PN-XCN-479

AFRICA NUTRITION

Nutrition and Health Status of Young Children and Mothers in Zambia

Findings from the 1996 Zambia Demographic and Health Survey

USAID

U.S. Agency for International Development

ORC MACRO™ ORC Macro

Nutrition and Health Status of Young Children and Mothers in Zambia

Findings from the 1996 Zambia Demographic and Health Survey

Robert Johnston[1]
Chongo Kaite[2]
Altrena Mukuria[1]

ORC Macro
Calverton, Maryland USA

June 2000

[1] ORC Macro, Calverton, Maryland, USA [2] National Food and Nutrition Commission, Lusaka, Zambia

This report is dedicated to the late

Chongo Kaite

in appreciation for
his contributions to nutrition in Zambia

Suggested citation:

Johnson, Robert, Chongo Kaite, and Altrena Mukuria. 2000. *Nutrition and Health Status of Young Children and Mothers in Zambia: Findings from the 1996 Zambia Demographic and Health Survey.* Calverton, Maryland, USA: ORC Macro.

CONTENTS

Page

Tables v
Figures vii
Acknowledgments ix
Executive Summary xi
Acronyms xv
Map of Zambia xvi

CHAPTER 1 INTRODUCTION 1

1.1 Physical Environment and Population of Zambia 1
1.2 Economy of Zambia 2
1.3 Food Security Situation 2
1.4 Health and Nutrition Situation 3
1.5 Micronutrient Deficiencies 4
1.6 National Nutrition Program 4
1.7 Data Source and Type of Information Collected 5
1.8 Study Data and Methodology 6

CHAPTER 2 NUTRITIONAL STATUS OF INFANTS AND CHILDREN 7

2.1 Effects of Malnutrition 7
2.2 Basic Indicators of Nutritional Status 9
2.3 Birth Weight 9
2.4 Overall Prevalence of Malnutrition 12
2.5 Trends of Malnutrition 12
2.6 Geographic Variations in Malnutrition 13
2.7 Malnutrition according to Age 15
2.8 Comparison with Other Sub-Saharan Countries 16
2.9 Summary 18
2.10 Recommendations 18

CHAPTER 3 INFANT AND CHILD FEEDING PRACTICES 21

3.1 Optimal Infant and Child Feeding Practices 21
3.2 Initiation of Breastfeeding 22
3.3 Exclusive Breastfeeding 24
3.4 Introduction of Solid Foods 26
3.5 Duration of Breastfeeding 28
3.6 Reasons for Weaning 30
3.7 Comparison with Other Sub-Saharan Countries 32
3.8 Summary 32
3.9 Recommendations 32

CHAPTER 4 MORBIDITY AND MORTALITY 35

4.1 Infant and Under-Five Mortality 35
4.2 Comparison with Other Sub-Saharan Countries 37

Page

4.3 The Relationship between Malnutrition and Mortality 37
4.4 Contribution of Malnutrition to Under-Five Mortality 38
4.5 Regional and Age-Specific Patterns of Morbidity 38
4.6 Patterns of Care Seeking and Treatment for Common Childhood Illnesses 41
4.7 Maternal Knowledge and Attitudes about Treatment of Diarrhea in Children 43
4.8 Factors Associated with Diarrhea 46
4.9 Summary 50
4.10 Recommendations 51

CHAPTER 5 FACTORS ASSOCIATED WITH MALNUTRITION 53

5.1 Biological and Health Characteristics of Stunting 53
5.2 Biological and Health Characteristics of Wasting 55
5.3 Socioeconomic and Demographic Characteristics of Stunting 55
5.4 Socioeconomic and Demographic Characteristics of Wasting 58
5.5 Multivariate Regression Analysis 58
5.6 Risk Factors for Stunting 60
5.7 Risk Factors for Wasting 63
5.8 Summary 64
5.9 Recommendations 64

CHAPTER 6 NUTRITIONAL STATUS OF WOMEN 65

6.1 Background 65
6.2 Data Collected 66
6.3 Indicators of Maternal Nutritional Status 67
6.4 Height, Weight, and Body Mass Index 68
6.5 Maternal Chronic Energy Deficiency 73
6.6 Summary 74
6.7 Recommendations 74

CHAPTER 7 KEY RECOMMENDATIONS 75

7.1 Food Security 75
7.2 Women's Welfare 75
7.3 Primary Health Care 75
7.4 Breastfeeding and Child Nutrition 77
7.5 Information, Education, and Communication 77
7.6 Research 77

REFERENCES 79

APPENDIX A Sample Design 87
APPENDIX B Household and Respondent Background Characteristics 91
APPENDIX C Anthropometric Data Verification 105
APPENDIX D Malnutrition among Children under Five Years of Age 109
APPENDIX E Residence, Gender, and Socioeconomic Differences in the Prevalence of Malnutrition by Child's Age, Zambia 1996 115
APPENDIX F Feeding Practices by Age 119
APPENDIX G Logistic Regression Analysis 123

TABLES

Page

Table 2.1 Birth weight and size at birth for children under five years 10
Table 2.2 Stunting, wasting, and underweight 13

Table 3.1 Initial breastfeeding 21
Table 3.2 Breastfeeding by age in living children in preceding 24 hours 25
Table 3.3 Types of foods received by living children in preceding 24 hours and feeding by bottle 26
Table 3.4 Types of foods received by children in preceding 24 hours 28
Table 3.5 Median duration and frequency of breastfeeding: background characteristics 29
Table 3.6 Reason for weaning 31

Table 4.1 Infant and under-five mortality rates 36
Table 4.2 Prevalence and treatment of diarrhea, fever, and cough with rapid breathing 39
Table 4.3 Source of treatment for diarrrhea and cough with rapid breathing 42
Table 4.4 Attitudes and practices concerning diarrhea care 43
Table 4.5 Knowledge of diarrhea care 44
Table 4.6 Use of oral rehydration therapy for treatment of diarrhea 45
Table 4.7 Prevalence and estimate of net relative odds of diarrhea among children under three years 47

Table 5.1 Stunting and wasting by biological characteristics 54
Table 5.2 Stunting and wasting by socioeconomic characteristics 57
Table 5.3 Estimated net relative odds of stunting and wasting 62

Table 6.1 Recommended total weight-gain ranges for pregnant women 66
Table 6.2 Distribution of mothers' ages 67
Table 6.3 Height, weight, and body mass index (BMI) of pregnant and nonpregnant mothers 67
Table 6.4 Distribution of mother's height 69
Table 6.5 Distribution of mother's weight and BMI 69
Table 6.6 Prevalence and estimated net relative odds of low body mass among nonpregnant mothers by background characteristics 71

Table B.1 Distribution of children by residence 96
Table B.2 Anthropometric measurement of children 96
Table B.3 Mean number of living and dead children 97
Table B.4 Mother's age 97
Table B.5 Mother's education 98
Table B.6 Mother's occupation 98
Table B.7 Usual caretaker of children of women working outside the home 99
Table B.8 Sex of household head 99
Table B.9 Mother's marital status 100
Table B.10 Mother's partner's education 100
Table B.11 Mother's partner's occupation 101
Table B.12 Toilet facility 101
Table B.13 Source of drinking water 102
Table B.14 Type of floor 102
Table B.15 Exposure to the mass media 103

Page

Table B.16 Socioeconomic status 103
Table B.17 Antenatal care provider 104
Table B.18 Assistance at delivery 104

Table C.1 Characteristics of children with missing anthropometric data 107
Table C.2 Digit preference in anthropometric data 108

Table D.1 Malnutrition by region and age 111

Table E.1 Malnutrition by residence, sex, and age 117
Table E.2 Malnutrition by socioeconomic status and age 118

Table F.1 Feeding practices by age 125

FIGURES

Page

Figure 2.1 Causes of malnutrition 8
Figure 2.2 Malnutrition among children under 5 years 12
Figure 2.3 Stunting and wasting among children under 5 years by region 14
Figure 2.4 Stunting and wasting among children under 5 years by urban-rural residence 14
Figure 2.5 Stunting and wasting among children under 5 years by socioeconomic status 15
Figure 2.6 Stunting, wasting, and underweight by age 16
Figure 2.7 Stunting among children under 3 years in sub-Saharan coutries 17
Figure 2.8 Underweight among children under 3 years in sub-Saharan countries 17

Figure 3.1 Exclusive breastfeeding among living infants under 6 months by residence and region 25
Figure 3.2 Breastfeeding with complementary solid foods among infants from 6 to 9 months by residence and region 27

Figure 4.1 Under-five child mortality in Zambia compared with other sub-Saharan countries 37
Figure 4.2 Contributing effects of malnutrition on under-five mortality 38
Figure 4.3 Diarrhea and wasting by age of child 40
Figure 4.4 Fever and cough by age of child 41

ACKNOWLEDGMENTS

The authors would like to thank a number of individuals for their valuable contributions to this project. In Zambia, we would like to thank Ms. Priscilla Likwasi, Acting Director, Ms. Beatrice Kawayana and Mr. Ward Yamasanto, National Food and Nutrition Commission, Dr. Peggy Chibuye, USAID/Lusaka, Mr. Malijanni and Dr. Rosemary Sunkutu, Central Borard of Health/Ministry of Health, Ms. Dorothy Namuchimba and Ms. Robina Mukenga, World Food Program, Dr. Mukumba and Ms. Milika Zimba, UNICEF, Mr. Jolly Kamwanga, Institute of Economics and Social Research, and Prof. G.H. Bhat, University Teaching Hospital.

In the United States, we would like to thank Ms. Hope Sukin, USAID, Africa Bureau, who was the driving force behind this report.

Several individuals from ORC Macro contributed to the project: Kaye Mitchell, who prepared the report for publication, and Sidney Moore, who edited the report are greatly appreciated.

EXECUTIVE SUMMARY

Malnutrition is one of the most important health and welfare problems among infants and young children in Zambia, resulting in serious health and economic consequences for both the individual and nation. Forty-two percent of Zambian children 0 to 59 months of age are stunted, 4 percent are wasted, and 24 percent are underweight. Of the children who are stunted, 41 percent are severely stunted. Less than 1 percent of all children are severely wasted. The high prevalence of severe stunting is likely a consequence of food insecurity. Limited duration of breastfeeding and poor quality of weaning foods are found to be responsible for poor growth performance (Ng'andu and Watts, 1990). Stunted children in Zambia more often consume foods that provide less energy, compared with nonstunted children. Poverty is the limiting factor for obtaining appropriate food items for children's diet (Ng'andu and Baboo, 1990). Premature births and intrauterine growth retardation (IUGR) are also common in Zambia, and this has an impact on anthropometric data (Gernaat et al., 1996).

There is a distinct age-specific pattern of stunting and wasting in children under five years of age. In Zambia, there is a general upward trend in the prevalence of stunting with increasing age. This trend peaks at 60 percent at age 21 months, drops slightly after the end of the second year of life, and continues on a slow decline to 40 percent by the end of year 5. The general age pattern of underweight falls in between that of stunting and wasting. Age variations in wasting prevalence are not as marked as stunting and underweight, although an age pattern still exists. Wasting prevalence peaks between 12 and 20 months, with a prevalence rate slightly less than 20 percent. By the end of the second year, the prevalence of wasting falls to near-zero levels for the remainder of the five-year period plotted on the graph.

It should be noted that during the early stages of infancy, the age pattern of wasting loosely mirrors age patterns in prevalence of diarrheal disease in the past two weeks. The prevalence of diarrhea in the past two weeks increases quickly in newborns. It peaks at ten months in more than 45 percent of the population. It begins to drop seriously just before 2 years of age. The increase of diarrheal disease is likely related to the introduction of complementary liquids and foods. Among children under the age of 3 years, the median duration of exclusive breastfeeding is slightly more than two weeks. Breastfeeding practices during the first 6 months of life are less than optimal in Zambia. The median duration of full breastfeeding is two and one-half months. For the most part, children are breastfed well into the second year of life. Ninety-four percent of all children 6-9 months of age were receiving complementary foods in addition to breast milk. The overall duration of any breastfeeding was 20 months, which is consistent with optimal breastfeeding standards. Nevertheless, the early age at which cereals and other foods are introduced increases the child's chances of becoming malnourished or ill. Thus, there is a need to raise awareness of the benefits of exclusive breastfeeding and age-appropriate weaning practices.

In Zambia, 109 infants out of every 1,000 born die before their first birthday. Among all children under 5 years, 192 of every 1,000 will die before reaching their fifth birthday. Malnutrition is an important factor in the deaths of young children. Indeed, an estimated 38 percent of all deaths among children under the age of 5 years are related to malnutrition. Moderate malnutrition accounts for a larger proportion of under-five mortality than severe malnutrition (33 percent versus 5 percent). Consequently, nutrition interventions aimed at the prevention, detection, and timely treatment of all types of malnutrition, in particular moderate cases, can have a tremendous impact on child survival in Zambia.

Among the children studied, 24 percent had diarrhea in the two weeks preceding the survey. Diarrhea follows an age pattern similar to wasting, with an upward trend throughout infancy, peaking between 10 and 20 months of age. Diarrhea frequently results in fluid loss and dehydration, decreased food and fluid intake due to anorexia, and malabsorption and increased nutrient loss, illustrating the similar age patterns between diarrhea and wasting. In addition to oral rehydration therapy (ORT), there are recommended home fluids (RHF) made of domestically available products to be used for oral

rehydration. The use of oral rehydration therapies, either oral rehydration salts (ORS) or RHF, was reported by 54 percent of mothers with children who had diarrhea in the previous two weeks. Additionally, during the two-week reference period, 58 percent of diarrhea-affected children received increased amounts of fluids during their illness.

