16.8	[15.3,18.4]	2904
Severe Anemia	0.7	[0.5,1.1]	2904
Anemia	38.4	[36.2,40.2]	2904
Pregnant Women			
Mild Anemia	14.6	[12.5,17.1]	1105
Moderate Anemia	17.1	[14.7,19.7]	1105
Severe Anemia	0.6	[0.3,1.3]	1105
Anemia	32.3	[29.3,35.4]	1105

Note: While there was no substantial difference in anemia prevalence between the RPC estates and private estates, in all age groups and among pregnant women, the prevalence rate in the government estate was much smaller; *percentages are adjusted for age and weighted for population; ** adjusted for altitude

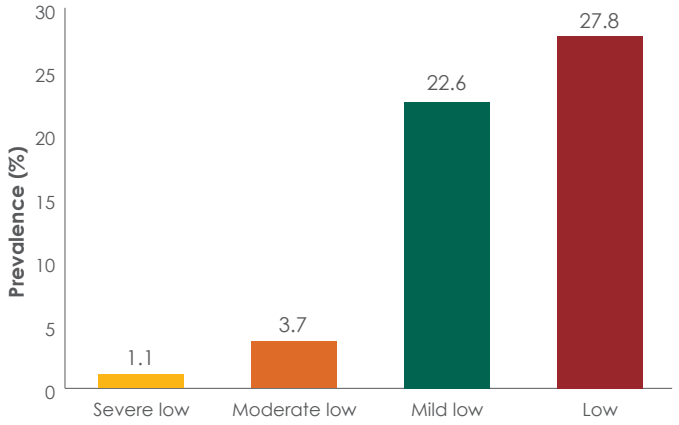
3.4 Birthweight

14. A child's weight at birth is a key biological variable that reflects maternal nutrition status, and determines perinatal and infant mortality, and is a significant predictor of nutrition status later in life. Birthweight is influenced by a range of factors, including intrauterine growth retardation due to maternal malnutrition, infections, a heavy workload, teenage pregnancy, short birth intervals, excessive tobacco or alcohol consumption, and possible exposure to smoke (Abu-Saad and Fraser 2010; Muthayya 2009).

15. The prevalence of low birthweight (< 2,500 grams) was 27.8 percent (Figure 3.6), and only 3 percentage points less than the 31.0 percent reported in DHS 2006–07. Prevalence of low birthweight was higher among girls (30.3%) than boys (25.3%).

Figure 3.6
Prevalence of Low Birthweight

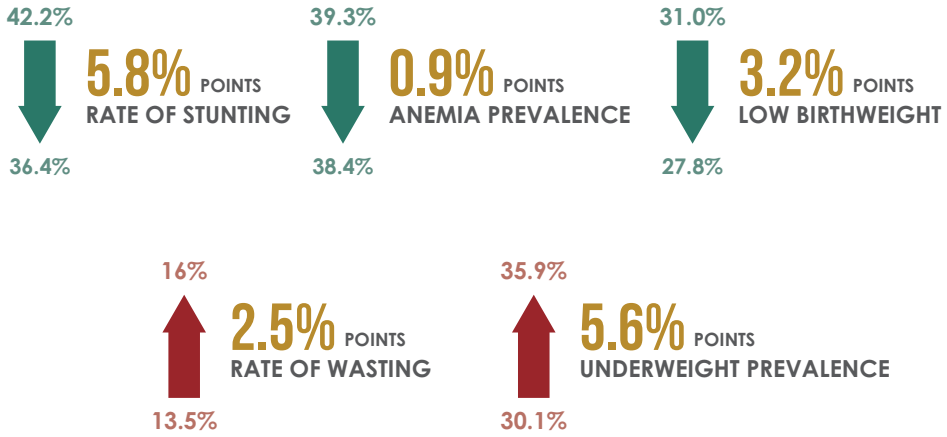
Low Birth Weight



Note: Severe LBW (<1.5kg), Moderate LBW (1.5kg-2kg), Mild LBW (2kg-2.5kg), LBW (<2.5kg)

16. To summarize, malnutrition in the estates is widespread as well as significant among both children and pregnant women. While there has been some reduction in stunting prevalence among the estate children, the levels remain significantly high. Moreover, prevalence of wasting, underweight, birthweight and anemia levels have either been stagnant or increasing.

Nutrition : Estate Sector Children Under-Five Years



CHAPTER 4

DETERMINANTS OF UNDERNUTRITION IN THE ESTATE SECTOR

In this chapter, the report follows the conceptual framework presented in Chapter 2 to examine the immediate, intermediate and basic causes of undernutrition in a bivariate and multivariate framework. The immediate determinants include maternal and child characteristics such as the sex, age, birthweight and any childhood illnesses, and the age and maternal height of the mother. Intermediate determinants include access to food (e.g., whether or not household owns livestock or home gardens), care practices (e.g. maternal and child care and feeding practices), utilization of health services (whether or not the child received vitamin A and deworming treatment) and environmental health (e.g., water and sanitation amenities, etc.). The basic causes include economic status (e.g., wealth), level of education of the father and the mother, the area of residence (estate type) and access to media.

4.1 Determinants of Child Undernutrition: Feeding Practices in the Estates and a Bivariate Analysis

1. Good IYCF practices of early initiation of breastfeeding, exclusive breastfeeding for the first six months and appropriate complementary feeding along with the continued breastfeeding during the first 23 months are considered some of the most important determinants of child nutrition.

2. Breastfeeding within the first hour of life significantly reduces newborn mortality as colostrum (i.e., first breast milk) is highly nutritious and has antibodies that protect the newborn from diseases. Proper breastfeeding also confers advantages in later life including higher IQ scores, reduced risk of childhood obesity and adult non-communicable diseases (NCD). Figure 4.1 provides breastfeeding rates in the sample. 85.4 percent of mothers initiated breastfeeding within an hour of birth, and 77.6 percent exclusively breastfed their infants, and almost all breastfed at some point. These figures are similar to the corresponding national averages (85% and 98.9% for initiation within one hour and ever breastfed (DHS 2006–07). Nearly 82 percent of mothers stated that, prior to giving birth, they had received advice from health workers on the importance of breastfeeding.

Figure 4.1
IYCF Practices

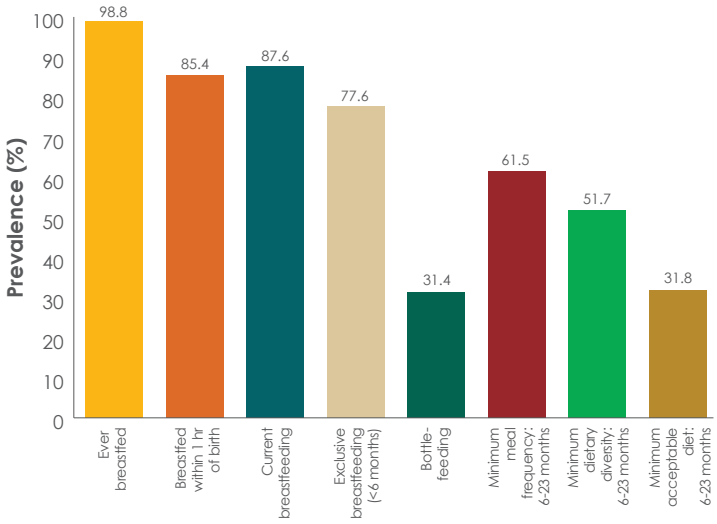


Figure 4.2
Age at Introduction of Complementary Feeding (0–23 Months)

Infant feeding practices by age

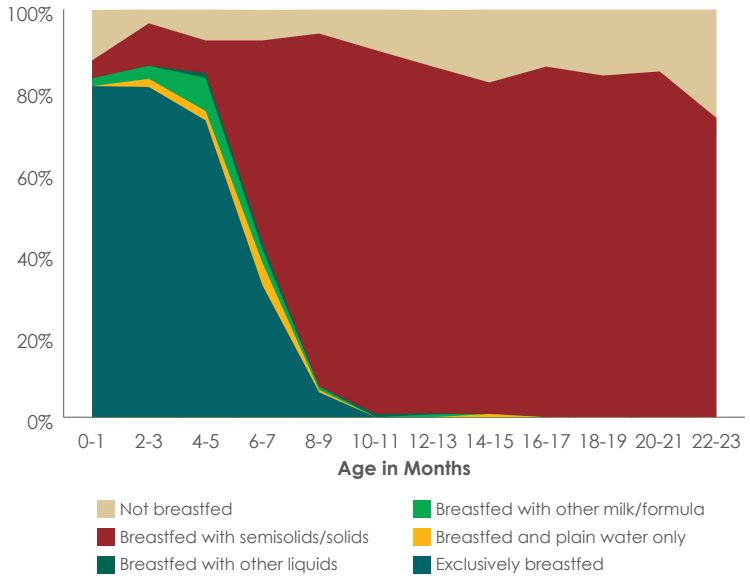
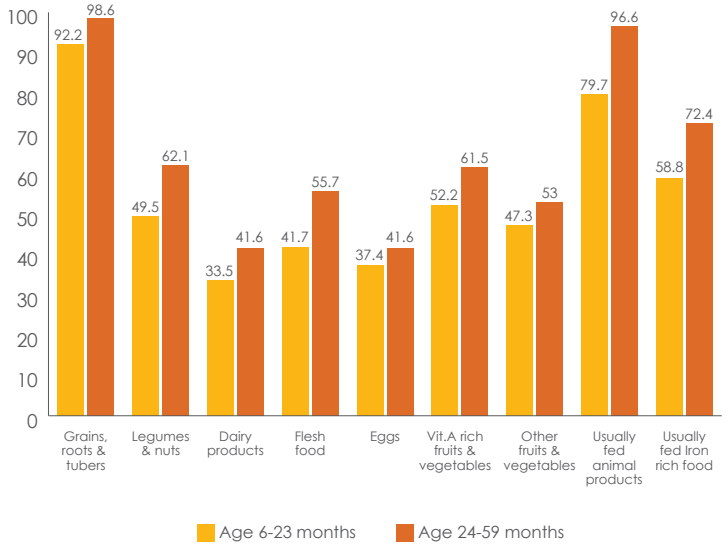
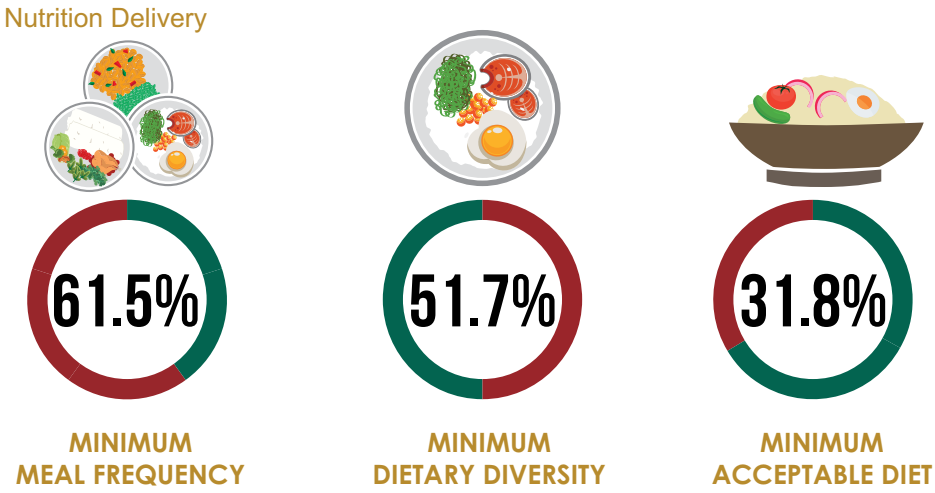


Figure 4.3
Children Dietary Intake by Food Type

% of children



3. In addition to breastfeeding, adequate complementary feeding in terms of timing, quantity and quality is a vital aspect of nutrition that affects the nutritional status of children. In the study sample, 8.1 percent of children were not given semisolid food until after eight months while about 12.5 percent were introduced before they turned six months, even as young as 0-1 month old (Figure 4.2). Less than one-third of children aged 6-23 months got a variety of foods for the desired number of times to meet the minimum acceptable diet even though about half of children got a variety of foods (i.e., minimum dietary diversity) and about two-thirds got the foods a desired number of times during the day (i.e., minimum frequency) needed (Figure 4.1).



