

*World Bank/UNICEF*

# **Situational Analysis**

**Improving economic outcomes by expanding  
nutrition programming in the Kyrgyz Republic.**

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## *Foreword*

Undernutrition is a major public health problem in Kyrgyzstan, causing preventable deaths of mothers and children and delaying the physical and cognitive development of girls and boys, sometimes beyond repair. Despite improvements since the 1990s, 22 per cent of all deaths of under-fives in the country are still caused by undernutrition. In 2006, some 14 percent of children in the age group were stunted, with stunting rates in three provinces of over 20 per cent.

The burden of undernutrition on Kyrgyzstan is also substantial in economic terms: estimated to be US\$32 million annually. Deaths in the labor force from undernutrition cost the country nearly US\$5 million a year; while productivity lost to stunting and iodine deficiency loses nearly six times more to the economy. Iodine deficiency is a key concern, accounting for almost half of the workforce's lost productivity.

However, this report shows that at least US\$6.25 million of the country's economic losses from undernutrition can be prevented by improving nutrition through a combination of behavioral changes and strengthening and scaling up of existing programs. The effects of stunting can be treated and even reversed in children under five.

The World Bank and UNICEF are both striving to raise the global profile of nutritional issues. The World Bank helped forge the global consensus on the Scaling Up Nutrition Framework. Meanwhile, UNICEF is focusing on nutrition in its Medium Term Strategic Plan (2006-2013), which includes efforts to improve young child survival and development by scaling up high-impact, cost-effective nutrition interventions which reduce neonatal and young child deaths.

In short, direct nutrition interventions are that rare prize in development: a high-return, low-cost investment. Delivery systems have been tested and have proved their impact in the field. They are now ready to be scaled up nationally: all that is required from here on is political and financial will.

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## *List of Acronyms*

<b>ACER</b>	Average cost effectiveness ratio
<b>ADB</b>	Asian Development Bank
<b>ANC</b>	Antenatal care
<b>ARI</b>	Acute respiratory infection
<b>BF</b>	Breastfeeding
<b>BMI</b>	Body mass index
<b>CCTs</b>	Conditional cash transfers
<b>CDC</b>	U.S. Centers for Disease Control and Prevention
<b>CEE/CIS</b>	Central and Eastern Europe/Commonwealth of Independent States
<b>CI</b>	Confidence interval
<b>DALY</b>	Disability-adjusted life year
<b>DCPP</b>	Disease Control Priorities Project
<b>DD</b>	Diarrheal disease
<b>DfID</b>	Department for International Development, UK
<b>DHS</b>	Demographic and Health Survey
<b>EBF</b>	Exclusive breastfeeding
<b>ECA</b>	Europe and Central Asia
<b>ECD</b>	Early childhood development
<b>FAO</b>	Food and Agricultural Organization
<b>GAIN</b>	Global Alliance for Improved Nutrition
<b>GBD</b>	Global Burden of Disease (WHO)
<b>GDP</b>	Gross domestic product
<b>GMI</b>	Guaranteed minimum income
<b>GNI</b>	Gross national income
<b>HAZ</b>	Height-for-Age Z Score
<b>HH</b>	Household
<b>IDD</b>	Iodine deficiency disorders
<b>IFA</b>	Iron folic acid
<b>IMMPaCT</b>	International Micronutrient Malnutrition Prevention and Control
<b>IPT/ITN</b>	Intermittent preventive treatment/insecticide treated nets
<b>IUGR</b>	Intrauterine growth retardation
<b>IYCF</b>	Infant and young child feeding
<b>KIHS</b>	Kyrgyz integrated household survey
<b>LBW</b>	Low birth weight

<b>LDF</b>	Lifetime discounting factor
<b>MCH</b>	Maternal and child health
<b>MDG</b>	Millennium Development Goal
<b>MICS</b>	Multiple Indicator Cluster Survey
<b>MMN</b>	Multiple micronutrient
<b>MMR</b>	Maternal mortality rate
<b>MN</b>	Malnutrition
<b>MNP</b>	Micronutrient powders
<b>MoH</b>	Ministry of Health
<b>MSB</b>	Monthly Social Benefit
<b>NGO</b>	Nongovernmental Organization
<b>NIP</b>	National Investment Plan (Uzbekistan)
<b>NPV</b>	Net present value
<b>OFDA</b>	Office of U.S. Foreign Disaster Assistance
<b>OR</b>	Odds ratio
<b>ORT</b>	Oral rehydration therapy
<b>PAF</b>	Population attributable fraction
<b>PC</b>	Pragmatic coverage
<b>PFA</b>	Programa Familias en Accion - Colombia
<b>PHC</b>	Public health care
<b>PM2A</b>	Preventing Malnutrition in Children Under Two Approach
<b>RCT</b>	Randomized controlled trial
<b>RPF</b>	Red de Proteccion Social - Nicaragua
<b>RR</b>	Relative risk
<b>SAM</b>	Severe acute malnutrition
<b>SES</b>	Department of Sanitary and Epidemiology Services
<b>SRC</b>	Swiss Red Cross
<b>SUN</b>	Scaling Up Nutrition (World Bank framework)
<b>SWAp</b>	Sector-wide approach
<b>TB</b>	Tuberculosis
<b>UC</b>	Universal coverage
<b>UIC</b>	Urinary iodine concentration
<b>UMB</b>	Unified Monthly Benefit
<b>UNICEF</b>	United Nations Children's Fund
<b>USAID</b>	United States Agency for International Development
<b>USDA</b>	United States Department of Agriculture
<b>USI</b>	Universal Salt Iodization

<b>VAD</b>	Vitamin A deficiency
<b>VAS</b>	Vitamin A supplementation
<b>VHC</b>	Village Health Committee
<b>WASH</b>	Water sanitation and hygiene
<b>WAZ</b>	Weight-for-Age Z Score
<b>WB</b>	The World Bank
<b>WFP</b>	World Food Program
<b>WHO</b>	World Health Organization
<b>WHZ</b>	Weight-for-Height Z Score
<b>WMD</b>	Weighted mean difference
<b>YLD</b>	Years lived with disability
<b>YLL</b>	Years of life lost

## *Glossary*

Variable	Definition
<i>Nutrition Indicators</i>	
<b>Stunting (Height for Age)</b> <i>Moderate and Severe</i>	Percentage below minus two standard deviations (moderate) and three standard deviations (severe) from median height for age of reference population
<b>Wasting (Weight for Height)</b> <i>Moderate and Severe</i>	Percentage below minus two standard deviations (moderate) and three standard deviations (severe) from median weight for height of reference population
<b>Underweight</b> <i>Moderate and Severe</i>	Percentage below minus two standard deviations (moderate) and three standard deviations (severe) from median weight for age of reference population
<b>Low Birth Weight (LBW)</b>	Percentage of infants with low birth weight (< 2,500 grams)
<b>Anemia</b>	Percentage of children 6–59 months defined as hemoglobin levels < 11 g/dl
<b>Iodine Deficiency</b>	Percentage of iodine deficiency measured by excretion of urinary iodine (< 100 ug/L in general population, 150 ug/L in pregnant women)
<b>Vitamin A Deficiency (VAD)</b>	Percentage vitamin A deficiency among children—level of serum retinol lower than 0.70 µmol/L
<i>Maternal Risk Factors</i>	
<b>Anemia</b>	For nonpregnant women, defined as hemoglobin levels <11.0 g/dl
<b>Low Body Mass Index (BMI)</b>	BMI of < 18.5 (weight/height <sup>2</sup> )
<b>Vitamin A Deficiency (VAD)</b>	Percentage of lactating women with a level of breast milk retinol lower than 1.05 µmol/L
<b>Exclusive Breastfeeding 0-3 months</b>	Percentage of children who are exclusively breastfed (< 3 months)
<b>Exclusive Breastfeeding 0-5 months</b>	Percentage of children who are exclusively breastfed (< 6 months)
<b>Appropriate Complementary Feeding (6-23 months)</b>	Percentage of children who are being fed in accordance with the WHO recommendations appropriate for their age
<i>Mortality Indicators</i>	
<b>Child Mortality Rate</b>	Probability of dying between birth and exactly five years of age expressed per 1,000 live births
<b>Infant Mortality Rate</b>	Probability of dying between birth and exactly one year of age expressed per 1,000 live births

Variable	Definition
<i>UN Food and Agriculture Organization Definitions</i>	
<b>Undernourishment</b>	The condition of people whose dietary energy consumption is continuously below a minimum dietary energy requirement for maintaining a healthy life and carrying out a light physical activity with an acceptable minimum body weight for attained height
<b>Prevalence of Food Deprivation</b>	The proportion of the population not consuming sufficient food to meet their energy needs
<b>Prevalence of Food Poverty</b>	The proportion of the population below the <i>critical</i> level of income (or proxy total expenditure) that represents the monetary value of the <i>minimum</i> dietary energy requirement of the population provided by a balanced energy-yielding nutrients food basket using energy-yielding nutrient prices of low-income population groups
<b>Food Security</b>	The condition that exists when all people, at all times, have access to sufficient, acceptable, safe, and nutritious food

# *1. Overview*

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## **1.1 Report Rationale and Objective**

The World Bank and The United Nations Children’s Fund (UNICEF) jointly developed this report to calculate the potential human and economic benefits to be gained from increasing nutrition investments in the Kyrgyz Republic. This report provides compelling evidence of the potential to improve health and economic outcomes through scaling up effective nutrition interventions and introducing new proven interventions to reduce the direct causes of undernutrition in order to support the Kyrgyz government’s commitment to the well-being and prosperous future of the Kyrgyz people.

This situational analysis examines and quantifies the scope of undernutrition in the Kyrgyz Republic by presenting: (1) the epidemiology of undernutrition; (2) an estimate of the health consequences of undernutrition in terms of mortality and disability adjusted life years (DALYs), and the economic losses due to lost workforce and productivity; (3) the health, social protection, and agriculture and food intervention systems relevant to delivering interventions for improving nutrition; (4) the current coverage of nutrition interventions; and (5) the potential economic gains achievable by scaling up effective nutrition interventions.

The current context is very favorable for scaling up nutrition interventions in the Kyrgyz Republic. Investing in nutrition has increasingly proven to have excellent development and health returns. The international development community has recognized (1) the need to scale up nutrition interventions; (2) the potential for public-private partnerships; and, (3) a growing consensus around a common framework for action. Reducing undernutrition worldwide is a priority for the World Bank and UNICEF, and also critical to achieving the Millennium Development Goals (MDGs).

The authors acknowledge an imbalance between the detailed analyses undertaken on the direct causes of undernutrition, which were available, and the more superficial analyses of the indirect or underlying causes, such as poverty, agriculture, and education, which were less available. This imbalance results from a lack of epidemiological evidence on the impact of interventions that affect these indirect causes of undernutrition. Such evidence is nonetheless required to analyze the economic benefits of the various interventions, which are essential to prioritize them, and should be the area of focus for future work. Despite the full complement of detailed analyses, the authors strongly advocate for the recommended multisectoral nutrition interventions – supported by best international practice – to begin, and look forward to discussing the feasibility of the available options with national stakeholders in the next phase of this assessment process.

The reader should be mindful of important caveats in interpreting the report’s findings. First, the best available data were used for the analyses presented, but, despite best efforts, some key data are missing and others are out-of-date. Second, while the models used in the epidemiological and economic analyses have been updated since the analysis for this report was prepared, this would not dramatically alter the presented results.

Because of these caveats, the findings, conclusions, and recommendations presented in this report are intended as a basis for discussions with the Kyrgyz Government and local stakeholders on the best way to proceed with investing in nutrition interventions in the immediate next steps. The key findings and recommendations for further policy dialogue are highlighted below.

## 1.2 The Burden of Undernutrition in the Kyrgyz Republic

**Undernutrition in the Kyrgyz Republic remains an important public health challenge, albeit a hidden problem.** Stunting, low birth weight and deficiencies of vitamins and minerals are major barriers to the country achieving its MDGs. In 2006, stunting rates in three Kyrgyz provinces were over 20 percent, and the proportion of low birth weight (LBW) babies was more than 5.3 percent. Further, the persisting high prevalence of anemia continues to increase the risks of perinatal, maternal, and child mortality, as well as impaired cognitive functioning in children. From another perspective, the long-term effects of childhood undernutrition negatively affect the health of adults throughout their life, as well as their potential productivity in the work force and possible economic contribution to the nation.

**Undernutrition claims the lives of more than 1,500 children under five annually in the Kyrgyz Republic.** Despite some improvement in child survival, mortalities attributable to undernutrition are still unacceptably high. Undernutrition constitutes 22 percent of all under-five deaths in the Kyrgyz Republic, approximately 1,547 deaths annually, including neonatal deaths. Stunting and LBW constitute the major share of mortality caused by undernutrition in children, and together, they account for 16 percent of all under-five deaths. Severe and moderate stunting are responsible for about one-half the mortality attributable to undernutrition while LBW is responsible for nearly a quarter.

**Undernutrition accounts for approximately 17 percent of DALYs in children under five in the Kyrgyz Republic.** Some undernutrition conditions adversely affect long-term outcomes without causing death, but cause moderate to severe disability by impairing cognitive and physical activity and/or mental development. Among those, LBW has the biggest share, constituting about 80 percent of total undernutrition-attributable DALYs. The share of LBW-attributable DALYs, relative to all-cause DALYs, in children under five is as high as 13.4 percent out of total undernutrition attributable DALYs of 16.6 percent.

**Undernutrition costs the Kyrgyz Republic US\$32 million annually.** These losses are caused by lost productivity due to increased mortality and reduced cognitive and physical development. Workforce lost to deaths from undernutrition costs the country US\$ 4.45 million a year; productivity lost to stunting and iodine deficiencies costs US\$ 27.9 million; together they amount to approximately US\$ 32 million or 0.7 percent of the Kyrgyz Gross Domestic Product. Iodine deficiency alone accounts for almost half of the workforce's lost productivity. The effects of undernutrition are sometimes invisible and not fully understood over time. Therefore, the burden of undernutrition could be even greater than estimated.

## 1.3 Prioritizing Nutrition Interventions in the Kyrgyz Republic

**About US\$ 6 million could be saved annually with key nutrition interventions.** Improving the population's nutrition through a combination of behavior changes, and strengthening and scaling up of existing nutrition programs will recoup losses and actually improve economic performance. Effects of stunting can be treated and even reversed in children under five. Further, direct nutrition interventions bring very high development returns. Effective, evidence-based interventions addressing the immediate causes of undernutrition are ready for scaling up. The estimated future economic gains in productivity and workforce size, if nutrition intervention packages are scaled up, are US\$ 6.25 million in the Kyrgyz Republic.

**The highest priority interventions will improve infant and young child feeding.** These include early initiation of breastfeeding, exclusive breastfeeding until six months of age, and timely and appropriate complementary feeding, including micronutrient powders, together with breastfeeding from 6 to 24 months of age. Strengthening and scaling up breastfeeding promotion will save lives and help to reduce

stunting as would complementary feeding for babies six months and older. Promoting exclusive breastfeeding for infants under six months is the most efficacious intervention to save lives, averting 9 percent of deaths from stunting-attributable under-five deaths. Kyrgyz women need to be made aware of the benefits of breastfeeding and sound nutrition. Further, children under two should be given multiple micronutrient powders because children require more vitamins and minerals than they can get from eating flour. If all Kyrgyz children were to receive micronutrient powders, childhood anemia could be reduced by approximately 20 percent.

**Supplementing pregnant women with either iron folic acid or multiple micronutrients** is the next highest priority. Pregnant women require daily supplements of vitamins and minerals to meet their substantially increased requirements. In addition to the impressive reductions in perinatal mortality as a result of scaling up these interventions, the reductions in maternal mortality by reducing anemia are substantial.

**Expand salt iodization and flour fortification programs.** Three-quarters of the country's salt is now iodized. Expanding iodization to all salt sold will reduce undernutrition and result in a US\$ 500,000 annual benefit due to increased worker productivity. Fortifying all of the country's flour with iron, folic acid, and other B vitamins will reduce diet deficiencies. Ten percent of wheat is fortified. The government's efforts to fortify wheat flour as a public health intervention need to be further supported.

**Maintain twice-annually vitamin A supplementation.** The country's program supplying vitamin A reaches an impressive number of people and should be made permanent, as well as mechanisms established to ensure sustained high coverage.

**Expand deworming program.** Expanding the current deworming program would result in an annual future gain in productivity of US\$ 450,000. Delivery costs can be lowered by combining helminth control with other programs, such as the twice-yearly vitamin A campaign.

**Zinc for the management of diarrhea.** Zinc, which is not currently used to manage diarrhea, should become part of the standard treatment. Investing in introducing this intervention and then scaling up would result in US\$ 2.28 million in economic benefits a year.

**Severe acute malnutrition treatment.** Treating severely malnourished children with special foods at home or in their communities, instead of in special facilities, could avoid almost one-fifth of deaths from wasting.

**Address the underlying and basic causes of undernutrition through other sectors.** While focusing on the immediate causes of undernutrition, opportunities should also be developed and exploited through other sectors, including social protection and agriculture. Interventions, particularly related to the availability and affordability of food and poverty reduction strategies are important and should be further explored. These could include smarter food subsidies, cash payments or delivery mechanisms of food to target the very young and the very poor. Other opportunities may be found in demand-side interventions and enhanced/innovative delivery mechanisms.

**Promoting handwashing and hygiene.** This approach is critical to decreasing diarrhea and other intestinal infections. Ideally, it will be included as a part of a package of preventive practices along with messages to improve infant and young child feeding practices.

## 1.4 Recommended Immediate Next Steps

To move to the next level, both the Government of the Kyrgyz Republic and the development partners could benefit from adopting the following immediate next steps.

### *Development partners could:*

**Disseminate the report's findings among stakeholders for review.** Country stakeholders need to review and discuss the report's conclusions and recommendations. Their input is an important consideration before the recommendations can be finalized. The dissemination process is an opportunity to involve stakeholders in the development process to strengthen the political commitment and stewardship required to scale up and sustain the priority nutrition policies and programs.

**Identify and exploit every opportunity to build national and regional capacity** to design and manage nutrition policy programs.

### **Work closely with government to mobilize resources to scale up the highest-priority interventions.**

Direct nutrition interventions that will reduce the immediate causes of undernutrition include breastfeeding, complementary feeding, universal salt iodization, maternal supplementation with vitamins and minerals, and other approaches to increasing vitamin and mineral intakes, such as fortification.

### *Whereas, the Government of the Kyrgyz Republic could:*

#### **Incorporate recommendations from the report into existing Kyrgyz nutrition strategies and plans.**

In particular, strengthen the design and implementation of the monitoring and evaluation components within each of these plans. Where possible, update the analyses presented in the report using more rigorous program coverage data and the latest prevalence data.

**Develop mechanisms to engage the social protection, agricultural, and education sectors to address the underlying and basic causes of undernutrition.** Identifying effective approaches will require additional research, evidence-based advocacy, and the institutional capacity to coordinate the design and implementation of multisectoral nutrition interventions in these sectors.

## 2. Putting Nutrition in Perspective

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### 2.1 Global Burden of Undernutrition

Undernutrition<sup>1</sup> is one of the world's most serious health problems, yet, it remains among the least addressed. Undernutrition encompasses low birth weight, low weight-for-age (underweight), low height-for-age (stunting), low weight-for-height (wasting), and inadequate intakes of key vitamins and minerals (micronutrient deficiencies). In developing countries, nearly one-third of children are underweight or stunted (Black and others 2008). Globally, undernutrition interacts with repeated bouts of infectious disease to cause an estimated 3.5 million preventable maternal and child deaths annually. An estimated 35 percent of child deaths are attributable to undernutrition (Black and others 2008). The economic costs of undernutrition, in terms of lost national productivity and economic growth, are huge, and these costs fall hardest on the very poor.

Nutrition interventions are critical to achieving the Millennium Development Goals (MDGs) (World Bank 2006). A United Kingdom consultation nutrition paper emphatically made this point. It underscored the “clear evidence of the critical importance of nutrition to the achievement of all MDGs and in maximizing the effectiveness of all development interventions” (DFID 2008). Table 1 illustrates the impact of a set of selected nutrition interventions on the MDGs.

**Table 1. Impact of Undernutrition Interventions on the Millennium Development Goals**

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<b>MDG 1. Eradicate extreme poverty and hunger</b>	Reducing “prevalence of underweight children under five years of age” is an agreed target.
<b>MDG 2. Achieve universal primary education</b>	Reducing undernutrition increases cognitive development and contributes to learning and school completion rates.
<b>MDG 3. Promote gender equality</b>	Maternal education and empowerment lead to better nutrition and health practices. Reduces discrimination against girls in family feeding practices.
<b>MDG 4. Reduce child mortality</b>	Enormous impact of improved nutrition in decreasing child mortality
<b>MDG 5. Improve maternal health</b>	Improved maternal nutrition and reduced maternal mortality through programs of behavior change and iron and folic acid supplementation.
<b>MDG 6. Combat HIV/AIDS, malaria, and other diseases</b>	Reduces maternal and child mortality due to negative interaction of undernutrition with HIV/AIDS and other infectious diseases.
<b>MDG 7. Ensure environment sustainability</b>	Improving food and nutrition security reduces households' need to adopt environmentally unfavorable practices.
<b>MDG 8. Global partnership for development</b>	Coalescing around the need to increase awareness of world hunger and malnutrition.

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A major reason the MDGs are not on track in many countries is that nutrition has been neglected for far too long. The recent and startling awareness that achievement of the MDGs is vitally linked to improved nutrition has invigorated donors and governments. They are collectively considering the potential of renewing and broadening their focus on nutrition through synergistic multisectoral actions aimed at prevention and intensifying proven traditional nutrition interventions.

Nutrition problems are often “hidden”. For example, while most micronutrient deficiencies have no visible or clinical signs, they can be deadly, e.g., by reducing immunity. Stunting is another unnoticed

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<sup>1</sup> The term *malnutrition* includes both undernutrition and overnutrition or obesity. This report focuses exclusively on undernutrition. Country nutrition strategies will normally address obesity as well.

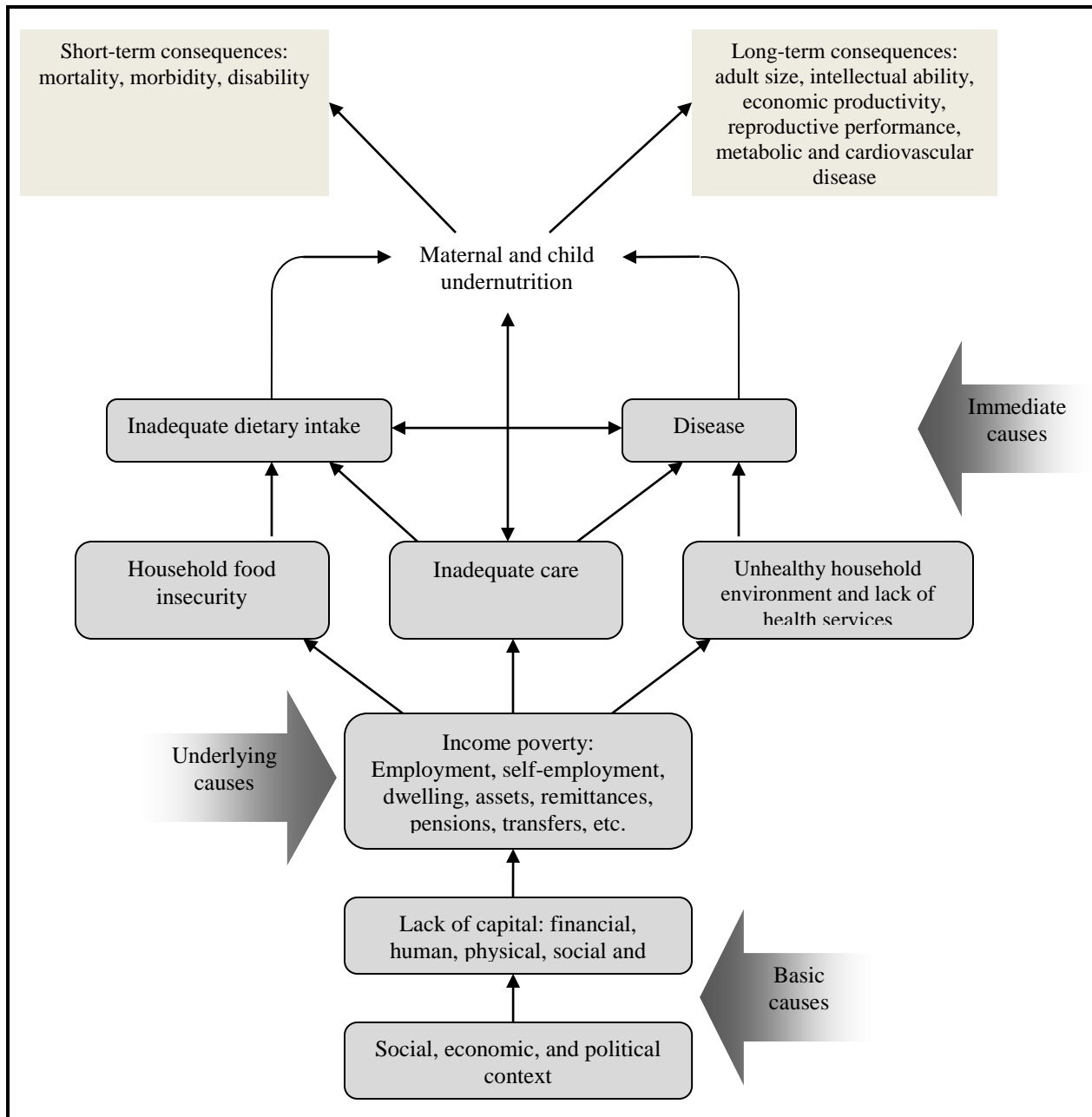
malady with long-term damaging health and economic effects. Stunting can become normalized when most children in a community suffer from it. Because the situation is perceived as “normal,” actions are not undertaken to resolve the problem. Those most in need of life-saving nutrition interventions—the fetus, young children, and pregnant women—are the weakest members of society with the smallest voices or none at all. They need concerned voices to speak and act on their behalf.