Women's nutritional status prior to conception and during pregnancy is important both as an indicator of overall women's health and as a predictor of pregnancy outcome for both the mother and infant. In Zambia, 9 percent of both nonlactating and of lactating, nonpregnant Zambian women experience chronic energy deficiency (CED), which can put women and their current and future pregnancies at risk. At the other end of the spectrum, 16 percent of nonlactating mothers and 10 percent of lactating, nonpregnant Zambian women are overweight, which may put them at risk for diabetes and cardiovascular disease.

Analyses of the factors related to both child and maternal nutrition point to the multidimensional nature of the nutrition problem in Zambia for both children and their mothers. However, because the immediate causes of malnutrition are inadequate food intake and illness, both short- and long-term strategies are needed. Selected important strategies that are recommended include the following:

Economic Access to Available Food

- Improve rural infrastructure (e.g., roads, water supply, health facilities, and schools) through labor-intensive employment programs targeting food-insecure and displaced individuals.
- In urban areas where households buy and trade food rather than rely on subsistence farming, provide means of income generation through skills training or business development through micro-credit loans.

Women's Welfare

Improvements in nutrition will entail addressing all aspects of Zambian women's well-being: social, economic, and health-related.

- Given the negative relationship between low maternal education and adverse child nutritional outcomes, expand educational opportunities for females and employ mechanisms to retain girls in school through the secondary level at the minimum.
- Increase availability and accessibility of family planning methods.

Primary Health Care

Monitoring growth and nutrition status.

- Given the low percentage of facility-based births, intensify training traditional birth attendants and other community health workers in growth monitoring and nutrition surveillance. Establish birth weight assessment as a normative practice among birth attendants in the community.

Influencing low birth weights through improved health status of women of reproductive age.

- Improve nutrition of women of reproductive age through specific programs to supplement their diet with iron/folic acid and the Safe Motherhood Program. Target these programs to the women in the provinces with the poorest conditions.

Improve coverage of child survival services.

- Given the incongruity between levels of ORT knowledge and use in Zambia, intensify community outreach programs of Control of Diarrheal Diseases that a) improve community access to and acceptance of ORT and b) educate caregivers on the proper use of ORT.
- Expand the malaria control program with education and distribution of impregnated bednets.

Priority should be given to integrating health, nutrition, and family planning services as opposed to establishing vertical programs.

- Strengthen the integrated health and nutrition approach to intervention projects with family planning, nutrition, and primary health care components.
- Continue expansion of the rural health care infrastructure with emphasis on the establishment of integrated "well-child" services (e.g., nutrition and immunization services) and integrated management of childhood illness (IMCI).

Breastfeeding and Child Nutrition

In improving infant nutritional status, address both supply-side (health facility/provider) and demand-side (community, culture) factors.

- Continue to expand and maintain compliance of all hospitals and clinics with standards of the International Baby-Friendly Hospital Initiative (BFHI).
- Expand BFHI mother support groups for breastfeeding promotion nationwide.

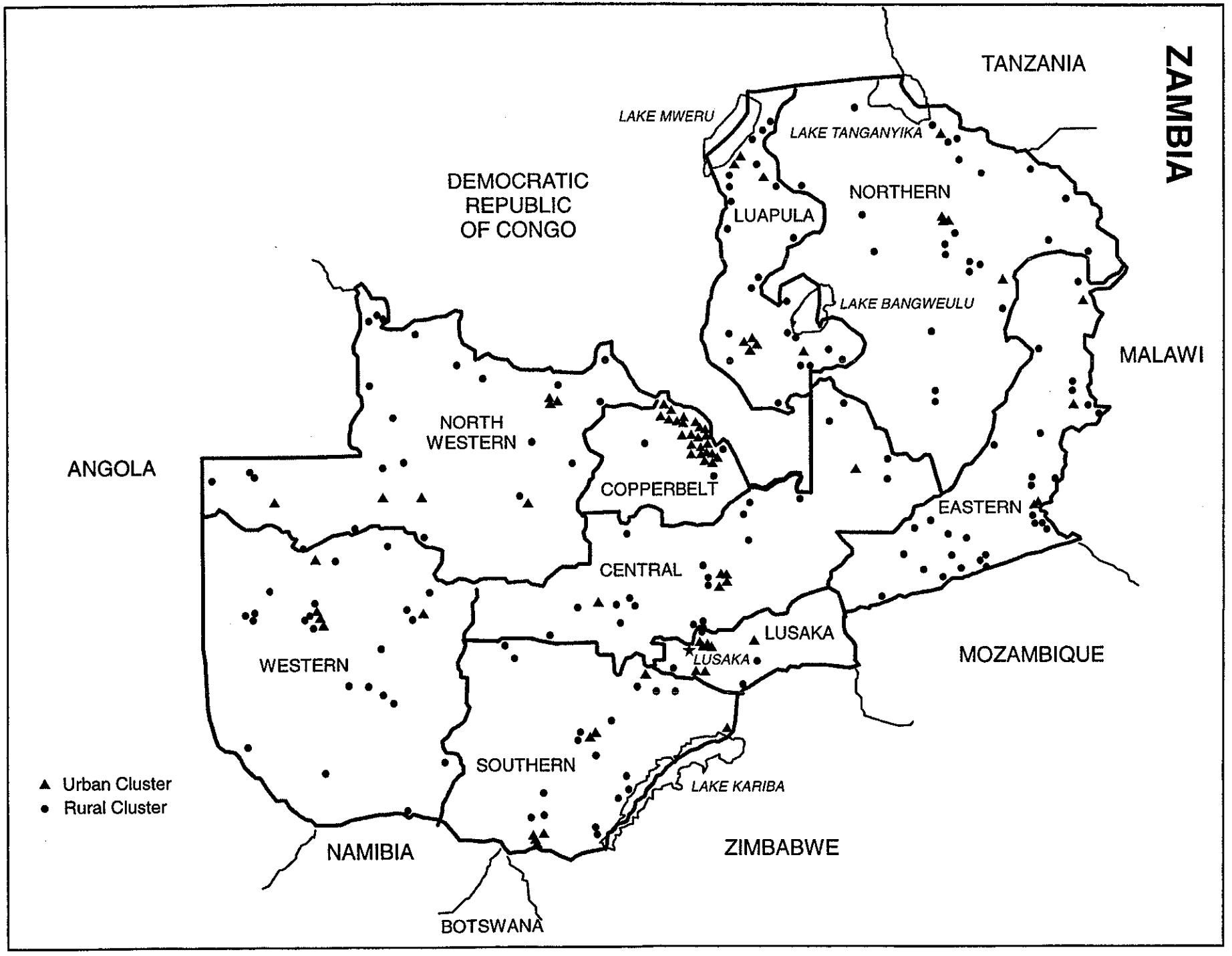
Research

Conduct both quantitative and qualitative studies to measure certain phenomena and health outcomes and to explain why those phenomena exist.

- Support research that aims to ascertain which underlying condition—preterm birth (PTB) or intrauterine growth retardation—is responsible for low birth weight in Zambia, and plan interventions accordingly.
- Conduct qualitative research studies to investigate factors that affect decisions on a) the early introduction of water and other liquids and b) the early introduction of complementary foods.
- Expand research and record collection on maternal child transmission of HIV/AIDS to help develop programs to reduce transmission.

ACRONYMS

BASICS	Basic Support for Institutionalizing Child Survival - Project
BMI	Body mass index
CBGMP	Community-based growth-monitoring program
CDD	Diarrheal Disease Control Program
CED	Chronic energy deficiency
EPI	National Expanded Program on Immunization
GNP	Gross national product
IDD	Iodine deficiency disorder
IUGR	Intrauterine growth retardation
LBW	Low birth weight
MCH	Mother-child health program
MOH	Ministry of Health
NHC	Neighborhood Health Committee
ORT	Oral rehydration therapy
PTB	Preterm birth
SD	Standard deviation
TBA	Traditional birth attendant
U5MR	Under-five mortality
ZDHS	Zambian Demographic and Health Survey


ZAMBIA
TANZANIA
LAKE MWERU
LAKE TANGANYIKA
DEMOCRATIC
REPUBLIC
OF CONGO
NORTHERN
LUAPULA
LAKE BANGWEULU
MALAWI
NORTH
WESTERN
ANGOLA
COPPERBELT
EASTERN
CENTRAL
LUSAKA
LUSAKA
MOZAMBIQUE
WESTERN
SOUTHERN
LAKE KARIBA
Urban Cluster
Rural Cluster
NAMIBIA
ZIMBABWE
BOTSWANA

CHAPTER 1

INTRODUCTION

This report investigates factors related to the health of women and children, morbidity and mortality, infant and child feeding, nutritional status of women and children, and diarrheal disease in children. Poor nutrition results in increased mortality, poor education, and less opportunity for economic development. Conversely, poor education, low socioeconomic status, and higher mortality rates are factors also related to poor nutritional outcomes. The economic evidence strongly suggests that short life expectancy is not just a result of poverty but is also a powerful indicator of impoverishment (Sachs, 1999). This demonstrates the importance of intervening on conditions of high mortality, poverty, and education. Improvement in these conditions is only possible when malnutrition in the population is greatly reduced. Zambia is devoted to eliminating malnutrition and improving the health and economic conditions of its population. The supplementation of sugar with vitamin A, iodization of salt, the Baby-Friendly Hospital Initiative (BFHI), and current work to fortify maize meal with a multivitamin and mineral supplements demonstrate this effort. However, the work to eliminate malnutrition continues.

1.1 Physical Environment and Population of Zambia

Zambia is situated in the southern part of Africa between 8 and 18 degrees south latitude and between 20 and 35 degrees east longitude. It is bordered by Zaire and Tanzania to the north, Malawi and Mozambique to the east, Zimbabwe and Botswana to the south, and Namibia and Angola to the west. The total area is 752,612 square kilometers, which encompasses about 2.5 percent of the total area of Africa (CSO, MOH, and MI, 1997).

Zambia has a tropical climate and vegetation. There are three distinct seasons:

- A warm, wet season from November through April
- A cool, dry season from May to August with the mean temperature varying between 14 and 30 degrees centigrade
- A hot, dry season during September and October with mean daytime temperatures rising to 32 degrees centigrade in the north and northwest and as high as 35 degrees centigrade over most of western Zambia.

The 1969, 1980, and 1990 national censuses reported total populations of 4 million, 5.7 million, and 7.8 million, respectively. Total population was projected to be 9.5 million in 1995. The population density increased from 5.3 people per square kilometer in 1969 to 7.5 in 1980 and 10.4 in 1990. Whereas the population in urban areas has grown by 2.7 percent annually during the decade 1980-1990, the population in the rural areas has increased by 3.5 percent. Data show that the speed of migration to the urban areas has slowed considerably during the 1980-1990 period compared with an earlier period (CSO, MOH, and MI, 1997).

The crude birth rate as estimated from the census data increased from 48 per 1,000 population in 1969 to 50 in 1980 and dropped to 44 in 1990. The crude death rate is estimated to have increased slightly from 17 per 1,000 during 1975-1980 to 18 during 1985-1990. The total fertility rate declined from 7 births per woman as estimated from the 1969 and 1980 censuses to 6.7 births per woman in 1990. Life expectancy at birth for males increased from 42 years in 1969 to 50 years in 1980 and was estimated to have declined

to 44 years by 1990. Zambian women live, on average, two to three years longer than men. The gap appears to have narrowed in 1990. The overall infant mortality rate declined from 141 deaths per 1,000 live births in the mid-1960s to 97 in the late 1970s, after which it increased to 123 in the late 1980s (CSO, MOH, and MI, 1997). The infant mortality rate was 114 deaths per 1,000 live births in 1995, and the maternal mortality rate was 940 per 100,000 in 1990 (Labbok et al., 1997).

1.2 Economy of Zambia

Zambia has a mixed economy consisting of a modern, urban-oriented sector confined to the regions around the rail line and a rural agricultural sector. Copper mining was the country's main economic activity, accounting for 95 percent of export earnings and contributing 45 percent of government revenue during the period from 1965-1975. The situation was sharply changed by the drastic decline in world copper prices in 1974 and 1975. In spite of attractive copper prices in 1989, acute shortage of foreign exchange remained a major constraint in the development of the economy. This was largely attributed to reduced volume of copper sales associated with difficulties in production and transportation.

Eighty-five percent of the labor force in Zambia is dedicated to agriculture (UNDP, 1996). The agricultural sector is expected to provide both food and industrial raw materials to rural and urban consumers. Ninety percent of the farming population consists of small-scale farmers, while less than 10 percent belongs to a large-scale agricultural sector. Maize is the country's staple as well as its major cash crop, accounting for 75 percent of the land cropped and 85 percent of the crop output. Other crops include cotton, groundnuts, sunflower, millet, tobacco, cassava, and vegetables. About 42 million hectares of the Zambian territory are potentially suitable for agriculture. However, only 2.5 million hectares (6 percent) of this land are cropped annually. Forty percent of available land is used as pastures. The development of non-traditional exports remained below expectations (EIU, 1998)

The Zambian gross national product (GNP) has not been growing steadily. From 1980 to 1995, the GNP registered positive growth of an average of 0.6 percent per year. Economic growth was complicated by continued efforts to satisfy the reforms demanded by structural adjustment policies. The economy on the whole has been growing, but the GNP per capita has declined. The overall GNP per-capita growth rate from 1980 to 1995 was a negative 2.3 percent (EIU, 1998).