4. Dietary diversity was lower in younger children compared to older children (Figure 4.3), especially animal sources of foods that are associated with linear growth (Marquis 1997). Vitamin A-rich fruits and vegetables were consumed by 52 percent of the younger cohort and 62 percent of the older cohort. Consumption of proteins from flesh food was low (42-56%) and even less expensive sources of protein such as eggs were consumed by only 37 percent of children aged 6-23 months and 42 percent of children 24-59 months. Legumes and nuts, which are good sources of plant proteins, were consumed by only half of the younger cohort and three-fifths of the older cohort.[28]

5. While owning livestock and keeping home gardens could be important sources of nutritious foods, to what extent they could affect undernutrition depends on whether or not they are consumed and the frequency of consumption. Due to low consumption even when there was a home garden in the study sample, the analysis did not find a statistically significant association with undernutrition (see Table 4.2).

6. The poor dietary practice did not seem to stem from lack of knowledge of the nutritional value of different foods. For example, 76 percent of caregivers were able to identify a food item rich in energy from a selection of items listed, and 83 percent were able to identify a common protein-rich food item. A similar proportion of mothers/caregivers were able to identify iron-rich foods, and 68 percent could identify calcium-rich foods.[29]

29. Annex Table A3 provides corresponding figures by estate type.

Identification of Food Items

7. The focus group discussion identified at least three reasons why nutrition knowledge was not being translated in to practice. The first was the inability to afford or access a variety of nutritious foods.[30] Residents of the estate sector often had to travel to a nearby town or village to purchase food items. Second, mothers were either unsure about the manner in which to introduce complementary foods or did not know the importance of introducing them (fish, meat and eggs) at six-months of age. Third, traditional beliefs played a role. For example, eggs, which are affordable and available in the estates, were believed to cause "phlegm" in children, and fresh milk to cause allergies (skin rashes and shortness of breath).

8. When comparing the prevalence of undernutrition in children born in the last 24 months by whether or not they were breastfed within an hour of birth and exclusively breastfed in the first six months; the study found a lower prevalence rate of stunting, wasting and underweight for those who were breastfed within the hour of birth, with a statistically significant difference for stunting for both early initiation of breastfeeding and exclusive breastfeeding.

9. A woman's employment status is an important determinant of child nutrition. While employment could reduce undernutrition via the income effect, it could increase it via a substitution effect - reduced care for the child, as time for child care competes with time for work. Children of the 47.5 percent working mothers in the study were 16.5 and 9.2 percentage points more likely to be stunted and underweight, respectively than children whose mothers stayed at home. Exclusive breastfeeding rates were significantly lower for working mothers than for non-working mothers ($P < 0.05$). Additionally, being a child of a working mother was significantly associated with having lower dietary diversity and lower minimum acceptable diet compared to the children of non-working mothers ($P < 0.01$).

10. Table 4.1 compares the prevalence of stunting, wasting, and underweight in children (0–59 months) across different groups. This bivariate analysis shows prevalence of stunting was higher among children who were male, older, and born with low birthweight. It was also higher among children of less educated parents, of mothers whose maternal height was less than 145 cm, of poorer households and those with working mothers. Wasting was higher among low birthweight children, and those of older and short-stature mothers.

30. Given the relative poverty levels of households in the estate sector, receipt of food rations was very low - only 5.4 and 6.7 percent of households were beneficiaries of the government social security program (Samurdhi) and the government preschool feeding program respectively.

Determinants of Undernutrition

LOW BIRTH WEIGHT

CHILDREN OF WORKING MOTHERS

MOTHERS WITH SHORT STATURE

POORER

Table 4.1
Prevalence of Undernutrition in Children (0–59 Months): a Bivariate Analysis

Characteristics		Stunting	Wasting	Under weight
Sex	Male	40.9 ***	17.1	38.6 **
	Female	32.2	14.8	33.3
Age months	(0-5)	23.2 ***	12.9 **	25.8 ***
	(6-11)	27.4	11.1	27.8
	(12-23)	34.4	17.1	30.2
	(24-35)	42.8	14.9	39.8
	(36-47)	44.8	15.9	39.9
	(48-59)	34.8	19.9	44.7
Birthweight	<2500gm	48.9 ***	24.5 ***	55.4 ***
	≥2500gm	32	12.7	28.7
Breastfed (BF) within 1hour	Yes	28.7 *	14.2	27.6
	No	34.8	16.4	32.6
Exclusively BF	Yes	27.7 ***	14.4	27.4
	No	36.4	14.7	31.4
Diarrhea	Yes	43.3 **	15.1	36.4
	No	35.7	16	35.9
Mother has secondary or vocational education	No	40.5 ***	16.7	39.1 **
	Yes	33.6	15.4	33.7
Currently working mother	Yes	43.4 ***	15.8	40.7 ***
	No	26.9	16.2	31.5
Maternal height cm	≤145	52 ***	19.8 *	49.8 ***
	>145	33.9	15.3	33.7
Maternal BMI kg/m^2	<18.5	41.5 **	21.1 ***	45.2 ***
	18.5-24.9	35.5	14.2	33.9
	≥25.0	33.5	14.2	31
Father has secondary or vocational education	No	41.7 ***	15.8	37.9
	Yes	32.9	15.9	34.5
Household Wealth Index	Poorest	41.7 ***	19.4	40.8 **
	2nd poorest	39.7	15.6	37
	Middle	38.7	14.5	39
	2nd richest	33.7	15.9	33.1
	Richest	29	14.3	30.5

Note: ***, **, and * indicate p<0.01, p<0.05 and p<0.1 respectively for differences in means of each category.

4.2 Determinants of Child Undernutrition: A Multivariate Analysis

11. This section examines the determinants of undernutrition in a multivariate context.[31] The objective was to test which variables continued to predict undernutrition after controlling for several relevant characteristics. Marginal effects from a multivariate probit regression are reported in Table 4.2.

12. Boys were ten percentage points more likely to be stunted and five percentage points more likely to be underweight than girls, perhaps indicating a biological factor. This difference was, however, not statistically significant in the case of wasting and anemia. As children got older, their probability of being stunted and underweight increased, and the likelihood of being anemic declined. The analysis found that receiving deworming treatment decreased the chances of being anemic by about 9 percentage points. However, there was no statistically significant association between receipt of vitamin A and being undernourished.

13. Even after controlling for several relevant characteristics, low birthweight significantly and substantially increases the chances of being stunted, wasted and underweight. The effect ranges from about 13 percentage points in the case of wasting to 26 percentage points in the case of underweight. Children of short-stature mothers (<145 cm) had a higher probability of being stunted and underweight by 18 and 12 percentage points, respectively. This result suggests that addressing child malnutrition requires a greater focus on ensuring the health and nutrition of mothers both before and during pregnancy.

14. A growing body of literature also indicates an association between stunting and environmental enteropathy (EE)—a disorder thought to be caused by repeated exposures to enteric pathogens. EE is a poorly defined state of intestinal inflammation without overt diarrhea that occurs in individuals exposed over time to poor sanitation and hygiene. It is characterized pathologically by small intestine villous blunting and inflammation, causing reduced absorption of nutrients, further affecting nutrition status. The measure of sanitation and hygiene for this analysis was whether the households had improved toilets and sources of water, and it did not find any association of these factors with the measures of undernutrition. Further analysis may be required to conclude that the habit of boiling household water amongst the estate population is fully protective.

31. These regressions are meant to explore factors associated with undernutrition in a multivariate setting and caution is necessary for causal interpretation.

Table 4.2
Determinants of Child Undernutrition (Probit Marginal Effects)

Variables	Stunting		Wasting		Underweight		Anemia	
Low birthweight	0.143	***	0.127	***	0.256	***	0.00700	
	(0.0273)		(0.0222)		(0.0270)		(0.0284)	
Male	0.0984	***	0.0209		0.0503	**	0.00147	
	(0.0234)		(0.0172)		(0.0238)		(0.0247)	
Age (in months)	0.00183	**	0.000836		0.00335	***	-0.00698	***
	(0.000915)		(0.000664)		(0.000924)		(0.000990)	
Had acute respiratory illness	0.0166		0.0136		0.0299		0.0223	
	(0.0244)		(0.0181)		(0.0248)		(0.0255)	
Had diarrhoea	0.0985	**	-0.000625		0.0394		-0.00509	
	(0.0392)		(0.0304)		(0.0384)		(0.0398)	
Maternal height <145 cm	0.178	***	0.0257		0.120	***	0.00701	
	(0.0359)		(0.0260)		(0.0365)		(0.0365)	
Mother is currently working	0.107	***	-0.0175		0.0442	*	0.0319	
	(0.0240)		(0.0174)		(0.0245)		(0.0253)	
Mother's age	0.0255		-0.000343		0.0185		-0.00933	
	(0.0168)		(0.0117)		(0.0170)		(0.0183)	
Mother's age squared	-0.000447	*	1.69e-05		-0.000273		3.82e-05	
	(0.000271)		(0.000188)		(0.000274)		(0.000294)	
Household size	0.0119		0.00344		0.0103		0.00574	
	(0.00826)		(0.00593)		(0.00844)		(0.00878)	
Unimproved water	0.0174		-0.0133		0.0120		-0.0567	
	(0.0433)		(0.0291)		(0.0443)		(0.0442)	
Unimproved toilet	-0.0391		-0.000108		-0.0268		-0.0321	
	(0.0462)		(0.0339)		(0.0460)		(0.0485)	
Have livestock	0.0364		-0.0125		0.0136		0.0720	**
	(0.0270)		(0.0213)		(0.0274)		(0.0280)	
Have home garden	-0.0252		0.0285		0.0125		-0.00306	
	(0.0277)		(0.0190)		(0.0276)		(0.0285)	
Had vitamin A past 6 months	-0.00810		-0.00756		-0.0156		-0.0359	
	(0.0257)		(0.0189)		(0.0259)		(0.0262)	
Received worm treatment past 6 months	0.0445		0.0143		0.0293		-0.0857	***
	(0.0279)		(0.0199)		(0.0278)		(0.0282)	
Have frequent access to media	-0.0137		-0.0138		-0.0522	**	-0.0484	*
	(0.0258)		(0.0185)		(0.0256)		(0.0267)	
Father has secondary/vocational education	-0.0481		0.0287		0.0243		-0.0567	
	(0.0323)		(0.0235)		(0.0327)		(0.0346)	
Mother has secondary/vocational education	-0.0223		-0.0220		-0.0471		0.0485	
	(0.0327)		(0.0249)		(0.0333)		(0.0341)	
Second poorest (Ref. poorest)	-0.0265		-0.0348		-0.0257		-0.0868	**
	(0.0349)		(0.0234)		(0.0356)		(0.0363)	
Third quintile	-0.0360		-0.0269		0.00375		-0.0516	
	(0.0368)		(0.0250)		(0.0382)		(0.0399)	

Variables	Stunting	Wasting	Underweight	Anemia
Second richest	-0.0332	-0.0121	-0.0385	-0.0807 **
	(0.0364)	(0.0260)	(0.0368)	(0.0368)
Richest	-0.0809 **	-0.0325	-0.0594	-0.0529
	(0.0373)	(0.0258)	(0.0380)	(0.0402)
Government estate (ref. RPC estate)	0.0339	-0.0169	-0.0156	-0.177 ***
	(0.0381)	(0.0248)	(0.0376)	(0.0315)
Private estate	-0.0163	0.00328	-0.0241	-0.0361
	(0.0237)	(0.0175)	(0.0238)	(0.0248)
Observations	2,721	2,721	2,721	2,468
Probit marginal effects reported.				