This joint World Bank/UNICEF report is an initial effort to provide compelling evidence of the potential to improve the health and economic consequences of the Kyrgyz people through effective nutrition interventions and to support policy makers in their commitment to the future well-being of their country.

## **2.2 Determinants of Undernutrition**

The determinants of undernutrition must be understood to identify their causes and the range of feasible interventions that are likely to have an impact on them. UNICEF developed the most widely used conceptual framework to describe the causes of undernutrition (see figure 1) (UNICEF 1990). This food-care-health framework describes three levels of undernutrition causes: immediate, underlying, and basic. The causes at each level influence the other levels. The immediate causes of undernutrition are inadequate dietary intake and disease. These immediate causes are impacted directly by inadequate access to food, inadequate care provided to children, and insufficient health and environmental services. Underlying the immediate causes of undernutrition is income poverty. Directly impacting poverty are employment opportunities and access to productive agricultural land and technologies. Other basic determinants of undernutrition are gender equality, girls’ education, and general governance issues, including rural/urban/other biases in government resource allocations that do not favor the poor.

**Figure 1. The Causes and Consequences of Undernutrition<sup>2</sup>**



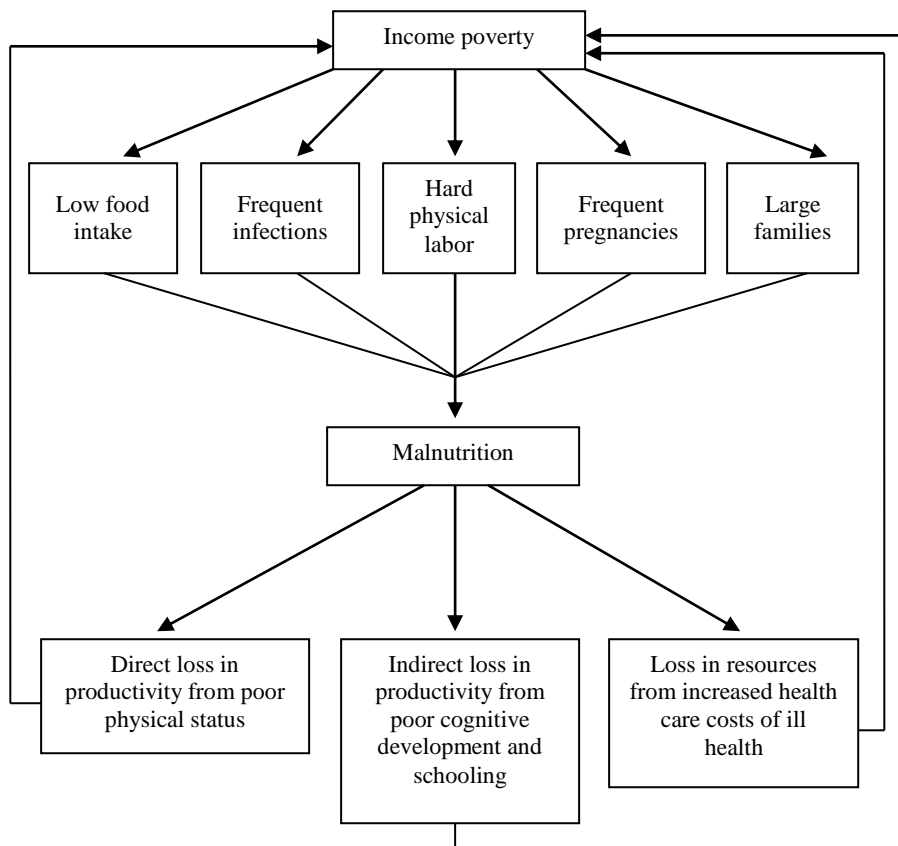
Provision of treatment and preventive health services, including hygiene and sanitation, are major determinants of undernutrition. Measures that reduce infections reduce nutritional losses associated with the infections, thus reducing “child frailty” and improving nutritional status and survival. Pneumonia and diarrhea remain the leading causes of death in children, and many children experience multiple episodes each year. Infections during pregnancy dramatically increase health risks for mother and child, and contribute to poor food absorption and utilization. Basic hygiene reduces the risk of infection, thereby reducing nutritional losses incurred by infection. Handwashing in older infants reduces infection risk and

<sup>2</sup> Black and others (2008) are cited as being derived from the UNICEF framework, 1990.

improves nutritional status as effectively as it does with their mothers. Available water for handwashing is critically important to promoting these behaviors.

Figure 2 illustrates the vicious cycle of income poverty and undernutrition. Undernutrition is both a cause and a consequence of income poverty. Undernutrition causes productivity losses in three ways: directly through restricted physical growth; indirectly through restricted cognitive development and hence lower learning through schooling; and by costs incurred through increased health care expenses. Undernutrition hampers both the physical capacity to perform work and earning ability. A recent longitudinal study in Guatemala of male children who received fortified complementary food during their first three years found that their wages as adults were 46 percent higher than the adults who had been the control children (Hoddinott and others 2008).

**Figure 2. The Vicious Cycle of Poverty and Malnutrition**



Access to productive agricultural land and technologies is another key determinant of food and nutrition security. The pathways linking agricultural and nutrition are complex and changing. The two most direct pathways are subsistence-oriented production and income-oriented production, and these depend upon access to arable land and the technologies developed over the last few decades. Access to land remains a major obstacle to the very poor who would benefit most from agricultural interventions harnessed to reduce undernutrition.

The empowerment of women is particularly important to improve household nutrition outcomes, especially for children’s nutrition. Women are consistently more likely than men to invest in their children’s well-being. The income and resources that women control have disproportionately strong positive effects on the health and nutrition of their children (Hawkes and others 2008). Access to

education, particularly for girls and women, is a further critical determinant of undernutrition. For example, school curricula should include basic knowledge of good nutrition, including family nutrition practices. The significance of women’s education to the health and nutrition of their children is an established axiom of development planning.

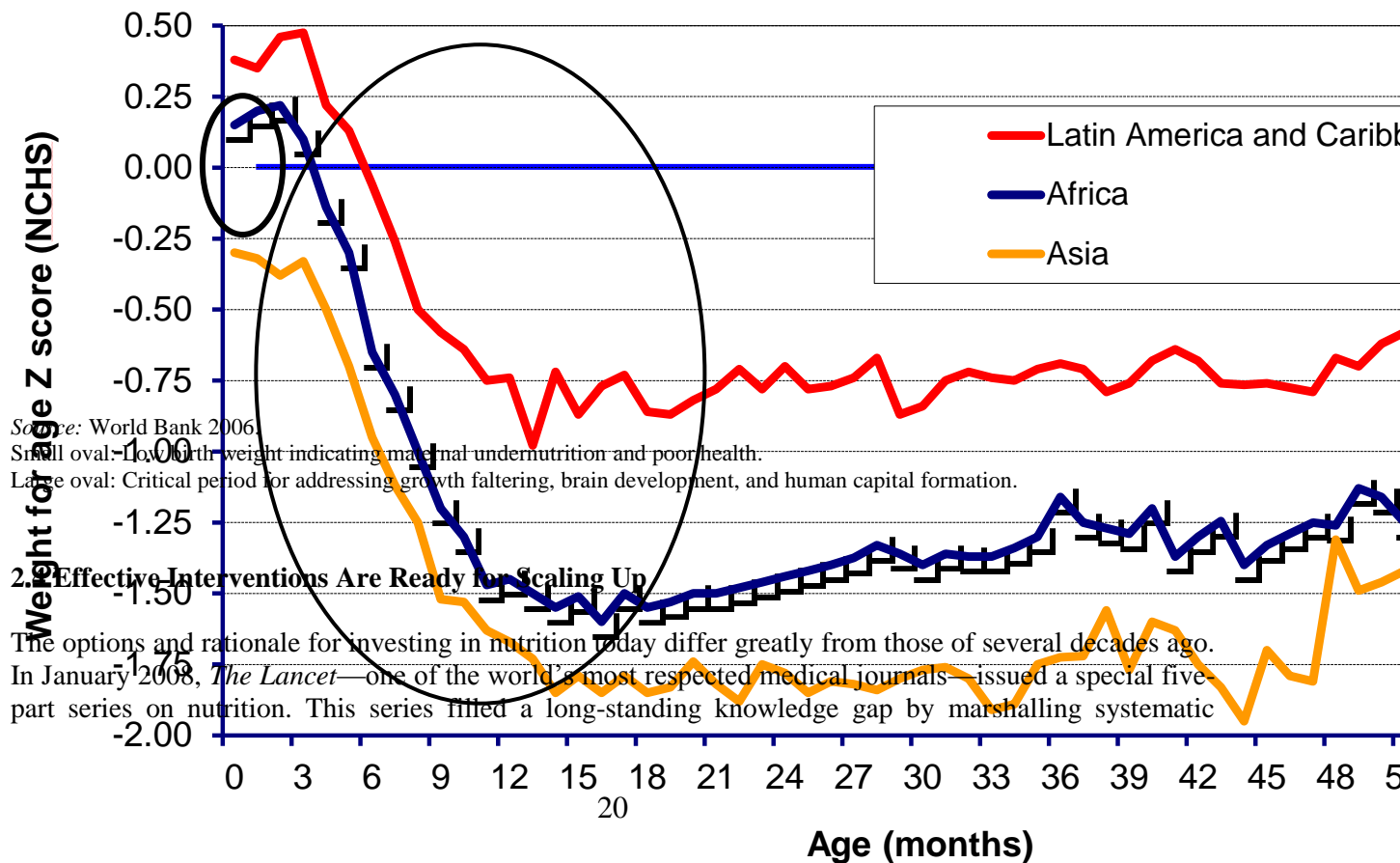
The scope of the current assessment includes brief discussions of the health, social protection, and agriculture sectors as they relate to nutrition. These descriptions are intended as a basis for future discussions about future potential interventions with local stakeholders, rather than a thorough examination of the linkages.

### 2.3 Focusing on the “Window of Opportunity”

The consensus of scientists and leading policy makers in nutrition—noted in The World Bank’s “Repositioning Nutrition” (World Bank 2006), and a central conclusion of *The Lancet* series on undernutrition—is that the damage to physical growth, brain development, and human capital formation that occurs in the period before pregnancy to 24 months of age is extensive and largely irreversible. Figure 3 shows the impact of undernutrition on regional growth patterns. The growth pattern for Central Asian babies likely lies between those of Asia and Africa. At birth (identified in the figure by the small oval shape), the babies of Asia are on average well below the expected weight of babies born in Africa, Latin America, or in richer countries. This discrepancy is due to poor maternal nutrition and health, and can only be corrected through interventions addressing these maternal issues. The larger oval shape in the figure highlights the dramatic falloff in growth during the critical first two years of life.

The window of opportunity is very brief—only about 1,000 days. To be effective in preventing irreversible damage, nutrition interventions must focus on this critical period of life. Investments after this period are much less likely to improve the child’s health or nutrition.

Figure 3. The Window of Opportunity for Addressing Undernutrition



Source: World Bank 2006.

Small oval: Low birth weight indicating marginal undernutrition and poor health.

Large oval: Critical period for addressing growth faltering, brain development, and human capital formation.

#### 2. Effective Interventions Are Ready for Scaling Up

The options and rationale for investing in nutrition today differ greatly from those of several decades ago. In January 2008, *The Lancet*—one of the world’s most respected medical journals—issued a special five-part series on nutrition. This series filled a long-standing knowledge gap by marshalling systematic

evidence of the impact of undernutrition on infant and child mortality and its largely irreversible long-term effects on health and on cognitive and physical development. The authors also demonstrated the availability of proven interventions that could address these problems and save millions of lives. The identified set of interventions in the series focused on the “window of opportunity” from minus 9 to 24 months (i.e., from pregnancy to two years old) for high-impact interventions to reduce death and disease and avoid irreversible harm to the child. The authors estimated that universal nutrition coverage with a full package of proven interventions (at the currently observed levels of program effectiveness) would prevent about one-quarter of child deaths under 36 months of age, reduce the prevalence of stunting at 36 months by about one-third, and avert 60 million DALYs in the 36 worst-affected countries (Bhutta and others 2008). Other studies drawing on a similar set of interventions have demonstrated very high cost-effectiveness with high returns to cognitive development, individual earnings, and economic growth.

Using the evidence presented in *The Lancet* series as a foundation, a broad group of nutrition community leaders came together to build consensus around a framework for scaling up actions to address nutrition. This resulted in the Framework for Action to Scale Up Nutrition, or SUN (UN 2010). The SUN Framework calls for two complementary approaches to reducing undernutrition. One is direct nutrition-specific interventions, focusing on pregnant women and children aged less than two years, with short-term public health interventions that are known to be effective, such as promoting good nutritional practices, increasing intake of vitamins and minerals, and complementary feeding to prevent and treat severe undernutrition. The second is a broader multisectoral nutrition-sensitive approach to development. This approach acts to counter the determinants of undernutrition by specifically promoting agriculture and food interventions to improve the availability, access to, and consumption of nutritious foods by improving social protection (including emergency relief), and by ensuring access to health care (including maternal and child health care, water and sanitation, immunization, and family planning).

## 2.5 Why Act Now?

There are several reasons for a major effort to address undernutrition in the Kyrgyz Republic. Partners working toward consensus on how to reduce undernutrition most effectively in the global context articulated these most recently (UN 2010).

1. Undernutrition is largely preventable, and the evidence of exceptionally high development returns for a number of direct nutrition interventions is conclusive. A recent study by the World Bank estimated the costs and the potential benefits of scaling up selected nutrition interventions at a global level (Horton and others 2010) (see table 2). Costs per DALY saved were as low as US\$ 3 (vitamin A supplementation), and benefit-cost ratios were as high as 30:1 (salt iodization). The Copenhagen Consensus 2008 brought together world-renowned economists to consider 30 interventions as the “best buys” for addressing the 10 great challenges facing global development.<sup>3</sup> Five of the top 10 priority interventions identified were nutrition programs. For example, supplementation with vitamin A and zinc were recognized as the first priorities, and iron fortification and salt iodization as the third priority (see table 3).
2. Success in reducing undernutrition is essential to meeting the MDGs and equally in contributing to achieving the human rights of health and freedom from hunger.
3. Subsequent to the publication of *The Lancet* (2008) series on maternal and child undernutrition, a consensus has been growing among development partners on how to reduce undernutrition, and acceptance is increasing of the imperative to share advocacy for collective action.
4. Relying on improvement in underlying socioeconomic determinants of undernutrition, such as income growth, would be a serious mistake and further prolong international development’s long-standing neglect of nutrition. Evidence shows nutrition improvement lags substantially behind income growth (Haddad and others 2003). Further, families with ample incomes for adequate

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<sup>3</sup> Copenhagen Consensus. <http://www.copenhagenconsensus.com/Default.aspx?ID=1318>. Accessed June 3, 2010.

food intake suffer from surprisingly high rates of undernutrition (Ergo, Gwatkin, and Shekar 2009).

5. The private sector has become more actively engaged in finding solutions to undernutrition, particularly in relation to fortifying foods with micronutrients. The private sector can also help by applying its marketing skills to “social marketing” of positive nutrition messages.
6. New initiatives in the closely related areas of food security, social protection, and health systems offer opportunities to raise the profile of nutrition in these areas, as well as to obtain financing for nutrition through them.

In sum, today’s context for scaling up nutrition in the Kyrgyz Republic is a new and far more favorable one than in the past. It is characterized by demonstrable and increasing proof of interventions with high development and health returns, increased recognition of the need to scale up such interventions, increased potential for public-private partnerships, and increased will by the international nutrition community to agree on a common framework for action.

**Table 2. Estimated Benefits from Scaling Up Nutrition Interventions**

<i>Intervention</i>	<i>Estimated benefit: cost savings or cost effectiveness</i>	<i>Source</i>
Behavior change (through community nutrition programs for behavior change)	US\$53-153 per disability-adjusted life-year saved	Ho (1985: Tamil Nadu) Waters et al. (2006: Peru)
Vitamin A supplements	US\$3-16 per disability-adjusted life-year saved	Ching et al. (2000); Fiedler (2000); Horton and Ross (2003)
Therapeutic zinc supplements	US\$73 per disability-adjusted life-year saved (zinc)	Robberstad et al. (2004)
Micronutrient powders	US\$12.20 per disability-adjusted life-year saved (zinc) 37:1 benefit:cost ratio	Sharieff et al. (2006)
Deworming	6:1 benefit:cost ratio	Horton et al. (2008)
Iron-folic acid supplements	US\$66-115 per disability-adjusted life-year saved (iron; no estimates known for folic acid)	Baltussen et al. (2004)
Iron fortification of staples	8:1 benefit:cost ratio	Horton and Ross (2003, 2006)
Salt iodization	30:1 benefit:cost ratio	Horton et al. (2008)
Complementary foods	US\$500-1,000 per disability-adjusted life-year saved	Authors’ rough estimates <sup>a</sup>
Community-based management of acute malnutrition	US\$41 per disability-adjusted life-year saved	Bachmann (2009)

*Source:* Horton and others 2010.

<sup>a</sup>. Based on Caulfield et al’s (1999) estimate that increased intake of 71-164 kcal per day for children younger than one year of age, as a result of complementary feeding, could decrease deaths due to malnutrition by 2-13 percent, depending on underlying presence of malnutrition in the community.

**Table 3. Rankings of Top 10 Priorities from the Copenhagen Consensus, 2008**

<b>Solution</b>	<b>Challenge</b>
1 Micronutrient supplements for children (vitamin A and zinc)	Malnutrition
2 The Doha development agenda	Trade
3 Micronutrient fortification (iron and salt iodization)	Malnutrition
4 Expanded immunization coverage for children	Diseases
5 Biofortification	Malnutrition
6 Deworming and other nutrition programs at school	Malnutrition & Education
7 Lowering the price of schooling	Education

8	Increase and improve girls' schooling	Women
9	Community-based nutrition promotion	Malnutrition
10	Provide support for women's reproductive role	Women

Source: Copenhagen Consensus. <http://www.copenhagenconsensus.com/Default.aspx?ID=1318>. Accessed June 3, 2010.

## 2.6 Nutrition: A Priority for The World Bank and UNICEF

Nutrition is a priority for both the World Bank and UNICEF. Each institution is committed to working collaboratively with other donors to support governments' efforts to reduce undernutrition and achieve the MDGs. The World Bank is striving to position nutrition in the mainstream of development initiatives, and the Bank was instrumental in bringing global partners together to build the consensus that enabled the SUN Framework to be developed.

UNICEF's Medium-Term Strategic Plan's (2006–2013) focus area of “Young Child Survival and Development” includes scaling up high-impact, cost-effective nutrition interventions to reduce the number of neonatal and young child deaths. UNICEF's nutrition programs in Central and Eastern Europe and Central Asia have resulted in some major achievements, including increasing household use of adequately iodized salt from 18 percent in 1990 to 56 percent in 2007. This has substantially improved iodine nutrition, which directly benefits improved growth and cognitive development of children, and hence efficiency of schooling and economic productivity. UNICEF's long-term support of the Multiple Indicator Cluster Surveys (MICS) has enabled countries throughout the world to continually monitor the status of nutrition, particularly among vulnerable groups, “through statistically sound, internationally comparable estimates of socioeconomic and health indicators.”

This report describes the joint effort of the World Bank and UNICEF's situational analysis for the Kyrgyz Republic. This information is intended to inform the further development and scaling up of policies and programs. The report describes (1) the epidemiology of undernutrition; (2) the health consequences of undernutrition in terms of mortality and DALYs, and the economic losses due to lost workforce and lost productivity; (3) the health, social protection, and agriculture and food intervention systems relevant to delivering interventions for improving nutrition; (4) the current coverage of nutrition interventions; and finally, (5) the potential economic gains of scaling up evidence-based nutrition interventions, and the appropriate and effective nutrition interventions to scale up.

The results makes a strong case for immediately scaling up proven interventions to reduce the direct causes of undernutrition, and, where opportunities exist, initiate multisectoral interventions that address the underlying and basic causes of undernutrition.

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## 3. Methods

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### 3.1 Assessing the Nutrition Situation and Its Context

The structure we use to describe the nutrition situation and context in the Kyrgyz Republic follows the structure proposed by Menon and others (2011). Our structure builds on the UNICEF conceptual framework explaining the three levels of causes of undernutrition, and includes the influence of factors in the policy context, as well as factors at the community, household, and child levels. Menon's structure was developed based on the experiences of scaling up nutrition interventions in several countries, which participated in the World Bank-funded Mainstreaming Nutrition Initiative from 2006 to 2009. This report uses the following three domains in our assessment structure:

- 1) *Epidemiological*, pertaining to the current nutritional situation in the country (e.g., prevalence and causes of key nutrition problems), and the current body of evidence about the efficacy and effectiveness of nutrition interventions;
- 2) *Operational*, pertaining to coverage, quality, and utilization of nutrition-related interventions and programs, as well as the capacities, opportunities, and constraints to improving these; and
- 3) *Economic and sociopolitical*, pertaining to economic and sociopolitical factors, from community to national and international levels, that may enhance or inhibit efforts to create positive changes in policies and programs.

This assessment describes the first domain comprehensively and components of the second and third domains. Detailed information about the quality of program delivery or capacities of institutions to scale up programs, although critical to the second operational domain, was unavailable to assess. Detailed information is presented on the third domain, the economic burden of undernutrition and the benefits of implementing programs. We briefly describe aspects of the health, social protection, and agricultural sectors that will be key to delivering interventions. Key sociopolitical issues, pivotal to building the political commitment required to mobilize the resources essential to scale up nutrition interventions, need to be examined. These issues include how resources are allocated to curative or preventive health programs, the relative priorities assigned to programs designed to build human capital, and the extent to which donors are aligned in direction and process to promote favored development objectives.

Understanding these sociopolitical issues is critical to realize the full potential that improving nutrition will contribute to achieving the MDGs in the Kyrgyz Republic. To understand the issues in-depth, interviews and discussions are required with key policy makers and program managers. These discussions should take place as an immediate next step to further develop the recommendations made in this report.

The primary source of data for this assessment was the most recent MICS. Additional sources are indicated where they were used. They include Demographic and Health Surveys (DHSs); Nutrition Landscape Information System of the World Health Organization (WHO);<sup>4</sup> country-specific national or subnational surveys of the food security, nutrition, and micronutrient situation; routine Ministry of Health (MoH) data; and information from national nutrition plans and programs. Published and unpublished reports were collected from the country offices of UNICEF, the World Bank (WB), WHO,

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<sup>4</sup> WHO. Nutrition Landscape Information System. <http://apps.who.int/nutrition/landscape/report.aspx>. Accessed February 15, 2010.

nongovernmental organizations (NGOs), and government ministries. Documentation available on websites was also used.

### **3.2 Estimating the Health and Economic Consequences of Undernutrition**

The consequences of undernutrition in terms of DALYs and mortality in children less than five years of age were estimated with the methods used in the WHO Global Burden of Disease, 2004 (Murray and others 2001) and in *The Lancet* series on Maternal and Child Undernutrition, 2008. A DALY is a health gap measure and provides a comprehensive summation of information that includes the impact of premature death, disability, and other non-fatal health outcomes. This indicator was used to count the nonfatal but important adverse consequences of iron and iodine deficiencies, for example. One DALY can be thought of as one lost year of healthy life. It measures the gap between the current health status of the target population and an ideal situation where everyone lives into old age free of disease and disability.

Mortality resulting from undernutrition was calculated with measures of attributable mortality and relative risk (These epidemiological concepts are explained in annex 1.). Based on these risk coefficients, as well as the UNICEF statistics for prevalence of undernutrition and demographic and mortality statistics, we calculated the number of annual deaths attributable to malnutrition. Using standard statistical methods, joint attributable fractions were calculated to avoid the double counting of deaths that occurs when cause-specific mortality attributed to individual risk factors is simply added up. Methods and formulas used are described in annex 1.