Inflation dropped dramatically from a high in 1993 at 188 percent to the low level of 24 percent in 1997. Trade liberalization in Zambia has led to the opening of the market to more goods. Due to very low wages and lack of disposable income, the population has not been able to take advantage of the greater availability of goods. Wage rates have not kept pace with inflation. For the majority of people in Zambia, real earnings have fallen in the 1990s (EIU, 1998).

Zambia enjoys friendly international relations with the surrounding countries of Tanzania, Mozambique, Malawi, and Zimbabwe, but instability in the region continues to threaten Zambian economic development. From the north, refugees from the Democratic Republic of the Congo, Rwanda, and Burundi have crossed into the northern provinces of the country in search of a safe haven. Continued civil war in Angola leads refugees to move into Zambia creating instability for the western region of the country.

1.3 Food Security Situation

Food security is defined as access to an adequate quantity and quality of food to sustain a healthy and active life. Research on food security explores factors that allow or impede access to food. These factors include household income, socioeconomic status, access to health care, sanitation, and amount and type of food staples available.

The World Bank, using the "food basket" approach, claimed that poverty increased between 1991 and 1993 (Kumar et al., 1995). The "Vulnerability Assessment and Mapping of 1996" asserted that the number of households living below the poverty level decreased (Riley et al., 1996). Despite the disparity between the two reports, both state that close to 70 percent of the population was impoverished during the 1991-1996 period.

Zambia has one of the largest market-dependent populations as a percentage of total population. Insufficient household income is the main problem. From the 1980s to the 1990s, the country experienced a rapid rise in prices of food and other basic commodities. Formal-sector employment has not increased since the mid 1970s, while informal-sector employment has increased, but wages remain low. Consumer price subsidies have largely been removed, and the urban maize coupon scheme was terminated. The use of food aid caused food prices to vary and interrupted the natural relation between domestic producers and domestic demand for staple crops (Riley et al., 1996).

Maize is the major food crop cultivated in Zambia. Droughts in the 1992-93 and 1994-95 agricultural seasons caused crop losses in five of the nine provinces. Usually carry-over stocks and imports make up production shortfalls. In Zambia, grain stores have suffered large losses threatening food security. Imports have been limited by the country's scarcity of foreign exchange to purchase goods on the international market. Other staple crops such as sorghum, millet, and cassava are grown in drier western and southern sections of the country, and in Northern, North-Western and Luapula provinces (Riley et al., 1996). These foods are used in differing amounts as staple foodstuffs during the hungry season when maize stocks are exhausted. The hungry season is between November and March, when maize supplies are lowest and labor needs are the highest. Children on a diet of cassava over a period of months will suffer from malnutrition if their diet is not supplemented with more nutritious food items.

1.4 Health and Nutrition Situation

Malnutrition is one of the most critical problems among infants and young children in Zambia. This is a result of two factors: inadequate food intake and poor environmental sanitation. Inadequate food intake is a consequence of insufficient food available at the household level and/or improper feeding practices. Improper feeding practices include both the quantity and quality of foods offered to young children as well as the timing of their introduction (Rutstein, 1996). Poor environmental sanitation also strongly affects child health, because it puts young children at increased risk of illness, in particular diarrheal disease, which adversely affects their nutritional status. Infectious diseases are also prevalent. Hookworm disease, schistosomiasis, and malaria are common diseases in Zambia that affect children, which can also have an impact on child's nutrition (Ng'andu et al., 1991). Both inadequate food intake and poor environmental sanitation reflect underlying social and economic conditions.

AIDS is a major public-health challenge in Zambia. A recent population-based survey indicates that about 20 percent of adults are infected with HIV, the virus that causes AIDS (Fylkesnes et al., 1998). AIDS affects children in both direct and indirect ways. Improvements in child survival rates observed until the mid-1980s have been effectively reversed during the late 1980s and the 1990s (CSO, MOH, and MI, 1997). Child mortality (ages 1-4) is expected to double by the year 2010 as a result of AIDS (Foster, 1998). Indirectly, children are greatly effected by the AIDS epidemic through the illness and loss of one or both parents and the associated social displacement, poverty, and disruption in child supportive networks, including those related to household food security.

While most men and women have a general knowledge of AIDS, more specific knowledge is lacking in many segments of the Zambian population. The results of the 1996 Zambia Demographic and Health

Survey indicate that nearly one in five women do not understand that the AIDS virus can be transmitted from a mother to her child. Strategies for improving the situation for children in Zambia include frank discussion of changes in sexual practices (to reduce AIDS-related impacts on households and parents) as well as interventions to support orphaned children and children who are affected by HIV infection directly. The Baby-Friendly Hospital Initiative, along with the Ministry of Health (MOH), has designed scientifically sound recommendations on breastfeeding when a mother is known to be HIV infected (UNICEF, 1999).

1.5 Micronutrient Deficiencies

The three most common micronutrient deficiencies—iodine deficiency, vitamin A deficiency, and anemia (most often caused by iron deficiency)—are found in Zambia. The MOH has devoted significant resources to the fight against micronutrient deficiencies.

Iodine deficiency disorder (IDD) is a serious problem that affects a large percentage of the population in many provinces of Zambia. The national prevalence rate of IDD is 32 percent (Kumar et al., 1995). Legislation for the mandatory iodization of salt was passed in 1978 and revised in 1994. The majority of salt consumed in Zambia is imported. It comes from sources in Namibia, Botswana, and South Africa (BASICS, 1997). Monitoring imports allows the country to ensure that salt is fortified with iodine. By the beginning of 1996, more than 90 percent of salt consumed in the country was iodized (BASICS, 1997). The 1996 ZDHS indicated that 86 percent of households used iodized salt.

Vitamin A is crucial for children and pregnant women to promote good health. According to a study conducted in conjunction with the Zambian National Immunization Days (NIDs) in August of 1997, vitamin A deficiencies were very common. Sixty-six percent of children age 0-4 years and 22 percent of women age 15-49 were found to be vitamin A deficient. This deficiency was severe enough to register night blindness in 12 percent of women and 6 percent of children (Luo, 1997). As a short-term solution, National Immunization Days and Child Health Weeks have been used to administer biannual doses of vitamin A supplements to children under five years of age. As a sustainable long-term approach, Zambia has become the first sub-Saharan country to fortify all domestically produced sugar with vitamin A.

Anemia has been recognized as a major cause of morbidity and mortality in women and children in Zambia. A baseline study done in 1998-1999 indicated that 65 percent of Zambian children were anemic and 14.5 percent were severely anemic. Thirty-nine percent of Zambian women were found to be anemic, and the prevalence of anemia was even higher in pregnant women (47 percent) (Luo, 1999). Iron deficiency was determined to be the largest cause of anemia in Zambia. Other causes include malaria and helminth infections. Intervention activities adopted by the health authorities include antimalarial campaigns, encouraging the use of bednets impregnated with insect repellent, helminthic control activities, and iron and folate supplementation of pregnant women and infants where necessary. A national program is being developed to fortify domestically produced maize meal with a multimineral, multivitamin combination that would also address iron deficiency anemia.

1.6 National Nutrition Program

In Zambia, malnutrition is regarded as a serious issue, and the government has been developing nutrition policies for more than 30 years. Recent key nutrition interventions are included in the national health reform program. The formation of the National Food and Nutrition Commission (NFNC) occurred in 1967. The NFNC is a statutory body funded by the MOH and dedicated to nutritional improvement of the Zambian population. It is responsible for conducting nutrition research and providing technical

assistance to nutrition programs. At the national level, the MOH sets broad nutrition policy, and a Central Board of Health (CBoH) provides support to the health sector reform. Together, these groups developed the National Plan of Action for Nutrition.

The goals of Zambia's National Program of Action (1994) are the following:

- Exclusive breastfeeding by 90 percent of women
- Virtual elimination of vitamin A deficiency
- Virtual elimination of iodine deficiency diseases
- Reduction by one-third in iron deficiency anemia in women
- Twenty-five percent reduction in moderate and severe malnutrition among children under 5 years of age.

The CBoH produced guidelines that outline curative, preventive, and promotional strategies for addressing health and nutrition problems in Zambia. At the core of the guidelines concerning the national nutrition program are six interventions that also comprise the most streamlined and cost-effective set of nutrition interventions implemented universally (International Conference on Nutrition, World Summit for Children). These are referred to as Nutrition Components of Health (NCH):

- Exclusive breastfeeding for the first six months of life
- Appropriate complementary feeding starting at about 6 months of age, in addition to continued breastfeeding until age 24 months
- Adequate vitamin A intake for women, infants, and young children
- Appropriate nutritional management during and after illness
- Iron/folate tablets taken by all pregnant women
- Regular use of iodized salt by all families.

The Baby-Friendly Hospital Initiative provides breastfeeding education. This program has been implemented in urban hospitals and clinics. Neighborhood Health Committees (NHCs), community-based organizations comprised of opinion leaders and health workers, assist the CBoH with implementing primary health care programs. Nutrition counseling for sick children is being developed as part of the Integrated Management of Childhood Illnesses (IMCI) Initiative. NHCs are in the process of developing health message plans, communication strategies, and efforts to motivate families to include iodized salt in their diet (BASICS, 1997).

1.7 Data Source and Type of Information Collected

The data presented in this report are based on the results from the 1996 Zambia Demographic and Health Survey, a nationally representative survey of 7,286 households. Fieldwork was conducted between July 1996 and January 1997. The 1996 ZDHS collected information on fertility; nuptiality; fertility preferences; family planning; infant, child, and maternal mortality; maternal and child health practices; breastfeeding practices; nutritional status of mothers and young children; and awareness and behavior regarding sexually transmitted diseases including AIDS.

The 1996 ZDHS weighted data includes 7,159 children under 5 years of age. Of these children, 6,109 were alive at the time of the interview and were therefore eligible for anthropometric data collection. Complete anthropometric data are available for 5,443 children or 73 percent of all living children under 5 years of age who were included in the ZDHS. Appendix C discusses some aspects of the quality of nutrition data from the 1996 ZDHS. Nutritional data collected on these children include height, weight, age,

breastfeeding history, and feeding patterns. Information was also collected on diarrhea, fever, and cough in the two weeks prior to the survey and on relevant sociodemographic characteristics. For comparison purposes, data are presented from DHS surveys conducted in other sub-Saharan countries and the 1992 ZDHS.

1.8 Study Data and Methodology

Unless otherwise noted, tables, figures, and analyses in Chapters 2 through 5 are based on the 5,443 children with complete anthropometric data. In the bivariate analyses, p-values were determined using Chi-square tests from cross-tabulations. In determining which variables would be included in the multivariate analyses, the p-value cutoff was 0.25. This cutoff was used rather than the conventional, more stringent $p < 0.05$ cutoff because some variables with p-values slightly higher than 0.05 may become statistically significant when other variables are taken into account (Hosmer and Lemeshow, 1989).

Multivariate logistic regression analyses were conducted using a forward stepwise technique ratio method (Appendix G describes the logistic regression methodology in more detail). In the multivariate analyses, variables with 95 percent confidence intervals (for the adjusted odds ratios) that do not include 1.0 ("no risk") amongst the range of possible risk estimates were deemed statistically significant. The results from the multivariate analyses are presented in Chapters 4 through 6.

CHAPTER 2

NUTRITIONAL STATUS OF INFANTS AND CHILDREN

Malnutrition is a crucial health and welfare problem for infants and young children in Zambia, causing serious health and economic consequences for the individual and nation. Poor nutritional status is linked to a number of social, economic, and health-related factors. In a country like Zambia where health resources are still developing, it is important to identify geographic areas and segments of the population that are at highest risk in order to best focus resources. Based on data from the 1996 ZDHS, this chapter discusses the prevalence and severity of key nutritional outcomes such as weight at birth and anthropometric measurements in Zambian infants and children under the age of 5. The differences in these outcomes are explored along various socio-demographic dimensions such as age, sex, and place of residence. In addition, ZDHS results are compared with findings from Demographic and Health Surveys in other African countries.