15. Parental schooling, and especially maternal education, influences child nutrition in different ways. First, educated mothers have more access to information about diets and are better able to assimilate information and influence child care practices in their homes. Second, they are more likely to be in jobs with better pay, which in turn improves socioeconomic status and the household's diet. Third, girls who stay in school longer are less likely to marry early and become pregnant at early ages—a relevant factor for undernutrition. Casanovas et al. (2013) reports that children of less-educated mothers have a lower chance of survival and a higher risk of undernutrition compared with children of educated mothers. The bivariate analysis (Table 4.1) confirms this claim. However, controlling for wealth and other factors, parental schooling (i.e. whether or not father/mother had secondary or vocational training) did not significantly predict undernutrition, suggesting that differences in nutrition information between these groups was negligible.

16. Another important factor determining nutrition is the economic status of the household. The estate sector population was relatively poorer compared to the national average. 76.8 percent fell below the 40th percentile of income at the national level, and only 2.5 percent of estate sector households belonged to the highest national income quintile.[32] Based on the World Food Program (WFP) criteria, prevalence of food insecurity in the estates is very low. Less than one percent of households in the sample reported being severely food insecure.[33] The study relied on wealth quintiles to assess the relevance of purchasing power to nutritional outcomes. Results showed that children from the richest 20 percent of households were 8 percentage points less likely to be stunted. Although there was no clear gradient with wealth quintiles, children from the second and fourth quintile are statistically significantly less likely to be anemic. However, even in the richest quintile, prevalence of stunting (29%), wasting (14%), underweight (31%) and anemia (38%) was very high. Clearly, undernutrition is a behavioral and cultural problem as well as an economic one.

32. The cut-off point for the highest quintile is LKR 57,495. The upper range for the second poorest quintile is LKR 25,903.

33. About 94 percent of households in the sample reported they were food secure; 5.3 percent moderately food insecure; 0.8 percent severely food insecure). On a different measure, 11 percent did not have enough food in the past 30 days to meet family needs. About a third of these (31.4 percent) reduced frequency of meals per day while about two-fifth (38.5 percent) reduced meal size and relied on less expensive food (coping responses are not mutually exclusive).

CHAPTER 5

POLICIES, INSTITUTIONAL ARRANGEMENTS FOR NUTRITION PROGRAMMING AND GAPS IN CURRENT NUTRITION-SPECIFIC, NUTRITION-SENSITIVE PROGRAMS

1. This chapter highlights the policies and institutional arrangements for nutrition service delivery by reviewing relevant policies, strategies and stakeholders; followed by a review of current nutrition-specific, nutrition-sensitive programs and the gaps therein.

5.1 Policies and Legislation

2. Nutrition is recognized as central to Sri Lanka's development as stated in 'The Development Strategy Paper of the Government of Sri Lanka'. The paper identifies the need to reduce undernutrition rates of under-five children from 33 percent to 12–15 percent, and underscores that a balanced diet is still an unmet need for many children, particularly in the estate sector.

3. The country has a National Nutrition Policy (NNP) that was developed in 1986 and revised in 2010 along with the National Nutrition Strategy. The vision of the NNP is to ensure that every Sri Lankan has access to appropriate and adequate food and nutrition irrespective of their geographical location and socioeconomic status. The 2011 Multi-sector Action Plan for Nutrition (MsAPN) is the guiding instrument to implement nutrition interventions across 17 ministries. The MsAPN targets the core determinants of malnutrition in the country. These are the overarching policy documents, which detail the national level commitment and multisectoral guide to scale up nutrition interventions in Sri Lanka.

4. There are a few legislations that directly or indirectly relate to nutrition. For example, the legislation on maternity benefits has been passed for women employed in different sectors. Table 5.1 shows that the maternity benefits package available to mothers in the estate sector is a little less favorable than the package available to mothers in other sectors. Another legislation that indirectly affects nutrition is the legislation on government-resourced free education policy that was introduced in 1943 and reconfirmed in the 1972 Constitution of Sri Lanka. Moreover, compulsory school education is required for all children through 14-years old, and national child labor laws prohibit children from working during school hours. Although these laws apply to the estate population, this study indicated that some children either receive no education or drop out before completing primary school.

Current Nutrition Programs and Gaps in the Estate Sector

Children/Adolescent

- School Health Promotion Program (School Medical Inspection/ Nutrition Month; (poor sanitary facilities in schools)
- School Garden Program; WASH) (G1-13;81%)
- Mid-day Meal Program for the vulnerable (G1-9;76%)
- Glass of Milk Program (G1-5); Production/ Consumption of milk, eggs, & meat
- Classroom Health/Nutrition Education (G1-11) (Scarcity of materials with Tamil language)

Women/HH

- Pre-conception Services Package (42-54%)
- Integrated Pregnancy Care Package
- Poshana Malla Program (not recieved regularly)
- Divineguma/ Samurdhi Safety Net Program (poorly targeted)
- Home garden promotion (26%) (less training)
- PHI visits for environmental sanitation (60%)

Pre-School Children

- Family Health Program including IYCF (sub-optimal practice)
- BFHI
- Glass of Milk Program (2-5 yrs)
- CDC (84%)
- Micronutient Program (less coverage)

Table 5.1
Sri Lanka Maternity Benefits Package

Legislation/ Regulation Coverage	Eligibility	Provisions	Cash Benefits and Nursing Intervals
Shop and Office Employees' Remuneration Act	All females employed in or related to the business of a shop or office.	84 working days (which could be taken as maximum 14 days prenatal and 70 days postnatal) for the first two children and thereafter from the third child it is reduced to 42 days.	Payment of salary based on full pay. No nursing intervals provided.
Maternity Benefits Ordinance	All females employed on a wage in any trade, industry, business undertaking, occupation, profession, or calling except, a) females covered by the Shop and Office Employees' Act or, b) whose employment is of casual nature, c) home workers, and d) domestic workers in private households.	84 calendar days (which could be taken as maximum 14 days prenatal and 70 days postnatal) for the first two children and thereafter from the third child, it is reduced to 42 days.	Six–sevenths of weekly wage to be paid. If crèche is provided, two intervals of breastfeeding of 30 minutes each are provided. If crèche is not provided, 60 minutes each of two intervals are provided.
Establishment Code	All females employed in the public sector or in Statutory Boards or covered by provisions of the Establishment Code (Chapter XII) or Administrative Circular (No. 4/22005, February 2005).	84 working days (which could be taken as 14 days prenatal and 70 days postnatal) and 84 calendar days half pay and another 84 calendar days no pay leave. This benefit is available for all births.	Payment of salary is based on full pay. Sixty minute nursing breaks are provided until the infant is six months old.

Source: IHP Maternity Benefits Report Sep 2014, Abeykoon et al.

5.2 Stakeholders in Nutrition Service Delivery

5. The MoH has the lead responsibility for the national response to nutrition in Sri Lanka. Multiple central level divisions of the MoH, including the Estate and Urban Health Unit, are involved in the work to improve: (i) the nutritional status of the targeted population, including pregnant and lactating mothers, children under-five, school-age children, and out-of-school adolescents; and (ii) healthcare services, especially those targeting vulnerable groups such as the estate sector population.

Stakeholders in Nutrition Services

6. The Estate and Urban Health Unit of the MoH was established in 1997. Its goal is to advance the quality of life of the estate and urban population by improving their overall health and access to health services. It aims to reduce the disparities in basic healthcare service delivery between the plantation sector and other sectors by improving the nutrition status of the estate population, developing resources, improving maternal and child health service delivery, and developing the health sector infrastructure. The Unit is in the process of finalizing a policy addressing nutrition of the estate sector. After finalizing the policy, it plans to develop an Estate Health Strategic Plan that is meant to identify gaps in MoH nutrition interventions and guide the work of the Unit in moving forward with more targeted planning, monitoring, implementation, and evaluation, and in fostering partnerships to advance the multisectoral nutrition response.

7. Nine Provincial Directors of Health Services (PDHS) supported by 26 Regional Directors of Health Services (RDHS) oversee the medical officers of health and the public health teams that implement the health and nutrition-related interventions.[34] Nutrition-related interventions are managed by the Family Health Bureau and are delivered by the RDHS-led Medical Officer of Health and the primary health care teams at the regional level. The Medical Officer of Health together with the Public Health Nursing Sister (PHNS) and the Public Health Midwife (PHM) conduct antenatal clinics. During antenatal assessments, they screen for nutrition problems, provide nutrition education, and identify nutritionally disadvantaged mothers for appropriate management. Additionally, the pregnant woman's BMI is assessed and she would be screened for anemia and monitored for pregnancy weight gain. Micronutrient and nutrition supplements are provided during the assessments. Nutrition-specific interventions for the estate sector are part of the respective district nutrition action plans prepared by the RDHS.

34. The RDHS serving the estate population are Badulla, Kandy, Matale, Nuwara Eliya, Colombo, Kalutara, Galle, Matara, Monaragala, Kegalle, and Ratnapura.

8. The Plantation Human Development Trust (PHDT) was established in 1992 by a Cabinet decision to provide social and health welfare to the population living in RPC estates. Prior to its establishment, health services were provided by the estate management. The PHDT was established to coordinate services with government programs with the objective of promoting productive and self-reliant plantation communities. There are seven regional PHDT officers, headed by a regional director, who are mandated to work with the 23 RPC estates. The regional PHDT director coordinates with the RDHS, the Medical Officer of Health, and the district and divisional secretary for social, health, and nutrition-related activities affecting the estate sector. The PHDT develops an annual plan that includes nutrition interventions. It also participates in the planning process of the Regional Directors of Health Services' (RDHS) nutrition action plan for the district.

9. The PHDT healthcare providers are supervised by the estate superintendent of their respective estates and are under the oversight of the regional PHDT director. The estate superintendent is responsible for coordinating the social and health activities of the estate population and coordinates with the Medical Officer of Health and the PHDT regional director for health-related activities.

10. The PHDT supports the respective area Medical Officers of Health, and the Primary Health Care Team in their provision of basic health promotion, prevention, and curative services to the estate population. The PHDT also partners with a network of other strategic partners to improve, among other things, sanitation, child care and development, safe drinking water, nutrition and education. Unlike the RPC estate population, the government and privately managed estates are served by the Public Health Midwives and the primary healthcare team of the MoH Unit only.

11. The PHMs are the grassroots level primary healthcare workers carrying out most of the healthcare activities. Two types of PHMs serve the estate sector: the government-resourced PHMs under the Medical Officer of Health, and the estate-resourced PHMs from the PHDT. Government PHMs must follow the central authorities' rules and regulations and adhere to circulars and guidelines issued by the Ministry of Health. The PHDT provides additional inputs to their PHMs with respect to maternal and child care. However, in 2007–08 the government made a policy decision to gradually absorb the estate PHMs into the government sector if they fulfilled the government's recruitment criteria. As a result, the majority of the PHMs serving the estates have become government-resourced but there are some estates where PHMs are still managed by the government and by the PHDT. With the change in management of the PHMs from the PHDT to the MoH, some estates no longer provide accommodation to PHMs, and this could become a disincentive, which the government would need to assess further.

12. The PHDT, under the policy guidance of the Child Development Ministry, supports the establishment and maintenance of the Child Development Centers (CDCs). It is mandatory for estate management to provide CDC facilities because the majority of the mothers are employed. The CDCs in RPC estates are provided and managed by the PHDT, while the CDCs in other estates are directly under the Child Development Ministry. Currently, there are 936 upgraded CDCs established in the estate sector, representing 60 percent of all CDCs. In the Nuwara Eliya district, where the maximum number of estates exist, there are 272 crèches and about 19,000 infants and children attend them. Although only infants and children from RPC estate employees are eligible to attend estate crèches, the children of other families living on the estate also use the crèches, especially when their mothers work daily.