Economic productivity is lost through both mortality and the reduced cognitive and physical development caused by undernutrition. The Kyrgyz Republic's net economic deficits as a consequence of undernutrition, including micronutrient deficiencies, was assessed by measuring workforce losses (based on premature mortality attributable to undernutrition) and future productivity losses among survivors (based on deficits in education and lower labor productivity). We applied similar methods to those used in the calculations made for *The Lancet* (2008) series on undernutrition and in the Uzbekistan National Investment Plan (NIP).<sup>5</sup> Economic losses due to six types of undernutrition that are widely prevalent were calculated. These were LBW, stunting, severe wasting, anemia, vitamin A deficiency, and iodine deficiency in children under five years of age. The net present values of losses from undernutrition due to lost workforce (mortality) and child productivity (reduced cognitive and physical development) were calculated using the algorithms developed for the Uzbekistan NIP, which are also applicable to the Kyrgyz Republic.

### **3.3 Estimating the Health and Economic Benefits of Scaling Up Nutrition Programs**

Information on existing nutrition interventions and their coverage levels were used to investigate potential options to reduce undernutrition. The goal of this exercise was to determine the efficacy of selected maternal and child interventions in reducing undernutrition, using as a reference the recent *Lancet* undernutrition and primary care series.

Field site visits to the Kyrgyz Republic were carried out in April–May 2009 and included a number of meetings with stakeholders to discuss and gather information on the epidemiology of nutrition and

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<sup>5</sup> The Uzbekistan Nutrition Investment Plan (NIP) was a multisectoral consultation conducted in 2007 and involved key stakeholders from government and private sectors. The NIP process included participation of experts from the Ministry of Health, Ministry of Public Education, Ministry of Economy, Ministry of Finance, and Tax Committee as well as representation from food industries, national media, and NGOs. Representatives of UNICEF, the World Bank, and the WHO participated and provided technical assistance.

operational details of programs, including activities, beneficiaries, durations, coverage rates, and where possible, budgets.

Based upon evidence on efficacy and effectiveness presented in *The Lancet* series, nutrition interventions were categorized as *Universal Interventions* that have sufficient evidence to warrant implementation, *Situational Interventions* that have evidence supporting their implementation in specific situational contexts, and *Other Supportive Strategies* for which the current evidence is insufficient or the effectiveness varies.

The impact of *The Lancet*-recommended nutrition interventions on reducing mortality and improving nutrition outcomes for women, newborns, and children was assessed by using a previously described and validated sequential model (Bhutta and others 2008). The expected reductions were estimated in prevalence of undernutrition and mortality from each intervention that would result from increasing coverage by 20 percent, a “pragmatic” increase, and universal coverage (100 percent).

Cumulative economic gains—achieved by investing in particular nutrition interventions—were calculated by comparing the national economy’s annual loss due to undernutrition with the effectiveness of existing nutrition interventions. The gains obtained after addition of new interventions and scaling up existing interventions are reflected as a percentage of the losses offset by the interventions.

### **3.4 Analyzing Cost-Effectiveness of Nutrition Programs**

The analysis of the cost-effectiveness of current nutritional interventions in the Kyrgyz Republic is based upon data from the Copenhagen Consensus,<sup>6</sup> the Disease Control Priority Project,<sup>7</sup> and *The Lancet* (2008) nutrition series.

These calculations are complex and were carried out by the team that developed the methods and undertook many of the calculations for *The Lancet* series on undernutrition. Details of the estimates of cost effectiveness from the literature are presented in annex 6.

### **3.5 Summarizing Analyses and Assigning Program Priorities**

Rankings for interventions were developed by considering three criteria: (1) expected impact on mortality, (2) expected economic returns on investments (benefits/cost effectiveness), and (3) feasibility of implementation at scale. Two ranking systems were developed: numbers suggesting operational priority and letters “grading” evidence for interventions. Both rankings took into account the first two of the three criteria, and the number ranking assigned more weight to operational feasibility. The letter ranking assigned greater weight to the “evidence base” as set out in *The Lancet* series, and placed less emphasis on pragmatic operational details. Importantly, the two sets of rankings are intended as a basis for discussion with local stakeholders who can provide a clearer understanding of the operational contexts of the interventions, and whose buy-in to the priorities set of interventions will ultimately determine the success and sustainability of their implementation.

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<sup>6</sup> Copenhagen Consensus. <http://www.copenhagenconsensus.com/Home.aspx>. Accessed November 10, 2009.

<sup>7</sup> WHO-Choice: Choosing Interventions That Are Cost-Effective. <http://www.who.int/choice/en/>. Accessed April 1, 2010.

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## 4. Addressing Challenges and Seizing Opportunities

This chapter describes the Kyrgyz Republic’s nutrition context, including the biological, epidemiological, and operational aspects of sectors, through which interventions could be delivered. It also discusses the economic burden of undernutrition and the possible estimated health and economic gains achievable by scaling up priority interventions to address the immediate causes of undernutrition. Finally, it makes initial suggestions for recommended actions as a basis for discussions to determine the country’s next steps.

### 4.1 Epidemiology and Health Consequences of Undernutrition

Results of the 2006 MICS indicate that the nutritional status of Kyrgyz children has improved substantially since the late 1990s. Nevertheless, stunting remains a serious problem. In 1996, almost 25 percent of children aged 0–35 months were stunted, as were 14 percent of children under five in 2006 (table 4).<sup>8</sup> Stunting carries important negative health and economic consequences, particularly in the three provinces with stunting rates over 20 percent—Batken, 22 percent, Issyk-Kul, 23 percent, and Talas, 27 percent (see map 1). The prevalence of stunting was higher among children in rural areas (15.7 percent) than in urban areas (10.8 percent). Mothers with more years of schooling had children less likely to be stunted. Children from poorer households (the first and second quintiles of the wealth index) had a higher prevalence of stunting (18.8 percent and 14.9 percent, respectively) than children in the higher wealth quintiles (10–12 percent). While the prevalence of wasting is only 4 percent nationwide, it is substantially higher in Jalal-Abad (9.2 percent) and Issyk-Kul (7.8 percent) provinces. The prevalence of wasting across other demographic variables was similar to that described for stunting.

The proportion of LBW babies being born is an indicator of undernutrition during gestation, a critical period for growth and development. In 2006, more than 5.3 percent of infants nationwide were born with LBW. Of particular concern was Naryn Oblast, with 10 percent LBW, almost double the national average. That the proportion of LBW is highest in the richest quintile (see table 4) is an unexpected finding. Although, it may be due to chance, additional investigation is warranted to rule out other possible causes. Potential explanations to explore would include a higher survival rate of LBW babies in this group, which presumably have better access to health services, or the use of alcohol and tobacco during pregnancy, which are major causes of LBW in “rich” countries.

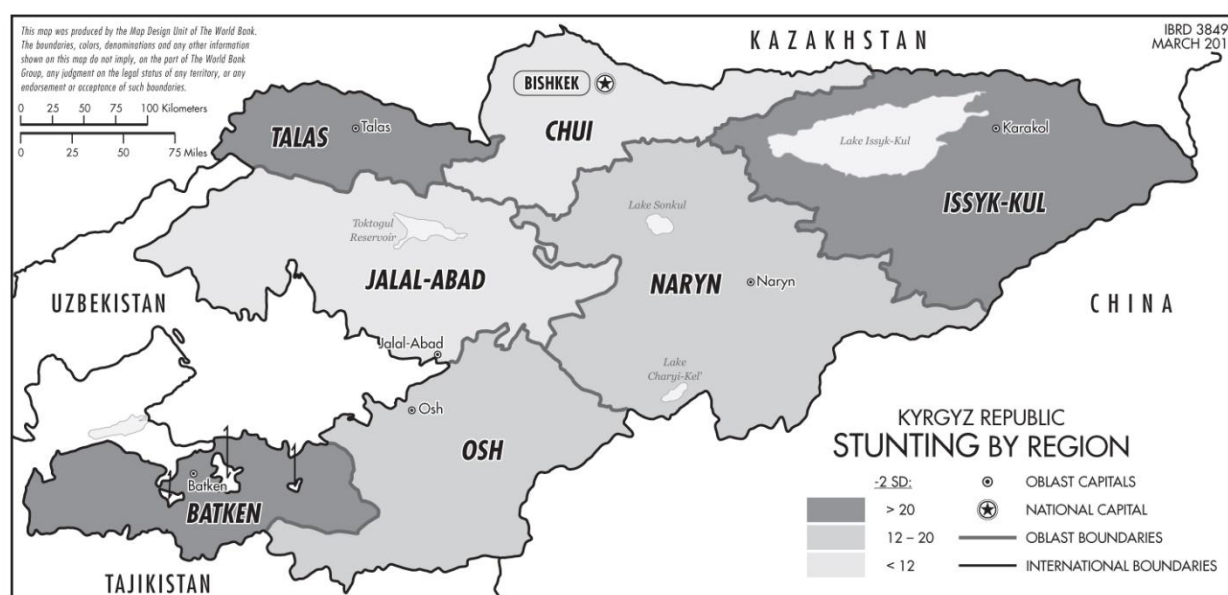
**Table 4. Nutrition Indicators in Children Under Five Years of Age, Kyrgyz Republic, 2006**

		Stunting	Wasting	Underweight	Low birth weight
<b>Region</b>	Batken	21.5	3.3	5.5	4
	Jalal-Abad	8.3	9.2	2.5	4
	Issyk-Kul	22.6	7.8	6.9	4
	Naryn	13.7	1.9	9	4
	Osh	15.2	1	2.7	10
	Talas	27.3	2	4.8	5
	Chui	10.5	2.9	2.3	4
	Bishkek	8.5	2.1	2.1	6

<sup>8</sup> The prevalence of stunting would have been higher than 25 percent had children 3–5 years been included in the 1996 calculations. Therefore, the reduction in prevalence was even greater than the available numbers indicate.

<b>Locality</b>	Urban	10.8	2.7	3.4	6
	Rural	15.7	4.1	3.4	5
<b>Maternal education</b>	None	21.7	6.4	11.8	6
	Primary	14.2	3.6	3.0	5
	Secondary or higher	9.7	1.9	2.4	4
<b>Wealth quintiles</b>	Poorest	19	3	3	5
	Second	15	3	3	4
	Middle	13	6	4	5
	Fourth	12	3	4	5
	Richest	10	3	3	7
<b>Total</b>		<b>13.7</b>	<b>4</b>	<b>3.4</b>	<b>5.3</b>

**Map 1. Stunting by Region in Kyrgyz Republic, 2006**



No nationally representative data on the prevalence of micronutrient deficiencies were available for this report. Prevalences of anemia and vitamin A deficiency were available for children aged 6–24 months and women of reproductive age from a population-based survey carried out in Talas Oblast in 2008. Anemia was common in both children (50.6 percent) and women (24.5 percent). About one-third (32 percent) of children had serum retinol levels indicating vitamin A deficiency.

The prevalences of both maternal and child anemia are high. Both contribute significantly to maternal and infant mortality and impaired cognitive development. The first national estimates of anemia prevalence are from the 1997 DHS, which covered children under three years of age. At that time, almost 50 percent of children and 38 percent of women of reproductive age were anemic. Preliminary results of a 2008 survey in Talas Oblast (supported by UNICEF, the Swiss Red Cross (SRC), and the U.S. Centers for Disease Control and Prevention (CDC)) reported that just over 50 percent of children 6–24 months old and 25 percent of mothers were anemic. This continuing high prevalence of anemia is a serious public health problem because it increases the risks of perinatal, maternal, and child mortality, as well as

impaired cognitive functioning in children. A national micronutrient survey including estimates of anemia prevalence was undertaken in 2009; preliminary results were expected to be available in June 2010.<sup>9</sup>

The 2006 MICS report noted that 76 percent of Kyrgyz households were consuming adequately iodized salt ( $\geq 15$  mg/kg iodine), and 98 percent of households were consuming salt with some iodine. The Universal Salt Iodization (USI) program, enacted into law in 2001, was further evaluated in a national iodine survey in 2007 (Sultanalieva and others 2009). This evaluation indicated a substantially lower proportion of households with adequately iodized salt (39.5 percent) than was reported in 2006. Biological assessment indicated that schoolchildren had adequate iodine nutrition—a median urinary iodine concentration (UIC) of 114  $\mu\text{g/L}$ , which is greater than the WHO cutoff, indicating adequate intake for this age group (100  $\mu\text{g/L}$ ). The median UIC for pregnant women was 111  $\mu\text{g/L}$ , and this is substantially less than the WHO cutoff of 150  $\mu\text{g/L}$ , indicating adequate intake for the higher requirements of this population group.<sup>10</sup> That pregnant women were not consuming adequate amounts of iodine to meet their requirements was confirmed with the finding that goiter size increased during pregnancy.

**Childhood infections interact with nutritional status.** Together with the quantity and quality of food and child care practices, infections are a major cause of undernutrition. Managing and preventing them contributes enormously to reducing undernutrition. This section describes the infections with the greatest negative impact on nutrition.

Diarrhea is one of the leading causes of death among children under five worldwide. In the Kyrgyz Republic, the mortality rate among children under five due to diarrhea per 100,000 people was 23.8 in 2008, 19.3 in 2009 and 15.4 in 2010, according to the MoH.<sup>11</sup> The 2006 MICS showed that only 20 percent of the children reported as having had diarrhea in the previous two weeks received any oral rehydration therapy (ORT), and three-quarters of that was home treatment. Furthermore, MICS indicated that only 25 percent of cases received any increase in volume of fluids, and 75 percent received just adequate or lower volume of fluids. Children in rural areas reported 1.5 more episodes of diarrhea compared to children in urban areas.

The burden of soil-transmitted helminth infections in the Kyrgyz Republic is extremely high. Epidemiologic surveys conducted by UNICEF and local governments have consistently shown parasite burdens of 50 percent or more among the general populations, and 75 percent among school-aged children.<sup>12</sup> One of the leading causes of this problem in the Kyrgyz Republic is the lack of access to improved sources of drinking water and the lack of sanitary means of excreta disposal. According to the 2006 MICS, 11.8 percent of the population did not have any access to clean drinking water. The highest proportions of the population consuming water from springs, surface water bodies, rivers, and a network of earth canals were reported in the Batken Oblast (24.3 percent) and Osh Oblast (21 percent).

**Feeding behaviors are a major determinant of nutritional status.** A common factor in child undernutrition is poor infant and young child feeding (IYCF) practices. While part of the problem is the lack of access to nutritious foods for children, another significant factor is that mothers lack a general awareness of what constitutes proper nutrition for young children. The core of IYCF practices is in breastfeeding behaviors and timely, appropriate complementary feeding. Breastfeeding can be further

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<sup>9</sup> Rafa Flores, personal communication, March 12, 2010.

<sup>10</sup> WHO. *Assessment of Iodine Deficiency Disorders and Monitoring Their Elimination: A Guide for Programme Managers*, 3rd edition. Page 32. [http://www.who.int/nutrition/publications/micronutrients/iodine\\_deficiency/9789241595827/en/index.html](http://www.who.int/nutrition/publications/micronutrients/iodine_deficiency/9789241595827/en/index.html). Accessed June 27, 2010.

<sup>11</sup> Ministry of Health, Kyrgyz Republic, official statistics 2010.

<sup>12</sup> [http://www.unicef.org/kyrgyzstan/reallives\\_13803.html](http://www.unicef.org/kyrgyzstan/reallives_13803.html).

categorized as early initiation, exclusive breastfeeding for the first six months, and continued breastfeeding from 6 to 24 months, with complementary foods. Data from MICS showed a 65 percent rate of timely initiation of breastfeeding (mothers start breastfeeding their newborn within one hour of birth), and nearly 90 percent initiated within one day. Slightly less than one-third (31.5 percent) of infants 0–6 months were exclusively breastfed in 2006; this is low. The proportion was lowest in Bishkek, with only 16 percent of mothers exclusively breastfeeding their infants less than six months of age. The highest rate of exclusive breastfeeding was in Osh Oblast, 52 percent. Only 38 percent of infants 6–12 months were fed as frequently and with a sufficiently diverse diet as the WHO recommends. Details of the variation in IYCF behaviors across geographic and demographic factors reported from the MICS are presented in annex 8. More detailed information about IYCF behaviors is necessary to design effective interventions. For example, it will be important to understand the main barriers to breastfeeding and the major determinants of the timing, frequency, and quality of complementary feeding.

**Health consequences.** Undernutrition causes mortality and reduces cognitive and physical development. This section describes the consequences of undernutrition in the Kyrgyz Republic that were estimated in terms of DALYs and mortality. Table 5 shows the burden of disease expressed in terms of DALYs. Males and females are listed separately because the calculations of future productivity losses are calculated separately for males and females (described in annex 2). Among children under five, LBW accounts for more than 13 percent of all causes of DALYs in the Kyrgyz Republic, the highest proportion of all forms of undernutrition.

**Table 5. Burden of Disease (DALYs) Caused by Five Types of Undernutrition, Kyrgyz Republic, 2006**

	Children 0–4.9 years			Females 15–44 years
	Male	Female	Total	
<b>All causes DALYs</b>	<b>171,190</b>	<b>145,648</b>	<b>316,839</b>	<b>186,353</b>
<b>Growth deficiencies</b>				
Low birth weight	23,738	18,688	42,426 (13.4%)	--
Stunting	3,109	3,032	6,141 (1.9%)	--
<b>Micronutrient deficiencies</b>				
Iron-deficiency anemia	1,027	963	1,990 (0.6%)	4163 (2.2%)
Iodine deficiency	978	1,012	1,990 (0.6%)	3 (0.0%)
Vitamin A deficiency	12	12	24 (0.01%)	--

21.8 percent (n = 1,547) of the total under-five deaths per year, estimated in 2004 for the Kyrgyz Republic (N = 7,099; see annex 3), were attributable to undernutrition (table 6). Severe and moderate stunting was the major cause of malnutrition-attributable mortality, accounting for roughly 50 percent of deaths (768/1547, 49.6 percent). The second most common cause of malnutrition attributable deaths was LBW (25 percent). It is notable that the milder form of LBW (2,000–2,499 g) contributes more to the burden of undernutrition than the more severe form (< 2,000 g).

**Table 6. Deaths Resulting from Undernutrition, Kyrgyz Republic, 2006**

Form of undernutrition	Prevalence	Relative risk	Estimated annual deaths
<b>Low birth weight</b>			
1,500–1,999 g	0.6	8.1	139
2,000–2,499 g	4.4	2.8	249
<b>Vitamin A deficiency</b>			
< 5 months	18.0	1.25	146
6–59 months	32.0	1.47 (DD) & 1.35 (ARI)	105
<b>Stunting</b>			
<-3 SD	3.7	4.1	442
<-2 SD	13.7	1.6	326
<b>Wasting</b>			
<-3 SD	0.4	9.4	140
<b>Total</b>			<b>1,547</b>

Note: DD = diarrheal disease; ARI = acute respiratory infection.

#### 4.2 Economic Consequences of Undernutrition

The economic costs of undernutrition result from both the workforce losses because of nutrition-related mortality and the productivity losses from reduced cognitive and physical capacities of the surviving workforce.

**Cost of lost workforce due to mortality from undernutrition.** The economic costs of undernutrition caused by deaths attributable to undernutrition and the value of the subsequent lost workforce are shown in table 7. The models used were based on the Uzbekistan NIP. A detailed description of the methods used can be found in annex 1. Net present values (NPVs) estimate, in today's economic terms, the value of future losses caused by undernutrition. All calculations are NPVs expressed in millions of U.S. dollars.

**Table 7. Annual NPV of Lost Workforce as a Consequence of Undernutrition, Kyrgyz Republic, 2006**

Form of malnutrition	Number of deaths	Lifetime discounting factor (LDF)	Value (US\$ millions)
Low birth weight	388	From birth: 14.9	1.28
Vitamin A deficiency	251	From 5 years: 17.42	0.97
Stunting	768	From 5 years: 16.9	1.86
Wasting	140	From 5 years: 16.9	0.34
<b>Total</b>	<b>1,547</b>		<b>4.45</b>

**Cost of future workforce productivity losses due to undernutrition.** Table 8 shows the economic costs of future productivity losses among survivors. These losses are due to childhood undernutrition and deficiencies which caused deficits in educational abilities and therefore lost labor productivity. Annual productivity losses were estimated at both a 3 percent and 10 percent discount rate (two values commonly employed in health project analysis). Iodine deficiency disorders contribute more than half of these losses; childhood anemia and stunting are also major contributors.

**Table 8. Estimated Annual NPV of Future Productivity Losses Due to Cognitive and Physical Growth Deficits in Children Caused by Undernutrition, Kyrgyz Republic, 2006**

Form of malnutrition	NPV at 3% discount rate (US\$ million/year)	NPV at 10% discount rate (US\$ million/year)
Iodine deficiency disorders	15.30	2.34
Stunting (< 5 years)	5.25	0.91
Low birth weight	1.30	0.20
Childhood anemia	6.09	1.22
<b>Total</b>	<b>27.94</b>	<b>4.67</b>

The cost of undernutrition and micronutrient deficiency in lost lives and economic losses is staggering. Financial losses in the Kyrgyz Republic from mortality due to undernutrition are US\$ 4.45 million (table 7), and productivity losses due to undernutrition at a 3 percent discount rate are US\$ 27.94 million (table 8). **The total loss is US\$ 32 million. Most of these losses are preventable by investing in programs to reduce undernutrition.**

### 4.3 The Operational Context for Nutrition Policies and Programs

The Kyrgyz Republic is a low-income country with an annual gross national income (GNI) per capita of US\$ 870 in 2009.<sup>13</sup> The population size is approximately five million, with 70 percent living in rural and high mountainous areas. Of these, nearly 80 percent live in poverty. Despite the extensive medical infrastructure established under Soviet rule, the republic has relatively high rates of infant, child, and maternal mortality. In fact, the rates are among the highest in Central Asia.

Strengthening nutrition policies and scaling up programs will contribute substantially to reducing mortality rates and building social capital. Policy and program recommendations are described below in the context of the health, social protection, agriculture, and education sectors.

#### 4.3.1 Health sector

In the Kyrgyz Republic, as in most other countries, the efforts to reduce undernutrition have focused almost exclusively on interventions delivered through the health system. The health system provides a good platform for delivering many of the evidenced-based interventions recommended in this report. Nevertheless, some of the recommendations involve other sectors as well. A brief outline of health reform efforts is presented, followed by a description of the three most relevant health system services: maternal and child, antenatal and obstetric, and community outreach.

**Health reforms.** The Kyrgyz government embarked on a series of health reforms in 1995. The first health sector strategy in 1996 was known as “Manas.” While it improved the efficiency of service delivery, it did not have a great impact on the population’s health status, including child and maternal health, financial protection, or equity. These areas became the priority goals of the second phase of health system reform, which was developed in 2005 and known as “Manas Taalimi.” This sector-wide approach (SWAp) program, supported by pooled budget funding from joint financiers (including the World Bank) and parallel financing from other development partners, is the first large scale SWAp in a former Soviet Union country. The program focuses on (1) improving health outcomes, especially those related to the MDGs, (2) strengthening public health, (3) enhancing the capacity of the institutions involved in policy formulation, planning, budgeting and monitoring and evaluation, and (4) improving the quality of care with a specific focus on maternal and child health (MCH), cardiovascular and respiratory diseases, tuberculosis (TB), and HIV/AIDS.

<sup>13</sup> World Bank. World Bank Indicators database. Accessed December 15, 2010.

Despite an otherwise relatively successful health reform, maternal and child mortality in the Kyrgyz Republic remain high. The midterm review of Manas Taalimi in May 2008 showed that it had reduced people's financial burden related to health care, improved their access to health services, and enhanced the transparency and efficiency of public expenditures on health. Substantial progress was made in child health outcomes during Manas Taalimi, but the situation with maternal health is less clear. The maternal mortality ratio more than doubled between 2003 and 2008, increasing from 49 cases to 104 per 100,000 live births, with the 2008 estimate being a little less than the 110 per 100,000 live births, estimated from a population-based survey in 2000 (WHO 2007). The increase reflected in official figures likely results more from improved quality of data than from actual mortality. Infant mortality has fallen from 43 per 1,000 live births in 2000 to only 27.1 in 2008, while under-five mortality during the same period fell from 50 to 31.5 per 1,000 live births. The share of perinatal deaths in child mortality is as high as 70 percent.

**Maternal and child health services.** The primary care services have been reorganized into Family Group Practices. By 2007, these were reported as covering 98.5 percent of the population (WHO 2009). Improving breastfeeding and complementary feeding behaviors are central to addressing undernutrition in the critical first two years of life, and these have improved in recent years in the Kyrgyz Republic. UNICEF reports that about half of the country's maternity homes are now certified as Baby-Friendly Hospitals, and the improvements noted above are likely attributable, in part, to this initiative. Yet, exclusive breastfeeding rates dropped to 40 percent at three months and to 31.5 percent at six months of age. The MICS results showed that a higher proportion of mothers in rural areas (38 percent) exclusively breastfed their 0–6-month-old children than did mothers in urban areas (22 percent).

Mothers' lack of awareness of what constitutes proper nutrition for young children is another significant factor affecting infant and young child feeding practices. The 2006 MICS showed that only a third of the mothers received counseling for exclusive breastfeeding or appropriate complementary feeding.

Another strategy being used globally to create environments that support breastfeeding is strengthening implementation of the WHO international code for marketing breast milk substitutes. The Kyrgyz Republic has made progress in this regard. The national laws now reflect many of the provisions of the code, which classifies the country in the WHO's compliance category two.