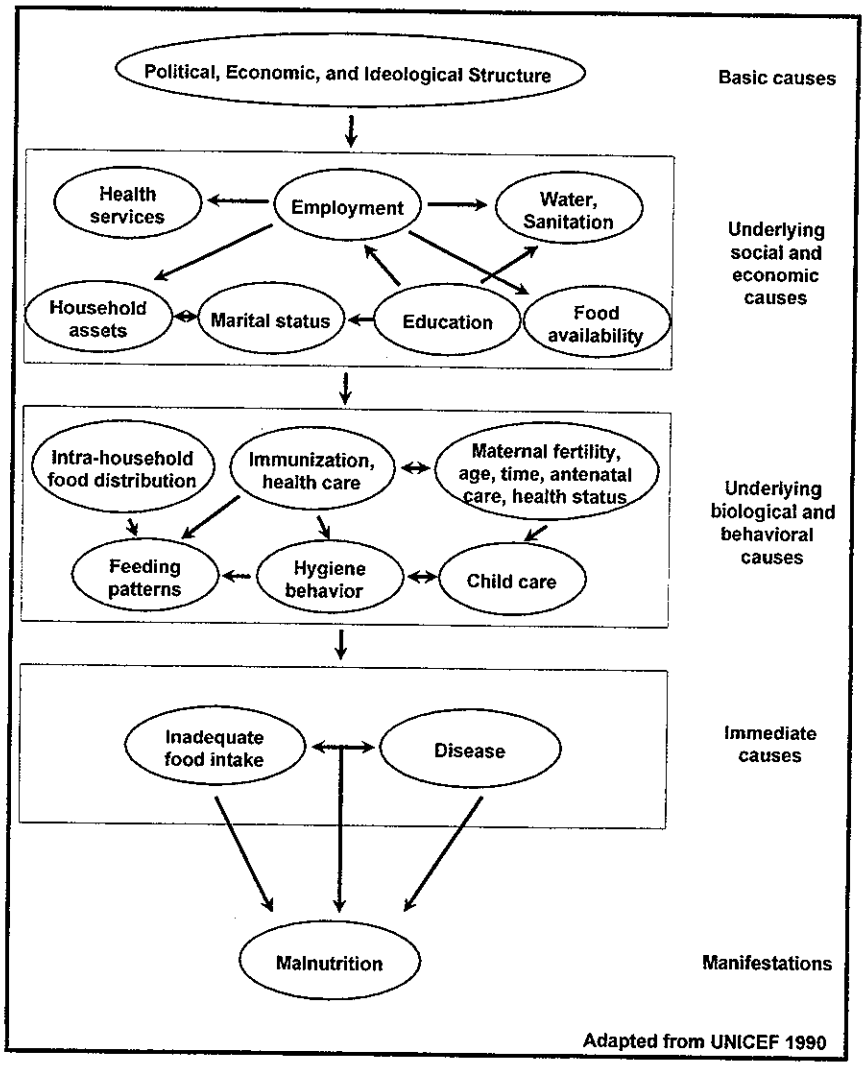
2.1 Effects of Malnutrition

Malnutrition is directly related to inadequate food intake and infectious diseases such as diarrhea, acute respiratory illness, malaria, and measles. Both infectious disease and inadequate food intake reflect underlying social and economic conditions at the household, community, and national levels. Figure 2.1 is adapted from the United Nations Children's Fund (UNICEF) conceptual framework for malnutrition (UNICEF, 1990; Jonsson, 1995) and reflects the relationships among various factors and the mechanisms that lead to childhood malnutrition. Political, socioeconomic, environmental, and cultural factors operating at the national, regional, and community levels as well as poverty at the household level, ultimately affect the nutritional status of children. For example, employment provides a source of income and is an important determinant of household food security. Female eduation and employment, in particular, offers women opportunities for resource control and may result in increased food availability, improved child care practices, and ultimately, improved nutritional status. Similarly, maternal education, maternal nutritional status, and child birth weight through their associations with biological and behavioral causes of malnutrition (e.g., child care practices, feeding behaviors and patterns) are powerful predictors of child nutritional status and fertility (Moore and Favin, 1990).

According to the UNICEF framework in Figure 2.1, poor children are more vulnerable to malnutrition as a consequence of poor environmental conditions, low immunization rates, poor antenatal care, and inadequate treatment of common childhood diseases. Substandard water and sanitation place children at increased risk of infection through exposure to contaminated foods and water (Haggerty et al., 1994a; Clemens and Stanton, 1987; Esrey et al., 1985). Children in poor living conditions typically suffer from recurrent infections such as diarrheal disease and are unable to fully recover from each bout of illness. Diarrheal disease reduces dietary intake and leads to poor absorption and increased nutrient loss (Brown et al., 1990; Rahaman and Wahed, 1983; Rosenberg et al., 1977).

In attempting to understand the direct causes of child malnutrition, it is important to recognize the interaction between inadequate food intake and infectious disease. The relationship between inadequate food intake and diarrhea is interactive (synergistic); that is, the joint effect of the two factors on nutritional status exceeds the simple additive effects of diarrhea or inadequate intake alone (Lutter at al., 1989; Rosenberg et al., 1977; Scrimshaw et al., 1968). In other words, a child who experiences both inadequate food intake and illness is extremely vulnerable to poor health outcomes such as malnutrition—more so than if the child has just one of those conditions.

Figure 2.1
Causes of Malnutrition



In addition to illness, malnutrition is also associated with increased risks of infant and child mortality. Even when malnutrition does not result in death or apparent illness, it may lead to lower levels of cognitive development and educational attainment (Brozek and Schurch, 1984). The adverse effects of poor nutrition during the earliest stages of life also extend into adulthood. Among adults, the cumulative effect of malnutrition may be demonstrated in low worker productivity and increased absenteeism in the workplace, both of which may reduce individual and national lifetime earning potential (World Bank, 1993).

Malnutrition also has intergenerational effects. Low birth weight (LBW), or birth weight less than 2,500 g, is attributed to maternal nutritional factors such as low caloric intake, low pre-pregnancy weight, and low weight gain during pregnancy (Kramer, 1987). Low birth weight is both a sensitive indicator of maternal nutritional status and a major determinant of infant survival. Small, undernourished women tend to give birth to small, low-weight infants (Villar and Belizan, 1982). These small babies have a greater risk of illness and death, compared with normal-weight infants (Baqui et al., 1994; UNICEF and WHO, 1992; Institute of Medicine [IOM], 1985). Despite the high prevalence of LBW in the developing world, birth weight is rarely ascertained in countries where the majority of births occur outside of health facilities. As a result, most children with increased risks of poor health and developmental outcomes are not identified in a timely manner.

2.2 Basic Indicators of Nutritional Status

The assessment of nutritional status is based on the concept that in a well-nourished population, the distribution of children's height and weight for a given age will approximate a normal distribution. This means that approximately 68 percent of children will have a height or weight Z-score within one standard deviation of the median for that age. Approximately 28 percent of children will have a height or weight Z-score within one or two standard deviations of the median for that age. Of the remainder, 4 percent will have a height or weight Z-score larger or smaller than two standard deviations from the median of that age. Half of this 4 percent will fall on the right tail of the normal distribution and will be categorized as overweight. The other 2 percent will fall on the left tail of the normal distribution and will be classified as malnourished. Because all populations have a similar genetic potential for growth (Habicht et al., 1974), the World Health Organization (1979) has recommended the use of U.S. National Center for Health Statistics (NCHS) Reference Data in the evaluation of nutritional status worldwide.

The following three indicators use height or weight in combination with age to determine the nutritional status of infants and children:

Stunting, defined as height-for-age more than two standard deviations below (-2 SD) the median of the NCHS reference population, is the failure to grow adequately in height in relation to age. It reflects past or chronic malnutrition and results from inadequate food intake over a long period of time and/or repeated episodes of illness, particularly diarrhea.

Wasting, defined as weight-for-height more than two standard deviations below (-2 SD) the median of the NCHS reference population, is the failure to gain weight adequately in relation to height and reflects recent or acute malnutrition. Wasting results from a recent shortage of adequate nutrition and/or recent or current acute illness, especially diarrhea.

Underweight, defined as weight-for-age more than two standard deviations below (-2 SD) the median of the NCHS reference population, is a composite indicator that reflects either chronic or acute malnutrition status, or both. It does not reveal additional information beyond what is provided by the stunting and wasting indicators. Nevertheless, it is often used as a general indicator of a population's health status.

There are different gradations of malnutrition. Children who are between -2 SD and -3 SD of the NCHS reference population's median are considered *moderately malnourished*, whereas children who are below -3 SD are considered *severely malnourished*. Although a child may be both stunted and wasted, these two indicators often reflect different etiologies and consequences and thus have different implications for programmatic action.

2.3 Birth Weight

In Zambia, only 43 percent of children under the age of 5 were weighed at birth (Table 2.1). This figure is not surprising since 53 percent of all deliveries take place outside of health facilities (ZDHS, 1997). Information on birth weight does not exist for 57 percent of births. This lack of information inhibits risk approach programs to identify, monitor, and treat at-risk infants in a timely manner. To identify LBW children, a growth-monitoring project began in the 1980s, as a part of the National Nutrition Surveillance program. To address the needs of those children born outside of hospitals and clinics, a pilot community-based growth-monitoring program (CBGMP) was implemented in the Copperbelt region in 1998 with support from the project, Basic Support for Institutionalizing Child Survival (BASICS). This program will soon be replicated in other parts of the country.

Table 2.1 Birth weight and size at birth for children under five years

Among children under five years of age, the percentage weighed at birth, mean birth weight in kilograms, the standard deviation (SD) of the birth weight, the percentage of low birth-weight (LBW) births, and the percentage distribution of births that were small at birth or of average size or larger, by region, residence, socioeconomic status, and whether the child was weighed at birth, Zambia 1996

Background characteristic	Weighed at birth	Birth weight (kg)		LBW[1] births	Size at birth					Number of children
		Mean	SD		Average+	Small	Very small	DK/ Missing	Total	
Region										
Central	32.0	3.2	0.05	11.9	79.4	14.6	5.7	0.3	100.0	587
Copperbelt	72.3	3.1	0.02	10.3	86.2	10.9	2.2	0.8	100.0	1,347
Eastern	27.7	3.1	0.04	12.2	94.9	4.8	0.2	0.2	100.0	1,103
Luapula	27.0	3.1	0.05	12.1	88.5	9.4	2.2	-	100.0	671
Lusaka	68.8	3.1	0.02	12.3	82.4	13.4	3.7	0.5	100.0	1,076
Northern	20.7	3.2	0.05	12.9	87.2	7.0	5.6	0.1	100.0	863
North-Western	58.4	3.1	0.04	8.2	81.4	15.6	2.9	0.2	100.0	287
Southern	24.6	3.2	0.05	9.1	83.8	12.7	3.5	-	100.0	764
Western	32.5	3.1	0.05	13.1	85.7	7.1	7.0	0.2	100.0	460
	p<0.001			*ns*			*p<0.001*			
Residence										
Urban	73.3	3.1	0.01	10.9	84.8	11.3	3.2	0.6	100.0	2,858
Rural	22.7	3.2	0.02	12.1	87.2	9.4	3.3	0.1	100.0	4,301
	p<0.001			*ns*			*p<0.001*			
Socioeconomic status										
Low	20.3	3.1	0.03	12.3	86.6	9.9	3.5	0.1	100.0	1,989
Medium	37.9	3.1	0.02	11.5	86.5	9.9	3.2	0.4	100.0	3,699
High	86.2	3.1	0.02	10.7	85.3	11.2	3.2	0.3	100.0	1,471
	p<0.001			*ns*			*ns*			
Gender										
Male	43.8	3.2	0.02	10.7	87.4	9.4	2.9	0.3	100.0	3,542
Female	42.1	3.1	0.01	11.9	85.1	10.9	3.6	0.3	100.0	3,617
	ns			*ns*			*p<0.05*			
Weighed at birth										
No	NA	NA	NA	NA	86.3	9.8	3.4	0.5	100.0	4,087
Yes	NA	NA	NA	NA	86.2	10.6	3.1	0.1	100.0	3,072
							p<0.05			
Total	42.9	3.1	0.01	11.3	86.3	10.2	3.3	0.3	100.0	7,159

Note: Level of significance determined using Chi-square test.
ns = Not significant (p>0.05).
NA = Not applicable.
[1]Low birth weight (less than 2.5 kg).

As indicated in Table 2.1, the percentage of urban infants who were weighed at birth is significantly higher than that of rural infants (73 percent versus 23 percent). The highest percentage is in the region of Zambia's capital, Lusaka (69 percent), and the lowest percentage is in the rural Northern region (21 percent). These findings correspond to delivery patterns in rural and urban areas, whereby a higher percentage of urban deliveries than rural deliveries occur in health facilities (86 percent versus 42 percent). Almost all children born in health facilities were weighed at birth (96 percent) (ZDHS, 1997). Among rural deliveries, the discrepancy between the percentage of facility-based births and the percentage of infants weighed at birth may reflect the fact that collecting the birth weight of newborn children has not been recommended practice for community health workers. Birth weight assessment is a standard practice covered in the training of staff in urban and rural facilities. Economic limitations of the program prevent the training and equipment from reaching the more rural areas of the country (personal communication, Kaite, 2000).

Among children who were weighed at birth, the median reported birth weight was 3.1 kg, which is slightly below the NCHS median of 3.3 kg (WHO, 1979). Eleven percent of infants weighed less than 2.5 kg at birth and were classified as having low birth weight. The incidence of LBW is not significantly different between rural and urban areas. As seen in Table 2.1, LBW varies by region but very little in comparison to regional rates in other countries. Low rates of LBW are found in the North-Western and Southern regions (8 percent and 9 percent, respectively), and as high as 13 percent are found in the Western Region.

The above LBW estimates should be interpreted with caution since they are only based on the 43 percent of infants who were reportedly weighed at birth. Only in the Copperbelt, Lusaka, and North-Western regions were about 60 percent of children weighed at birth. The LBW estimates presented in this report are in all likelihood underestimates of the true magnitude of LBW in Zambia. In addition to the questionable degree to which LBW estimates represent all births, it is important to note that 60 percent of the data are recorded from maternal recall of birth weight. The average birth weight recorded on health cards does not significantly vary from the average taken from maternal recall. In urban areas, there are more opportunities to identify LBW babies than in areas where the majority of infants are born outside of health facilities and are not weighed at birth. It should also be noted that poor and uneducated women, who may be at greatest risk of delivering an LBW infant, are usually the least likely to deliver in a health facility. The likelihood that their infants are weighed at birth is therefore low.