13. Other stakeholders involved in providing nutrition-sensitive interventions include trade unions (such as The Ceylon Workers Congress, The Lanka Jathika Estate Workers Union and Democratic Workers Congress)[35] and The Planters' Association of Ceylon. The trade unions support the government and PHDT in uplifting the social and health status of estate workers by participating in planning interventions. The Planters' Association of Ceylon, which has wide representation in the RPC and privately-owned estates, is a strong stakeholder in its efforts to improve the social and physical wellbeing of the estate population. It works towards goals that include: zero anemia for a healthy life; clean, tidy homes and working places; and a healthy lifestyle and nutritious food for a better quality of life.

5.3 Current Nutrition Programs and Gaps in the Estate Sector

14. The health sector provides a countrywide comprehensive package of nutrition-specific interventions for women at every age. This and the subsequent section outline these current nutrition-specific, nutrition-sensitive interventions in the estate sector and highlight their implementation and coverage gaps (see Table 5.3 for a summary).

5.3.1 Interventions to Address Adolescent Health and Nutrition

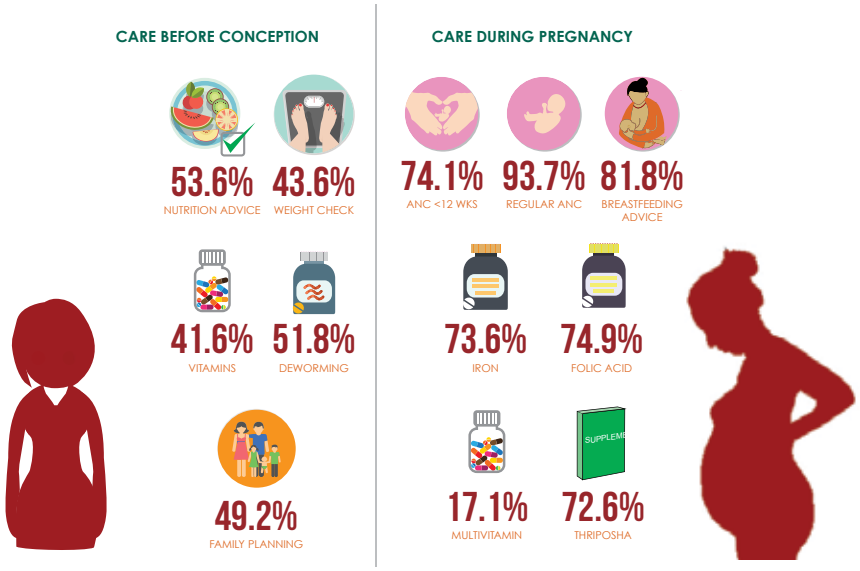
15. The School Health Promotion Program (SHPP), introduced in 2009, is a comprehensive national program that includes nutrition-specific and nutrition-sensitive interventions in schools. The program is jointly developed and implemented by the Ministry of Education (MoE) and the MoH together with relevant stakeholders. By 2013, the SHPP had been initiated in 81 percent of the estate schools.

16. The School Medical Inspection (SMI) and School Nutrition Month are two important countrywide nutrition interventions led by the Medical Officer of Health and implemented through the primary healthcare system and the government school system. The Nutrition Month in schools is an important annual intervention where the primary healthcare team conducts an assessment of the nutrition status of children. The SMI's nutrition interventions target students from grade 1-13 and include assessment of nutrition status (including BMI), deworming treatment, weekly supplementation of micronutrients (i.e., iron, folic acid, and vitamin C tablets for six months), and rubella immunization. The globally recommended public health intervention of weekly iron folate supplementation was introduced in 2013–2014 to prevent iron-deficiency anemia, improve pre-pregnancy iron reserves, and increase the folate levels in adolescent and young women. According to data from FHB, SMI coverage of schools countrywide is 93.4 percent. The MoE reports that in 2013, SMI was conducted in 80 percent of estate schools. However, the SMI data from the RDHS areas is not presented separately in the FHB data, making it difficult to assess the nutritional status of these schoolchildren and impact of the intervention.

17. The Mid-Day Meal Program was launched by the government of Sri Lanka for one million children in grades 1-9 for schools with major nutrition problems, and for those situated in vulnerable and food insecure areas. Students in schools with fewer than 100 students are also eligible. Meal planning is the responsibility of the school authorities and the school development society. The school health promotion committee is involved in this program. Of the 827 estate schools, 75.8 percent (627) are implementing the mid-day meal program.

35. More than 50,000 plantation workers are enrolled with trade unions. The Ceylon Workers Congress is the largest trade union, with about 40 percent of workers.

Nutrition Interventions for Women



5.3.2 Nutrition Interventions for Women before Pregnancy

18. The pre-conception service package targets newly-married couples and is aimed at correcting undernutrition and anemia among women before pregnancy. Initiatives are also targeted at reducing teenage pregnancies as a strategy to reduce low birthweight and nutrition deficiencies. The interventions included in the package are implemented nationwide through the primary healthcare delivery system and include: (i) nutrition education and counseling, (ii) BMI assessment, (iii) providing knowledge about the usefulness of folic acid for women planning pregnancy, (iv) education about safe motherhood, (v) provision of family planning services if needed, (vi) referral to the medical officer of health for health screening, and (vii) immunization for rubella. All government-resourced PHMs working in the estate sector and the estate-resourced PHMs have been trained in the implementation of these services. It is during home visits that the PHM is expected to provide most of these services to the target population of pre-pregnant women as identified by the 'eligible family register'.

19. Data from the survey on the percentage of pregnant women who received these pre-pregnancy services indicate that there is huge room for improving service delivery (Table 5.2). Nearly 30 percent of women in the survey had a pre-pregnancy BMI level below 18.5; about 50 percent received advice on nutrition and family planning; 43.6 percent had their weight checked and received vitamin supplements; and little more than half received deworming. Qualitative data suggest that difficulties to access this population, PHM's time constraints, and lack of appropriate facilities (e.g., a place to discuss sensitive issues such as family planning) are possible factors for the inadequate coverage.

Table 5.2
Pre- and During Pregnancy Care

	Percentage of pregnant women
Care before conception	
Nutrition advice	53.6
Weight check	43.6
Vitamins	41.6
Deworming treatment	51.8
Family planning	49.2
Care during pregnancy	
Registered before 12 weeks of gestation	74.1
Regular visits to antenatal clinic	93.7
Mother advised on breastfeeding	81.8

20. An additional limitation is that there is no official nutrition program for unmarried young men and women. Only married couples are identified by the PHM through the register. The most vulnerable group of unmarried teenagers, who may get pregnant prior to marriage, is excluded in the current model. Even if such outreach services were available, key informant interviews indicate that young people would not be comfortable discussing such issues in the home environment. It was suggested that this be done in either schools or through other community-based channels in the estates. Integrating sexual and reproductive health education in the school curriculum was also suggested to avert teenage pregnancy—an underlying factor of undernutrition.

5.3.3 Nutrition Interventions for Pregnant Women

21. Pregnant woman have access to the comprehensive integrated pregnancy care package from the time they register with the PHM. A wide spectrum of nutrition-related services is included in this package. These services include assessing nutrition, monitoring and providing advice on weight gain, promoting breastfeeding (e.g., antenatal preparation to endure breastfeeding practices) and providing dietary and micronutrient supplements. Weight gain is monitored at monthly intervals. The government's dietary and micronutrient program includes the provision of micronutrients (folic acid, iron, calcium, and vitamin C), anti-helminthic therapy, and dietary supplementation with two packets of Thriposha per month.[36]

22. The study data indicates that three-quarters of pregnant women registered their pregnancy between 8–12 weeks. For 93.7 percent of women, the PHM made at least one home visit during pregnancy. The average number of home visits by the PHM was good, with an average of 2.6 home visits during the first 12 weeks, 2.7 visits during the next 12–27 weeks, and 3.9 visits during 27–39 weeks. About 81.8 percent of mothers received advice on breastfeeding and its importance during their pregnancy.

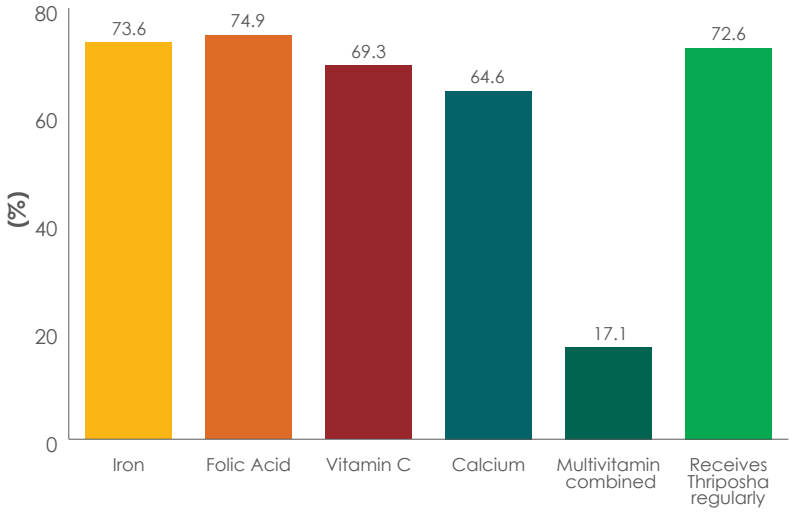
23. About one quarter of women interviewed during the study did not consume iron and folic acid supplements respectively, with an even higher proportion of them not consuming vitamin C and calcium (Figure 5.1).

36. Thriposha is a government food supplement (ready-to-eat cereal legume-based food consisting of calories, proteins, and micronutrients) that is supposed to benefit all pregnant and lactating women up to six months after childbirth.

24. Although Thriposha is meant to be provided on a regular basis to all pregnant women, 18 percent of women did not receive it regularly and 10 percent never received it.[37] This supply constraint is confirmed by estate superintendents, officials of the RPCs, and workers who stated that the supply is very often disrupted (no supplies for as long as 2-3 months). Moreover, there is a compliance problem, with about 80 percent of pregnant women always sharing the supplement with other household members.

25. In addition to the Thriposha supplementation program, in 2015 the MoH introduced the Poshana Malla program for all pregnant women. However, the focus group discussions indicated that women in the estates did not receive the Poshana Malla regularly.

Figure 5.1
Percent of Pregnant Women who Received Micronutrients and Food Supplements During Pregnancy



5.3.4 Nutrition Interventions and Health Services for Children

26. The MoH implements IYCF activities countrywide. The IYCF interventions are integrated into the maternal and child health component of the Family Health Program. The intervention calls for early initiation of breastfeeding, exclusive breastfeeding up to six months, and the continuation of breastfeeding for two years and beyond, while introducing safe and nutritious complementary feeding at six months of age. The DHS 2006–07 and subsequent surveys show that a majority of women in the estate sector have good breastfeeding practices. In the urban sector, 78.1 percent of mothers initiate breastfeeding within the first hour. The corresponding figures for the rural and estate sectors are 79.8 percent and 85.0 percent, respectively.

27. The Baby Friendly Hospital Initiative (BFHI) was introduced in Sri Lanka in 1985. The FHB is responsible for training healthcare providers to implement the ten steps of BFHI. The BFHI is established in all specialist hospitals in the country, including those covering the estate sector. The FHB also promotes Kangaroo mother care centers, lactation management centers, breastfeeding corners and rooms, and mother-baby centers in hospitals to encourage mothers to start skin-to-skin contact with the baby as soon as possible to facilitate the initiation of breastfeeding. Unfortunately, there are no data to assess the quality of the initiative.

37. Pregnant women living in the government estates are less likely to receive Thriposha on a regular basis than women living in the RPCs or the private estates.

28. The Glass of Milk Program is a government program that provides a glass of milk to children aged two to five years who are attending preschools, and to students in grades one to five if the school does not have the Mid-day Meal Program. In the plantation sector, 38 schools without the Mid-day Meal Program have the Glass of Milk Program.