Micronutrient interventions have been the focus of much support. The Kyrgyz Ministry of Health responded to the international guidelines endorsed by UNICEF and the WHO, and established a biannual universal distribution of high-dose vitamin A capsules for children 6–59 months. According to the WHO, 95 percent of children 6–59 months in Kyrgyz Republic are receiving vitamin A supplements twice each year, as recommended. Deworming in children requires the same frequency of delivery as vitamin A supplements. The two have been delivered at the same time in many countries. This combination has often become the basis of a package of preventive services that results in more efficient use of resources.

A new and promising intervention to enhance complementary feeding is micronutrient powders (MNPs) (e.g., Sprinkles<sup>TM</sup>), which relies upon a strong link between child health services and community outreach. The MNPs are usually packaged in single-serve sachets that are added daily to the food of infants and young children immediately before it is consumed. These products have been developed and trialed over the last decade, providing evidence that MNPs are both an effective and a feasible approach to reducing anemia in young children. A pilot program in Talas Oblast is well under way to determine how best to deliver this intervention. With early success achieved, such an intervention was launched in Naryn Oblast, and plans have been developed for subsequent scale up throughout the country.

**Antenatal and obstetric care services.** With universal coverage of primary health care, the utilization of maternal and child health services in the Kyrgyz Republic is high. All pregnant women are entitled to free

antenatal care (ANC) services, and more than 95 percent of births take place in health facilities. Therefore, the problem of persistently high maternal and neonatal deaths is not rooted in the lack of availability of care; rather, there is a consensus that the underlying cause is mainly low quality of care exacerbated by the limited use of evidence-based clinical practices among providers.

However, the lack of skilled human resources to address emergencies in non-specialist centers in remote areas appears to be a significant issue. The MICS indicated that 97 percent of women received at least one ANC visit and 85 percent received ANC service provided by a physician. The highest proportions of women receiving antenatal care from medical doctors were in Bishkek (98 percent) and the Naryn region (95 percent), while coverage in Issyk-Kul and Batken regions was the lowest, at 78 percent and 76 percent, respectively. High coverage of ANC is a requirement for delivery of most nutrition interventions during pregnancy.

Although the coverage of antenatal care is relatively high, several barriers to accessing these services have been noted. The main barriers are lack of an effective referral system for high-risk pregnancies, lack of compliance with evidence-based protocols, poor quality of care, and lack of skilled human resources. Although the core delivery services are provided free of charge, out-of-pocket expenses are common and constitute a barrier for some.

The National Clinical Protocols require prescription of folic acid within the first three months of pregnancy and of vitamin A within the first days after delivery (Order #260 of 2004, MoH). However, only 17 percent of mothers reported receiving folic acid during pregnancy, and 41 percent of mothers reported receiving vitamin A supplementation within the first days after the delivery in 2006.<sup>14</sup>

Delivery at hospitals in the Kyrgyz Republic is free of charge, and the rate of deliveries attended by qualified personnel has increased in recent years. This rate varies by a woman's place of residence. In urban areas, more than 9 of 10 (94.2 percent) deliveries are attended by a physician; while in rural areas, only 6 of 10 (64 percent) deliveries are attended. Hospitals are not accessible to women who live in remote mountainous areas such as in the Naryn, Osh, and Jalal-Abad regions. In 2005, 71 centers of emergency obstetric care with a total capacity of 3,800 beds were available countrywide. The size of the units ranged from 5- to 70-bed multiservice units with access to specialty doctors.

**Community outreach.** Nutrition interventions such as promoting breastfeeding and complementary feeding involve substantial behavior change and thus require a community platform for effective delivery. The Community Action for Health in the Kyrgyz Republic project, established in 2001, aims to enable rural communities to “act on their own for improvement of health in their villages,” and for “the governmental health system to work in partnership with village communities for improving health.”<sup>15</sup> These objectives are met through the work of voluntary Village Health Committees (VHCs) that have been formed throughout the country. With support from several international donors, the Ministry of Health is extending VHCs to the entire country.

This program provides a key a platform for delivery of health and nutrition interventions. Through links with VHCs, UNICEF-supported nutrition communication activities, this program could deliver quality education and counseling on nutrition issues that would quickly provide measurable impact on IYCF behaviors and coverage of other nutrition interventions. VHCs are being used, in coordination with the early childhood development personnel, in the initial implementation of an MNP intervention in Talas Oblast.

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<sup>14</sup> UNICEF. MICS 2006.

<sup>15</sup> Community Action for Health in Kyrgyzstan. [http://cah.kg/en/useful\\_links/](http://cah.kg/en/useful_links/).

**Building capacity in nutrition.** Maternal and child health training by I.K. Akhunbaev is now included in the Kyrgyz Republic’s curriculum of medical workers training at the Kyrgyz State Medical Academy. A program was developed for the course “Nutrition, Hygiene, and Dietetics” to train physicians in the nutrition requirements of children, adolescents, and adults based on their age, gender, physical status, and national traditions. However, the nutrition content of this curriculum or the curricula used in training other health and community workers was not reviewed for this report. Nutrition content is important in this curriculum, and the counseling skills of health workers and community volunteers need to be strong, particularly to facilitate the behavior changes needed for infant and young child feeding.

**Food fortification.** Fortification of staples and condiments is a highly cost-effective and efficient intervention that increases the consumption of key vitamins and minerals in populations consuming fortified foods.<sup>16</sup> The Kyrgyz Republic has made great progress in food fortification over the last 10 years, and the Ministry of Health has played a major role in promoting it. Much progress has been made in fortifying salt with iodine and wheat flour with iron, folic acid, and other B vitamins. Fortification requires a multisectoral effort to be effective. To this end, the Ministry of Health established a Food Fortification Working Group to facilitate building the necessary partnerships. The current situation with food fortification is described in section 4.3.4.

#### 4.3.2 Social Protection Sector

Poverty has always been a primary factor contributing to undernutrition. However, as with food production, the relationships between poverty and nutritional status are complex. The evidence is clear that improvements in nutrition lag far behind income growth (World Bank 2006, 29). In addition, surprisingly high levels of malnutrition, due to poor nutrition practices or lack of micronutrients, persist in families with ample incomes for adequate food intake (Ergo, Gwatkin, and Shekar 2009). And, as the effects of recent global crises in food, fuel, and finance have clearly shown, the poor suffer most from these added shocks; the undernourished become even more undernourished, and death rates rise. Thus, effective strategies for social protection, whether in current or future crises, must address undernutrition.

Poverty rates in the Kyrgyz Republic have been decreasing significantly since the beginning of the decade. According to 2008 data, one-third of the population is living below the poverty line, and 6 percent is considered extremely poor. Poverty is highest in rural areas (37 percent), and lowest in Bishkek (15 percent), with 81 percent of the extremely poor living in rural areas. The majority of the poor are families with children. The poor in the Kyrgyz Republic were hit by the food crisis in 2007–08 (food price inflation was 32 percent in 2007), the global energy price increases in 2008–09, and the continuing global economic and financial crisis. These consecutive shocks were compounded in 2010 by significant energy tariff reforms, which have sharply increased the consumer costs of electricity, heating, and water. The Kyrgyz Republic has also been affected by the adverse effects of climate change (such as severe winters and flooding), and other natural disasters, all of which are expected to increase poverty and nutrition stress.

Social safety nets have responded to the crises in various ways. The Kyrgyz Republic has been spending between 1 percent and 1.5 percent of GDP on social assistance benefits and services in the 2000s. This rate is lower than the average social assistance spending in ECA, about 1.7 percent of GDP, but still comparable with relative spending-to-GDP shares in countries with a similar level of economic development. These funds traditionally have been channeled to a patchwork of “old-style” categorical

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<sup>16</sup> WHO/FAO. *Guidelines on Fortification of Foods with Micronutrients*. Eds. Allen and others. [http://www.who.int/nutrition/publications/micronutrients/guide\\_food\\_fortification\\_micronutrients.pdf](http://www.who.int/nutrition/publications/micronutrients/guide_food_fortification_micronutrients.pdf). Accessed January 15, 2010.

benefits known as “privileges,” although two relatively new benefits targeting the poor hold promise of reducing poverty.

The country inherited a safety net from the Soviets consisting of a large number of poorly targeted, categorical, and costly benefits known as “privileges.” Prior to 2010, 39 categories of the population (e.g., World War II veterans, Chernobyl catastrophe liquidators, and people with disabilities) were entitled to more than 40 types of in-kind subsidies, representing a legacy of the past. These benefits included free transportation, discounted utility bills, free medicines, provision of a horse and a cart for rural transportation, free dentures, and so on. Entitlements to such benefits did not necessarily mean that the benefits were fully financed and used. It was a partially funded mandate shared with the service providers, and many people were de facto excluded from the system because they did not have access to the actual services (e.g., people with limited ability to travel could not use free transportation; or, no supplies of free medicines existed in the stores).

At the end of 2009, the government significantly began to reform the social protection system to improve its effectiveness and efficiency. One key area was monetizing the categorical in-kind benefits and reducing the number of entitled categories. Only 25 groups of privileged beneficiaries continue to be entitled to categorical benefits, which are now provided 100 percent in cash as flat monthly payments ranging from 1,000 to 7,000 som per month. This reform is aimed at achieving greater transparency of public expenditures, expanding consumer choice through the provision of cash instead of notional—but often unavailable or badly targeted services—simplifying the administration of cash benefits instead of in-kind privileges, and mitigating the negative effects of energy and heating tariff increases on consumption by vulnerable households.

Despite these reforms, the measures enacted have not focused on channeling social protection resources to the lowest-income households. The remaining categories of beneficiaries do not correlate strongly with the poverty profile. The population most at risk of poverty is small children, while the beneficiaries are mostly elderly.

The entire set of social assistance programs includes only two that have poverty alleviation objectives and are targeted to lower-income households. These are the two targeted cash transfer programs: the Unified Monthly Benefit (UMB) and the Monthly Social Benefit (MSB), which were introduced after Kyrgyz independence in 1991. They have the potential to support nutrition intervention components.

**The UMB** was introduced in 1995 as part of an important step in reforming the old-style safety net. It is a last-resort poverty-targeted variable cash benefit program that is means-tested and categorically targeted to children from 1.5 to 16 years of age (or up to 21 years of age when still studying) from low-income families. The UMB also includes payment of a fixed birth grant and an increased allowance for children under 1.5 and 3 years old, targeting that corresponds well to the country’s poverty profile. It is based on a gap formula covering the difference between the household’s per capita income and the guaranteed minimum income (GMI) used as a threshold for eligibility. According to administrative data, 396,000 low-income families received UMB in 2009. In 2008, 387,000 beneficiaries received the UMB.

**The MSB**, established in 1998, is a cash income-replacement program that is categorically targeted (but not means-tested) to disadvantaged groups, including children with disabilities up to 18 years of age, and other categories of people with disabilities, as well as orphaned children, mothers of large families, and the elderly who do not qualify for pensions from the social security system. It is a flat benefit of 1,000 to 2,000 som per month, depending on the category of beneficiary. According to administrative data, 64.8 thousand people were receiving the MSB in 2009 (nearly 60,000 in 2008).

The current UMB is the only rather well-built instrument to channel public resources to the poor and to promote investments in the human capital of older children in the Kyrgyz Republic. It performs well compared to poverty-targeted programs in many other ECA countries, especially taking into account the country situation—large agricultural sector, high level of subsistence agriculture, informal economy, and remittances.

**The UMB is fairly accurate in channeling benefits to the poor.** Fifty-four percent of the total benefit amount goes to those in the poorest quintile, and another 23 percent goes to those in the next quintile. The poorest 40 percent of the population receives more than 77 percent of total benefits. Leakages to the non-poor are minimal (see table 9).

However, in **terms of program coverage, UMB is not particularly strong.** Only 20 percent of the lowest quintile and another 14 percent of the second poorest quintile participate in the program. The reasons for this are not clear, but anecdotally, they are related to the difficulties in obtaining the documentation needed and low awareness of the program.

In terms of benefit value, **the UMB is not a generous transfer.** The value of the GMI that determines UMB eligibility is lower than the extreme poverty line. The UMB accounts for only 1.3 percent of the total household consumption in the poorest recipient households. Consequently, its impact with respect to the absolute poverty line is quite limited, even though the UMB has been successful in reducing the extreme poverty gap by 12 percent.

**Table 9. Distribution of UMB Benefits, Kyrgyz Republic, 2008**

	Q1	Q2	Q3	Q4	Q5	Total
UMB coverage	20.1	14.1	8.6	4.1	1.1	9.6
Distribution of beneficiaries	42.0	29.4	17.8	8.5	2.3	100
Distribution of benefits	54.1	23.3	17.0	0.5	0.1	100
Share of UMB in total HH consumption	1.3	0.4	0.2	0.04	0.0	0.4

*Source:* Calculations based on Kyrgyz Integrated Household Survey (KIHS), 2008.

*Note:* Quintiles based on annual per capita consumption before transfers, assuming a marginal propensity to increase consumption of 25 percent.

HH = household.

In sum, the social safety nets in the Kyrgyz Republic are undergoing significant and well-aimed reforms, but further efforts are needed to strengthen the UMB before other assistance programs can use it as a mechanism. It remains the only vehicle channeling budget resources directly to the poorest in the society, since most of the poor in the Kyrgyz Republic do not belong to the groups receiving categorical benefits. With the currently low eligibility threshold of 282 som, and administrative barriers that need to be thoroughly studied, the UMB does not yet assist a large number of the poor.

While the UMB has a strong foundation of respectable performance, improvements can be made in such aspects as expanding coverage, reducing the exclusion errors, and increasing the benefit adequacy (or generosity), which will all strengthen its impact in reducing poverty.

**Coverage** could be expanded by improving outreach methods and actively involving social workers in disseminating information and rapidly assessing poverty and vulnerability to reach more eligible households. Social Passports can be used for mapping all the poor and vulnerable, for monitoring vulnerability, and for policy planning. Coverage also could be improved by enhancing fiscal efforts, preferably with funding from downsizing and consolidating other social programs that are not targeted to

the poor. Furthermore, coverage could be increased by extending UMB eligibility to poor childless households.

Finally, by allocating more resources and raising the GMI much higher, the **benefit value** of the UMB could be raised, thereby increasing the impact on poverty reduction. This could also improve program participation, as the benefit becomes more meaningful for a larger number of poor households.

The UMB provides an interesting option for reducing undernutrition caused by poverty. On average, more than half of total household expenditures are for food. In rural areas, even with better access to home production, expenditure on food averages 67 percent of the household budgets, substantially more than in urban budgets (53 percent).

A relatively small-scale example of how the UMB could be used to reduce undernutrition is provided by a recent World Bank response to the food crises in three Central Asian countries, including the Kyrgyz Republic. Using global funds earmarked to relieve hardship resulting from the food crisis of 2008, US\$ 5 million was made available to provide a 30 percent top-up of the UMB. These funds were designed to compensate for the loss in purchasing power due to the food crisis. Approximately 360,000 people from socially vulnerable groups benefited from this funding. The success of the program prompted the European Union to continue with the top-ups beyond The World Bank-provided financing. In a second component of the program, vitamin A supplements were provided to more than one million children aged 6–59 months, and also to all nursing mothers in the targeted area. The project is still set to distribute a similar number of doses to mothers and children during 2010 and 2011. The project also addressed broader policy issues related to childhood development and supported the promotion of flour fortification and subsidizing the price of this intervention for targeted socially vulnerable populations.

#### **4.3.3 Agriculture and Food Interventions**

After the collapse of the Soviet Union, most sectors of the Kyrgyz economy, including agriculture, were marked by enormous changes. As a part of the Soviet Block, the Kyrgyz Republic had ready access to an enormous market for the raw materials it produced and exported for industrial processing elsewhere. With the virtual disappearance of this market, the Kyrgyz Republic sought to maintain self-sufficiency in cereal grains to ensure its food security, but this has not yet been achieved. In addition to the challenges presented by transitioning from collective ownership of farms, the high prices of imported agrichemicals and petroleum continue to constitute major barriers to increasing productivity. Much farming is done manually and using horse-drawn plows, as it was generations ago, instead of with machines.

**Agriculture production.** Agriculture remains the backbone of the Kyrgyz economy. It contributes over one-third of GDP and employs about 40 percent of the workforce. The country has a predominantly mountainous terrain; less than 8 percent of the land is suitable for cultivation. Raising livestock is the country's largest agricultural activity, and wool, meat, and dairy products are the major commodities. More than 90 percent of cattle, sheep, and horses and 85 percent of poultry are owned by small-scale farmers with small household plots or private farms. Strategies to enhance this sector hold great potential. In addition, animal-based foods are rich sources of vitamins and minerals and are important components to improving the nutritional status among the most vulnerable groups of young children and mothers.

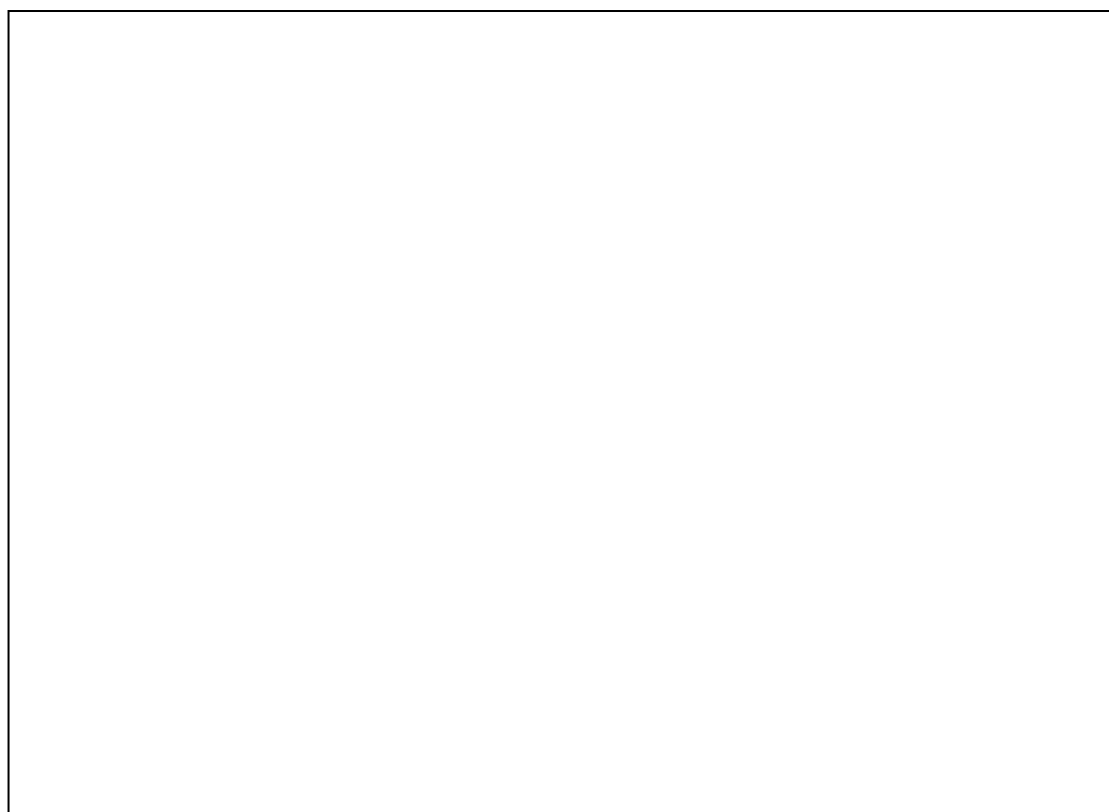
The country's major crops are potatoes, wheat, sugar beets, cotton, tobacco, vegetables, and fruit. A large number of homes achieve self-sufficient in food production by combining farming and raising livestock. However, domestic production of wheat is sufficient to satisfy only 50 to 60 percent of local demand for wheat and flour products. Much of the shortfall is imported from Kazakhstan, which is an important consideration for wheat flour fortification (see below), and a policy concern for food security. In response to the food crisis of 2007–08, Kazakhstan restricted its wheat exports, thereby decreasing availability in

the Kyrgyz Republic and causing a substantial price increase. And even though cereal production in 2009 increased by 12 percent over 2008, imports of wheat, largely from Kazakhstan, were still required to meet demand and enhance food security.

**Food crises.** The 2008 global food crisis aggravated the precarious food security situation for many in the country. The global economic crisis continues to affect the Kyrgyz Republic; many of the poor are unable to meet their health care and food needs. They not only eat less, the food they eat is of lower quality. During the first quarter of 2008, the Kyrgyz Republic experienced a severe winter; hydroelectric power resources were constrained; the country suffered a locust infestation and damaging hailstorms. As a result, agriculture production declined 1.2 percent despite an increase in the area of land cultivated. During this stressful period, an estimated one in five households consumed inadequate diets in terms of energy and protein.<sup>17</sup> The World Food Program (WFP) prepared a comprehensive assessment of the food security situation between 2006 and 2008 (Dhur 2008). The WFP apparently completed another assessment in 2010, but is not yet available.

A brief overview of the impact of the food, fuel, and economic crises' impact on food consumption in the Kyrgyz Republic is presented in box 1.

**Box 1. Impact of Food, Fuel, and Financial Crises on Food Consumption in Kyrgyz Republic**



**Food security interventions.** Ensuring food security requires food availability and food affordability. Agriculture deals with both of these, but food affordability is also addressed through social protection programs. Interventions targeting food insecurity in the Kyrgyz Republic, implemented in 2009 and for which information is available, represented investments of at least US\$ 20 million. They included:

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<sup>17</sup> WFP (2009). Emergency operation in the Kyrgyz Republic.

- UN World Food Program food distributions targeted vulnerable households countrywide (US\$ 8.6 million).
- Mercy Corps/Save the Children implemented two distributions of locally procured foods through the Office of U.S. Foreign Disaster Assistance/United States Agency for International Development (OFDA/USAID) during August and December 2009. These provided supplemental nutrition distributions, prioritizing vulnerable households with pregnant women and children up to age five in the selected *rayons* of Naryn, Issyk-Kul, Jalal-Abad, and Osh (US\$ 7 million was budgeted for the August round).
- The U.S. Department of Agriculture's (USDA) Food for Education Programs in kindergartens, orphanages, and government-licensed boarding schools distributed food together with nutrition education and budgeting for sustainable feeding programs in schools (US\$ 2.4 million).
- Save the Children implemented supplemental feedings as part of OFDA/USAID's Local/Regional procurement in Uzgen Rayon and Osh Oblast.
- Kompanion Financial Group/Mercy Corps strengthened household livelihoods by improving harvest security, yields, and ability to sell yields for reliable annual production, and strengthened poverty reduction through agricultural training (including storage), mobilization, marketing, access to credit, and budgeting skills.
- Numerous other NGOs provided various nutrition supports to the nutritionally vulnerable countrywide.

Traditionally, food security interventions have focused primarily on providing food and not on the nutritional outcomes of providing that food. This is now changing at the global level with ongoing movements such as that initiated at the L'Aquila Summit in Italy during 2009, and the International Health Partnership. The SUN Framework, providing a consensus on scaling up nutrition interventions, is an extension of these movements.

**Food fortification.** Ongoing efforts to achieve universal salt iodization and introduce flour fortification are being guided by the Food Fortification Working Group established by the Ministry of Health. This group has representatives from the local food industry; government ministries responsible for establishing and enforcing food standards and regulations and regulating food imports; research institutions/academics; and donors including the Asian Development Bank (ADB), UNICEF, the World Bank, and the Global Alliance for Improved Nutrition (GAIN) is providing technical support.

A 2001 law mandated that all salt consumed in the country be fortified with iodine. The law is now implemented through the USI program. The iodine fortification program was evaluated in 2007 (Sultanalieva and others 2009), and the results indicate substantial progress since the 2001 enactment of the law, and a vast improvement since the early 1990s. As described above, the levels of iodine in household salt in 2007 were sufficient to provide adequate iodine nutrition for schoolchildren, but did not meet the requirements for pregnant women.

Overall, less than 40 percent of the salt tested in 2007 had adequate levels of iodine ( $\geq 15$  mg/kg). More than half of the domestic salt samples (66 percent) had iodine levels  $< 15$  mg/kg. Imported brands of salt were more likely to have adequate concentrations of iodine than domestically produced salt, indicating that the border controls were working to some extent. However, more than half the imported salt brands fell short of the minimum compulsory iodization range of 25–55mg iodine/kg agreed upon in the Commonwealth of Independent States (CIS 2001). This suggests that the quality of the iodization processes being used by both domestic and foreign manufacturers needs to be further improved.

The Ministry of Health's leadership in initiating flour fortification was catalyzed by external support, first by two ADB projects and then with substantial contributions from UNICEF, the World Bank, and GAIN.

Central to the success of fortifying wheat flour is a productive collaboration of public health workers and the flour-milling industry. Comprehensive documentation of the efforts made to support fortification of wheat flour in Central Asia is available publicly.<sup>18</sup> This documentation provides details of the issues to advance fortification, including the structure of the milling industry, the rationale and formulation of premixes, and the need for further strengthening of capacity in the milling industry and the public sector to ensure high-quality processing and its regulation.