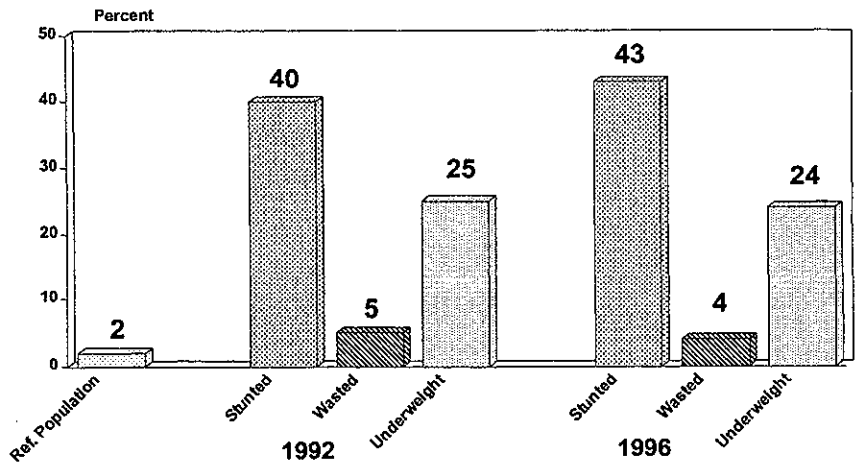
In some contexts, when information on birth weight is unavailable, the mother's perception of the infant's size at birth may serve as a proxy. Although maternal perception of the baby's size is a very subjective measure, it can be informative when exploring factors related to malnutrition, since the mother's perception of her newborn's size may influence her feeding and child-rearing behaviors. In Zambia, approximately 10 percent of all children were perceived by their mothers as "small" at birth, with an additional 3 percent of children perceived as "very small." Regional differences are apparent, with the highest percentage of children perceived to be small or very small occurring in the Central region. This region is only one of six regions with LBW higher than 11 percent. The result of mother's perceptions of birth size could be the outcome of expanding health care projects raising awareness about child care in the region. There is a small but statistically significant difference between rural and urban areas, with more urban children considered to be small at birth than rural children. There are no significant differences in perception of infant's size at birth by socioeconomic status (Table 2.1).

Due to limitations of the data, it is not possible to disaggregate LBW into preterm and intrauterine growth-retarded (IUGR) births. Each of these conditions has different causal factors, and information on them would assist program planners and policymakers in establishing programs that target high-risk populations in Zambia. In developing countries, the vast majority of LBW births are IUGR infants (Kramer, 1987; Villar and Belizan, 1982). Poor maternal nutritional status is the root cause of IUGR. Little information is known about the causes of preterm birth (PTB), although it appears to be highly linked to women with a history of adverse pregnancy outcomes (i.e., prior PTB or spontaneous abortions) and/or negative health behaviors such as smoking. Although it is likely that IUGR is more prevalent than PTB in Zambia, it is not possible to substantiate this claim without the necessary data. In addition to nutritional factors, sexually transmitted diseases (STDs) may lead to adverse pregnancy outcomes such as LBW and are prevalent among Zambian women of reproductive age. STDs are considered among the possible areas of intervention to improve both maternal and fetal/infant outcomes. The well-established Safe Motherhood and Reproductive Health Programs address prevention and treatment of STDs. Separate programs deal exclusively with HIV/AIDS. These clinic-based programs are more prevalent in urban areas.

2.4 Overall Prevalence of Malnutrition

Childhood malnutrition is a severe problem in Zambia. Forty-three percent of children under 5 years of age are stunted as shown in Figure 2.2. This estimate is 18 times the expected level in a healthy, well-nourished population. The prevalence of wasting (4 percent) is very low, indicating that acute malnutrition is not a significant problem. Almost one-quarter of all children are underweight—10 times higher than what is expected in a healthy population.

Figure 2.2 Malnutrition among Children under 5 Years, Zambia, 1992 and 1996



Note: *Stunted* reflects chronic malnutrition; *wasted* reflects acute malnutrition; *underweight* reflects chronic or acute malnutrition, or a combination of both.

Source: ZDHS 1996

In a healthy, well-nourished population, only 0.13 percent of children are expected to be severely malnourished. Severe stunting affects 18 percent of Zambian children and accounts for 41 percent of all stunting (Table 2.2). This high prevalence of severe stunting indicates chronic malnutrition affects a substantial portion of Zambian children. Stunting is a consequence of infection, inadequate food intake, quality of care, and/or seasonal issues (Hautvast et al., 1999). High levels of severe stunting may also reflect high morbidity, in particular, recurring diarrheal disease (Molbak et al., 1997).

2.5 Trends of Malnutrition

Since the season in which anthropometric data are collected can potentially affect the proportion of children classified as malnourished, temporal comparisons of the nutritional status of infants and children must be done with caution. Indicators such as wasting reflect recent changes in nutritional and health status and are particularly vulnerable to this limitation. In contrast, stunting reflects chronic malnutrition and/or morbidity and thus is more resistant to seasonality. The conditions of malnutrition of the 1996 ZDHS compared with the 1992 ZDHS show very little change over the four-year period. The prevalence of stunting increased slightly from 40 percent in 1992 to 42 percent in 1996. The percentage of children underweight declined slightly from 25 percent in 1992 to 24 percent in 1996. These slight changes most likely do not reflect any definite shift in malnutrition rates. As weight can fluctuate, wasting reflects the changes that can occur to a child during seasonal patterns of illness or food scarcity. Due to the sensitive nature of wasting, all trend analysis on acute malnutrition should be done with care. Nevertheless, conditions of wasting measured by the two surveys show no actual change.

Table 2.2 Stunting, wasting, and underweight

Among children under five years of age, the percentage who are moderately and severely stunted, wasted and underweight, by selected background characteristics, Zambia 1996

	Stunting			Wasting			Underweight			
	Mod-erate[1]	Severe[2]	Total	Mod-erate[1]	Severe[2]	Total	Mod-erate[1]	Severe[2]	Total	Number of children
Region										
Central	25.4	12.6	38.1	4.8	1.3	6.1	15.1	4.8	19.9	458
Copperbelt	22.1	9.3	31.4	3.7	0.6	4.3	14.4	2.8	17.2	1,051
Eastern	25.3	22.7	48.1	2.3	0.4	2.7	20.4	5.6	26.0	866
Luapula	27.3	30.5	57.7	5.2	1.3	6.5	25.1	7.6	32.7	498
Lusaka	21.6	8.6	30.2	2.7	0.3	3.0	12.6	2.9	15.5	786
Northern	27.7	29.6	57.3	4.0	0.8	4.8	21.0	10.4	31.5	671
North-Western	28.1	19.3	47.4	1.6	0.7	2.3	22.3	4.8	27.1	224
Southern	25.9	13.6	39.5	3.3	0.2	3.5	16.6	4.5	21.1	564
Western	25.5	19.5	44.9	4.7	0.6	5.3	25.2	6.8	32.1	326
		p<0.001			*p<0.05*			*p<0.001*		
Residence										
Urban	22.6	10.1	32.7	2.7	0.5	3.1	13.8	2.7	16.5	2,159
Rural	26.3	22.4	48.7	4.1	0.8	4.8	21.0	7.0	28.0	3,284
		p<0.001			*p<0.01*			*p<0.001*		
Socioeconomic status										
Low	26.1	26.3	52.3	4.2	0.9	5.1	23.2	8.5	31.7	1,468
Medium	26.2	17.7	43.9	3.5	0.6	4.1	18.3	4.9	23.2	2,821
High	19.7	6.1	25.8	2.6	0.4	3.1	11.4	2.3	13.7	1,154
		p<0.001			*ns*			*p<0.001*		
Sex of child										
Male	25.0	18.1	43.1	4.0	1.0	5.0	18.4	6.1	24.5	2,665
Female	24.7	17.0	41.7	3.0	0.3	3.3	17.9	4.6	22.5	2,778
		ns			*p<0.001*			*p<0.05*		
Total	24.8	17.5	42.4	3.5	0.6	4.2	18.1	5.3	23.5	5,443

Note: Level of significance determined using Chi-square test
ns = Not significant
[1]Between -2 and -3 standard deviations from the median of the NCHS/WHO/CDC reference population
[2]Below -3 standard deviations from the median of the NCHS/WHO/CDC reference population

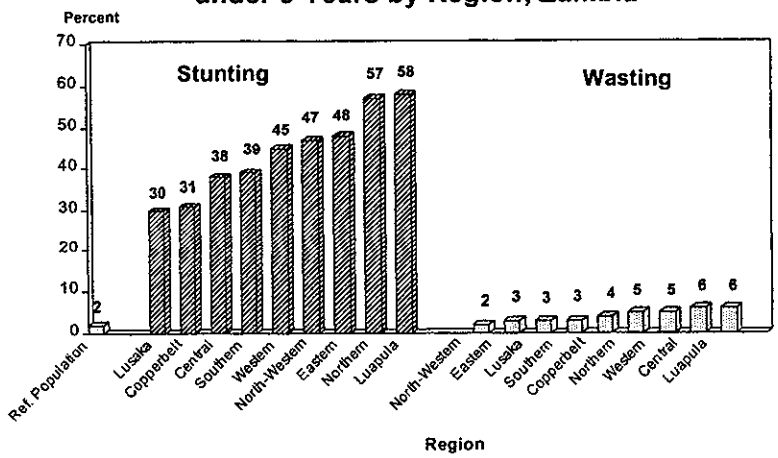
Other surveys measuring anthropometry in Zambia include the Social Dimension of Adjustment Priority Surveys I and II of 1991 and 1993. According to these surveys, chronic malnutrition among children under 5 years of age indicated by stunting has increased from 41 percent to 48.4 percent in Zambia. Acute malnutrition ranged from 23 to 25 percent, and general underweight status ranged from 6 to 7 percent (Kumar et al., 1995). These prevalences closely correspond to the rates of malnutrition reported in the ZDHS surveys of 1992 and 1996.

2.6 Geographic Variations in Malnutrition

As seen in Table 2.2, more rural than urban children are stunted (49 versus 33 percent). The prevalence of wasting is also higher among rural than among urban children (5 versus 3 percent). Rural families in Zambia rely primarily on subsistence farming to meet their basic dietary needs. Among rural children, chronic problems with food availability and access (due to droughts or poor harvests) may manifest themselves as childhood stunting. In contrast, urban families rely more often on food purchases to meet their basic dietary needs. The high prevalence of childhood stunting among urban children indicates that adequate nutrition and health care is a problem both rural and urban areas (Figure 2.4).

Regional variations in stunting are strong, with the highest prevalences of stunting evident in the north of the country in the Luapula and North-Western regions (58 percent and 57 percent, respectively) (Figure 2.3). The regions where the majority of the population is urban have the lowest prevalences of stunting. These regions are Lusaka and Copperbelt, and the rate of stunting is 30 percent and 31 percent, respectively. These prevalence rates closely match the urban average noted above. The regional differences are not explained by the variation in maternal education. Those regions with the highest percentage of uneducated mothers do not have the highest prevalences of malnutrition. Socioeconomic status appears more associated with conditions of child malnutrition (Figure 2.5). Stunting is highest in provinces that are remote, where the communities are poor and access to health care is limited. Regional variations in wasting are statistically significant, but not particularly important.

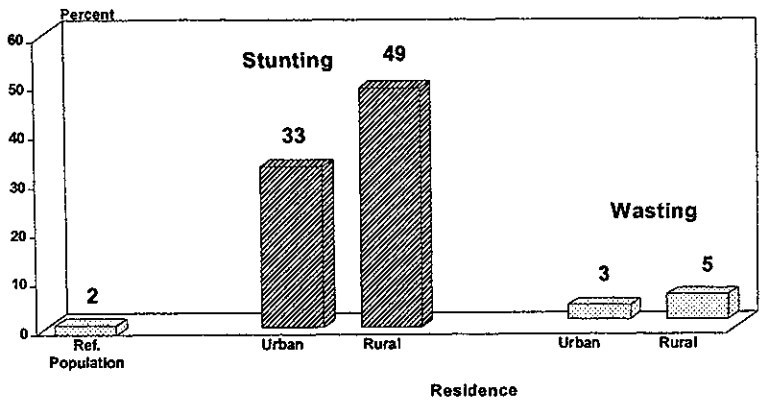
Figure 2.3 Stunting and Wasting among Children under 5 Years by Region, Zambia



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition.

Source: ZDHS 1996

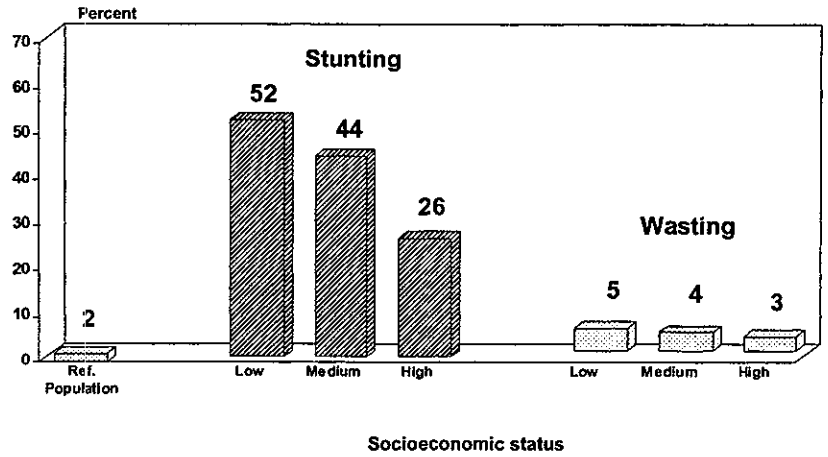
Figure 2.4 Stunting and Wasting among Children under 5 Years by Urban-Rural Residence, Zambia



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition.

Source: ZDHS 1996

Figure 2.5 Stunting and Wasting among Children under 5 Years by Socioeconomic Status, Zambia



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition.