29. Amongst the study sample there was relatively high utilization of health and nutrition services: 86.5 percent of households reported regular visits by the PHM;[38] 99 percent of the children were born in a hospital, and nearly as many had a Child Health Development Record (CHDR). Furthermore, a majority of the mothers were reported to have attended the regular growth-monitoring sessions, evidenced by the knowledge they displayed about their child's growth. While more than 80 percent understood their child's growth trajectory (weight gain, height, nutritional status, and early childhood development), it was apparent from the focus group discussions that their understanding of stunting and its consequences remained poor.

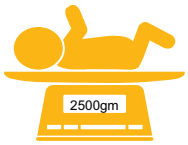
Healthcare for Children

99.1%

BORN IN A GOVERNMENT HEALTHCARE FACILITY

98%

CAN PRODUCE CHILD HEALTH DEVELOPMENT RECORD



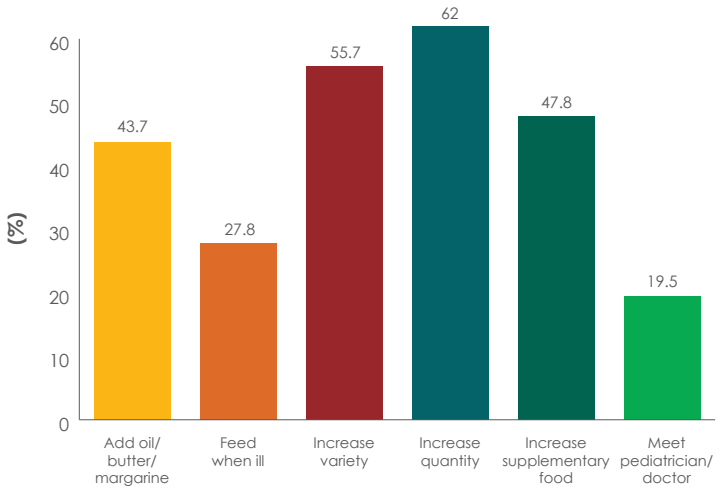
28.4%

RECEIVED SPECIAL ADVICE FOR CHILDREN

38. The highest proportion of regular visits (95.3 percent) was recorded in the RPC estates, while the lowest (60 percent) in the government estates.

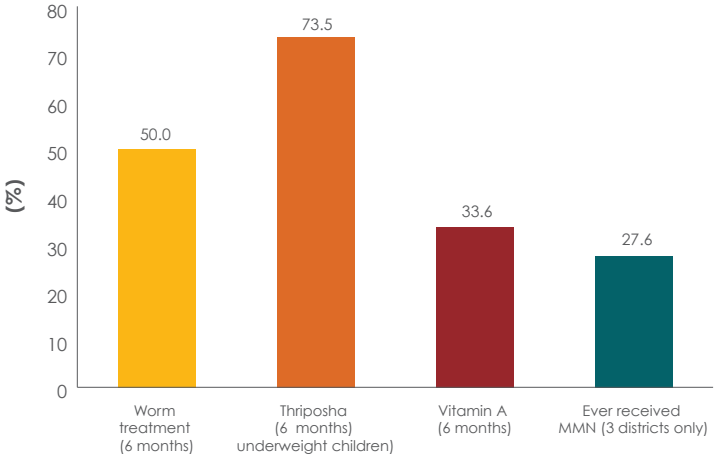
30. Although utilization of health and nutrition services was high, gaps in quality of service provision were noted. Only 28.4 percent of mothers whose children had poor weight gain received specific advice on how to address the problem.[39] Among other inquiries, mothers were asked if they were advised to increase the quantity and quality of food they fed their child (Figure 5.2). Less than two-thirds (62%) were advised to increase the amount of feeding and 55.7 percent to increase the variety of food. One of the responsibilities of the PHM, who is the primary source of nutrition advice, is to refer a malnourished child to hospitals to meet a pediatrician; however, only 19.5 percent of children were referred to a hospital/a specialist.[40]

Figure 5.2
Advice Provided for Children With Poor Weight Gain



The study also showed deficiencies in children's receipt of micronutrient supplements (Figure 5.3). Only 33.6 percent of children had received vitamin A supplement within the last six months of the survey, and 54 percent of the children had never received it.[41]

Figure 5.3
Health and Nutrition Services Given to Children (Percent of Children)



39. Sixty-seven percent of mothers reported the PHM as the main source of nutrition advice.
40. See annex Table A4 for disaggregation by estate type.
41. Annex Table A5 provides corresponding figures by estate type.

31. Multiple Micronutrient (MMN) supplementation is another intervention to improve the nutrition status of children. It contains iron and zinc, which are important for cognitive development. For children at 6, 12, and 18 months of age, the government recommends one sachet per day of MMN supplementation for two consecutive months. At the time of the study, this intervention was implemented in three of the sample districts: Nuwara Eliya, Badulla and Monaragala. The receipt of the MMN supplement in these districts was very poor: only 28 percent of children surveyed had ever received it; and of them, only 45 percent consumed the entire sachet.

32. Only 50 percent of children received deworming treatment in the six months period prior to the survey, and 43.7 percent had never received it.

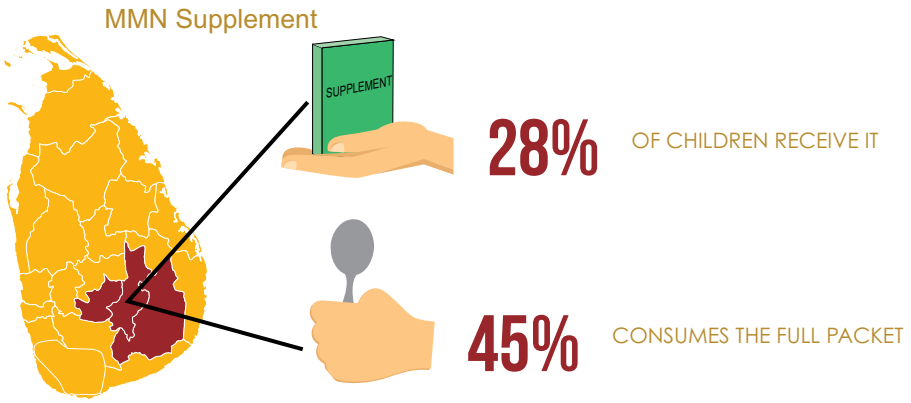


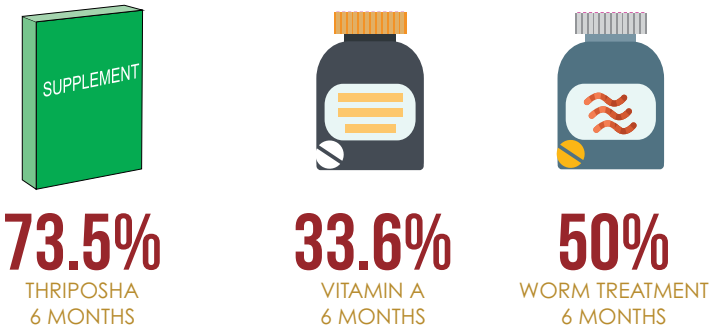
Table 5.3
Current Nutrition-Specific and Nutrition-Sensitive Interventions and Gaps in the Estate Sector

Interventions/Activities	Sector	Target group	Gap in system/coverage
School Health Promotion Program (SHPP)	MoH/ MoE	School children (grade 1-13)	- initiated in 81% of estate schools by 2013 - School Medical Inspection data from the RDHS areas are not presented separately in the FHB data
The Mid-day Meal Program	MoH	Students (grade1-9) in targeted schools	- implemented in about 76% of estate schools
The pre-conception service package	MoH	Newly-married couples	- poor coverage (e.g. only 53.6% of pregnant women received nutrition advice before pregnancy); - difficulties in trying to reach newly-married couples because some of them work outside the estates and are unavailable during the day - lack of suitable settings to discuss sensitive matters such contraceptive use; unmarried women are not targeted - absence of estate-level nutrition-related data on pre-pregnant women; PHMs report time constraint to effectively deliver services

Interventions/Activities	Sector	Target group	Gap in system/coverage
Dietary and micronutrient programs	MoH	Pregnant women and children	- coverage can be improved; about 25% didn't register their pregnancy between 8-12 weeks
The Poshana Malla Program	MoED	All pregnant women	- not received regularly
Thriposha food supplementation	MoH	All pregnant and lactating mothers and undernourished children between the ages of six months and five years of age (In the Estate Sector, all children attending CDC/ Creche are provided Thriposha)	- sub-optimal practice (e.g. less than a third of children 6-23 months old get the Minimum Acceptable Diet); a lack of knowledge about the consequences of stunting
Promoting Infant and Young Child Feeding (IYCF) activities	MoH	Infants and young children	- sub-optimal practice (e.g. less than a third of children 6-23 months old get the Minimum Acceptable Diet); a lack of knowledge about the consequences of stunting
The Baby Friendly Hospital Initiative (BFHI)	MoH	All specialist hospitals	- absence of data to evaluate quality
The Glass of Milk Program	MoE	Children 2-5 years attending preschools and students in grades 1-5, if school doesn't have Mid-day Meal Program	
Classroom health and nutrition education	MoE	Students from grade 1-11 (in the school curriculum of different courses)	- needs to be evaluated and updated with practical approaches - communication material should be made available in Tamil language
Improving water and sanitation in schools under the SHPP package	MoE	School children	- poor water and sanitation facilities (lack tap water connections and enough latrines or adequate number of latrines)
The Divineguma/Samurdhi safety net program (cash transfer)		Pregnant and lactating women of low-income families	- poorly targeted (excluding deserving families)
Home gardening promotion under the National Agricultural Policy	MoA		- only few received training - seeds provided to some didn't germinate - cultivation and consumption is rare
School Garden Programs under the SHPP	MoE	School children	
Promoting the production and consumption of milk, eggs, and meat	MoL		- need to link with the Glass of Milk program to enable distribution at a reasonable cost

Note: MoA = Ministry of Agriculture; MoE = Ministry of Education;
MoED = Ministry of Economic Development; MoH = Ministry of Health; MoL = Ministry of Livestock

Nutrition-Sensitive Interventions



5.4 Nutrition-Sensitive Interventions and Gaps

33. Several nutrition-sensitive programs are carried out by non-health ministries with the support of NGOs and civil-based organizations. These include nutrition education at schools, improved care at CDCs, provision of safe drinking water and sanitation, social safety nets, home and school gardens, livestock development and dairy use.

5.4.1 Education and Early Childhood Development

34. Classroom health and nutrition education is included in the national school curriculum. It is taught under 'Environment Studies' in grades 1-5, under 'Health and Physical Education' in grades 6-9, and under varying subjects in grades 10 and 11. Classroom nutrition education is aimed at promoting healthy eating habits and physical education, using safe drinking water and proper sanitation, creating a healthy school environment, and empowering students to monitor their BMI and to change behavior as necessary.

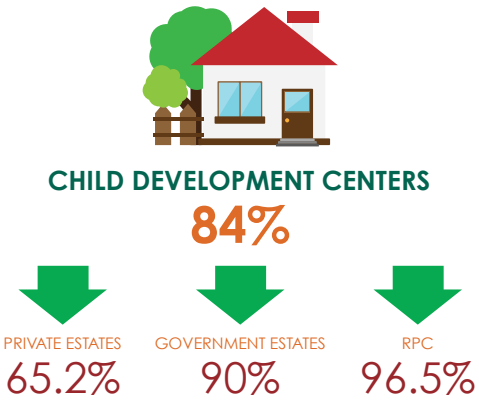
35. The key informant interviews indicated that nutrition education in schools needed to be evaluated and the curriculum needed revision, including practical approaches, such as how to measure BMI and what actions are necessary for underweight or obese children. Communication material for students, parents, and teachers should be made available in the Tamil language.