The broad issues being addressed in establishing fortification were set out systematically by Ranum in 2004. The structure of the milling industry and the key issues shaping mandatory legislation were described by Bagriansky in 2007.<sup>19</sup> Together, these two papers provide a strong foundation for the ongoing development needed to exploit the opportunities and address the challenges of fortifying wheat flour as a public health intervention.

The wheat flour milling industry in the Kyrgyz Republic is complex. Observers have concluded that a single “universal” approach to flour fortification was inappropriate for the Kyrgyz Republic. There are likely 2,500 to 3,000 mills of varying sizes and technologies producing a range of flour types, and a large number of very small in-home grinding/crushing operations. Importantly, a high proportion of the vulnerable population does not consume flour produced in large central mills. The milling variation will require a flexible approach to match the many fortification technologies, premix designs, quality control processes, legal approaches, food control strategies, and social marketing perspectives of each context. Perhaps the greatest barrier to government-mandated fortification is that much of the flour market is beyond government control.

Successes in wheat flour fortification have included the following:

- Legislation mandating that flour producers fortify top and first grade flour was signed into law on March 17, 2009.
- Assistance was provided to install appropriate and affordable equipment in selected pilot mills, including feeders.
- A regional GAIN grant facilitated the demonstration of effective approaches to overcome the challenges of fortifying and maintaining the quality of the product affordably for vulnerable groups in small-capacity mills. This grant responded to the key issue that a substantial proportion of the targeted vulnerable population consumes only flour produced in small mills.

Ongoing issues to further strengthen flour fortification include the following:

- Strengthen compliance with legislation and standards, particularly where much of the marketing of flour is beyond government control.
- Develop and implement realistic subsidies and/or incentives (e.g., modification of value-added tax applied to operating components of fortification).
- Trade issues include dependence on imported wheat or flour from Kazakhstan, estimated at 40 to 50 percent of total supply. Stability of wheat supply became a critical issue during the food crisis of 2008. Three-quarters of imported flour is estimated to be from unofficial sources that are difficult to regulate.
- Sustain production of premix in the region; the premix currently being used is purchased with support from the World Bank.
- Sustain fortification in small-capacity mills, particularly in dealing with the well-known challenges of inherently higher costs (among the poor, any increase in food prices represents

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<sup>18</sup> <http://www.adb.org/Projects/sustainable-food-fortification/progress-report.asp>

<sup>19</sup> Bagrianski J. Personal communication, 2007.

- a relatively large share of overall expenditures), and maintain high quality and compliance in numerous and widely dispersed mills.
- Develop segmented social marketing to create demand for fortified products across the many segments of consumers of wheat flour.

Program coverage is difficult to estimate due to a lack of data about the variation in consumption of flour and flour products and the different grades of wheat flour across geographic, economic, and demographic groups in the country. These data are necessary to develop alternative approaches in areas where fortified foods are not consumed in sufficient quantities to provide the additional vitamins and minerals required. One such alternative is “point of use” fortification, also known as micronutrient powders or Sprinkles. The International Micronutrient Malnutrition Prevention and Control (IMMPaCt) project of the CDC is working with UNICEF to support operations and evaluate research in support of the micronutrient powders intervention in Talas Oblast (described above).

The CDC is also working in close collaboration with other partners in the Fortification Working Group to guide the development of a monitoring and evaluation protocol for national fortification efforts. In 2009, the CDC provided technical assistance to UNICEF in a national micronutrient survey.<sup>20</sup> Results from this survey will provide the baseline data from which the impact of fortification and other nutrition interventions will be evaluated over the next two to four years.

**Food regulation, safety, and trade.** Responsibility for monitoring the food supply and enforcing regulations lies with the Department of Sanitary and Epidemiological Services (SES), a unit within the Ministry of Health. Under the general food law issued in 1998, SES has broad authority to police the market place and confiscate products that the SES finds to be “unsafe.” To date, the implementation of the authorizing law has focused on food safety rather than food quality. The unit, however, will be responsible for ensuring compliance with regulations introduced as part of the mandatory fortification of selected grades of wheat flour described above.

This assessment does not include a description of the SES’s capacity-building needs, but other assessments of the wheat flour fortification programs have gathered information on those needs. As noted above, a major challenge to regulating the food supply is the fact that a substantial proportion of it is beyond government control. The central challenges to establishing control result from the large number of enterprises and industry segments involved, the large proportion of these enterprises that are unregistered and untaxed, the significant volume of production from grey and black market operations, and the significant volume of “unofficial” wheat and wheat flour entering the country from Kazakhstan.

Like other Central Asian countries, the Kyrgyz Republic’s food safety system has many constraints, including: (1) lack of human capacity; (2) lack of financial capacity to conduct staff training to monitor and enforce food safety requirements, and to develop appropriate infrastructure (processing enterprises, storage, transportation infrastructure, etc.); (3) lack of political commitment to food safety issues; (4) fragmentation among the different agencies responsible for food issues; and (5) inadequate post-harvest food handling (Suresh and Rhoe 2005). Currently, the inter-agency working group is preparing technical regulations on iodized salt and fortified flour.

#### **4.3.4 Early Childhood Development Projects and the Education Sector**

There are important synergies between early childhood development and nutrition interventions to ensure full mental and physical development. Undernutrition early in life, particularly before the age of two

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<sup>20</sup> Rafa Flores, personal communication, 12 March 2010.

years, has important negative impacts on the effectiveness of education programs, and therefore should be of national concern.

Preschool and early childhood development (ECD) projects provide an opportunity to deliver key nutrition interventions. Parents are often more motivated by child development than by hidden micronutrient deficiencies. Highlighting the contributions of nutrition to ECD can help ensure caregiver compliance with the nutrition messages. Because some ECD projects establish contact with infants and children before the age of two years, they facilitate the delivery of interventions in the critical window of opportunity before irreversible developmental losses from undernutrition have occurred.

Links between community health programs and preschool interventions will provide an excellent delivery mechanism for interventions requiring frequent contact with mothers. Nutrition has many such interventions; micronutrient powders are a good example. The UNICEF pilot in Talas Oblast is using this linkage with substantial success. With help from the CDC and NGOs, UNICEF plans to scale up this intervention with assistance from volunteer groups.

With the collapse of the Soviet system, support for preschool services declined substantially. More than 70 percent of kindergarten buildings were sold to private companies and access to preschool education became very limited, particularly in rural areas. Today, the situation has improved slightly; however, preschool education still lacks resources and qualified staff. MICS showed that about 35 percent of children attended preschool in urban areas, but only 10 percent attended in rural areas. The highest attendance was 42 percent in Bishkek city and the lowest was 7 percent in the Batken region.

From 2002 to 2006, the Ministry of Health of the Kyrgyz Republic initiated a pilot “Healthy Schools” program. Courses were developed for teachers of secondary school classes one through five. This included a section called “A Health Culture;” and four of the 36-hours of instruction were about nutrition. The MoH introduced this program in 22 pilot schools nationwide. In 2009, an edited teacher manual for this program was translated into Kyrgyz. Given the high number of secondary school graduates in the Kyrgyz Republic, this is a clear opportunity to include nutrition information in school curricula to teach adolescents key information for parenthood.

#### **4.4 Current Coverage and Potential Benefits of Scaled Up Nutrition Interventions**

In this section, the estimates of current coverage of nutrition interventions that were recommended in the 2008 *Lancet* series are presented. It shows the potential to reduce the prevalence of undernutrition and neonatal and child mortality by scaling up these interventions by 20 percent, considered a pragmatic increase, and to 100 percent, or universal coverage. Estimates also are presented of potential economic gains from an increased workforce (by mortality reduction) and workforce productivity by scaling up nutrition interventions at both pragmatic and universal coverage.

##### **4.4.1 Current Coverage**

Table 10 presents information available on coverage of nutrition programs in 2009.

**Table 10. Proportion of Target Populations Covered by Selected Nutrition Interventions, Kyrgyz Republic, 2009**

<b>Universal interventions</b>	<b>Coverage</b>
Breastfeeding promotion strategies (individual and group counseling)	32
Maternal iodine through iodization of salt	94
Maternal iron folic acid supplementation	60
Maternal calcium supplementation	
Zinc fortification/ supplementation	10
Zinc in management of diarrhea	
Vitamin A fortification/supplementation	98
Universal salt iodization	94
Treatment of severe acute malnutrition	
Behavior change communication for improved complementary feeding	37
Delayed cord clamping	55
Maternal multiple micronutrient supplementation	
Handwashing / Hygiene interventions	
<b>Situational interventions</b>	
Maternal balanced energy protein supplementation	E
Maternal iodine supplements	
Iron fortification/supplementation programs	E
Provision of complementary foods	E
Neonatal vitamin A supplementation	E
Maternal deworming in pregnancy	
Deworming in children	27
Multiple micronutrient supplements	7
<b>Other supportive strategies</b>	
Conditional cash transfers (unspecified)	
Unconditional cash transfers and microcredit programs	
Conditional cash transfer programs (with nutrition education)	
Maternal mental health interventions	
Family planning interventions to promote birth spacing	48
Handwashing / Hygiene interventions	
Mass media strategies for breastfeeding promotion, dietary diversification, etc.	4
Baby Friendly Hospital initiatives	48
Food for work programs and generalized food subsidies	
Dietary diversification strategies, small animal husbandry and home gardening	

*Note:* E = existing program but no available coverage data.

#### 4.4.2 Reductions in Undernutrition from Scaling Up Nutrition Interventions

Scaling up nutrition interventions in the Kyrgyz Republic will reduce undernutrition and yield substantial health and economic benefits, owing to reductions in mortality and increased productivity. Table 11 presents the potential relative reductions in prevalence of undernutrition if coverage is increased by 20 percent a year (pragmatic coverage) and to 100 percent (universal coverage). The estimates were derived from methods described in annex 1.

The greatest impact on undernutrition noted in this analysis is for maternal anemia, where pragmatic coverage and universal coverage of iron folic acid supplementation would yield reductions of 26 percent and 51 percent, respectively. Reductions in maternal anemia of 37 percent at universal coverage would also occur by scaling up maternal micronutrient supplementation. This intervention would reduce LBW at the same time. For child interventions, universal coverage of complementary feeding promotion and micronutrient powders results in the largest reductions in prevalence in stunting and anemia.

**Table 11. Relative Reduction in Prevalence (%) of Undernutrition Outcomes from Maternal and Child Interventions through Pragmatic Coverage (PC) and Universal Coverage (UC), Kyrgyz Republic**

Interventions	LBW		Stunting		IDD		Maternal anemia		Childhood anemia	
	PC*	UC	PC*	UC	PC*	UC	PC*	UC	PC*	UC
<b>Maternal interventions</b>										
Maternal micronutrient supplementation	2.8	13.3					8.0	37.4		
Maternal balanced energy protein supplementation	6.4	31.7								
Maternal iron folic acid supplementation							26.0	50.7		
Use of IPT/ITN during pregnancy **	7.4	36.6					2.4	11.9		
<b>Child interventions</b>										
Complementary feeding promotion through community education (food secure population)			1.9	5.7						
Complementary feeding promotion through community education and support (food insecure population)			3.6	11.9						
Zinc fortification			3.0	13.6						
Iodization of salt					3.3	3.4				
Micronutrient supplementation with sprinkles									4.2	19.9
Deworming of child $\tau$									2.1	7.4

\* Assumed 20 percent increase from existing coverage per year.

$\tau$  Only in children with intestinal helminths.

\*\* For areas with endemic malaria (subnational).

Note: IPT/ITN = intermittent preventive treatment/insecticide-treated nets.

### 4.4.3 Reductions in Neonatal and Child Mortality by Scaling Up Nutrition Interventions

In this section, the potential neonatal and child deaths averted per year are estimated if the coverage of maternal and childhood interventions, respectively, listed in table 12, were increased by 20 percent (pragmatic coverage) or to 100 percent (universal coverage).

**Table 12. Estimated Impact of Core Nutrition Interventions on Neonatal and Child Mortality, Kyrgyz Republic**

<b>Maternal interventions</b>	<b>Pragmatic Coverage* Annual number of deaths prevented (%)</b>	<b>Universal Coverage Annual number of deaths prevented (%)</b>
Maternal balanced energy protein supplementation	14 (0.4)	67 (2.0)
Maternal iron folic acid and multiple micronutrient supplementation <sup>¶</sup>	5 (0.2)	31 (0.9)
Periconceptual folic acid supplementation	6 (0.2)	30 (1.0)
Immediate breastfeeding	32 (0.9)	52 (1.6)
Exclusive breastfeeding	28 (0.8)	89 (2.8)
<b>Child interventions</b>		
Exclusive breastfeeding < 6 months	20 (2.2)	67 (7.4)
Continued breastfeeding beyond 6 months	10 (1.1)	23 (2.6)
Appropriate complementary feeding in food secure and insecure populations	12 (1.4)	31 (3.4)
Vitamin A supplementation	5 (0.6)	5 (0.6)
Promotion of WASH strategies	9 (1.0)	9 (1.0)
Zinc fortification <sup>†</sup>	2 (0.3)	10 (1.1)
Zinc for diarrhea treatment	11 (1.2)	9 (1.0)
WHO-recommended case management of SAM	6 (0.6)	25 (2.8)

\*Assumed 20 percent increase from existing coverage per year.

<sup>†</sup> Estimates will improve after comparative risk assessment.

<sup>¶</sup> Maternal iron folic acid supplementation will also impact maternal mortality (estimated 4.7 percent reduction in anemia deaths at universal coverage).

*Note:* WASH = water sanitation and hygiene; SAM = severe acute malnutrition.

The greatest numbers of neonatal and child deaths averted with pragmatic (20 percent) increases in coverage are from breastfeeding interventions (early initiation, exclusive to six months, and continuing to two years). Together, these would save 90 deaths (60 neonatal, 30 child). At universal coverage, these breastfeeding interventions would avert 231 deaths (141 neonatal, 90 child).

After breastfeeding, the largest impacts on mortality result from promoting appropriate complementary feeding, enhancing treatment of diarrhea with zinc and ORT, and promotion of WASH strategies. Together, these account for another 32 child deaths averted. At universal coverage, the recommended case management of severe acute malnutrition would avert 25 child deaths.

Not included in these estimates were reductions in maternal mortality. It is of enormous public health significance that universal supplementation programs with either iron folic acid or multiple micronutrient supplements would reduce maternal mortality by 4.7 percent.

#### 4.4.4 Future Economic Gains from Scaling Up Nutrition Interventions

In this section, results of reductions in the prevalence on undernutrition and mortality from scaling up nutrition interventions are used to estimate the future economic gains in productivity and numbers in the workforce if nutrition intervention packages are implemented at universal coverage. Results are shown in tables 13 and 14.

**Table 13. Future Gain in Productivity by Nutrition Intervention Package at Universal Coverage, Kyrgyz Republic, US\$ million**

Intervention	LBW	Stunting	IDD	Childhood anemia
Maternal multiple micronutrient or iron folic acid supplementation	0.18			
Maternal balanced energy protein supplementation	0.42			
Use of IPT/ITN during pregnancy	0.47			
Complementary feeding promotion through community education (for food-secure pop.)		1.35		
Complementary feeding promotion through community education (for food-insecure pop.)		1.59		
Zinc for diarrhea treatment		1.71		
Iodized salt			0.52	
Micronutrient supplementation with Sprinkles				1.21
Deworming of child				0.45
<b>Package</b>	<b>0.78</b>	<b>1.93</b>	<b>0.52</b>	<b>1.58</b>

**Table 14. Future Gain in Workforce by Nutrition Intervention Package at Universal Coverage, Kyrgyz Republic, US\$ million**

Intervention	Low birth weight	Stunting
Maternal multiple micronutrient or iron folic acid supplementation	0.17	
Maternal balanced energy protein supplementation	0.39	
Use of IPT/ITN during pregnancy	0.44	
Complementary feeding promotion through community education (for food-secure pop.)		0.45
Complementary feeding promotion through community education (for food-insecure pop.)		0.53
Zinc for diarrhea treatment		0.57
<b>Package</b>	<b>0.75</b>	<b>0.64</b>

#### 4.5 Summary

The results are collated in table 15 and summarized here. We have described the epidemiological situation of nutrition, the operational context of scaling up selected nutrition interventions, and the expected health and economic benefits if the selected interventions are scaled up. In addition to our analysis on relative reduction in risk, deaths averted, losses in productivity averted, and cost-benefit comparison, we have

evaluated the cost-effectiveness of interventions based upon global evidence (not only Kyrgyz Republic-specific evidence; see annex 7). Unavailable data are a major barrier limiting the comprehensiveness of our analyses. Because the nutrition situation in Central Asia is quite fluid, we hope that stakeholders in the Kyrgyz Republic will use current data on prevalence of conditions, coverage, and costs of the interventions described as soon as it is available to update table 15 and the conclusions drawn from it.

We have developed two ranking systems. First, a numerical ranking (1–9) presents our recommended priorities for policy and program action. These priorities were developed by combining the results of the analyses presented with our judgments and understanding of the feasibility of scaling up the selected interventions in the Kyrgyz Republic at this time. In this ranking, the highest weighting was assigned to the feasibility of program implementation. Therefore, the highest priorities were assigned to a set of direct public health interventions.

Second, the letter ranking was developed by combining the analyses presented in this report with the recent work undertaken by global nutrition partners moving toward consensus on the interventions to recommend at a global level. This consensus builds upon the evidence presented in *The Lancet* maternal and child undernutrition series and seeks to balance two complementary sets of interventions that address the immediate and underlying causes of undernutrition. The immediate causes are addressed through public health interventions focusing on the minus 9 to 24-month target group—the so-called “window of opportunity” for nutrition interventions. The underlying causes will be addressed with a broader set of longer-route interventions, primarily delivered through social protection and agriculture sectors.

Table 15 presents a summary of our findings for the types of undernutrition we have reviewed: low birth weight, stunting, severe wasting, vitamin A deficiency, iodine deficiency, childhood anemia, and maternal anemia. We report the prevalence and attributable deaths for each (the absolute number of deaths from the condition), including the proportion of deaths this contributes to the number of deaths in children under five years of age. We evaluated potential interventions with a high impact on child survival recommended by *The Lancet* nutrition series and the more recent *Framework for Global Action*. Our evaluation considered the coverage rates for each of the recommended interventions, if already ongoing in the country, and the relative risk reduction achievable with universal coverage. We also estimated the avertable number of deaths with full-scale implementation of the intervention, and calculated the economic benefits in millions of U.S. dollars per year for future gains in productivity and workforce. The table also incorporates the cost-effectiveness for each of the interventions and categorizes each as a core minimum cost-effective intervention or a country-specific recommendation. The intervention categories are listed below:

- 1–9 = Overall priority assigned on the basis of expected impact and feasibility of delivery, interventions using the same delivery platform are assigned the same priority
- A = Recommended core of direct interventions are from the *Framework for Global Action*
- A\* = Priority multisectoral interventions addressing the underlying determinants for undernutrition, important to initiate programs for long-term sustainable impacts
- B = Situational recommendations depending upon prevalence rates of deficiencies or disease (e.g., malaria, parasitic worms) and availability of delivery mechanisms
- C = Optional second-level interventions depending upon burden (prevalence of maternal low BMI) and experience of successful delivery

Interventions using the same delivery platform (e.g., complementary feeding promotion and micronutrient powders for children; vitamin A and deworming for preschool children) are assigned the same numerical priority because this makes sense from an operational point of view.

There are no compelling data on impact to support investments in large-scale nutrition interventions for agriculture, and the evidence supporting interventions in social protection interventions is growing, but remains limited. However, it is abundantly clear that factors in these sectors are the underlying causes of undernutrition, and, that developing effective interventions to address these factors are critically important to establishing sustainable national programs to reduce undernutrition. Although agricultural and social protection interventions are presented in table 15 as only reducing stunting—because these interventions address the underlying causes of undernutrition—they will in fact have a positive impact on all forms of undernutrition. As a result, the impact of these interventions actually will be more powerful than indicated. Due to the positive rippling effect of these actions, we endorse initiatives to strengthen these interventions.

**Table 15. Summary of Findings on the Consequences of Undernutrition, the Costs and Benefits of Scaling Up Program, and Priorities Recommended, Kyrgyz Republic**

Form of undernutrition	Prevalence	Attributable < 5 deaths (%)	Interventions				Economic benefit (US\$ mil/year)	Cost Effectiveness (US\$)		Priority assigned/ intervention grade
			Potential interventions	Coverage*	Relative risk reduction at UC	Deaths averted		Cost per death averted	Cost per DALY averted	
LBW	5.0	388 (5.5)	Maternal balanced energy protein	E	31.7	67 (17.3)	0.81	NA	NA	8/C
			Maternal multiple micronutrient supplementation	NA	13.3	31 (8.0)	0.35	100-300	3-11	2/A
			IPT/ITN during pregnancy	NA	NA	NA	0.91	NA	5-17	9/C
Stunting	13.7	768 (10.8)	Exclusive breastfeeding until 6 months	31.5	NA	67 (8.7)	NA	NA	NA	1/A
			Complementary feeding promotion for food secure population	38.0	5.7	NA	1.8	NA	NA	1/A
			Complementary feeding promotion and support of food-insecure population	33.0	11.9	NA	2.12	NA	NA	1/A
			Complementary feeding promotion (overall)	44.0	NA	31 (4.0)	NA	NA	NA	1/A
			Zinc fortification/supplementation	10.0	14.9	10 (1.3)	NA	NA	12.20	3/A//9/B
			Zinc for diarrhea treatment	NA	NA	9 (1.2)	2.28	2100	73	5/A
			Promotion of handwashing and hygiene strategies	NA	NA	9 (1.2)	NA	NA	NA	7/A
			Agriculture/food production interventions to improve nutrition	NA	NA	NA	NA	NA	NA	6/A*
			Poverty reduction: cash transfers—conditional/unconditional	NA	NA	NA	NA	NA	NA	6/A*
Severe Wasting	0.4	140 (2.0)	WHO-recommended case management of SAM	NA	NA	25 (17.9)	NA	NA	5/A	
VAD	50.0	105 (1.5)	Twice-annual vitamin A supplementation	98.0	NA	5 (4.8)	NA	19-193	NA	4/A
IDD	16.4	-	Universal iodization of salt	94.0	3.4	NA	0.52	NA	34-36	3/A
Childhood Anemia	50.6	-	Micronutrient powders for children added to food at point of use	5.0	19.9	NA	1.21	248-273	8-97	1/B
			Deworming during childhood	27	7.4	NA	0.45	NA	2-9	4/B
Maternal	24.5	-	Maternal iron folic acid supplements	60	50.7	NA	NA	NA	66-115	2/A

Form of undernutrition	Prevalence	Attributable < 5 deaths (%)	Interventions				Economic benefit (US\$ mil/year)	Cost Effectiveness (US\$)		Priority assigned/ intervention grade
			Potential interventions	Coverage*	Relative risk reduction at UC	Deaths averted		Cost per death averted	Cost per DALY averted	
Anemia			Maternal multiple micronutrient supplementation	NA	37.4	NA	NA	NA	NA	2/A
			Fortification of wheat flour	25%	NA	NA	NA	NA	NA	3/A
			IPT/ITN during pregnancy	NA	NA	-	NA	NA	13-24	9/B

\* E = Existing program but no available coverage data; N = No existing program;

Note: UC = universal coverage.

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## 5. Nutrition Intervention Priorities for the Kyrgyz Republic

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Undernutrition costs the Kyrgyz Republic more than US\$ 32 million annually due to workforce losses caused by mortality (US\$ 4.45 million), and lost productivity (US\$ 27.94 million). Future productivity losses from childhood anemia alone are estimated at between US\$ 1.2 and US\$ 6.1 million per year. Improving the population's nutrition through evidence-based, preventive, and therapeutic nutrition interventions at scale could save approximately US\$ 6.25 million annually.

### ***Most effective interventions for averting deaths***

Almost 17 percent of under-five deaths are attributable to stunting and LBW. Increased interventions are urgently needed to prevent childhood deaths. We analyzed the impact of seven interventions to reduce stunting. To save lives, promoting exclusive breastfeeding for infants under six months and appropriate complementary feeding are the most efficacious, with 9 percent and 4 percent respective reductions in under-five deaths with universal coverage. Although additional country data to estimate the cost-benefit of these interventions are needed, both are recommended as core effective interventions based on global evidence from *The Lancet* nutrition series. These interventions are proven to reach children during the critical window of opportunity from the beginning of pregnancy to 24 months.

Providing mothers with balanced energy protein supplements was predicted to provide a sizable impact on LBW. This intervention reduced the relative risk of death by 32 percent, and we estimate that when implemented at scale, it would avert 17 percent of attributable child deaths. The estimated cost-benefit of universal maternal balanced energy protein coverage is nearly US\$ 800,000 a year in averted economic losses. Currently, pregnant women are targeted for food supplementation through many of the food security interventions, but the appropriateness of the types of food used in these programs has not been assessed, to our knowledge. Normative guidelines are needed for scaling up implementation of this intervention.