Source: ZDHS 1996

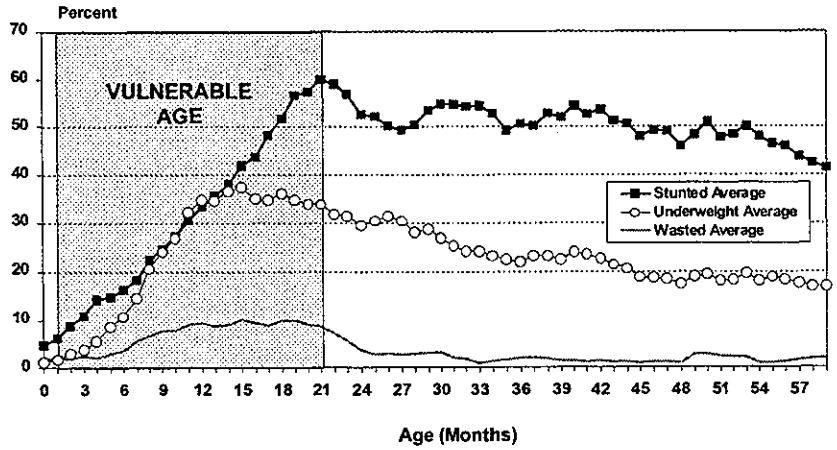
2.7 Malnutrition according to Age

There is a distinct age pattern of malnutrition in Zambia (Figure 2.6). The upward trend in the prevalence of stunting begins immediately after birth. The trend peaks at 60 percent at the age of 21 months. This growth retardation caused by stunting registers permanently in individuals. For this reason, the prevalence of stunting does not decline in the same manner as wasting and underweight. The prevalence of stunting remains around 50 percent until the middle of the fourth year. It declines to 40 percent by the end of the fifth year.

The trend of children underweight begins later than stunting. Around the fourth month of life, the prevalence of children underweight begins to increase. The percentage of children underweight peaks at 38 percent at 15 months. After that point, it declines steadily until the end of the third year. During the fourth and fifth years, the percentage of children underweight remains about 20 percent.

Age variations in wasting prevalence are not remarkable compared to stunting and underweight, though an age pattern still exists (Figure 2.6). Wasting prevalence peaks between 12 and 19 months at a prevalence of 10 percent. After the end of the second year of life the prevalence drops to around 3 percent. This rate is just slightly above conditions in developed countries. It should be noted that during the early stages of infancy, the age pattern of wasting appears to follow the age patterns in infant feeding. With the introduction of complementary liquids and foods, wasting increases. This observation suggests that the dietary needs of Zambian infants who are being weaned from breast milk are not fully satisfied, thus highlighting a need to educate mothers on the role of proper weaning practices.

Figure 2.6 Stunting, Wasting, and Underweight by Age, Zambia



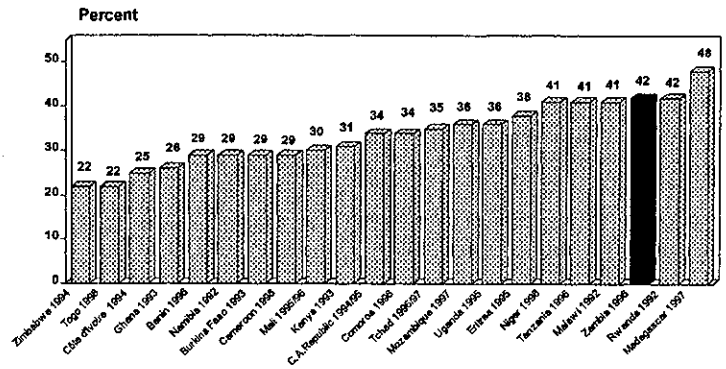
Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition; *underweight* reflects chronic or acute malnutrition, or a combination of both. Plotted values are smoothed by a five month moving average.

Source: ZDHS 1996

2.8 Comparison with Other Sub-Saharan Countries

A comparison of statistics on stunting from DHS surveys in 22 sub-Saharan countries reveals that Zambia has the third highest level of chronic malnutrition (Figure 2.7). Zambia's rate of stunting is similar to the neighboring countries of Malawi and Tanzania (both 41 percent) but is higher than other neighbors: Mozambique (36 percent), Zimbabwe (22 percent), and Namibia (29 percent). The percentage of children underweight in Zambia (26 percent) is in the lower half of the range of sub-Saharan countries (Figure 2.8). The prevalence of children underweight in Zambia is similar to rates in neighboring Namibia, Mozambique, Malawi, and Tanzania. Only the neighboring country to the south, Zimbabwe, has a significantly lower percentage of children underweight.

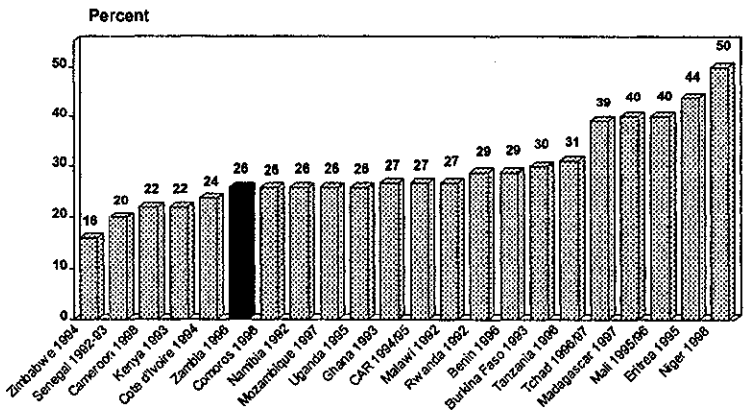
Figure 2.7
Stunting among Children under 3 Years in Sub-Saharan Countries, DHS Surveys 1992-1998



Note: *Stunting* reflects chronic malnutrition

Source: DHS Surveys 1992-1998

Figure 2.8
Underweight among Children under 3 Years in Sub-Saharan Countries, DHS Surveys 1992-1998



Note: *Underweight* reflects chronic or acute malnutrition or a combination of both.

Source: DHS Surveys 1992-1998

2.9 Summary

Malnutrition is a public-health concern for infants and young children in Zambia: at least two of every five Zambian children are too small for their age. The overall lower prevalence of wasting (4 percent) compared with stunting (42%) indicates that malnutrition reflects widespread chronic conditions that are probably rooted in food insecurity, lack of access to health care and economic stagnation in this developing country (Riley et al., 1996). The Northern and Luapula regions, which have the highest prevalences of stunting and wasting, stand out as areas in strongest need of health and development interventions.

According to the 1996 ZDHS, the LBW incidence in Zambia is 11 percent, although this estimate is based on a minority of births for which birth weight information was available. Although the estimate presented in this report may understate the true LBW incidence in Zambia, this high rate still suggests that in addition to addressing health needs of infants and children, it is also necessary to address women's nutritional and health needs, especially before pregnancy and childbirth.

2.10 Recommendations

General recommendations to improve the birth weight and nutritional status of infants and young children are as follows:

Monitoring Growth and Nutrition Status

- Increase the practice of weighing infants at birth in order to identify 'at-risk' infants in a timely manner, especially in rural areas.

- Given the low percentage of facility-based births, intensify training traditional birth attendants and other community health workers in growth monitoring and nutrition surveillance. Establish birth weight assessment as a normative practice among birth attendants in the community.

- Address logistical constraints in weighing children in areas with poor infrastructure, namely rural areas.

Influencing Low Birth Weights through Improved Health Status of Women of Reproductive Age

- Address iron/folic acid deficiency, malaria, and other infectious diseases in women. These conditions have been documented to cause anemia (which is linked to low birth weight) in women of reproductive age.

- Establish mechanisms for the prevention and timely detection and treatment of sexually transmitted diseases. Given the high prevalence of STDs in Zambia, efforts aimed at their reduction may have a positive impact on reducing adverse pregnancy outcomes that are STD-related (e.g., low birth weight).

Improving Health Infrastructure

- Continue expansion of the rural health care infrastructure, with emphasis on the establishment of integrated "well-child" services (e.g., nutrition and immunization services) and integrated management of childhood illness.

Economic Access to Available Food

- Improve rural infrastructure (e.g., roads, water supply, health facilities, and schools) through labor-intensive employment programs targeting food-insecure and displaced individuals.

- In urban areas where households buy and trade food rather than rely on subsistence farming, provide means of income generation through skills training or business development through micro-credit loans.

Reducing Stunting and Wasting

- In an effort to reduce stunting among rural children, establish extension activities of appropriate technology to diversify productive activities and improve output on small family farms. Poor agricultural production is one of the root causes of food insecurity in rural remote areas.

Research: Conduct both Quantitative and Qualitative Studies to Measure Certain Phenomena and Health Outcomes and to Explain Why Those Phenomena Exist

- Support research that aims to ascertain which underlying condition—preterm birth or intrauterine growth retardation—is responsible for LBW in Zambia, and plan interventions accordingly.

- Through qualitative research, explore the influence of the mother's perception of her newborn's size on caretaking and feeding practices.

CHAPTER 3

INFANT AND CHILD FEEDING PRACTICES

Infant and child feeding practices are major determinants of the risks of malnutrition, morbidity, and mortality in the developing world. In light of their importance, the World Health Organization (WHO) and UNICEF (WHO, 1994; WHO and UNICEF, 1990) have devised international standards of infant and child feeding. This chapter describes infant and child feeding practices in Zambia and compares them with the optimal infant feeding practices prescribed by WHO and UNICEF.

3.1 Optimal Infant and Child Feeding Practices

WHO and UNICEF (WHO and UNICEF, 1990; WHO, 1994) define optimal infant and child feeding as follows:

- Initiation of breastfeeding within one hour of birth
- On-demand and frequent feeding (including night feeds)
- Exclusive breastfeeding (defined as breast milk only and no other foods or liquids) until the infant is about 6 months of age
- Breastfeeding complemented with appropriate local foods at about 6 months of age
- Increased breastfeeding during illness and recovery
- Continued breastfeeding well into the second year of life and beyond.

As seen in the above guidelines, breastfeeding is both necessary and sufficient for infant nutrition during the first 6 months of life. A delay in breastfeeding results in the premature introduction of other liquids and foods, which may introduce infection and impede the mother's delivery of breast milk to the infant (Perez-Escamilla et al., 1996). Breastfeeding within the first hour of life takes advantage of the newborn's innate sucking reflex, which helps to stimulate breast milk production and provides the newborn with the nutritional, anti-bacterial, and anti-viral properties of colostrum (Righard and Alade, 1990). In addition, early contact between the mother and newborn fosters mother-infant bonding and helps to maintain the infant's body temperature—an important factor in newborn survival (Daga et al., 1993). Early breastfeeding also causes the uterus to retract, which can reduce postpartum blood loss in the mother.

In addition to timing of breastfeeding initiation, frequency of feeding is also important. Frequent, on-demand breastfeeding, which includes night-feeds, ensures that the infant receives sufficient quantities of breast milk to meet his or her dietary needs and also helps to maintain a constant supply of breast milk. Frequent feeding is also essential in maintaining the infant's weight and may help prevent the problem of breast engorgement in the mother (de Carvalho et al., 1983). Ideally, infants should be breastfed 8 to 10 times every 24 hours. During the first month of life, however, feeding may be even more frequent.

Of all the feeding behaviors, exclusive breastfeeding is most predictive of infant survival. Exclusive breastfeeding involves the provision of breast milk as the sole source of nourishment and is sufficient in meeting the infant's nutritional requirements during the first 6 months of life (Cohen et al., 1994). In hot and humid climates, breast milk satisfies the infant's fluid needs and prevents dehydration (Sachdev et al., 1991). Exclusive breastfeeding also reduces the risk of illness during infancy (Huffman and Combest, 1990). For example, exclusively breastfed infants are 14 times less likely to die from diarrhea, compared with formula-fed infants, and 4 times less likely to die, compared with partially breastfed infants (Victora et al., 1987).

PREVIOUS PAGE BLANK

Both WHO and UNICEF (1990) state that children can benefit from the many nutritional and immunological benefits of breastfeeding through the second year of life. Nevertheless, at about 6 months of age, breast milk alone no longer satisfies the energy and protein requirements of most infants. In response to these new nutritional demands, complementary foods—soft foods that are easy to eat and rich in energy, protein, and micronutrients—should be given to the infant in addition to breast milk. During the transition period when complementary foods are being introduced, the mother should continue with on-demand and frequent breastfeeding to ensure that the infant continues to reap the benefits of breast milk.

In the developing world, diarrheal disease is often associated with the introduction of complementary foods and liquids. As a preventive measure against illness, it is important that proper hygiene is maintained during food preparation and storage. In the event of an illness, increased breastfeeding is highly important since it a) reduces the risk of inadequate nutrient intake during illness, b) prevents dehydration, and c) promotes catch-up growth. Dietary intake of all foods, except breast milk, is reduced during illness (Hoyle et al., 1980; Brown et al., 1990; Dickin et al., 1990). Thus, breastfeeding, by providing a continual source of high-quality and hygienic food, plays a critical role in the maintenance of infant and child nutritional status in and around periods of illness.

3.2 Initiation of Breastfeeding

In Zambia, 98 percent of infants are breastfed (Table 3.1). Although initiation of breastfeeding is slow for slightly less than half of all infants, (58 percent being breastfed within the first hour of life), by the end of the first day, more than 91 percent of Zambian infants have begun to breastfeed.