36. Consultations are in progress to include 'Food and Nutrition' as a subject in the basic curriculum of the College of Education and the in-service teacher education programs of the Teacher Training College. Plantation sector schools could potentially benefit from this national strategy.

37. Since most children of working estate mothers are cared for at the estate–run CDCs/crèche, and in almost half the cases, fed at the CDC, nutrition status is also a possible reflection of inadequate feeding and care at these centers. For working mothers, the availability of CDCs in the estates is crucial as it allows easy access for breastfeeding. Table 5.4 shows CDCs are available in 83.6 percent of the estates, but there are far fewer CDCs in the private estates (65.2%) compared to government (90%) and RPC estates (96.5%).[42]

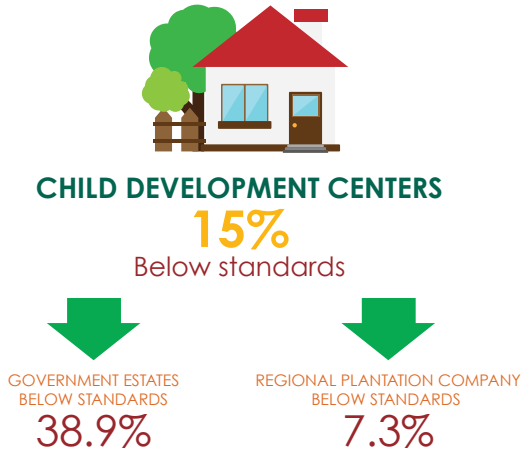
42. In the RPC estates where working mothers—especially those involved in tea plucking—work close to the CDC, exclusive breastfeeding rate (79.6) is higher compared to private estates (74%) and government estates (63%).

Availability of Facilities



38. The quality of facility such as cleanliness and availability of amenities is equally crucial.[43] More than 15 percent of the crèches were found to be either 'not clean' or 'extremely not clean' (Table 5.4). There were substantial differences by estate types, with the government estates being the most unclean (38.9%) and the RPC estates being the least unclean (7.3%). This difference is also visible in toilet availability. Less than a third (30%) of the crèches either did not have any toilet or lacked a proper toilet. RPC estates were comparatively better, corroborating the fact that they had upgraded most of the CDCs.[44]

Cleanliness of Facilities



43. Cleanliness was measured on a scale (very clean, somewhat clean, not clean and extremely unclean) based on the observers' judgment of the following aspects: presence of smells and garbage, upswept floors, ventilation, and the cleanliness of utensils used for feeding.

44. Water sealed toilet availability in RPC, private and government estate CDCs was 79.3 percent, 64.3 percent and 38.9 percent respectively. The rest did not have toilet or had no 'proper toilet'.

Table 5.4
Availability and Sanitary Facilities in Estates (Percent)

	RPC estates (n=82)	Private estates (n=42)	Government estates (n=18)	All estates (n=142)
Crèche available in estate*	96.5	65.2	90.0	83.6
Crèche not clean/extremely unclean	7.3	21.4	38.9	15.5
No proper toilet/no toilet in Crèche	20.7	35.7	61.2	30.3

39. The CDCs were often found to be crowded and the ratio of children to caregivers was high. In the clusters studied, the CDCs in the RPC estates had, on average, 26 children per trained staff member: a child development officer (CDO) and one non-trained staff member. In private estates, this was lower—on average, 15 children per CDO trained in child care and early childhood development and one non-trained staff. The corresponding figure for government estates was 21. The ideal ratio of staff to children to maintain good child care practices may need further analysis.

5.4.2 Water and Sanitation

40. Providing safe drinking water and sanitation in schools is included in the School Health Promotion Program package facilitated by the MoE, and is promoted as a supportive service to increase the nutrition status of children. Under this program, an annual school sanitation survey is carried out in all schools. However, the study visit to the schools revealed that water and sanitation facilities in the estate sector was poor. Most schools lacked tap water connections and had very few latrines.

41. Although 90 percent of the entire estate sector population had access to improved water sources, the quality of water at different sources varied. Water is usually supplied through a common “stand post” installed close to the housing units, allowing some houses to get temporary connections. Some estates have built water storage tanks and the water is pumped into it from a close-by spring. Ideally, estate authorities make efforts to protect the spring from contamination. The water that is collected in the tank is purified based on the instructions of the Public Health Inspector (PHI).[45] The main responsibility of the PHI is to supervise and disinfect the water supply and carry out bacteriological analysis of the water supply. Sixty percent of estates reported regular PHI visits, with RPC estates reporting the highest proportion of regular visits (74%) and government estates reporting the lowest (35%).

42. More than 92 percent of the estate sector water supplies at source were contaminated with E. coli.[46] (Table 5.5). Only five percent of the water samples at household level and crèches were clear of E. coli. The focus group discussions revealed that some houses got water directly from springs, bypassing the stock tank that is supposed to supply purified water because of frequent disruptions to the water supply. Respondents reported that sometimes even the water that was taken from the stock tank was discolored, especially when there were water shortages. A significant majority of households reported that they drank cooled boiled water.

45. The estate management is responsible for this water supply and samples are tested.
46. Figures by estate type are provided on annex Table A6.

Water and Sanitation

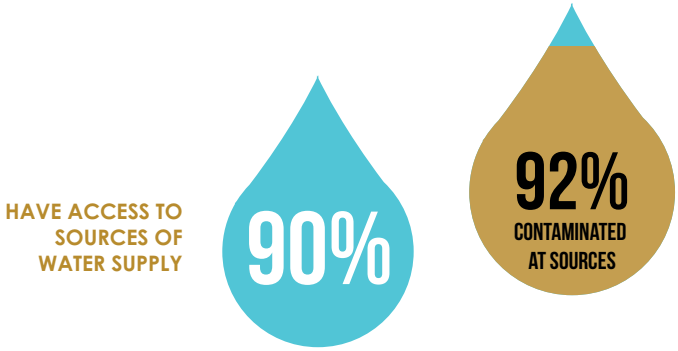


Table 5.5
Water Quality Assessment

	Main source water sample (n=143)	Household water sample (n=161)	Crèche water sample (n=138)
E.coli count, median [range]	25 [0, 200]	25 [0, 200]	25 [0, 80]
No (%) without E.coli	11 (7.7%)	8 (5%)	7 (5.1%)
Presumptive coliforms median [range]	95 [0, 550]	110 [0, 550]	110 [0, 550]
No. (%) with coliforms count <10	10 (7.0%)	6 (3.7%)	6 (4.3%)

* The goal was to collect three samples from the main water source, one household, and the crèche from each of the 170 clusters. Water samples were not available for some clusters due to practical/ logistic reasons.

5.4.3 Social Protection

43. The safety net program Divineguma, which was formerly called Samurdhi, is the country's main comprehensive cash-transfer program to alleviate chronic poverty. The prime objectives of the program include empowering household economies and ensuring nutrition security, especially of pregnant and lactating women of low-income families. Interviews with some field-level officers indicated that the Divineguma program was poorly targeted—many deserving families did not receive the benefits. At the focus group discussions, estate workers explained that officers rarely visited the estates and, as a result, households that could easily meet the criteria rarely received the program benefits. Although the program distributed cows, goats, chicks, and pigs to some estates, the focus groups indicated that this was not done in an organized manner.

5.4.4 Agriculture

44. The National Agriculture Policy promotes home gardening to supplement household nutrition and income and to promote female participation in ensuring healthy nutrition in the family. However, only a few of the privately owned and government estate workers have received training in home gardening. As discussed in the previous chapter, only a quarter of estate households are cultivating home gardens and fewer (18.3%) of them consumed the produce. Discussions with estate workers revealed that men were not interested in gardening, and working women either had no time for home gardening or were unaware of the nutritious value of foods.

45. School Garden Programs are included in the School Health Promotion Program implemented by the Ministry of Education. The main objective of this program is to enhance the nutrition status of school children, their families, and the community by introducing the concept of consuming low cost, nutritious, chemical free, fresh garden produce, and creating a model school garden. Children are provided with knowledge and skills to create their own garden plots at school or at home to meet their daily food requirement and are increasingly getting involved.[47] Principals, teachers, and students are the stakeholders in this program. Government ministries support the program by providing plants, seeds, organic fertilizers, and garden tools.

46. The Ministry of Livestock supports the national nutrition strategy by promoting the production and consumption of milk, eggs, and meat, and providing coolers in three-wheeler vehicles to dairy farmers and collectors to transport perishable products. The discussion with key informants underscored the need to link 'The Glass of Milk' program to the Ministry of Livestock in order to enable distribution at a reasonable cost. The ministry is also promoting the consumption of rice-based products among vulnerable populations and implementing household cash management programs in the estate sector.

47. To conclude, while there are several nutrition-specific and nutrition-sensitive programs, certain gaps in program implementation were identified and are described below:

    i) Uneven targeting/coverage: some programs did not cover the entire targeted population, were ill-targeted or benefits were provided on an irregular basis (supply disruption). For example, children in some estate schools did not get the Mid-day Meal; pregnant women in the estates were not included in the Poshana Malla Program; mothers received Thriposha on an irregular basis; and some deserving pregnant and lactating women were excluded from receiving Samurdhi. There is a need to prioritize and target programs, so that beneficiaries receive the full package of essential interventions.

    ii) Implementation impediments to MoH's pre-pregnancy health and nutrition package include: difficulties in trying to reach newly married couples because some of them work outside the estates and are unavailable during the day; lack of suitable settings to discuss sensitive matters such as contraceptive use and the absence of estate-level nutrition-related data on pre-pregnant women.

47. Children are taught to prepare organic fertilizer using refuse from school and home.

iii) Ineffective communication: Information handouts may not be the best means of communicating health and nutrition messages to the estate population as some residents are illiterate and others are reluctant to read messages due to time constraints. In addition, nutrition-related education materials in schools (for students, parents and teachers) was not available in the Tamil language, and lacked practical suggestions on how to circumvent undernutrition.

iv) Inadequate monitoring mechanisms: the School Medical Inspection (SMI) data from the RDHS areas is not presented separately in the FHB data. As a result, the nutrition status of school children and the outcomes of those detected with poor indicators is not known.

v) Lack of coordination among the MoH's different nutrition programs and among other ministries with different nutrition-sensitive programs.

CHAPTER 6

RECOMMENDATIONS

1. Undernutrition in the estate population is high and requires strategic action. Except for stunting that has declined by 5.8 percentage points since the 2006-07 DHS, both wasting and underweight show an increasing trend (by 2.5 and 5.8 percentage points respectively). Moreover, the estate sector still lags behind the rest of the country; the stunting rate, at 36 percent, is almost three times the national average. The prevalence of underweight (36%) and wasting (16%) in the estate sector constitutes a serious public health emergency, according to the WHO classification. In addition, the persisting prevalence of anemia both amongst children and pregnant women, and a 27.8 percent prevalence of low birthweight points to the need for concerted action to adopt a life-cycle approach to improve and maintain the nutrition status of adolescent girls, newly-married women, pregnant women, and infants and young children.

2. Achieving strides in improving nutrition outcomes would require investments in nutrition-specific and nutrition-sensitive interventions. The GoSL is already committed to focusing on the first 1,000 days (between conception and a child's 2nd birthday) of maximum vulnerability. A window of opportunity, this is the most critical period in which to make a positive impact on a child's cognitive and physical development. While there is a multitude of both nutrition-specific and nutrition-sensitive programs being implemented in the country, this report identifies specific gaps in service delivery in the estates. The report also identifies the potential to substantially increase efficiencies by improving coordination and joint implementation of different programs. Finally, improved monitoring and reporting mechanisms could help inform evidence-based policy.

3. The report's recommendations are outlined below. While several of these recommendations would need stewardship from the center, the RDHS which is mandated (with the PHDT for RPC estates) to prepare annual district nutrition action plans, could include estate-specific interventions, including regular monitoring and feedback mechanisms.