**Two complementary sets of interventions** are proposed to address the immediate and underlying causes of underweight. The immediate causes should be addressed through a set of direct public health interventions focusing on the minus 9 to 24-month window of opportunity, which are described below. Efforts should be initiated to address the underlying causes through a broader set of longer-route interventions, primarily delivered through agriculture and social protection. Action to sustainably reduce undernutrition will require a multisectoral approach involving coordination across sectors, which are not currently involved in nutrition activities. Participation from these sectors will require a long-term strategic approach that begins by developing active commitment from the highest political offices in the country. The economic rationale for supporting nutrition interventions—as well as the humanitarian one—presented in this report is incontrovertible evidence for government officials to act upon.

Achieving measurable success in reducing undernutrition by rapidly scaling up the recommended direct public health nutrition interventions may contribute to catalyzing the political commitment required to sustain the necessary longer-term effort. Therefore, the highest priority should be assigned to the set interventions of the three groups described below, because they will have the greatest impact on reducing undernutrition.

Targeting interventions in geographic areas with the most nutrition problems may result in the greatest potential for benefits, and is also justified based on equity. In the Kyrgyz Republic, the highest rates of stunting—generally the most stable indicator of undernutrition—have been reported in Talas, Isskyl-Kul, and Batken Oblasts. Another important consideration in targeting nutrition interventions is the capacity

available to deliver them. In subsequent discussions with stakeholders to finalize decisions about targeting and resource allocation, the delivery capacity of both government and NGO services need to be identified and mapped in the highest-priority areas being considered for interventions.

### **Priority 1. Promoting Good Nutritional Practices**

Behavior changes to reduce and treat undernutrition include breastfeeding, complementary feeding for infants after six months of age—preferably using locally available and affordable foods and multiple micronutrient powders where needed—and improved hygiene. Changing family behavior is crucial. The most important short-run determinants of nutrition status are choices that families make in markets, as consumers and in many cases as producers, and in household practices.

***Infant and young child feeding.*** While several IYCF nutrition interventions exist in the Kyrgyz Republic, the coverage varies widely, as does equitable access for the poor. The 2006 MICS shows current coverage rates for exclusive breastfeeding and its appropriate promotion at 32 percent and 44 percent, respectively. Current programs should be strengthened and scaled up. The MICS data show a relatively high 65 percent rate of early initiation of breastfeeding, which is one of the primary targets of the ***Baby-Friendly Hospital Initiative***. Forty-eight percent of maternal health facilities are certified to implement this initiative, and it is recommended that the quality of the program be maintained or strengthened where necessary. Ways should be found to strengthen interventions supporting ***counseling for exclusive breastfeeding***, especially group counseling in community settings. Exclusive breastfeeding rates drop to 40 percent at three months and to 32 percent at six months. Understanding the reasons for these dropping rates is an important first step in designing interventions to change these behaviors. Increased investment in promoting exclusive breastfeeding is necessary. This will likely include further training and supervision of both clinic-based and outreach workers.

***Improving complementary feeding in both food-insecure and food-secure settings.*** Providing appropriate complementary foods and education strategies in food-insecure households will reduce stunting and result in an estimated US\$ 2.1 million benefit per year in the Kyrgyz Republic. In food-secure households, the annual benefit of this intervention is estimated to be US\$ 1.8 million. Opportunities to provide greater cost efficiencies exist through linking these interventions with existing food distributions. Operational guidance on how to build these linkages has been recently disseminated by USAID's FANta project.<sup>21</sup> Multiple micronutrient powders for infants after six months are a key component of strengthening complementary feeding practices, and is described below.

As noted above, more detailed information will be needed about breastfeeding and complementary feeding behaviors to enable effective interventions to be designed.

The MoH and Swiss Red Cross plan to ***extend VHCs*** to the entire country and link them with UNICEF-supported nutrition communication activities. This expansion promises to provide an effective delivery mechanism for strengthening IYCF intervention.

### **Priorities 2–5. Increasing Vitamin and Mineral Intake**

Most of the recommended interventions are already in place, but need to be strengthened and scaled up. The only new intervention to introduce is zinc supplementation for diarrhea.

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<sup>21</sup> FANta/USAID. Preventing malnutrition in children under two approach (PM2A): A food-assisted approach. [http://www.fantaproject.org/pm2a/PM2A\\_v1.1\\_Mar2010.pdf](http://www.fantaproject.org/pm2a/PM2A_v1.1_Mar2010.pdf) (accessed 9 April 2010).

**Maternal supplementation with either multiple micronutrients or iron folic acid (IFA).** Pregnant women require daily supplements of vitamins and minerals to meet their substantially increased requirements. The delivery mechanism for both IFA and multiple micronutrients is the same, and hence issues in scaling up these interventions are the same. IFA supplementation delivered through antenatal care services currently has coverage of 60 percent. Contrary to the often-held belief that maternal anemia programs are not effective at scale, the programs of Thailand, Nicaragua, and Nepal provide evidence of successful implementation (Klemm and others 2009). In addition to impressive reductions in perinatal mortality, the reductions in maternal mortality by reducing anemia are substantial (Black and others 2008).

**Universal salt iodization.** The 2006 MICS confirms that only 76 percent of salt was adequately iodized (i.e., 15 parts per million). Comparisons of economic benefits indicate that expanding adequate salt iodization to universal coverage would result in an annual benefit of over US\$ 500,000. The overall economic benefit was probably underestimated because the deceptively high coverage rate likely skewed the analysis. Limited investments in the quality control of both domestic and foreign salt producers would lead to a significant improvement in the iodization program's effectiveness.

**Flour fortification.** Wheat flour is an appropriate vehicle to provide many vitamins and minerals that are deficient in the Kyrgyz diet. The president endorsed mandatory flour fortification in March 2009. An inter-agency working group is finalizing the implementation plan with UNICEF's technical support. Even though only about 10 percent of all flour is currently fortified, development partners have made a lot of progress on this issue. They have an excellent understanding of the structure of the flour industry and the challenges faced both by industry and governments. They have also identified the fortification issues that need to be addressed and have agreed upon a strategic approach to achieving the potential of intervention. We recommend continuing support to the Food Fortification Working Group.

Flour fortification is not a panacea to redress deficiencies of vitamins and minerals in all contexts. Analysis is needed to identify the situations where fortification is unlikely to be effective, such as with children under two years who do not eat sufficient amounts of the fortified flour to meet their relatively high requirements and for populations in the more remote areas. To reach children under two, interventions specifically for children, such as micronutrient powders, need to be expanded concurrently with flour fortification.

**Multiple micronutrient powders for children** (a component of Priority 1 above). The demonstration home-based micronutrient powders project (called *Gulazik* after the highly nutritious traditional dried food of warriors) reaches all children 6 to 24 months in Talas Oblast. This joint project of the Ministry of Health, UNICEF (with support from Dutch and Australian NatCom), CDC, and Swiss Red Cross offers great promise for reducing the alarmingly high rate of childhood anemia. Universal coverage of the program could result in a 20 percent relative reduction in prevalence of childhood anemia and an annual gain of US\$ 1.21 million in future productivity. In terms of cost-effectiveness, global estimates indicate that micronutrient powders cost between US\$ 8 and \$ 97 per DALY averted—depending on the delivery mechanism and existing health infrastructure. The Kyrgyz Republic's existing network of primary health care systems linked with VHCs is a potential mechanism to deliver Sprinkles and maintain high compliance and awareness. Other nutrition interventions could be bundled with the Sprinkles and distributed by the VHCs to lower program costs and increase coverage.

**Twice-yearly vitamin A.** The vitamin A supplementation (VAS) program achieves impressive coverage and should be maintained. The MoH should establish permanent mechanisms to oversee the VAS program to ensure sustained high coverage. Declines in coverage should prompt an immediate investigation to determine the strength of logistics, supply, supervision, and the mechanics of community mobilization.

***Deworming in children.*** Expanding the current deworming program would result in an annual future gain in productivity of US\$ 450,000. The Copenhagen Consensus project found that deworming programs are among the most cost-effective health interventions. The the first large-scale dehelminthization campaign for the population of the Kyrgyz Republic ages two to 56 was carried out in 2009–2010, and the second large-scale campaign for schoolchildren was carried out early 2011. Delivery costs can be lowered by combining helminth control with other programs, such as the twice-yearly vitamin A campaign.

***Zinc for the management of diarrhea.*** This intervention—to be incorporated into the standard management of diarrhea—has not yet been introduced in the Kyrgyz Republic. Our analyses estimate that investing in introducing the intervention and then scaling up would result in economic benefits of US\$ 2.28 million a year. Extensive programming experience is now available on the different options for introducing and scaling up this intervention by combining public and private sector delivery mechanisms.

#### **Priority 5. Therapeutic Feeding for Malnourished Children with Special Foods**

Severe acute malnutrition remains a major killer of children under five years of age, and we estimate that in the Kyrgyz Republic, scaled up **implementation of WHO-recommended protocols to reduce severe acute malnutrition (SAM)** could avert 18 percent of severe wasting related deaths. Until recently, treatment has been restricted to facility-based approaches, greatly limiting its coverage and impact. New evidence suggests that large numbers of children with SAM can be treated in their communities without being admitted to a health facility or a therapeutic feeding center (WHO and others 2007).

The community-based approach involves timely detection of children with SAM in the community, and for those children without medical complications, providing treatment at home with ready-to-use therapeutic food or other nutrient-dense foods. If properly combined with a facility-based approach for malnourished children with medical complications and implemented on a large-scale, community-based management of SAM could prevent the deaths of hundreds of thousands of children.

#### **Priority 6. Interventions Addressing the Underlying Determinants of Undernutrition.**

These interventions, particularly related to the availability and affordability of food and poverty reduction strategies, are important to initiate. Programs such as the UMB have strong potential as vehicles for delivering nutrition and other health and population services. We recommend that discussions be undertaken with Kyrgyz policy makers to explore designs for smarter food subsidies that may improve the efficiency of the UMB (e.g., through better-fortified foods/staples and stronger targeting strategies). Other opportunities may be found in demand-side interventions and enhanced/innovative delivery mechanisms.

#### **Priorities 7–9. Promoting Handwashing and Hygiene.**

This approach is critical to decreasing diarrhea and other intestinal infections. Ideally, it will be included as a part of a package of preventive practices along with messages to improve infant and young child feeding practices. Providing pregnant women with a balanced energy protein supplement has been shown in well-controlled studies to have high efficacy, but the WHO has yet to develop protocols to guide the delivery of this intervention in program settings. If the opportunity arises in the context of food distribution programs, for example as part of a food security program, undertaking operational research to develop such protocols would be a worthwhile investment. Since malaria is not of public health significance in the Kyrgyz Republic, malaria control measures are not needed.

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## 6. Putting it All Together

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### 6.1 Interpreting the Results

The evidence from this report offers national policy makers tools to identify the most appropriate and effective interventions to combat undernutrition in a cost-effective manner. In some cases, the evidence supports existing programs, and in others, it lends support to advocate for and attract additional funding for expanding effective programs.

This report calculates the specific estimated health and economic costs of undernutrition and also the economic benefits and cost effectiveness of scaling up a selected set of direct nutrition interventions to be delivered through the health sector (“*The Lancet* interventions”). Additionally, it has attempted to present this information in the context of the SUN framework (UN 2010), a consensus developed by global nutrition partners in 2010. This consensus framework seeks to provide guidance to countries in how to address both the immediate and underlying causes of undernutrition through a multisectoral strategy, by striking the locally appropriate balance between direct short-term public health interventions and the indirect or longer-term strategies of agriculture and social protection.

The interpretation of the results presented in this report, and hence the recommendations, have important caveats. First, the analyses and subsequent development of recommendations would further benefit from the insights of local stakeholders, who (a) have detailed understanding of both the operational context of nutrition programs and the sociopolitical factors determining policy decisions and resource allocation (i.e., the third domain of the Menon and others structure we used in this report<sup>22</sup>); and (b) will be responsible for the implementation of these programs. The first recommended next step seeks to include input from local stakeholders.

Second, while the best available information was used for the analyses, and despite our best efforts, some key data are missing due to a variety of reasons. Some of the data are outdated, so we strongly recommended that new data be obtained and used, as they become available, to update these analyses. Some of the information on the current coverage of programs was either missing or of uncertain quality. This detracted from our ability to provide more precise estimates of the potential impacts resulting from scaling up programs, as well as the potential positive health and economic benefits of scaling up interventions.

Because of issues with data quality resulting from the limited scope of the project (i.e., an initial contribution to the discussions required to develop momentum for scaling up nutrition), more detailed economic analysis has not been presented. It is acknowledged that linking the presented cost estimates of not intervening with the costs and benefits of intervening would be of great interest to Ministries of Finance and overall would provide more compelling support for allocating more resources for nutrition.

Our findings closely indicate the reality of the undernutrition situation in the Kyrgyz Republic in spite of the caveats. They provide significant evidence in quantifying the significant human and economic benefits achievable by scaling up the nutrition interventions recommended.

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<sup>22</sup> See Chapter 2.

## 6.2 Addressing the Underlying Causes of Undernutrition

The underlying causes of undernutrition are mitigated with a broader set of longer-route interventions, primarily delivered through social protection sectors and agriculture. Poverty has always been a primary factor contributing to undernutrition. Although, as with food production, the relationships between poverty and nutritional status are complex, a number of interventions have attempted to improve household economics specifically to improve nutrition. These include conditional or non-conditional cash transfers (the former noted as effective in certain contexts in *The Lancet* series), and microcredit programs, among others. Save the Children UK (2009) describe social cash transfers and safety nets as short-term emergency or seasonal safety nets to ensure household food security and to prevent the sale of vital livelihood assets. These programs are usually delivered by governments on a permanent basis to reduce poverty and vulnerability. A clear distinction needs to be drawn between conditional and non-conditional cash transfer. The former have a double aim: reducing vulnerability in the short run and building human capital to break the intergenerational cycle of poverty in the longer term. Unconditional transfers, on the other hand, are focused only on the short-term impacts.

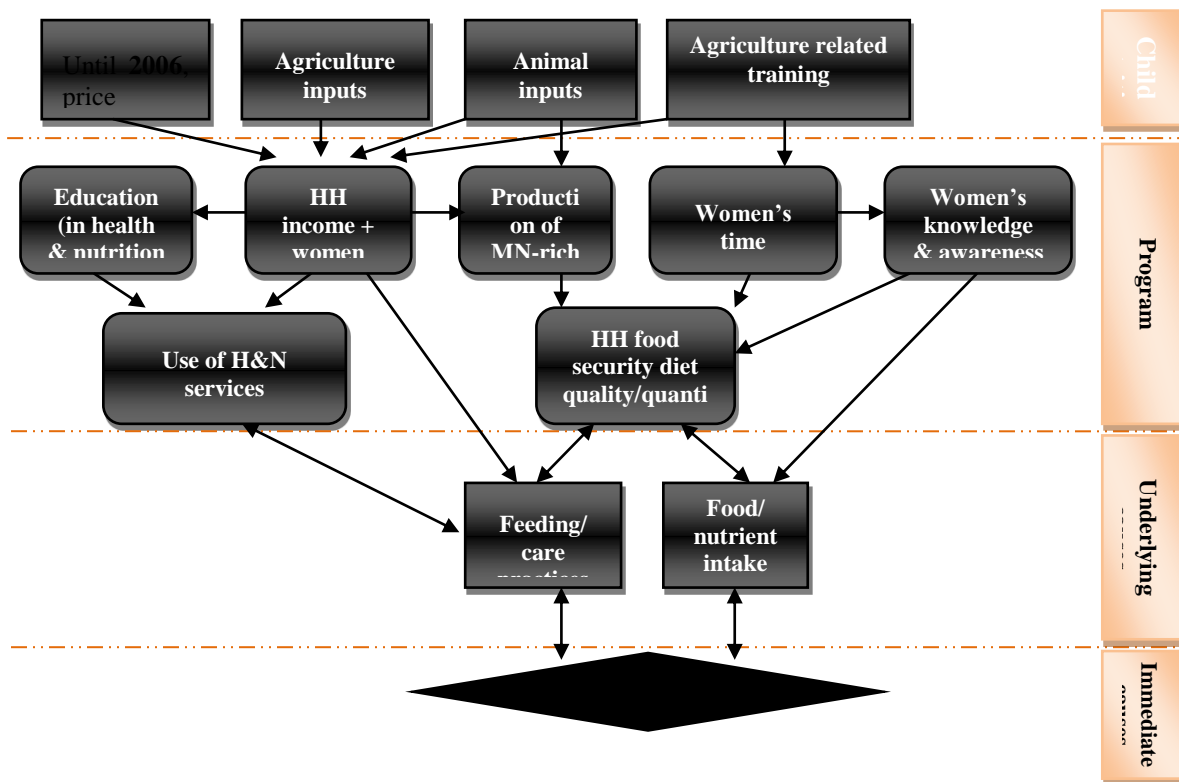
In the Kyrgyz Republic, programs such as the UMB have strong potential as vehicles to deliver nutrition and other health and population services. We recommend that discussions be undertaken with Kyrgyz policy makers to explore designs for smarter food subsidies that may improve the efficiency of the UMB, for example, through better fortified foods and staples and stronger targeting strategies. Other opportunities may be found in demand-side interventions and enhanced or innovative delivery mechanisms.

Five pathways link the food supply chain from food production to food consumption and nutrition (Hawkes and others 2008). Through these pathways, interventions in agriculture will reduce undernutrition. These pathways are: (1) subsistence-oriented production for households' own consumption; (2) income-oriented production for sale in markets; (3) reduction in food prices associated with increased production; (4) empowerment of women as agents instrumental to household food security; and (5) the indirect relationship between the contribution of agricultural production to increased national income and economic growth and improved nutrition outcomes. The first four of the pathways are illustrated in figure 4.<sup>23</sup> Agricultural policies and programs may impact directly on all these pathways. Therefore agriculture holds enormous potential to impact, either positively or negatively, on the nutritional well-being of populations. These critical linkages between agriculture and nutrition are often under-recognized by those responsible for developing policies in both health and agriculture.

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<sup>23</sup> Modified from LeRoy and others. *The micronutrient impact of multisectoral programs focusing on nutrition*. [http://www.micronutrientforum.org/Innocenti/Leroy%20et%20al%20MNF%20Indirect%20Selected%20Review\\_FI\\_NAL.pdf](http://www.micronutrientforum.org/Innocenti/Leroy%20et%20al%20MNF%20Indirect%20Selected%20Review_FI_NAL.pdf), p. 62. Accessed February 14, 2010.

**Figure 4. Mechanisms by Which Agriculture Programs Might Improve Nutrition**



In the context of emergency relief, new approaches are being developed to strengthen the impact that food distributions might have on strengthening nutrition. An example is the recently developed “Preventing Malnutrition in Children Under Two Approach (PM2A): A food-assisted approach” of USAID’s FANta Project.<sup>24</sup> The three core PM2A services provided to participants are: (1) conditional food rations<sup>25</sup> for the individual woman or child and for the household; (2) preventive and curative health and nutrition services for children and women, according to national protocols; and (3) behavior-change communication targeting priority context-specific nutrition actions.

### 6.3 Recommended Actions

***Increase investments in nutrition.*** This report’s results definitively show that undernutrition is a tremendous burden of mortality and morbidity, as well as an enormous cause of economic losses. The findings also demonstrate that averting significant financial loss by scaling up high-impact cost-effective nutrition interventions is a strategic economic investment returning high benefits. That good nutrition equals good fiscal policy is a message that needs to reach policy makers. By raising their awareness to the national undernutrition problem and its interconnectedness to their country’s economic health, the recommendations for expanding funding for scaled up nutrition programs will be appreciated, examined, and adopted.

<sup>24</sup> FANta/USAID. Preventing malnutrition in children under two approach (PM2A): A food-assisted approach. [http://www.fantaproject.org/pm2a/PM2A\\_v1.1\\_Mar2010.pdf](http://www.fantaproject.org/pm2a/PM2A_v1.1_Mar2010.pdf). Accessed April 9, 2010.

<sup>25</sup> “Conditional” ration indicates that beneficiaries must participate in behavior change interventions and attend and receive a minimum package of preventive health services to receive the ration. The specific behavior change and health service requirements for participation are determined on a case-by-case basis based on each program’s context.

***Prioritizing interventions to scale up.*** Our discussion with country stakeholders, lead us to recommend updating the country’s nutrition plan by priority stages. Based on our analysis, stage one priority interventions should focus on deaths averted, economic gains, relative reduction in prevalence, and cost effectiveness. Although the analysis identifies key evidence-based interventions to reduce IDD, stunting, and anemia, the degree and pace of program expansion will likely be dictated by the level of capacity, commitment, and funding. To plan successful interventions, planners must ensure that available local technical and managerial capacity exists to implement interventions and to fund monitoring and evaluation to gauge the interventions’ impact. In many rural areas, technical and managerial capacity is limited. Therefore, incremental expansion and extensive capacity building may be necessary before expanding nutrition interventions.

***Filling gaps in information.*** Important gaps in information need to be filled in the process of designing interventions. This is particularly true for interventions to address infant and young child feeding. Effective communication strategies will require detailed knowledge on the social, economic, environmental, and cultural determinants of current feeding behaviors.

***Addressing the causes of undernutrition.*** Two complementary sets of interventions are available to address the immediate and underlying and basic causes of undernutrition. The immediate causes can be most effectively addressed through a set of direct public health interventions that focus on the minus 9 to 24-month “window of opportunity.” The strong evidence base for these interventions was presented in the 2008 *The Lancet* series on undernutrition, as previously mentioned. The impact these interventions will have on reducing undernutrition in the Kyrgyz Republic was determined in this report by using the same analytical methods as the authors of *The Lancet* series. We strongly recommended that highest priority be assigned to the set of direct interventions that address undernutrition during the narrow window of opportunity from pre-pregnancy through 24 months of age. Measurable success in reducing undernutrition with these direct interventions will establish the confidence among decision makers to pledge their commitment, which is required to overcome the bureaucratic challenges inherent in any multisectoral coordination.

***Facilitating Multisectoral Action.*** A high-level coordinating group should be established to which line ministries report. Line ministries must be made responsible for nutrition outcomes, for example, the prevalence of underweight. This coordinating group will also increase “policy coherence” by enabling government-wide attention to unintended negative nutrition consequences by other sectors’ policies. Well-known examples are subsidies for biofuels and food exports. What is required is both better and timelier analysis of nutritional consequences and inclusion of nutritional consequences in “all government” mechanisms for policy coordination.

Successfully incorporating concern for nutrition across multiple sectors will require substantial effort, as previous attempts to do this have had little success. Positive incentive levers for governments to encourage harmonized multisectoral attention to nutrition are available and include: (1) sustained political visibility coupled with progress reporting; (2) financial levers (mandated budgetary earmarks and pools of funding to attract competition/ innovation); (3) organizational mandates with resources and staff; and (4) relevant laws/regulations to support nutrition actions. These incentives require structures, leadership, and resources.

## **6.4 Moving to Action**

This situational analysis of undernutrition in the Kyrgyz Republic has provided valuable information on the immediate and root causes of undernutrition. It has also examined what interventions work, and the economic benefits and cost effectiveness of these interventions where possible. The SUN Framework for

scaling up nutrition at the global level describes nine steps in moving to action (UN 2010). These steps have been modified into five broader categories to guide and support national-level efforts where this is determined to be appropriate.

- i. Build Political Commitment.** Strong political commitment to reduce undernutrition is needed to mobilize the political will and the financial resources necessary to implement the policies and programs required for success. Direct nutrition interventions should be sharply scaled up immediately (see Step iii below), and the necessary support mobilized to build the human capacity to design, manage, and evaluate the policies and programs (see Step ii below). This will require key stakeholders' galvanizing behind an inclusive approach to build country ownership. To the extent possible, leaders should draw on support from related international initiatives such as the International Health Partnership. Strategic advocacy will be required and the development partners should provide the means to design and implement this.
- ii. Build Capacity to Design, Manage, and Evaluate Nutrition Policies and Programs.** Sustaining effective national nutrition programs requires leadership from national stakeholders. Development partners should provide for the stewardship of these national leaders as they acquire the necessary skills that these complex tasks demand. Opportunities for these leaders to learn-by-doing should be created and supported. Understanding and using epidemiological and program data are the fundamental skills that are needed. Discussions resulting from the presentation of the findings and recommendations of this report will provide important opportunities to highlight both information gaps and the availability of local stakeholders with the skills needed to fill these gaps.
- iii. Strengthen Policies and Operational Strategies.** The analysis presented in this report is designed to support and invigorate ongoing activities related to further development of the national plan of action for nutrition. It is hoped that these findings can be incorporated into the national plan and strategies in ways consistent with the Paris-Accra principles of aid effectiveness. Using the "three ones approach" has proven effective in the effort to combat HIV/AIDS, and may be highly applicable to nutrition: one agreed framework provides the basis for coordinating the work of all partners; one national coordinating authority with a broad multisectoral mandate is designated to lead; and one national monitoring and evaluation system is developed.<sup>26</sup>
- iv. Strengthen Program Implementation.** Scale up a set of direct evidence-based interventions that address the immediate causes of undernutrition in the window of opportunity from the start of pregnancy to two years of age. These include maternal supplementation with vitamins and minerals, early initiation of breastfeeding, exclusive breastfeeding for six months, timely and appropriate complementary feeding, increasing intakes of vitamins and minerals in children through micronutrient powders with food, medicinal supplements (vitamin A and zinc for diarrhea), or fortification (iron, zinc, folic acid, and other B vitamins), therapeutic feeding for malnourished children with special foods.