There are no rural-urban differences in overall breastfeeding prevalence, although significant differences exist with respect to breastfeeding initiation. A larger percentage of rural infants than urban infants are breastfed within the first hour of life (61 percent versus 54 percent, respectively). By the first day of life, however, the prevalence increases in both areas and the rural-urban differences disappear (91 percent). Regional variations in the timing of breastfeeding initiation within the first hour are large, ranging from 41 percent in the province of Luapula to 87 percent in Eastern province. These differentials are reduced greatly by the end of the first day of life. The percentage of infants breastfed within the first day is lowest in the Western province (78 percent), compared with 88 percent or higher in all other provinces.

Breastfeeding promotion programs under the Baby-Friendly Hospital Initiative began in 1992. These programs can explain some of the regional differences that are seen in breastfeeding initiation. Implementation began in the populous urban areas of the country. However, the initiative was not able to cover all provinces. Training was halted in 1996 due to fears of maternal transmission of HIV/AIDS through breastfeeding. In 1999, the breastfeeding promotion program resumed training. For the 80 percent of the population of mothers who are not infected with the HIV/AIDS virus, the program emphasizes breastfeeding promotion and HIV prevention. For the estimated 20 percent of the population of mothers with HIV/AIDS, the program emphasizes education, individual choice concerning breastfeeding, and methods to reduce the risk of maternal transmission of HIV/AIDS.

Table 3.1 Initial breastfeeding

Percentage of children under three years who were ever breastfed, and the percentage who started breastfeeding within one hour of birth, or within 24 hours of birth, by background characteristics, Zambia 1996

Background characteristic	Ever breastfed	Started breastfeeding: Within 1 hour	Started breastfeeding: Within 1 day	Number of children
Region				
Central	98.8	46.7	88.4	587
Copperbelt	98.2	48.9	91.3	1,347
Eastern	97.1	87.3	95.7	1,103
Luapula	99.6	40.9	97.6	671
Lusaka	97.7	60.4	91.2	1,076
Northern	98.7	46.8	86.0	863
North-Western	98.7	82.0	98.2	287
Southern	98.5	62.5	94.2	764
Western	97.3	50.1	78.1	460
	p<0.01	*p<0.001*	*p<0.001*	
Residence				
Urban	98.1	53.5	90.7	2,858
Rural	98.2	61.2	91.9	4,301
	ns	*p<0.001*	*ns*	
Gender				
Male	98.2	57.3	90.6	3,542
Female	98.1	59.0	92.2	3,617
	ns	*ns*	p<0.05	
Mother's age				
15-19	96.2	57.3	87.5	556
20-24	97.9	58.1	90.9	2,250
25-29	98.8	58.5	91.9	1,750
30-34	98.9	58.2	93.2	1,354
35-49	97.9	58.0	91.5	1,250
	p<0.001	*ns*	*p<0.01*	
Mother's education				
No education	97.2	67.4	93.2	982
Primary	98.4	57.7	91.4	4,604
Secondary +	98.3	53.7	90.5	1,572
	p<0.05	*p<0.001*	*ns*	
Socioeconomic status				
Low	98.2	56.6	90.2	1,989
Medium	98.2	59.7	92.4	3,699
High	98.2	56.3	90.7	1,471
	ns	*p<0.05*	*p<0.05*	
Delivery assistance				
Doctor	94.6	39.4	74.8	259
Nurse/Midwife	98.9	60.5	93.2	3,036
TBA	98.5	57.1	92.5	386
Other/None	97.8	57.8	91.2	3,416
	p<0.001	*p<0.001*	*p<0.001*	
Total	98.2	58.1	91.4	7,159

Note: Level of significance determined using Chi-square test
ns=Not significant

Urban-rural differences in breastfeeding initiation may be partially explained by differences in birth weights and care-seeking patterns for delivery services in a small portion of the population. Urban mothers are more inclined to seek facility-based care, whereas rural mothers tend to deliver at home with the assistance of a traditional birth attendant (TBA), auxiliary midwife, or relative. Children born in health facilities with low birth weights are less likely to be put to the breast immediately. Mothers in the most urban areas of the country have had more opportunities to receive the pro-breast-milk message from hospitals and clinics than rural mothers. However, the impact of these programs is not evident in this data. As seen in Table 3.1, there are significant differences in overall breastfeeding prevalence and breastfeeding initiation according to the type of delivery assistance. Infants delivered by doctors are least likely to be breastfed (75 percent), and even when breastfeeding is initiated, only 39 percent of physician-delivered infants are breastfed within the first hour of life. In contrast, infants delivered by nurses, midwives, or relatives/no one are most likely to be breastfed (91 to 93 percent). The lower percentage of doctor-assisted births that are breastfed is possibly because doctors usually care for the most difficult cases of childbirth. There is no difference between breastfeeding initiation within the first hour of life for those births assisted by nurses, midwives, relatives or other/no one. These findings show that initiation is slower than recommended, but in general, Zambian mothers value breastfeeding, regardless of whether they deliver in facilities or in the community. However, the difference between breastfeeding initiation by doctor-assisted births compared with other births highlights the need for increased targeting of breastfeeding promotion campaigns to doctors and the women who seek their services. The Baby-Friendly Hospital Initiative began in 1992 as a national campaign to address these issues. As a result of the work of this initiative, several hospitals and 47 health clinics were declared baby friendly by 1997.

Maternal background characteristics such as age, education, and socioeconomic status are significantly related to the timing of breastfeeding initiation but do not demonstrate any serious differences (Table 3.1). There is evidence of a gender differential in breastfeeding initiation that is statistically significant but not important. Other infant characteristics such as perceived size at birth appear to influence feeding patterns. The perception of infant's size may reflect low birth weight and premature births. LBW and premature birth affects the infant's ability to suckle the mother's breast. This, in turn, may influence the timing of initiation and the amount and frequency of feeds. When differences in breastfeeding initiation were explored by perceived infant size, it was discovered that a lower percentage of "small/very small" infants were breastfed within the first hour of life (51 percent) compared with "average- or large-sized" infants (59 percent, respectively).

3.3 Exclusive Breastfeeding

Despite the high breastfeeding prevalence in Zambia, the vast majority of infants under 6 months of age are not fed in compliance with WHO/UNICEF recommendations. Only 19 percent of all infants 0-5 months of age are exclusively breastfed (Table 3.2). Slightly more than one-third of all neonates (infants less than 1 month) were exclusively breastfed during the 24-hour reference period. The practice of exclusive breastfeeding declines throughout early infancy. Compared with the exclusive breastfeeding rate in neonates (37 percent), the rate of exclusive breastfeeding in children decreases by one-third by the second month (25 percent) and decreases by more than three-quarters by the fourth month (7 percent). The lack of exclusive breastfeeding is likely to be a factor in infant morbidity and malnutrition.

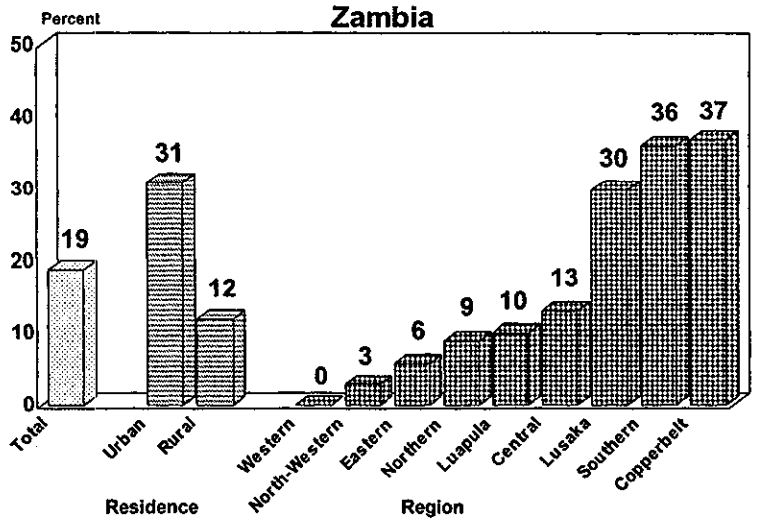
There are significant urban-rural differences in exclusive breastfeeding in Zambia. Urban infants under 5 months of age are more than twice as likely to be exclusively breastfed (31 percent) than rural children (12 percent). Significant variation also exists by region (Figure 3.1). Exclusive breastfeeding is least practiced in the Western and North-Western provinces where it is between 0 and 3 percent, respectively, of living children under 6 months. The BFHI program has not been implemented in these two remote provinces. The extreme low levels of exclusive breastfeeding reflect this fact. The Lusaka, Southern, and Copperbelt provinces have the highest rates of exclusive breastfeeding (from 30 to 37 percent). It is possible that the higher rates of exclusive breastfeeding are due to the breastfeeding promotion programs accompanied by mother's breastfeeding support groups in these urban areas.

Table 3.2 Breastfeeding by age in living children in preceding 24 hours

Percentage distribution of living children under three years who were exclusively breastfed, not exclusively breastfed, or not breastfed, according to child's age in months, Zambia 1996

Age (in months)	Exclusively breastfed	Not exclusively breastfed	Not breastfed	Total	Number of children
Breastfeeding age					
<1 month	37.3	61.0	1.6	100.0	58
1 month	33.3	66.7	-	100.0	133
2 months	24.4	75.6	-	100.0	131
3 months	16.0	84.0	-	100.0	127
4 months	7.3	91.3	1.4	100.0	116
5 months	2.9	97.1	-	100.0	107
All ages					
0-5 months	19.3	80.3	0.4	100.0	671
6-9 months	0.7	98.2	1.1	100.0	396
10-11 months	-	96.3	3.7	100.0	250
12-15 months	0.2	95.5	4.3	100.0	495
16-19 months	-	82.9	17.1	100.0	406
20-23 months	0.3	43.1	56.6	100.0	443
24+ months	-	2.9	97.0	100.0	3,437
Total				100.0	6,098

Figure 3.1 Exclusive Breastfeeding among Living Infants under 6 Months by Residence and Region, Zambia



Note: Full Breastfeeding includes children exclusively breastfed and those who received water as well as breast milk.

Source: ZDHS 1996

In Zambia, slightly more than one-half of infants less than 6 months of age are fully breastfed; that is, they receive breast milk only or breast milk and water (Table 3.3). The remaining infants receive breast milk and solid foods (23 percent), breast milk and cereals (17 percent), breast milk and other liquids (7 percent), or are already weaned (0.4 percent). Although full breastfeeding is not an optimal feeding behavior, its prevalence in Zambia indicates that breast milk remains a major component of the infant's diet during the critical early months of life. Nevertheless, the provision of water, in addition to other liquids or foods, increases the risk of illness in most poor countries, particularly where water and sanitation are substandard (Haggerty et al., 1994a; Clemens and Stanton, 1987; Esrey et al., 1985). Although the vast majority of mothers initiate breastfeeding in Zambia, some mothers may be misinformed about the sufficiency of breast milk during early infanthood and consequently place their infants at risk by introducing foods that are inadequate, inappropriate, and possibly contaminated.

Survey questions on the nature and extent of bottle-feeding were included in the 1996 ZDHS. Bottle-feeding is rare in Zambia with only 4 percent of children under 6 months of age being fed with a bottle (Table 3.3). In Zambia, it is illegal to advertise breast milk substitutes. There is no domestic production of breast milk alternatives, and artificial baby formulas are not promoted in hospitals. This was legislated in the Code of Marketing of Breast Milk Substitutes in 1982 and updated in 1994.

Table 3.3 Types of foods received by living children in preceding 24 hours and feeding by bottle.

Percentage distribution of living children under five years who received specific types of food and percentage of children fed by bottle, according to child's age and age groups in months, Zambia 1996

Age (in months)	Full breast-feeding[1]	Breast milk plus other liquids	Breast milk plus cereals[2]	Breast milk plus other solid foods	Not breastfed	Total	Number of children	Bottle use
Breastfeeding age								
<1 month	93.5	4.9	-	-	1.6	100.0	58	3.8
1 month	86.9	6.9	2.7	3.6	-	100.0	133	3.0
2 months	66.8	6.8	12.8	13.5	-	100.0	131	2.3
3 months	40.9	9.2	16.9	33.0	-	100.0	127	6.7
4 months	28.8	9.7	34.6	25.5	1.4	100.0	116	2.1
5 months	14.0	1.7	27.1	57.2	-	100.0	107	5.6
All ages								
0-5 months	53.2	6.8	16.5	23.1	0.4	100.0	671	3.9
6-9 months	3.5	1.7	13.3	80.3	1.1	100.0	396	4.6
10-11 months	1.8	0.5	6.0	87.9	3.7	100.0	250	3.1
12-15 months	1.0	0.7	5.7	88.2	4.3	100.0	495	3.3
16-19 months	1.1	-	5.0	76.8	17.1	100.0	406	3.7
20-23 months	0.3	-	1.9	41.1	56.6	100.0	443	2.1
24+ months	0.1	-	0.2	2.7	97.0	100.0	3,437	1.7
All children	6.4	1.0	4.0	28.1	60.6	100.0	6,098	2.5

Note: Includes all living children
[1]Full breastfeeding and exclusive breastfeeding.
[2]Cereals include any solid or mushy food made from grain such as maize, rice, wheat, or soybeans.