Design an estate-specific BCC strategy and ensure it is an integral part of every nutrition intervention.

4. The study findings and analysis indicate high levels of undernutrition amongst all income quintiles; significant gaps in knowledge and infant and child feeding and caring practices among the estate sector population. It is therefore recommended that the MoH, in consultation with relevant stakeholders, design and implement an estate sector-specific, multipronged comprehensive BCC strategy as an integral part of all nutrition interventions/programs. This strategy should also be informed by formative research including traditional beliefs and practices affecting nutrition status, and target mothers as well as other child care providers (such as caregivers at CDCs), the community, and policymakers. It could start with a limited number of user-centric, short-term knowledge/behavior changes through multiple channels and then phase into medium/long-term system changes. These could include: (i) the importance of introducing complementary feeding at six months of age, and appropriate foods; (ii) more Tamil-based communication material, and material that would be appropriate for the illiterate population; (iii) hygiene promotion activities such as hand-washing with soap for all household members before preparation of food, feeding of the infant/young child, and after use of the toilet; while continuing to encourage and maintain the household habit of boiling water for consumption; (iv) encouragement to mothers (while understanding constraints) of utilizing the full maternity leave; and (v) awareness of the impact of stunting in children.

Institutionalize capacity building of frontline nutrition workers.

5. This could be undertaken by both MoH and other relevant ministries as appropriate. Specific actions could include: (i) strengthen the capacity of front line workers (e.g., PHMs) to promote good nutrition during the pre-pregnancy phase and for children; and prevent, identify, and manage malnutrition among adolescents, pregnant women and children. (ii) Review whether the number of frontline workers, including at the CDCs, are sufficient to deal with the population and workload, and develop a human resource strategy in case increased workforce is required; and (iii) under the direction of the Ministry of Agriculture, strengthen the capacity of agricultural extension workers serving the estate population to enable them to facilitate and integrate nutrition promotion messages in to activities to improve household food security and child dietary diversity.

Employ a set of complementary and innovative platforms to target better and reach the underserved.

6. The study findings indicate that low birthweight (LBW) significantly and substantially increased the chances of the child being stunted, wasted or underweight. In addition, children of short-stature mothers had a higher probability of being stunted and underweight. This suggests that addressing child malnutrition requires a greater focus on ensuring the health and nutrition of girls/women both before and during pregnancy. However, there were gaps in the reach to this group, particularly for working women and adolescent girls. The MoH and relevant stakeholders should consider exploring, developing and testing new complementary models of nutrition service delivery that reaches (i) working women who are not available at home during visits by the frontline workers, and (ii) adolescent girls, particularly for teenage pregnancies, which which are likely to be reported late.

Improve the effectiveness and efficiency of existing programs.

7. While the GoSL has made efforts to improve the nutrition status of the population by implementing various programs in multiple sectors, these programs have not always been effective and efficient due to various reasons, some of which are described in Chapter 5. The GoSL, with relevant stakeholders, could focus on addressing the supply- and demand-side bottlenecks to make these programs fully functional. This could include:

   i) increasing the coverage of Thriposha supplementation to children and pregnant women in the estates by identifying causes of its supply disruption;

   ii) exploring the possibility of changing the packaging of the food supplementation into small single-serve “doses” so that families would treat it more like medicine. This will also reduce the chance they will share it with other family members;

   iii) reviewing the existing guidelines for CDCs, and establishing, if required, Standard Operating Procedures for optimal child feeding and child care practices;

   iv) strengthening monitoring and evaluation practices for school-based interventions, including relevant classroom curriculum and school garden programs;

   v) assessing and planning for improved water and sanitation facilities at schools and CDCs;

vi) the Ministry of Agriculture could take the lead to re-orient their approach to food security beyond the focus on the staple diet (rice and wheat flour) by initiating and/ or scaling up programs that focus on the production and consumption of livestock, fruits and vegetables, poultry and poultry products, especially by infants and young children;

vii) working with the MoE, the National Nutrition Steering Committee could submit appropriate recommendations to include in the Basic Teacher Curriculum which is due to be revised in 2017, focusing on the importance and means to improve undernutrition; and

viii) better targeting of Divineguma, the safety net program, particularly for low-income households in the estates.

Strengthen leadership, coordination and performance monitoring for stronger accountability.

8. The 2011 Multi-sector Action Plan for Nutrition is the guiding instrument to implement nutrition interventions across 17 ministries. The GoSL could consolidate and strengthen the estate multisectoral coordination mechanisms comprising of key stakeholders (PHDT, MoH, Ministry of Agriculture, Ministry of Plantation and Infrastructure, Ministry of Education, Development Partners) at the provincial, district, and divisional levels, and make them accountable for results at each level. This could be done at either the central or the regional level, as planning and targeting estates in each district would ensure better implementation and monitoring. Although strong awareness exists among stakeholders that effective coordination is necessary at the district and divisional levels, currently, different stakeholders work independently of each other. Further discussions and consensus would be required as to who would be best placed to lead this coordination effort. To facilitate this effort, there needs to be an improvement and institutionalization of the estate sector maternal and child nutrition reporting systems to generate and collect timely data for better nutrition program monitoring. This should include a mechanism for sharing data and analysis across sectors.

REFERENCES

Abeykoon, A.T.P.L, Rannan-Eliya, R.P., Wickremasinghe, R., Thowfeek, R., Anuranga, C. and Siriwardena (2014). Study on the Establishment of Maternity protection Insurance in Sri Lanka. IHP.

Abu-Saad, K. and Fraser, D. (2010) Maternal nutrition and birth outcomes. Epidemiologic Reviews. 32 (1): 5-25. doi: 10.1093/epirev/mxq001

Anthropological survey of nutrition determinants in Sri Lanka (2007).

Auranga, C., R. Wickramasinghe, R.P. Rannan-Eliya, S.M.M. Hossain, and A.T.P.L Abeykoon. (2012). Trends, inequalities and determinants of low birthweight in Sri Lanka. Cey Med J., 57: 2

Black, Robert E., Alderman, H., Bhutta, Z.A., and Gillespie, S. et al. (2013). Executive Summary of The Lancet Maternal and Child Nutrition Series Maternal and Child Nutrition Study Group. Lancet.

Black, R.E., C.G. Victora, S.P. Walker, Z.A. Bhutta, P. Christian, M. de Onis, et al. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. Maternal and Child Nutrition Study Group Lancet 382 (9890): 427–51, doi: 10.1016/S0140-6736(13)60937-X.

Bloom, D.E., Cafiero, E.T., Jané-Llopis, E., Abrahams-Gessel, S., Bloom, L.R., Fathima, S., Feigl, A.B., Gaziano, T., Mowafi, M., Pandya, A., Prettner, K., Rosenberg, L., Seligman, B., Stein, A.Z., & Weinstein, C. (2011). The Global Economic Burden of Non-Communicable Diseases. Geneva: World Economic Forum.

Brown, J., K. Berdan, R. Splett, M. Robinson, and L. Harris. (1980). Prenatal weight gains related to the birth of healthy-sized infants in low-income women. Journal of the American Dieticians' Association 7: 662–667.

Casanovas, M.C., C.K. Lutter, N. Mangasaryan et al. (2013). Multi-sectoral interventions for healthy growth. Maternal and Child Nutrition 9 (Suppl. 2): 46–57.

Case, A. and C. Paxson. (2008). Stature and status: height, ability, and labor market outcomes. Journal of Political Economy 116: 499–532.

Colagiuri S, Lee CMY, Colagiuri R, Magliano D, Shaw JE, Zimmet PZ, Caterson ID. (2010). The cost of overweight and obesity in Australia. Medical Journal of Australia, 192: 260–64

de Lanerolle-Dias, M. et al., (2012). Micronutrient status of female adolescent school dropouts. Ceylon Medical Journal. 57(2), pp.74–78. DOI: http://doi.org/10.4038/cmj.v57i2.4460

Department of Census and Statistics. (2009). Sri Lanka Demographic and Health Survey 2006–07. Colombo, Sri Lanka.

Department of Census and Statistics. (2012). Sri Lanka Household and Expenditure Survey 2012.

Department of Census and Statistics. (2012). Census 2012 report

De Silva, I. (2009). Micro level determinants of poverty reduction in Sri Lanka: Multivariate approach. International Journal of Social Economics 35 (3): 140–158. http://dx.doi.org/10.1108/03068290810847833.

Dileni, G. (2004). Poverty measurement: meanings, methods and requirements. Colombo: Centre for Poverty Analysis.

Dobbs R, Sawers C, Thompson F, Manyika J, Woetzel J, Child P, Mckena S, Spatharou A. (2014). Overcoming obesity: An initial economic analysis. London: Mckinsey Global Institute.

Espo, M., T. Kulmala, K. Maleta, T. Cullinan, M.L. Salin, and P. Ashorn. (2002). Determinants of linear growth and predictors of severe stunting during infancy in rural Malawi. Acta Paediatr 91 (1): 364–1,370.

Family Health Bureau, Ministry of Health. (2013). Annual Report.

Family Health Bureau, Ministry of Health. (2010). National Maternal and Child Health Policy.

FAO (2014). The State of Food Insecurity in the World.

Finkelstein, EA, Trogdon, JG, Cohen, JW, and Dietz, W. 2009. Annual medical spending attributable to obesity: Payer- and service-specific estimates. Health Affairs 28(5)

Frost, M. B. Forste, R., and Haas, D.W. (2005). Maternal education and child nutritional status in Bolivia: finding the links. Social Science and Medicine 60: 395–407.

Haddad, L., and H.E. Bouis. (1989). The impact of nutritional status on agricultural productivity: wage evidence from the Philippines. Warwick, United Kingdom of Great Britain and Northern Ireland: Development of Economics Research Centre. Papers, No.97.

HK International. (2002). How to assess iron deficiency anaemia and use the hemocue.

Hoddinott, J., H. Alderman, J.R. Behrman, L. Haddad and S. Horton. (2013). The economic rationale for investing in stunting reduction. Maternal and Child Nutrition 9 (Suppl. 2): 69–82.

Hoddinott, J., J.A. Maluccio, J.R. Behrman, R. Flores, and R. Martorell. (2008). Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults. Lancet 371: 411–16. doi:10.1016/S0140- 6736(08)60205-6.

Lundborg P., P. Nystedt, and D. Rooth D. (2009). The height premium in earnings: the role of physical capacity and cognitive and non-cognitive skills. IDA Discussion Paper 4, 266 IZA. Bonn, Germany.

Lutter C.K., L. Iannotti, H. Creed-Kanashiro, A. Guyon, B. Daelmans, Robert R. et al. (2013). Key principles to Improve programmes and interventions in complementary feeding. Maternal and Child Nutrition 9 (Suppl. 2): 101–115.

Marquis, G.S., J.P. Habicht, C.F. Lanata, R. E. Black, and K.M. Rasmussen. (1997). Breast milk or animal-product foods improve linear growth of Peruvian toddlers consuming marginal diets. The American Journal of Clinical Nutrition 66 (1): 102–09.

Medical Research Institute. Nutrition and Food Security Assessment in Sri Lanka. (2009). Ministry of Health, WFP, UNICEF. Sri Lanka.

Ministry of Education. (2009). Sri Lanka School Health Promotion Program.

Ministry of Education Services. (2014). Report of the Director Health and Nutrition.

Ministry of Health. (2013). National Strategic Plan on Adolescent Health 2013–17.

Ministry of Health. (2012). Adolescent Health Policy.

Ministry of Healthcare and Nutrition (2010). National Nutrition Policy of Sri Lanka

Ministry of Healthcare and Nutrition, Sri Lanka. (2012). Annual Health Bulletin.

Ministry of Healthcare and Nutrition (2014). Infant and Young Children Feeding Strategy. Family Health Bureau Sri Lanka

Muthayya, S. (2009). Maternal nutrition & low birthweight - what is really important? Indian Journal of Medical Research 130 (5): 600-608.