Initiate interventions to address the underlying and basic causes of undernutrition through sectors other than health. A potential starting point for this is to build links with high-priority global initiatives recently launched by the international development community to include specific pro-nutrition actions in other sectors, such as agriculture and social protection. Examples are investments in agriculture and social protection to enhance food security. Good nutrition is essential to the success of these initiatives. Persons suffering from undernutrition are by definition

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<sup>26</sup> [http://data.unaids.org/UNA-docs/Three-Ones\\_KeyPrinciples\\_en.pdf](http://data.unaids.org/UNA-docs/Three-Ones_KeyPrinciples_en.pdf).

food insecure, unhealthy, and lacking adequate social protection. So it is essential to include an indicator of undernutrition in the results frameworks for each of these sectors, both as part of a broader effort to hold the sectors to account for nutrition results, and as a measure of their progress in meeting their overall objectives.

- v. **Use Monitoring and Evaluation to Design and Manage Programs.** Increase the use of data in designing, monitoring, managing, and evaluating nutrition policies and programs. Linking with point two above, building capacity in these skills is critical at all levels of implementation and coordination. This will not only improve program quality but will also further strengthen the evidence base for them. Operational research is important to develop delivery platforms for existing and new interventions. Regional workshops are recommended as platforms for building capacity in these complex skills. These would also serve as means of disseminating findings and sharing lessons learned.

## 6.5 Immediate Next Steps

To move to the next level, both the Government of the Kyrgyz Republic and the development partners could benefit from adopting the following immediate next steps.

### *Development partners could:*

- i. Engage partners. Present these findings and recommendations as a means of engaging key stakeholders within the country including government, UN, and NGO stakeholders. This might be done in conjunction with disseminating the SUN Framework. The active participation of key stakeholders is required to discuss findings, elicit feedback, determine analysis shortcomings, modify conclusions and recommendations where needed, and identify priorities for the way forward. The purpose is to build commitment to nutrition, which is likely the single biggest determinant of success in scaling up activities at the national level.
- ii. Identify and exploit opportunities for building capacity of the national staff and institutions. Allow additional time in the plans being developed to enable the learning-by-doing that is central to building capacity. In this step, the institutions providing leadership to promoting global action for nutrition have an opportunity, perhaps an obligation, to provide the technical and strategic stewardship that will be required to make this a reality.
- iii. Work closely with government to mobilize resources to scale up the highest-priority interventions. Direct nutrition interventions that will reduce the immediate causes of undernutrition include breastfeeding, complementary feeding, universal salt iodization, maternal supplementation with vitamins and minerals, and other approaches to increasing vitamin and mineral intakes, such as fortification.

### *Whereas, the Government of the Kyrgyz Republic could:*

- i. Incorporate recommendations from the report into existing Kyrgyz nutrition strategies and plans. In particular, strengthen the design and implementation of the monitoring and evaluation components within each of these plans. Where possible, update the analyses presented in the report using more rigorous program coverage data and the latest prevalence data.
- ii. Prioritize the direct interventions to be scaled up and assign responsibilities for key tasks to the staff of government units, donors, and where appropriate, to NGOs.
- iii. Develop mechanisms to engage the social protection, agricultural, and education sectors to address the underlying and basic causes of undernutrition. Identifying effective approaches will

require additional research, evidence-based advocacy, and the institutional capacity to coordinate the design and implementation of multisectoral nutrition interventions in these sectors. Donors should provide financial support to facilitate the discussions and development of strategic investments necessary for national stakeholders to create the coordinating mechanisms required to ensure that intersectoral coordination addressing the basic causes of undernutrition will be both feasible and efficient.

- iv. Develop a national log frame with key steps and a realistic timetable to guide a set of short- and medium-term objectives emerging from the above recommendations for stakeholders to adopt.

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## *Annex 1. Details of Methods Used in the Analyses*

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### **A1.1 Prevalence Data**

Indicators were grouped into two categories: (1) *nutrition indicators in children under five* and (2) *risk factors* associated with women of reproductive age—factors that may increase the risk of childhood malnutrition. The categories were then stratified by region, locality, maternal education, and wealth quintile.

The explanatory (independent) variables used for this analysis included: *region*, *locality*, (defined as either urban or rural), and *maternal education* (defined as none, primary or secondary, and beyond). *Wealth quintile* is a composite measure of the cumulative living standard of a household based on asset ownership. The households were classified as either poorest, second, middle, fourth, or richest. All data is from the 2006 MICS unless otherwise specified.

### **A1.2 Estimates of DALYs Lost Due to Malnutrition**

The effects of adverse health outcomes have traditionally been measured by estimating excess mortality. But mortality rate alone does not adequately measure the adverse impacts of certain conditions on the quality of life. Some conditions adversely affect long-term outcomes without causing death. For example, conditions such as iron and iodine deficiencies in children have very low mortality rates, but cause moderate to severe disability by impairing cognitive physical activity and/or mental development. To quantify the burden of such diseases, the WHO introduced the Global Burden of Disease project in 2000 and a new metric: disability-adjusted life years (DALY).

DALY is a “health gap measure.” It is a more comprehensive summation of information that includes the impact of premature death, disability, and other non-fatal health outcomes. One DALY can be thought of as “one lost year of healthy life.” It measures the gap between current health status of the target population and an ideal situation where everyone lives into old age free of disease and disability (Murray and others 2001).

### **A1.3 Estimating Mortality Attributable to Malnutrition**

*Population Attributable Fraction (PAF)*. The PAF is defined as the proportional reduction in disease or death that would occur if exposure to the risk factor were reduced to zero (Cole and MacMahon 1971; Eide and Heuch 2001; Greenland 1984; Levin 1953; Rockhill, Newman, and Weinberg 1998; Uter and Pfahlberg 2001). The attributable mortality, here denoted as *AB*, is the incidence or burden of disease due to a particular risk factor and is calculated as  $AB = PAF \times B$ , where *B* is the total burden of disease from a specific cause or group of causes affected by the risk factor with a relative risk of *RR* (see table 1 for *RR*).

The overall attributable fraction of under-five mortality due to the above defined risk factors can be computed according to formula:

$$PAF = \frac{P(RR - 1)}{P(RR - 1) + 1}$$

Where *P* is the prevalence of the risk factor and *RR* is the associated risk ratio.

Based on risk coefficients, the prevalence of malnutrition indicators, and demographic and mortality statistics from UNICEF, we calculated the number of annual deaths attributable to malnutrition. Because many diseases are caused by the interaction of multiple risk factors (Rothman 1976; Rothman and Greenland 1998; Walter 1976; Walter 1980; Yerushalmy and Palmer 1959), double counting the number of deaths may occur if the cause-specific mortality attributed to individual risk factors is simply added up. To calculate the joint PAF for multiple risk factors, the following formula is used (Walter 1980):

$$\text{Joint PAF} = 1 - \prod_{i=1}^n (1 - \text{PAF}_i)$$

We estimated the crude PAF for various micronutrient deficiencies and key undernutrition indicators by using the approximate distribution of PAF as per the comparative risk assessment and the overall DALYs envelope from the WHO Global Burden of Disease, 2004. While these estimates were useful for this report, future research needs to include more in-depth analysis with primary data.

#### Relative Risk (RR)

Relative risk is an epidemiological term describing the likelihood of a consequence arising from a particular risk factor, compared to the risk of the same consequence occurring without the presence of the risk factor. The global relative risks used in our computations of adverse outcomes caused by undernutrition are based on *The Lancet* series on maternal and child undernutrition and are shown in table 2.

**Table 1: Key Types of Undernutrition Evaluated, Relative Risks of Mortality and Potential Interventions**

Forms of undernutrition	Impact on mortality in terms of RR	Potential interventions
Low birth weight	Infants born at term weighing 1500–1999 g were <u>8.1</u> (95% CI 3.3–19.3) times more likely to die from all causes during the neonatal period, and those weighing 2000–2499 g were <u>2.8</u> (95% CI 1.8–4.4) times more likely to die, than were those weighing more than 2499 g at birth.	<ol style="list-style-type: none"> <li>1. Maternal balance energy protein</li> <li>2. MMN supplementation</li> <li>3. IPT/ITN during pregnancy</li> </ol>
Stunting	Odds of mortality when HAZ(<-3 sd) is <u>4.1</u> (95% CI 2.6-6.4) and HAZ (<-2 sd) is <u>1.6</u> (95% CI 1.3-2.2)	<ol style="list-style-type: none"> <li>1. Complementary feeding education for food secure population</li> <li>2. Complementary feeding education and support of food insecure population</li> <li>3. Zinc fortification</li> <li>4. Exclusive breastfeeding till six months and continued breast feeding beyond six months</li> <li>5. Complementary feeding promotion</li> <li>6. Zinc for diarrhea treatment</li> <li>7. Promotion of handwashing and hygiene strategies</li> </ol>
Severe Wasting	Odds of mortality for severe wasting (WHZ<-3 sd) is 9.4 (95 percent CI 15.3-16.8) as above for stunting.	<ol style="list-style-type: none"> <li>1. WHO-recommended case management of SAM</li> </ol>

Vitamin A deficiency	Relative risk of diarrhea mortality is 1.47 (95% CI 1.25–1.75) and 1.35 (0.96–1.89) for measles mortality related to vitamin A deficiency.	1. Vitamin A supplementation
Iodine deficiency	Iodine deficiency impairs child motor, mental, and cognitive development and negatively effects future productivity.	1. Iodization of salt 2. Maternal iodization of salt
Maternal and child hood anemia	Anemia impairs infant mental and motor skills development, and causes fatigue impairing physical work in adults and therefore has negative consequences on future productivity.	1. Maternal iron folic acid supplementation 2. Maternal micronutrient supplementation 3. IPT/ITN during pregnancy 4. Micronutrient supplementation with Sprinkles fortification for children 5. Deworming during childhood (for children with intestinal helminthes)

Source: Black and others 2008.

Note: HAZ = Height-for-Age Z Score; WAZ = Weight-for-Age Z Score; CI = Confidence Interval.

**Table 2: Relative Risks of Mortality Due to Undernutrition**

Nutrition indicator	Relative risk
<b>LBW</b>	
Low birth weight (1500-1999 gm)	8.1
Low birth weight (2000-2499 gm)	2.8
<b>Breastfeeding (BF)</b>	
Relative risks among predominant BF (0-5 months)	1.48
Relative risks among partially BF (0-5 months)	2.85
Relative risks among not BF (0-5 months)	14.40
Relative risks among not BF (6-23 months)	3.68
<b>Vitamin A Deficiency (VAD)</b>	
Relative risks among vitamin A deficient(< 5 m)	1.25
Relative risks among vitamin A deficient (6-59 m)	1.47 (diarrhea), 1.35 (ARI)
<b>Stunting</b>	
Relative risk among stunted (<-3 SD)	4.1
Relative risk among stunted (<-2 SD)	1.6
<b>Underweight</b>	
Relative risk among underweight (<-3 SD)	9.7
Relative risk among underweight (<-2 SD)	2.5
<b>Wasting</b>	
Relative risk among wasted (<-3 SD)	9.4
Relative risk among wasted (<-2 SD)	3

Source: Black and others 2008.

We also estimated the adverse effects of undernutrition by estimating DALYs as described below.

#### A1.4 Estimation of Economic Cost of Malnutrition

To evaluate net economic deficits as a consequence of undernutrition, including micronutrient deficiencies, we measured workforce lost because of premature mortality attributable to undernutrition, and future productivity losses among survivors because of deficits in cognitive and physical development caused by undernutrition. Our approach was similar to the one used for the NIP.<sup>27</sup> We used the same set of calculations used for the NIP (see below) to estimate economic losses for all three countries and updated information on the impacts of interventions where these were available from *The Lancet* series on undernutrition.

We calculated the economic losses due to the six types of undernutrition that are most prevalent. These are LBW in infants, and in children under-five years, stunting, severe wasting, anemia, vitamin A deficiency, and iodine deficiency. Severe wasting and stunting are mutually exclusive; using these two markers does not lead to double counting.

We used the following algorithms<sup>28</sup> to calculate value of lost workforce and future child productivity losses, respectively:

- (child deaths attributed to malnutrition) x (average wage) x (labor force participation rate) x (lifetime discounting factor (LDF)) = (net present value (NPV) of losses)
- (# of children affected by indicator) x (coefficient of deficit) x (average wage) x (labor force participation rate) x (manual labor share) x (lifetime discounting factor) = (NPV of losses)

Where:

- Data on child deaths attributed to malnutrition are from annex 3.
- Average wage is calculated by 60 percent of wage share of per capita GDP, based on World Bank data.
- Effective employment is based on the labor force participation rate, from the UN International Labor Organization, for ages 15-64 years.
- We use estimates of LDF similar to that used in the NIP analysis. LDF is derived from a discount rate (Phillips 1996), age of entry and exit into workforce, and other factors.<sup>29</sup> The LDF essentially represents the years of earnings that are “counted” in the calculation.
- Manual labor share is defined as employment in manual labor (agriculture + construction). We calculate manual labor share by multiplying economic activity rate with percent share of GDP obtained from agriculture and construction. Economic activity rate is defined as percent of labor force in age group 25-54 years.

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<sup>27</sup> The Uzbekistan Nutrition Investment Plan (NIP) is based on a multisectoral consultation conducted in 2007, involving key stakeholders from government and private sectors. The NIP process included participation of experts from the Ministry Health, Ministry of Public Education, Ministry of Economy, Ministry of Finance, and Tax Committee as well as representation from food industries, national media and NGOs. Representatives of UNICEF, World Bank, and the WHO participated and provided technical assistance.

<sup>28</sup> Uzbekistan NIP. 2008.

<sup>29</sup> For mortality at birth, the discount rate is 14.9. For mortality through age five years from vitamin A deficiency or stunting, a higher LDF of 17.42 is used to reflect the shorter period from mortality to entering the work force. Other conditions such as breastfeeding are discounted from ages 1-2 years. An alternative scenario based on a 10 percent discount rate derives LDFs of 2.65 to 3.93 as opposed to the 14.9 – 17.42 used at 3 percent. Discount rate estimates are based on the World Bank’s *The Economic Analysis of Nutrition Projects: Guiding Principles and Examples* (Phillips 1996).

## A1.5 Interventions, Current Coverage, and Potential Benefits

### A1.5.1 Evaluating the interventions that may reduce undernutrition

Our findings are based on the results of evaluated existing data and potential nutrition interventions that may reduce undernutrition based on recent reviews of the *The Lancet* 2008 undernutrition series, as well as the 2008 primary care series. Table 3 summarizes the interventions evaluated as part of this exercise. Detailed impact estimates for these interventions across various age bands are summarized in annex 4.

**Table 3: Potential Maternal and Child Interventions Targeting Undernutrition**

Interventions for which there is sufficient evidence for inclusion in all programs (Universal)	Interventions for which there is evidence for inclusion in specific contexts (Situational)	Other supportive strategies
Breastfeeding promotion strategies (individual & group counseling)*	Maternal balanced energy protein supplementation	Conditional cash transfers (unspecified)
Maternal iodine through iodization of salt*	Maternal iodine supplements	Unconditional cash transfers and micro-credit programs
Maternal iron folic acid supplementation*	Iron fortification/supplementation programs	Conditional cash transfer programs (with nutrition education)
Maternal calcium supplementation	Maternal multiple micronutrient supplements	Maternal mental health interventions
Zinc fortification/ supplementation	Behavior change communication for improved complementary feeding	Family planning interventions to promote birth spacing
Zinc in management of diarrhea	Provision of complementary foods	Handwashing/Hygiene interventions
Vitamin A fortification/supplementation	Neonatal vitamin A supplementation	Mass media strategies for breastfeeding promotion, dietary diversification, etc.
Universal salt iodization	Maternal deworming in pregnancy	Baby-Friendly Hospital Initiatives
Treatment of severe acute malnutrition	Deworming in children	Food-for-work programs and generalized food subsidies
Delayed cord clamping		Dietary diversification strategies, small animal husbandry, and home gardening
		Agricultural subsidies and land reform

Source: Bhutta and others 2008a.

\*Includes interventions that also affect neonatal outcomes.

### A1.5.2 Inventory of Existing Nutrition Interventions and Coverage

We collected all available information on existing nutrition interventions and their coverage levels wherever possible to investigate the interventions' potential to reduce undernutrition. The goal of this analysis was to determine the efficacy of select maternal and child interventions (listed in table 3) in reducing undernutrition in reference to the recent *The Lancet* undernutrition and primary care series. When programs covered only select regions, coverage rates were estimated using the region's population or best estimates. Programs are classified, according to evidence from *The Lancet* maternal and child undernutrition series, as *Universal Interventions* (sufficient evidence exists to implement them in any

program); *Situational Interventions* (evidence exists to implement the programs in specific situational contexts); and *Other Supportive Strategies* (evidence is insufficient or the effectiveness varies).

### **A1.5.3 Assessing the Impact of Nutrition Interventions on Mortality and Malnutrition**

We assessed the impact of major nutrition interventions on reducing mortality and improving nutrition outcomes for women, newborns, and children by using the same sequential model employed in the Uzbekistan NIP (see annex 5). The effects of the interventions are correlated to estimates of current deaths associated with each cause of death (see annex 3). We assumed that the positive effect of the intervention on the population would increase linearly with expanded coverage. We estimated the intervention's impact on mortality and malnutrition using the following equation and employing a previously described and validated sequential application model (Bhutta and others 2008b).

$$\text{Deaths prevented} = N \times I \times (P_1 - P_0) (1 - I \times P_0)$$

Where:

N= number of deaths prior to intervention

I= percentage by which intervention reduces deaths

P<sub>0</sub>= existing coverage of intervention

P<sub>1</sub>= target coverage for intervention

The effects of nutrition interventions (by percent) on newborn and maternal mortality and nutritional status are shown in annex 5. The impacts were modeled at two levels of coverage:

1. A pragmatic increase in intervention coverage by 20 percent per annum over baseline; and
2. Universal coverage (at 100 percent) assuming rapid and comprehensive scale up.

The results for the relative reduction in prevalence of undernutrition outcomes and neonatal and child mortality are presented.

### **A1.5.4 Estimating Economic Gains from Interventions**

Once we estimated lives lost and productivity losses due to undernutrition, we were able to estimate the country's potential economic gains achieved by averting the burden of mortality and undernutrition from high-impact nutrition interventions implemented at universal coverage. Economic gains assume improvement in the population's nutrition status and survival through nutrition programming, thereby increasing the size and productivity of the workforce. The economic costs of malnutrition to a country can be reduced by the economic gains achieved by an intervention's positive impact on reducing the prevalence of mortality and malnutrition at universal coverage.

We calculated the cumulative economic gains achieved by investing in particular nutrition interventions by comparing the national economy's annual loss due to undernutrition with the effectiveness of the existing nutrition programs and interventions. The additional gains obtained after adding new interventions and scaling up existing interventions are reflected as a percentage of the deficits offset by the interventions.

### **A1.5.5 Assessment of Cost Effectiveness**

A detailed cost-effectiveness analysis was impossible because country-specific costs for nutrition interventions are limited. We overcame this gap by conducting a detailed review of existing global evidence of the various nutrition interventions and their cost effectiveness from the Disease Control

Priority Project, *The Lancet* series on primary health care, and the Copenhagen Consensus project on malnutrition and hunger. The results of the global effectiveness of various intervention are expressed in (US\$) cost per DALY averted or cost per life saved (see annex 6 for the cost effectiveness of various nutrition interventions.) We used evidence from global cost effectiveness to further evaluate the appropriateness of nutrition interventions.

### Disability Life Years Calculation

The DALYs measure the total burden of disease by summing up the “years of life lost” (YLL), due to cause-specific mortality, and “years lived with disability” (YLD), that is,

1. Burden of disease = DALYs lost = YLL + YLD, where
2. YLL = f (size of target group, mortality rate of disease, discount rate), and
3. YLD = f (size of target population, incidence rate, disability weight, discount rate).

Taking account of potentially different incidence rates and levels of severity of a disease between different groups within a population, the complete formula can be represented more formally as follows:

$$DALY_{S_{lost}} = \sum_j T_j M_{ij} \left[ \frac{1 - e^{-rL_j}}{r} \right] + \sum_i \sum_j T_j I_{ij} D_{ij} \left[ \frac{1 - e^{-rd_{ij}}}{r} \right]$$

where  $T_j$  is the number of people in the target group  $j$  and  $M_{ij}$  is the mortality rate associated with the given disease  $i$ .  $I_{ij}$  is the incidence rate of disease  $i$  that is of interest,  $D_{ij}$  is the corresponding disability weight, and  $d_{ij}$  is the duration of the disease. Future life is discounted at the rate of  $r^{2-3}$ .

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## *Annex 2. Attributable Fractions, Joint Attributable Fractions, and Pathways Due to Malnutrition for Under-Five Mortality*

**Table 1: Attributable Fractions of Under-Five Mortality, %**

	Neonatal	ARI	Diarrhea	Malaria	Measles	All causes
Maternal iron deficiency anemia						3.0
VAD			0.23	0.15	0.17	
Zinc deficiency		6.00	3.00	7.00		2.0
Under weight		20.00	26.00	22.00	15.00	11.0
LBW/IUGR	11.50					
Low maternal BMI	<b>1.60</b>					
<i>Age 15-29</i>	1.90					
<i>Age 30-44</i>	1.20					
<b>Joint PAF</b>	<b>12.9</b>	<b>24.8</b>	<b>2.4</b>	<b>5.6</b>	<b>15.1</b>	<b>4.7</b>

*Note:* IUGR = Intrauterine growth retardation.

**Table 2: Under-Five Mortality Pathways Due to Undernutrition**

	Neonatal	Pneumonia	Diarrhea	Malaria	Measles	All cause
Maternal iron deficiency anemia						213
VAD			3	0	0	
Zinc deficiency		70	41	0		142
Under weight		235	353	0	0	781
LBW/IUGR	353					
Low maternal BMI	95					
<i>Age 15-29</i>	58					
<i>Age 30-44</i>	37					
Total using individual PAFs	449	305	397	0	0	1136
Total using joint PAFs	397	291	33	0	0	336

### *Annex 3. Causes of Death in Children and Neonates*

**Causes of Death in Children Under Five and Neonates (GBD 2004)**

<b>Under-five death</b>	<b>Deaths</b>	<b>Percentage of total under five</b>	<b>Neonatal death</b>	<b>Deaths</b>	<b>Percentage of total neonatal deaths</b>
0 days to 28 days (neonatal)	3073.63	43.3	Prematurity and low birth weight	1188.55	38.7
28 days to 5 years	4025.23	56.7	Birth asphyxia and birth trauma	704.99	22.9
Pneumonia	1173.68	16.5	Neonatal infections	559.88	18.2
Diarrheal diseases	1357.99	19.1	Other non-infectious perinatal causes	165.81	5.4
Malaria	0.00	0.0	Diarrheal diseases	53.06	1.7
Measles	0.17	0.0	Neonatal tetanus	0.00	0.0
HIV/AIDS	4.47	0.1	Congenital	352.27	11.5
Other infectious, parasitic, and nutritional deficiencies	795.40	11.2	Other non-communicable and injury	49.06	1.6
Non-communicable diseases	349.28	4.9			
Injuries	344.24	4.8			
<b>Total under five</b>	<b>7098.86</b>		<b>Total neonatal</b>	<b>3073.63</b>	

*Source:* WHO GBD Project, 2004 (unpublished data courtesy Mathers et al).

## Annex 4. Evidence-Based Nutrition Interventions and Target Age Groups

Interventions	Evidence reviewed	Age groups affected and impact			
		Prenatal and antenatal <sup>∞</sup>	Newborn (0-1 month)*	Infants (1-12 months)	Child (12-59 months)
<b>A. Interventions to increase general nutrient intake (including food supplements)</b>					
<b>Balanced energy protein supplementation in pregnancy</b>	Systematic review of RCTs (Kramer and Kakuma 2003)	32% reduction in term IUGR births (RR= 0.68; 95% CI= 0.56, 0.84)  45% reduction in the risk of stillbirths (RR= 0.55; 95% CI= 0.31,0.97)	-	-	-
<b>Breastfeeding education/promotion strategies</b>	Effect on breastfeeding patterns from RCTs and one systematic review (Britton and others 2007)  Effect of BF on mortality from observational studies	-	-EBF in the neonatal period Group counseling increased odds of EBF in the neonatal period by a factor of 3.88 as compared to routine care (OR=3.88; 95% CI=2.09, 7.22, p<0.0001 (random effects). Individual counseling increased odds of EBF in the neonatal period by a factor of 3.45 as compared to routine care	Impacts on growth negligible  -BF at 6 months of age Group counseling increased odds of BF by a factor of 5.19 as compared to routine care (OR=5.19; 95%CI=1.90, 14.15, p<0.00001 (random effects). Individual counseling increased odds of BF by a factor of 1.93 at 6 months of age as compared to routine	Impacts on growth negligible  No evidence of impact of BF promotion on BF rates beyond 12 months

Interventions	Evidence reviewed	Age groups affected and impact			
		Prenatal and antenatal <sup>∞</sup>	Newborn (0-1 month)*	Infants (1-12 months)	Child (12-59 months)
			(OR=3.45, 95% CI=2.20 to 5.42, p<0.00001) (random effect). An evaluation of national mass media campaign of Honduras reported that EBF increased from 48% to 70% at one month.	care (OR=1.93; 95% CI=1.18, 3.15, p<0.00001) (random effect). An evaluation of national mass media campaign of Honduras reported that BF increased from 24% to 31% at 4 months and from 7% to 12% at 6 months of age.	
<b>Complementary feeding support and education strategies without provision of food supplements or conditional cash transfers (CCTs)</b>	Systematic review of RCTs			Reduced stunting (in food-secure populations), educational intervention vs control: HAZ WMD= 0.25 (95% CI= 0.01, 0.49) (random effects)	Reduced stunting (in food-secure populations), educational intervention vs control: HAZ WMD= 0.25 (95% CI= 0.01, 0.49) (random effects)
<b>Complementary feeding support including education plus provision of food supplements or CCTs</b>	Systematic review of RCTs			Reduced stunting (in food-secure populations), provision of complementary food with or without education: HAZ WMD= 0.41 (95% CI= 0.05, 0.76) (random effects)	Reduced stunting (in food-secure populations), provision of complementary food with or without education: HAZ WMD= 0.41 (95% CI= 0.05, 0.76) (random effects)
<b>WHO-recommended case management of</b>	RCTs and observational studies			Reduced mortality (Case fatality rate	Reduced mortality (Case fatality rate

Interventions	Evidence reviewed	Age groups affected and impact			
		Prenatal and antenatal <sup>∞</sup>	Newborn (0-1 month)*	Infants (1-12 months)	Child (12-59 months)
severe acute malnutrition				RR= 0.45; 95% CI 0.32-0.62, random effects)	RR= 0.45; 95% CI 0.32-0.62, random effects)
<b>B. Vitamin and mineral interventions</b>					
<b>Food fortification strategies and programs (including iodized salt, iodization of water, vitamin A fortification, and iron fortification strategies)</b>	Limited number of RCTs; largely observational studies	<p>Improved MN status (in women of childbearing age Hb conc g/L WMD=5.70; 95% CI=0.02, 11.38). In pregnant women Hb conc 6.90 g/L higher as compared to no fortification (WMD=6.90, 95% CI 2.74-11.06).</p> <p>USI programs decreased goiter prevalence by 19%-64%.</p> <p>Rate of goiter reduced by 51% -89% by iodization of water.</p>	Neonatal mortality reduced by 65.7% after iodization of water.	<p>Improved MN status (Hb conc g/L WMD=7.36; 95% CI= 2.88, 11.84)</p> <p>Infant mortality decreased 56.5% after iodization of water.</p>	<p>Improved MN status (Hb conc g/L WMD=7.36; 95% CI= 2.88, 11.84)</p> <p>Beyond 24 months of age the use of general fortified foods including milk has shown benefits on micronutrient status (WMD 10.33 from a meta-analysis of studies).</p> <p>Additional reduction in diarrhea morbidity noted in one recent study. The fortified milk reduced the odds for days with severe illnesses by 15% (95% CI=5% to 24%), the incidence of diarrhea by 18% (7% to 27%), and the incidence of acute lower</p>

Interventions	Evidence reviewed	Age groups affected and impact			
		Prenatal and antenatal <sup>∞</sup>	Newborn (0-1 month)*	Infants (1-12 months)	Child (12-59 months)
					respiratory illness by 26% (3% to 43%)
<b>Antenatal iron-folate/iron supplementation</b>	Systematic review of RCTs (Pena-Rosas and Viteri 2006; Gera and others 2007)	Improved MN status (Hb conc g/L WMD= 12.00; 95% CI=2.93, 21.07)	Improved MN status (Hb conc g/dL WMD = 0.74; 95% CI= 0.61, 0.87)	Improved MN status (Hb conc g/dL WMD = 0.74; 95% CI= 0.61, 0.87)	Improved MN status (Hb conc g/dL WMD = 0.74; 95% CI= 0.61, 0.87). Potential increased risk of death in malaria areas so only recommended for non-malaria areas as a treatment strategy.
<b>Multiple micronutrient (MMN) supplements in pregnancy</b>	Systematic review and recent studies of MMN supplementation in pregnancy (altogether nine RCTs) were reviewed	MMN supplementation (defined as supplementation with three or more micronutrients) was associated with 39% reduction in maternal anemia compared to placebo or two or less micronutrients (RR=0.61; 95% CI=0.52, 0.71)	Pooling these recent studies of MMN with the results of the Cochrane review now indicate a significant reduction in the risk of LBW births (RR=0.84 ;95% CI=0.74-0.95)	A recent study from Indonesia using these MMN in comparison with iron-folate tablets in over 31,000 women was also associated with a 22% reduction in infant mortality (RR=0.78; 95% CI=0.64-0.95)	
<b>Sprinkles for home fortification</b>	Systematic review of RCTs and observational studies			Use of Sprinkles for home fortification in anemic children results in a significant impact on Hb level (WMD=5.68, 95% CI=1.78, 9.57) and iron deficiency anemia (RR=0.54; 95% CI= 0.42, 0.70) (random effects as	

Interventions	Evidence reviewed	Age groups affected and impact			
		Prenatal and antenatal <sup>∞</sup>	Newborn (0-1 month)*	Infants (1-12 months)	Child (12-59 months)
				compared to placebo).	
<b>Vitamin A supplementation</b>	Three systematic reviews of RCTs	No impact on LBW in HIV-negative populations, some impact in HIV-positive populations	Reduced mortality between 0- 6 months (RR=0.80; 95% CI= 0.66, 0.96)	-Reduced disease burden (reduction in persistent diarrhea rate ratio=0.45; 95% CI=0.21, 0.94) -Reduced mortality (RR=0.76; 95% CI= 0.69, 0.84) Impact usually between 6 and 11 months of age	Reduced disease burden (reduction in persistent diarrhea rate ratio=0.45; 95% CI= 0.21, 0.94) Reduced mortality (RR= 0.76; 95% CI= 0.69, 0.84)
<b>Zinc supplementation (preventive and therapeutic)</b>	Four systematic reviews (Aggarwal, Sentz, and Miller 2007; Bhutta and others 1999; Brown and others 2002; Mahomed, Bhutta, and Middleton 2007)	No evidence of benefit except for small reduction in prematurity rates	No evidence of benefit	No evidence of benefit of therapeutic zinc supplementation under 6 months of age  Fewer episodes of diarrhea (rate ratio 0.86; 95% CI=0.79-0.93), severe diarrhea or dysentery (0.85, 0.75-0.95), persistent diarrhea (0.75, 0.57-0.98)  Reduced stunting (weighted average effect size for change in height =0.35; 95% CI= 0.19, 0.51)	Fewer episodes of diarrhea (rate ratio 0.86; 95% CI=0.79-0.93), severe diarrhea or dysentery (0.85, 0.75-0.95), persistent diarrhea (0.75, 0.57-0.98)  Reduced stunting (weighted average effect size for change height =0.35; 95% CI= 0.19, 0.51)  Reduced mortality

Interventions	Evidence reviewed	Age groups affected and impact			
		Prenatal and antenatal <sup>∞</sup>	Newborn (0-1 month)*	Infants (1-12 months)	Child (12-59 months)
				Reduced mortality (9%)	
<b>Maternal calcium supplementation</b>	One systematic review (Hofmeyr, Atallah, and Duley 2006)	Reduced risk of pre-eclampsia (12 trials, 15,206 women: RR=0.48; 95% CI=0.33 to 0.69). The effect was greatest for high-risk women (5 trials, 587 women: RR=0.22; 95% CI=0.12 to 0.42), and those with low baseline calcium intake (7 trials, 10,154 women: RR=0.36; 95% CI=0.18 to 0.70). The composite outcome maternal death or serious morbidity was reduced (4 trials, 9732 women; RR=0.80, 0.65 to 0.97).			
<b>Delayed cord clamping</b>	Three systematic reviews (Hutton and Hassan and 2007; Van Rheezen and Brabin 2004; Villabona and others 2005)	-	Improved MN status (mean neonatal hematocrite at 24 to 48 hours, WMD= 10.01%; 95% CI, 4.10-15.92%)		-
<b>Cooking in iron pots</b>	Three RCTs and one systematic review (Adish and others 1999; Borigato and Martinez 1998; Geerligs and others 2002; Geerligs, Brabin, and Omari 2003; Geerligs and others 2002)				Iron pot group (after 8-12 months) showed a significantly higher Hb (1.3 g/dL) vs non-iron pot use group (p<0.05)

Interventions	Evidence reviewed	Age groups affected and impact			
		Prenatal and antenatal <sup>∞</sup>	Newborn (0-1 month)*	Infants (1-12 months)	Child (12-59 months)
<b>C. Disease prevention strategies</b>					
<b>Malaria prophylaxis and intermittent preventive treatment for malaria IPT in pregnancy and children</b>	A systematic review of RCTs (ter Kuile, van Eijk, and Filler 2007)	In women in their first or second pregnancy, IPT reduced severe antenatal anemia (RR=0.62; 95% CI=0.50-0.78; 2809 participants, 1 prophylaxis and 2 IPT trials) and perinatal deaths (RR=0.73; 95% CI=0.53 - 0.99; 2 prophylaxis and 1 IPT trial)  Pooled data from five studies showed reduction in LBW (RR= 0.55; 95% CI= 0.43, 0.70)		IPT results in 46% reduction in the risk of severe anemia (RR= 0.54; 95% CI= 0.42, 0.68)  IPT results in 48% reduction in the risk of Clinical malaria, from the age of 2 months (RR= 0.52; 95% CI= 0.35, 0.77) (random effects)	
<b>Insecticide treated bed nets</b>	A systematic review of RCTs (Gamble, Ekwaru, and ter Kuile 2006)	Pooled estimates indicated a 23% reduction in the risk of delivering a LBW infant (RR= 0.77; 95% CI= 0.61-0.98, equivalent to a reduction in odds of term LBW of 43%)			
<b>Hygiene interventions (handwashing, water quality treatment, sanitation, and hygiene)</b>	Three systematic reviews (Curtis and Cairncross 2003; Fewtrell and others 2005; Zwane and Kremer 2007)			Significant decrease in diarrhea (handwashing vs control: RR= 0.70; 95% CI= 0.56, 0.89 random-effects model). Multiple interventions also had similar effects on severe diarrhea and dysentery (pooled	Significant decrease in diarrhea (handwashing vs control: RR= 0.70; 95% CI= 0.56, 0.89 random-effects model). Multiple interventions also had similar effects on severe diarrhea and dysentery (pooled estimate of relative

Interventions	Evidence reviewed	Age groups affected and impact			
		Prenatal and antenatal <sup>∞</sup>	Newborn (0-1 month)*	Infants (1-12 months)	Child (12-59 months)
				estimate of relative risk 0.68, 0.62–0.74).	risk 0.68, 0.62–0.74).
<b>Deworming in pregnancy and childhood</b>	Three studies and a systematic review of RCTs (Dickson and others 2000)	Improved MN status (mean decline in Hb between first and third trimester was 6.6 g/L less as compared to the placebo)		<p>Improved MN status (Hb g/l WMD=0.93; 95% CI=0.10, 1.77)</p> <p>Increase in height with a single dose was 0.14 cm (95% CI=0.04 to 0.23)</p> <p>A single dose was associated with an average 0.24 kg increase in weight (95% CI=0.15 kg to 0.32 kg). For multiple doses, the increase was 0.10 kg (0.04 kg to 0.17 kg) for up to one year of follow-up.</p>	<p>Improved MN status (Hb g/l WMD=0.93; 95% CI=0.10, 1.77)</p> <p>Increase in height with a single dose was 0.14 cm (95% CI 0.04 to 0.23)</p> <p>A single dose was associated with an average 0.24 kg increase in weight (95% CI=0.15 kg to 0.32 kg). For multiple doses, the increase was 0.10 kg (0.04 kg to 0.17 kg) for up to one year of follow-up.</p> <p>5%-10% reduction in rates of anemia in populations with high rates of intestinal helminthiasis</p>
<b>D. General Nutrition Support Strategies</b>					
<b>CCTs</b>	Six case studies, mostly observational data were reviewed	<b>No maternal impact estimates available</b>	No neonatal impact estimates available	Reduced stunting Increase in height on average 0.44 cm for children ages 0- 12	Reduced stunting Increase in height on average 0.44 cm for

Interventions	Evidence reviewed	Age groups affected and impact			
		Prenatal and antenatal <sup>∞</sup>	Newborn (0-1 month)*	Infants (1-12 months)	Child (12-59 months)
				<p>months (PFA in Colombia)</p> <p>An increase of 16 % in mean growth rate per year corresponding to 1 cm increase in height per year. Reduced prevalence of stunting by 10% in 12-36 months age group (PROGRESA in Mexico)</p> <p>Decline in stunting from 41.9% to 37.1% over 2 years (RPS in Nicaragua)</p>	<p>children ages 0- 12 months (PFA in Colombia)</p> <p>An increase of 16 % in mean growth rate per year corresponding to 1 cm increase in height per year. Reduced prevalence of stunting by 10% in 12-36 months age group (PROGRESA in Mexico)</p> <p>Decline in stunting from 41.9% to 37.1% over 2 years (RPS in Nicaragua)</p>
<b>Dietary diversification strategies including home gardening, livestock, and dietary modifications</b>	Twenty-nine studies and one systematic review were included	<b>No impact estimates available</b>	No impact estimates available	<p>Improved hemoglobin concentration (107 vs. 102 g/L; p &lt; 0.01)</p> <p>Improved serum retinol WMD=0.12 (95% CI= 0.07, 0.17)</p>	<p>Improved hemoglobin concentration (107 vs. 102 g/L; p &lt; 0.01)</p> <p>Improved serum retinol WMD=0.12 (95% CI= 0.07,0.17)</p>

<sup>∞</sup> Includes interventions focusing on mothers and the impacts on maternal and child health.

\*Includes interventions in the neonatal period of life.

Note: RCT = randomized controlled trial; WMD = weighted mean difference; Hb conc = hemoglobin concentration.

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## *Annex 5. Effects of Newborn and Maternal Nutrition Interventions on Mortality and Nutritional Status*

**Table 1: Effects of Newborn and Maternal Nutrition Interventions (Percentage) on Neonatal and Child Mortality**

	<b>Severe infections</b>	<b>Diarrhea</b>	<b>Congenital disorders</b>	<b>All cause mortality</b>
<b><i>Maternal Interventions*</i></b>				
Maternal balance energy protein supplementation**				2%
Maternal micronutrient supplementation***				1%
Periconceptual folic acid supplementation			8%	
<b><i>Newborn Interventions*</i></b>				
Early initiation of breastfeeding	22%			
Exclusive breastfeeding	19%	36%		
	<b>Diarrhea</b>	<b>Pneumonia</b>	<b>Measles</b>	<b>SAM and other nutritional deficiencies</b>
<b><i>Child Interventions*</i></b>				
Exclusive breastfeeding < 6 months	19%	14%		
Continued breastfeeding beyond 6 months	11%	6%		
Complementary feeding promotion (for both food-secure and -insecure population)	8%	10%		20%
Vitamin A supplementation	33%		66%	
Preventive zinc supplementation****				9%
Zinc for management of diarrhea	20%			
Promotion of handwashing and hygiene strategies	30%			
WHO-recommended case management of SAM				55%

\*Bhutta and others 2008.

\*\*Maternal balance energy protein supplementation reduced risk of LBW by 32 percent and LBW contributes around 7.4 percent of neonatal deaths therefore it translates to 2 percent reduction in overall neonatal mortality.

\*\*\* Similarly maternal micronutrient supplementation reduced risk of LBW by 14 percent therefore it translates to 1 percent reduction in overall neonatal mortality.

\*\*\*\*Aggarawal, Sentz, and Miller 2007; Mahomed, Bhutta, and Middleton 2007.

**Table 2: Effects of Newborn and Maternal Interventions (Percentage) on Nutrition Status**

	LBW	Stunting	Iodine deficiency	Maternal anemia	Child anemia
Maternal balance energy protein*	32%				
Maternal IFA supplementation**				73%	
Maternal micronutrient supplementation	14%***			39%****	
IPT/ITN during pregnancy*****	37%			12%	
Complementary feeding*****		26%			
Food secure		17%			
Food insecure		9%			
Iodization of salt			41%		
Zinc fortification*****		15%			
Micronutrient supplementation with Sprinkles					21%
Deworming during childhood*****					10%

\*Kramer and Kakuma 2003.

\*\*Pena-Rosas and Viteri 2006.

\*\*\*Brent and others 1995.

\*\*\*\*Haider and Bhutta 2006.

\*\*\*\*\*ter Kuile, van Eijk, and Filler 2007; Gamble, Ekwaru, and ter Kuile 2006.

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## *Annex 6. Cost Effectiveness Estimates for Various Nutrition Interventions*

<b>Interventions</b>	<b>Cost effectiveness estimates (DCPP)</b>	<b>Lancet PHC cost effectiveness</b>	<b>Copenhagen Consensus</b>
<b>Maternal</b>			
Iron folic acid supplementation	N/A	N/A	US\$ 66-115 per DALY*
Maternal calcium supplementation	N/A	N/A	N/A
Maternal balanced energy protein supplementation	N/A	N/A	N/A
Maternal iodine supplements	US\$ 1.80–18/ infant-early child death avoided*	N/A	N/A
Vitamin A supplementation	US\$ 19–193/maternal death averted**	N/A	N/A
Maternal deworming in pregnancy	N/A	N/A	N/A
Insecticide-treated bednets (for family)	US\$ 5-17 per DALY averted	N/A	N/A
Intermittent preventive treatment for malaria (pregnancy)	US\$ 13-24 per DALY averted	N/A	N/A
Family planning interventions to promote birth spacing	N/A	N/A	N/A
Maternal mental health interventions	N/A	N/A	N/A
Support for breastfeeding mothers (50% coverage)***	8 mil. DALY averted/year (ACER=6)		
Support for breastfeeding mothers (80% coverage)***	14 mil. DALY averted/year (ACER=6)		
Support for breastfeeding mothers (95% coverage)***	16 mil. DALY averted/year (ACER=6)		
<b>Neonatal</b>			
Breastfeeding promotion strategies (individual and group counseling)	N/A	N/A	N/A

<b>Interventions</b>	<b>Cost effectiveness estimates (DCPP)</b>	<b>Lancet PHC cost effectiveness</b>	<b>Copenhagen Consensus</b>
Breastfeeding promotion (Baby-Friendly Hospitals )	N/A	N/A	US\$ 2-4/DALY to US\$ 12-19/DALY****
Delayed cord clamping	N/A	N/A	N/A
Growth monitoring and counseling	US\$ 8-11 per DALY averted	N/A	N/A
<b>Infants and Children</b>			
Behavior change communication for improved complementary feeding	N/A	N/A	N/A
Multiple micronutrient supplementation	N/A	N/A	US\$ 8-97/ DALY gained, US\$ 273-248/ death averted*****
Vitamin A supplementation	US\$ 6-12 per DALY averted	N/A	US\$ 64-294 /death-averted***** US\$ 3-16/DALY*****
Vitamin A fortification	US\$ 33-35 per DALY averted	N/A	N/A
Zinc supplementation in diarrheal management	N/A	N/A	US\$ 73/DALY US\$ 2,100 / death-averted*****
Zinc fortification	N/A	N/A	US\$ 12.20/DALY*****
Improved diarrhea management	US\$ 527-2,001 per DALY averted	US\$ 132-2570 per DALY averted	N/A
Iodine fortification	US\$ 34-36 per DALY	N/A	N/A
Treatment of severe acute malnutrition	N/A	N/A	N/A
Iron fortification/supplementation programs	US\$ 66-70 per DALY averted	US\$ 66-70 per DALY averted	N/A
Provision of complementary foods	N/A	N/A	N/A
Neonatal vitamin A supplementation	N/A	N/A	N/A
Multiple micronutrient (breastfeeding programs)	US\$ 3-11 per DALY averted US\$ 100-300 per death averted	N/A	N/A
Deworming in children	US\$ 2-9 per DALY averted	N/A	N/A
<b>Strategies</b>			
Conditional cash transfer	N/A	N/A	N/A
Unconditional cash transfers and micro-credit programs	N/A	N/A	N/A

<b>Interventions</b>	<b>Cost effectiveness estimates (DCPP)</b>	<b>Lancet PHC cost effectiveness</b>	<b>Copenhagen Consensus</b>
Handwashing/hygiene interventions	N/A	N/A	N/A
Mass media strategies for breastfeeding promotion, dietary diversification, etc.	N/A	N/A	N/A
Food for work programs & generalized food subsidies	N/A	N/A	N/A
Dietary diversification strategies, small animal husbandry, and home gardening	N/A	N/A	N/A
Agricultural subsidies and land reform	N/A	N/A	N/A

*Note:* ACER= average cost effectiveness ratio; DCPP= Disease Control Priorities Project.

\*Baltussen, Knai, and Sharan 2004.

\*\*Rouse 2003.

\*\*\*Adam and others 2005.

\*\*\*\*Horton and others 1996.

\*\*\*\*\*Robberstad and others 2004.

\*\*\*\*\*Ching and others 2000.

\*\*\*\*\*Ching and others 2000; Fiedler 2000; Horton 1999.

\*\*\*\*\*Sharieff, Horton, and Zlotkin 2006.

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## ***Annex 7. Summary and Key Messages of The Lancet Nutrition Series***

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*The Lancet's* series on maternal and child undernutrition provide new insight into the global prevalence and impact of maternal and child undernutrition. The series follow a number of earlier important series from *The Lancet*—such as those on child survival and newborn health—which have shaped policy and action. The authors of the series examined evidence-based interventions that, if implemented at scale, could significantly reduce the effects of maternal and child undernutrition. This reduction requires improved coordination between national agencies and international organizations, as well as efficient management of resources and a dedicated effort to strengthen global capabilities.

The first two papers of the series quantify the prevalence of maternal and child undernutrition and consider the short-term consequences in terms of deaths and disease burden, as measured by DALYs. They also quantify the long-term educational and economic effects and associations with adult chronic diseases, particularly as countries go through the demographic, epidemiological, and nutritional transitions. The third paper reviews the evidence base for interventions that impact maternal and child undernutrition and survival, and estimates the potential benefits of implementing effective and relevant evidence-based health and nutrition interventions in low- and middle-income countries. The final papers in the series consider the current state of such interventions, and how they could be implemented at scale through actions at national and global levels.

### **Key messages**

- In low-income countries, maternal and child undernutrition is the underlying cause of more than one-third (3.5 million) of all child deaths under five years of age, many of which are preventable through effective nutrition interventions operating at scale.
- Pregnancy to age 24 months is the critical window of opportunity for the delivery of nutrition interventions. If proper nutrition interventions are not delivered to children before the age of 24 months, they could suffer irreversible damage into their adult life and through subsequent generations.
- Effective interventions are available to reduce underweight, stunting, micronutrient deficiencies, and child deaths. Among the currently available interventions reviewed, breastfeeding counseling, appropriate complementary feeding, and vitamin A and zinc have the greatest potential for reducing child deaths and future disease burden related to undernutrition. Interventions to reduce iron and iodine deficiencies are important for maternal survival and for children's cognitive development, educability, and future economic productivity.
- Ninety percent of the world's undernourished children live in just 36 countries. Intensified nutrition action in these countries can lead to the achievement of the MDGs' goals of halving severe hunger by 2015 (MDG 1) and greatly increase the chances of achieving the goals for child and maternal mortality (MDGs 4 and 5).
- Nutrition should be a priority at all levels—subnational, national, and global—because it is a central component for human, social, and economic development. Undernutrition is a key factor in reducing child development, maternal health, and productivity. The prevention of maternal and child undernutrition is a long-term investment that will benefit the current generation and their children.
- Reducing maternal and child undernutrition will require improved coordination between national governments and international organizations. Additionally, the international nutrition effort requires significant reform in order to be effective. Although undernutrition and poverty are often intertwined and long-term solutions to eradicate poverty and undernutrition must be linked, proven steps can be taken now to alleviate the immediate effects of maternal and child undernutrition.

## *Annex 8. Infant and Young Child Feeding Behaviors*

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Percentage of Infants Being Fed According to the WHO Age Recommendations, 2006

		Age in months		
		0-3	0-6	6-9
Region	Batken		46.0	
	Jalal-Abad		41.5	
	Issyk-Kul		31.1	
	Naryn		27.9	
	Osh		51.6	
	Talas		39.0	
	Chui		25.0	
	Bishkek		15.9	
Locality	Urban	34	22.3	48
	Rural	45	38.0	51
Maternal education	None		21.4	
	Primary	42	35.9	43
	Secondary or higher	34	24.9	57
Wealth quintiles	Poorest	30	30	43
	Second	70	48	
	Middle	43	38	48
	Fourth	36	29	60
	Richest	23	15	51
<b>Total</b>		<b>40.7</b>	<b>31.5</b>	<b>49.3</b>