National Micro-Nutrient Survey. (2012).

Piwoz E, Sundberg S, Rooke J (2012): Promoting healthy growth: what are the priorities for research and action? Advances in Nutrition 3: 234 - 241.

Prendergast, A.J., S. Rukobo, B. Chasekwa, K. Mutasa, R. Ntozini, M.N.N. Mbuya et al. (2014). Stunting is characterized by chronic inflammation in Zimbabwean infants. PLoS One. 9 (2): e86928. doi:10.1371/ journal.pone.0086928.

Ruel, R.M., H. Alderman, and the Maternal and Child Nutrition Study Group. (2013). Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? http://dx.doi.org/10.1016/S0140-6736(13)60843-0.

Samaraweera, G. R. (2009). The relationship between poverty and population characteristics in the estate sector of Sri Lanka. Sri Lanka Journal of Humanities and Social Sciences 1 (1): 31–37.

Shekar, M. Somanathan, A. Du, L. (2007). Malnutrition in Sri Lanka: Scale, Scope Causes and Potential Response. Health, Nutrition and Population, Report No. 40906-LK

Stein AD, Wang M, Martorell R, Norris SA, Adair LS, Bas I, et al. (2010). Growth patterns in early childhood and final attained stature: data from five birth cohorts from low- and middle-income countries. American Journal of Human Biology, 22(3): 353–9.

Strauss J. and D. Thomas D. (1996). Wages, schooling and background: investments in men and women in urban Brazil in Opportunity Foregone: Education in Brazil, eds. N. Birdsall and R. Sabot 147–191. The Johns Hopkins University Press for the Inter-American Development Bank: Baltimore, MD.

Thomas, D and Strauss, J. (1997). Health and wages: Evidence on men and women in urban Brazil, Journal of Econometrics, 77 (1), 159-185

UNICEF (1990) Strategy for Improved Nutrition of Children and Women in Developing Countries, Policy Review paper E/ICEF/1990/1.6, UNICEF, New York

UNICEF Sri Lanka. (2011). Nutritional status in Sri Lanka, determinants and interventions: a desk review, 2006–11.

UNICEF (2015). The state of the World Children: Reimagine the future.

UNICEF, and WHO. (2009). Diarrhoea: why children are still dying and what can be done. New York, NY: UNICEF. [Available at] www.unicef.org/media/files/Final_Diarrhoea_Report_October_2009_final.pdf.

Medical Research Institute Sri Lanka. (2009). Nutrition and food security assessment in Sri Lanka. [Available at] http://documents.wfp.org/stellent/groups/public/documents/ena/wfp245807.pdf?iframe

UNDP (2015). Human Development Report 2015: Work for Human Development. [Available at] http://hdr.undp.org/sites/default/files/hdr_2015_statistical_annex.pdf accessed 01st June 2016

Victora, C.G., M. de Onis M., P. C. Hallal, M. Blössner M. and Shrimpton R. (2010). Worldwide timing of growth faltering: revisiting implications for interventions. Pediatrics 125 (3): e473–e480.

Victora, C.G., Adair, L., Fall, C., Hallal, P.C., Martorell, R., Richter, L. and, Sachdev, H.S. (2008). Maternal and child undernutrition: consequences for adult health and human capital. The Lancet 371 (9609): 340-357.

Wamani, H., A. Nordrehaug, S. Peterson, J.K. Tumwine and T. Tylleskär. (2007). Boys are more stunted than girls in Sub-Saharan Africa: a meta-analysis of 16 demographic and health surveys. BMC Pediatrics 7(17). doi:10.1186/1471-2431-7-17.

WHO (1995). Physical Status: The Use and Interpretation of Anthropometry. Geneva: WHO.

WHO. (2001). Iron Deficiency Anaemia. Assessment, Prevention and Control. A guide for programme managers. WHO/NHD/01.3.

WHO. (2009). Acute respiratory infections. [Available at] www.who.int/vaccine_research/diseases/ari/en/.

WHO (2009). Child growth standards and the identification of severe acute malnutrition in infants and children. A Joint Statement by the World Health Organization and the United Nations Children's Fund.

WHO (2010). Coordinated approach to prevention and control of acute diarrhoea and respiratory infections.

WHO (2010). Nutrition Landscape Information System: Country Profile Indicators Information Guide. [Available at] http://www.who.int/nutrition/nlis_interpretation_guide.pdf

WHO SEARO (2010). [Available at] www.searo.who.int/LinkFiles/RC_63_a-11-SEA-RC63-10.pdf.

WHO. (2012). Comprehensive implementation plan on maternal, infant and young child nutrition.

WHO. (2012). Proposed Global Targets for Maternal, Infant and Young Child Nutrition. [Available at] http://www.who.int/nutrition/events/2012_proposed_globaltargets_summary_mainissuesandresponses.pdf.

World Bank. (2006). Repositioning Nutrition as Central to Development–A Strategy for Large-Scale Action. Washington, DC: World Bank.

World Bank (2007). Malnutrition in Sri Lanka: Scale, Scope, Causes and Potential Responses. Report No. 40906-LK. Washington, DC: World Bank

World Bank (2015). A Systematic Country Diagnostic. Sri Lanka. Report Number 103246. Washington, DC: World Bank

Zere, E. and D. McInyre. (2003). Inequities in under-five child malnutrition in South Africa. International Journal for Equity in Health 2 (7).

ANNEX

Table A1
Nutritional Status by Estate Type

	RPC	Private	Government	All estates
Stunting	36.7	35.2	37.5	36.4
Sample size	1673	1247	374	3294
Wasting	16.2	15.1	14.2	16
Sample size	1673	1247	374	3294
Underweight	36.6	34	32.4	35.9
Sample size	1673	1247	374	3294
Anemia children 6-23	54.1	53.1	38.7	53.1
Sample size	776	518	173	1467
Anemia 24-59	31.4	30.4	15.1	30.4
Sample size	704	573	160	1437
Severe Low Birthweight				
<1500 g (%)	1.2	0.9	1.2	1.1
Moderate Low Birthweight 1500-1999 g (%)	3.6	4.8	2.8	3.7
Mild Low Birthweight				
2000-2499 g (%)	23.4	20.2	18.1	22.6
Low Birthweight				
<2500 (%)	28.6	26.1	22.9	27.8
Mean Birthweight (SD)	2.678	2.717	2.744	2.688
	(0.433)	(0.452)	(0.438)	(0.437)
Sample size	1758	1292	395	3445

Table A2
Nutritional Status by Estate Type

	RPC	Private	Government	All estates
Grains, roots and tubers	98.8	98.0	98.2	98.6
Legumes and nuts	60.3	67.5	69.4	62.1
Dairy products	41.4	42.6	40.4	41.6
Flesh food	56.0	55.2	53.8	55.7
Eggs	42.4	38.7	40.5	41.6
Vit A rich fruits and vegetables	62.8	57.1	57.7	61.5
Other fruits and vegetables	50.6	60.1	63.2	53.0
Iron-rich food*	74.2	66.5	67.1	72.4
Usually given foods of animal source (fish, meat, egg)	95.5	96.5	98.3	96.6

Note: Except the last row, figures are based on reports about feeding on the previous day. Iron-rich food comprising one of these: dark green leafy vegetables, organ meats (liver, kidney, heart, others), fish, seafood or any meat.

Table A3
Maternal Knowledge Regarding Foods and Their Main Nutrient Component

	RPC	Private	Government	All estates
Ability to identify a single food item rich in:				
Energy	76.3	77.4	75.8	76.5
Protein	83.1	83.9	82.4	83.2
Iron	82.5	81.6	84.6	82.5
Calcium	67.3	70.4	77.5	68.4
Source of knowledge for food choices *				
Family	56.3	53.6	61.1	56.1
PHM	84.1	82.4	70.4	83.1
Health worker	11.7	7.4	3.3	10.5
Doctor	30.6	18.8	22.4	28.1
EMA	13.9	6.7	9.6	12.4
Media	14.0	11.3	6.1	13.1
Other	1.0	1.1	0.5	1.0
Sample size of mothers	1781	1305	403	3,489

Note: * Multiple responses allowed for source of knowledge for food choices; Sample is on mothers of children less than 5 years of age

Table A4
Institutional Delivery and Advice on Child Growth (% of Children Under 5 Years)

	RPC	Private	Government	All estates
Place of birth				
Govt. hospital	99.3	98.4	98.4	99.1
Estate hospital/maternity home	0.6	0.6	1.2	0.6
At home	0.6	0.8	0.3	0.3
On the way to hospital	0	0.1	0	0
Growth monitoring and advice				
Having CHDR	98.3	97.9	95.9	98.1
Mother was informed that child had adequate weight gain by health worker	64.6	65	65.6	64.7
Special advise given due to child's poor weight gain by a health worker	28.9	27.2	25.8	28.4
Type of health worker who advised mother*				
Doctor	41.4	22.6	30	37.7
Estate Medical Assistant	31.8	10.5	12.9	27.3
Nurse	14.9	8.3	6	13.4
Public health Midwife	63.8	81.9	82.6	67.7
Health volunteer	0.6	0.8	3.6	0.8
Other	0.6	0.2	0	0.5
Type of advice for poor weight gain in child				
Add oil, butter or margarine to food	41.6	54.6	42	43.7
Feeding during illness	27.7	26.8	32.3	27.8
Increasing variety of food	55.3	56.9	59.2	55.7
Increasing quantity of food	61	63.7	72	62
Increasing supplementary food	48.1	48.6	40.6	47.8
Meet Pediatrician/doctor in hospital	19.4	17.7	26.1	19.5
Other	1	2.2	3.5	1.3
Sample size	1,781	1,305	403	3,489

Table A5
Health and Nutrition Services for Children (Percentage of Children)

	RPC	Private	Government	All estates
Worm treatment received during past 6 months	49.6	52.3	50.2	50.0
Thriposha received during past 6 months				
(Among underweight children)	70.2	88.2	75.6	73.5
Vitamin A received during past 6 months	31	43.6	36.9	33.6

Table A6
Water Quality at Different Sources by Estate Type

	RPC	Private	Government	All estates
Main water source				
Sample size	N=78	N=17	N=48	N=143
E.coli count, median [range]	25 [0,200]	35 [0, 80]	25 [0, 200]	25 [0, 200]
No (%) without E.coli	4 (5.1%)	2 (11.8%)	5 (10.4%)	11 (7.7%)
Presumptive coliforms median [range]	80 [2, 550]	170 [0, 550]	110 [0, 550]	95 [0, 550]
No (%) with coliforms count <10	2 (2.6%)	2 (11.8%)	6 (12.5%)	10 (7.0%)
Household source				
Sample size	80	19	62	161
E.coli count, median [range]	25 [0, 95]	35 [13, 80]	20 [0, 200]	25 [0, 200]
No (%) without E.coli	4 (5%)	0 (0%)	4 (6.5%)	8 (5%)
Presumptive coliforms median [range]	80 [2, 550]	130 [25, 550]	88 [0, 550]	110 [0, 550]
No (%) with coliforms count <10	3 (3.8%)	0 (0%)	3 (4.8%)	6 (3.7%)
Crèche source				
Sample size	77	17	44	138
E.coli count, median [range]	24 [0, 80]	27 [13, 80]	20 [0, 80]	25 [0, 80]
No (%) without E.coli	3 (3.9%)	0 (0%)	4 (9.1%)	7 (5.1%)
Presumptive coliforms median [range]	80 [0, 550]	130 [25, 550]	110 [0, 550]	110 [0, 550]
No (%) with coliforms count <10	2 (2.6%)	0 (0%)	4 (9.1%)	6 (4.3%)

* 3 samples (the main water source, one household, and the Crèche) were collected from each cluster (number of clusters in RPC (85), government (20) and private estates (65)). Water samples were not available for some clusters due to logistical constraints.
Reference: Sri Lanka Standards

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