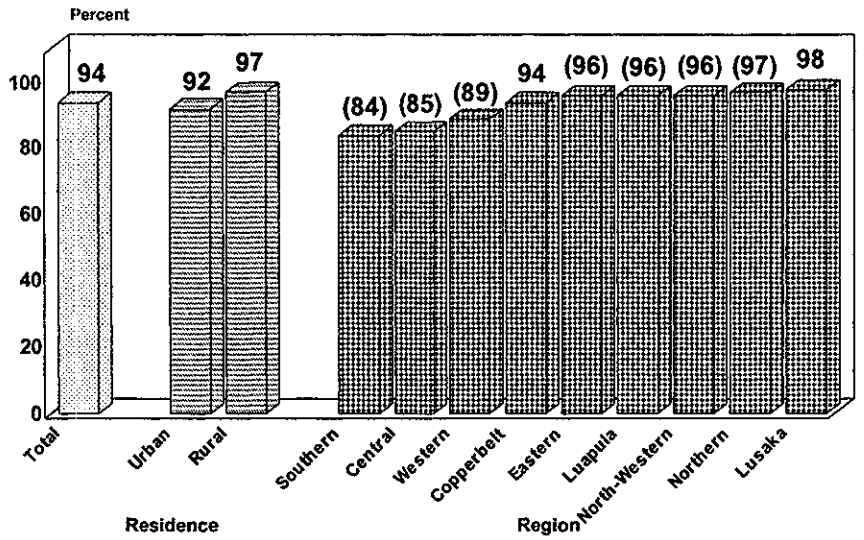
3.4 Introduction of Solid Foods

UNICEF recommends the introduction of solid foods at about age 6 months. Ninety-four percent of Zambian infants between 6 and 9 months of age are fed in compliance with this international standard (Figure 3.2). The remaining 6 percent do not receive the appropriate combination of solids and breast milk to meet their nutritional requirements. Four percent of all 6- to 9-month-old infants receive only water in addition to breast milk, 2 percent receive breast milk and other liquids (e.g., milks, juice, sugared water, herbal tea), and 1 percent are completely weaned from breast milk. Based on Figure 3.2, it is

apparent that most infants receive complementary foods by the recommended age. There is still a need, however, to educate some mothers on 1) the appropriate time when such foods should be introduced to the infant and 2) the types of foods that are most appropriate.

Figure 3.2 indicates significant rural-urban and regional differences in the introduction of solid foods to infants 6 to 9 months of age. Ninety-two percent of urban infants receive solid foods at the appropriate age, compared with 97 percent of rural infants. The Southern and Central provinces report the lowest percentage of infants receiving solid foods (84 and 85 percent, respectively). It should be noted that these data for most regions are based on few cases (25-49), which may not accurately reflect practices in these regions. Timely introduction of solid foods is crucial for good nutrition, but due to few cases in the data, its importance is not evident.

Figure 3.2 Breastfeeding with Complementary Solid Foods among Infants from 6 to 9 Months by Residence and Region, Zambia



Note: Figures in parentheses are based on 25 and 49 children.

Source: ZDHS 1996

The types of complementary foods received during the 24 hours preceding the survey varied by the child's age and whether or not s/he was breastfeeding. As shown in Table 3.3, full breastfeeding (breast milk only or breast milk and water) is widely practiced in Zambia. Ninety-four percent of neonates and 53 percent of 0- to 5-month-olds were fully breastfed during the preceding 24 hours. Full breastfeeding prevalence generally declines with age; by age 6 to 9 months, it is only 4 percent, and it declines even further thereafter. In Zambia, complementary foods are incorporated into the diet early in life; 50 percent of 3-month-old infants received breast milk plus a varied diet (e.g., breastfeeding plus cereals [16.9%] and/or breastfeeding plus other solid or semisolid foods [33.0%]). By the sixth month of life, when complementary foods should be introduced, the majority of infants receive breast milk plus a varied diet, i.e., 94 percent of 6- to 9-month olds (breastfeeding plus cereals [13.3%] and/or breastfeeding plus other solid or semisolid foods [80.3%]). Breast milk remains a prominent part of the child's diet through the second year of life. Table 3.3 also indicates that slightly less than one-half of infants age 20-23 months received breast milk plus other foods. By the end of the second year of life, however, the vast majority of infants are fully weaned: 97 percent of infants age 24 months and older did not receive breast milk during the preceding 24 hours.

Table 3.4 presents the types of foods children ate in the 24 hours prior to the interview. The categories presented in the table are not exclusive, so the same child who consumed other milks could have also consumed semisolid foods. Giving other types of milk to children was not common in children less than 5 months. After 9 months, between 10 to 15 percent of children consumed other milks. At 6 months and later, the majority of children consumed cereals and semisolids. The widespread feeding of cereals and semisolid foods to children 6 months and older suggests that home-based infant foods are popular in Zambia. Formula use was rare in Zambia. Besides breast milk, the feeding patterns of non-breastfeeding children do not vary notably compared with breastfeeding children.

Table 3.4 Types of foods received by children in preceding 24 hours

Percentage of children under three years who received specific types of food by breastfeeding status and child's age in months, Zambia 1996

BREASTFEEDING CHILDREN								
Age (in months)	Breast milk only	Breast milk and water	Other[1] liquid	Other[2] milk	Cereals	Sem-solid foods	Meat, fish, poultry, or eggs	Formula
<1 month	37.9	62.1	5.0	3.7	0.0	0.0	0.0	0.0
1 month	34.2	63.4	6.9	3.3	3.6	3.6	0.6	3.5
2 months	25.0	69.1	8.3	0.9	14.1	13.5	0.6	1.6
3 months	17.7	75.6	13.6	5.0	28.1	32.0	4.5	3.0
4 months	11.9	79.4	24.8	6.4	46.8	24.4	5.6	8.4
5 months	5.4	93.3	21.4	10.9	61.2	49.6	23.2	4.3
0-5 months	21.2	74.2	13.6	4.9	26.6	21.5	5.7	3.7
6-9 months	1.3	96.5	43.0	11.5	79.9	67.5	47.5	3.9
10-11 months	0.7	99.3	54.0	16.3	83.6	75.7	65.2	2.3
12-15 months	0.2	98.4	60.0	16.9	83.0	79.0	62.9	1.4
16-19 months	0.0	100.0	59.4	15.1	82.8	83.1	69.5	0.9
20-23 months	0.7	98.2	54.1	15.2	82.1	83.9	58.2	0.0
24+ months	1.5	97.8	46.3	18.1	86.5	78.2	59.5	0.7
NONBREASTFEEDING CHILDREN								
Age (in months)	Breast milk only	Water	Other[1] liquid	Other[2] milk	Cereals	Semi-solid food	Meat, fish, poultry, or eggs	Formula
0-5 months	NA	74.4	13.0	4.7	27.0	18.5	5.5	3.9
6-9 months	NA	96.2	37.7	10.3	79.9	61.3	42.8	4.2
10-11 months	NA	99.3	46.1	14.7	83.1	69.7	59.4	2.3
12-15 months	NA	98.2	52.6	16.0	83.2	70.8	57.7	1.7
16-19 months	NA	98.4	51.6	13.7	82.5	71.1	60.1	1.0
20-23 months	NA	96.9	55.0	17.1	79.5	71.1	59.4	0.0
24+ months	NA	92.3	49.4	14.2	78.3	67.4	52.7	0.5
Total (12-35)	NA	92.1	45.7	13.3	73.7	62.5	49.0	1.3

[1] Other liquids include sugar water, juice, tea, and other liquids.
[2] Other milks include tinned or powdered milk, and fresh milk.
NA = Not applicable

3.5 Duration of Breastfeeding

Among children under the age of 3, the median duration of exclusive breastfeeding, that is, the time for which 50 percent of children receive breast milk only, is slightly more than half of 1 month (Table 3.5). Although gender differences are minimal, girls are exclusively breastfed slightly longer than boys (0.6 months versus 0.5 months). Duration of exclusive breastfeeding varies substantially by region, level of maternal education, and type of delivery assistance. Infants in the Copperbelt, Lusaka, and Southern provinces have the highest median duration of exclusive breastfeeding of about 1 month. In contrast, infants from the Eastern, North-Western, and Western provinces were exclusively breastfed for less than 2 weeks. Children whose mother was assisted at delivery by medical personnel were exclusively

breastfed for 0.9 months, whereas children whose mother was assisted by other types of birth attendants exclusively breastfed for one-half month. It should be noted however, that the longer duration of breastfeeding among medical personnel-assisted deliveries does not necessarily apply to all types of medical personnel. Nurses and not doctors were responsible for the majority of cases of medical-personnel-assisted deliveries. Children who were delivered by nurses and midwives have the longest period of exclusive breastfeeding.

Table 3.5 Median duration and frequency of breastfeeding: background characteristics

Median duration of any breastfeeding, exclusive breastfeeding and full breastfeeding among children under three years, and the percentage of children under six months of age who were breastfed six or more times in the 24 hours preceding the interview, by background characteristics, Zambia 1996

	Median duration in months[1]				Children under 6 months	
Background characteristic	Any breast-feeding	Exclusive breast-feeding	Full breast-feeding[2]	Number of children under 3 years of age	Breastfed 6+ times in preceding 24 hours	Number of children
Sex of child						
Male	19.9	0.5	2.4	2,199	94.4	356
Female	20.2	0.6	2.6	2,250	94.3	317
Residence						
Urban	19.1	0.9	2.5	1,719	93.1	262
Rural	20.7	0.5	2.5	2,730	95.1	411
Region						
Central	19.2	0.5	3.1	368	86.6	65
Copperbelt	19.0	1.0	2.7	815	91.2	114
Eastern	21.2	0.4	1.8	690	93.4	103
Luapula	19.6	0.5	2.2	416	97.5	63
Lusaka	18.1	1.2	2.6	657	96.0	100
Northern	21.9	0.5	2.4	553	96.6	75
North-Western	21.1	0.4	2.5	179	100.0	31
Southern	20.3	1.2	4.4	480	97.7	77
Western	24.2	0.4	2.9	293	93.7	45
Mother's education						
No education	21.3	0.4	1.8	622	95.7	82
Primary	20.1	0.6	2.8	2,856	94.5	439
Secondary or higher	19.3	1.1	2.4	971	93.0	150
Assistance at delivery						
Medical Professional	19.3	0.9	2.4	1,995	93.5	284
Trad. birth attendant	20.1	0.5	2.4	255	98.5	40
Other or none	20.7	0.5	2.7	2,191	94.5	348
Total	20.0	0.6	2.5	4,449	94.3	673
Mean	19.7	1.8	3.9	NA	NA	NA
Prevalence/Incidence[3]	19.1	1.1	3.1	NA	NA	NA

NA = Not applicable
[1] Medians and Means are based on current status
[2] Either Exclusive breastfeeding or breastfeeding and plain water only
[3] Prevalence/Incidence mean

Children who were born to a mother with at least a secondary school education breastfed exclusively for a longer period than children of less-educated mothers (more than one month versus about one-half month). Caution should be used with the interpretation of these data because the mothers who breastfed longer may be different from the general population of highly educated mothers.

Although breastfeeding practices during the first six months of life are less than optimal in Zambia, there is an extended period of full breastfeeding compared with exclusive breastfeeding. The median duration of full breastfeeding, that is, feeding the child only breast milk and water, is 2.5 months (Table 3.5). If access to clean, safe drinking water could be ensured for all Zambians, full breastfeeding would not be detrimental to infants. However, given low levels of access to potable water in the country, the use of water in addition to breast milk raises concern about the increased risks of diseases such as diarrhea and other waterborne illnesses.

Small gender differences were found for full breastfeeding, girls are breastfed slightly longer than boys (2.6 months versus 2.4 months). No variation was found between urban and rural children with full breastfeeding. Differences in the duration of full breastfeeding were also observed according to the mother's education (Table 3.5). Children whose mother had no education had the shortest duration of full breastfeeding (1.8 months), compared with those with primary education or higher (2.4 to 2.8 months). The differences between assistance at delivery and full breastfeeding were minimal. There are significant regional differences in the duration of full breastfeeding. Infants in the Central and Southern provinces were fully breastfed for the longest periods (3 and 4 and one-half months, respectively). In contrast, infants in the Eastern province were fully breastfed for less than two months.

The majority of Zambian children are breastfed well into the second year of life (Table 3.5). The overall duration of any breastfeeding is 20 months, which is consistent with optimal breastfeeding standards. The province of Lusaka has the lowest median duration of any breastfeeding at 18 months. This is 6 months less than the province with the longest median duration of breastfeeding (Western province has a duration of 24 months). Rural infants tend to breastfeed longer than urban infants (24 months versus 19 months). Likewise, infants of uneducated women are breastfed longer than infants whose mother has some education (21 months versus 19 months). It is possible that educated mothers are engaged in occupations that require them to be separated from their infants sooner and for longer periods of time than other working mothers. Although educated mothers exclusively and fully breastfeed longer than uneducated mothers, the data suggest that children of educated women are weaned slightly earlier than children of uneducated women. This is most likely due to working women in the urban area having to leave their children with other caretakers during working hours and losing the opportunity to breastfeed. Concern about the early cessation of breastfeeding has been recognized and the first baby-friendly workplaces have appeared in the capital city.

Although breastfeeding duration varies substantially by a number of background characteristics, there is little variation in terms of breastfeeding frequency. Overall, 95 percent of infants under 6 months of age were breastfed at least 6 times during the 24 hours preceding the survey. The Central province had the lowest percentage of infants who were breastfed 6 or more times during the preceding 24-hour period (87 percent). This rate does not appear to be critically different from other provinces where more than 90 percent of infants were breastfed 6 times or more during the preceding 24 hours.

3.6 Reasons for Weaning

Information on the reasons for weaning was obtained from mothers of all children less than 3 years old. The survey identified four major categories of reasons for weaning: 1) maternal factors (e.g., maternal illness, nipple/breast problems, insufficient milk, mother working), 2) child factors (illness/weakness, child's refusal of breast milk, death of child), 3) weaning age' and 4) pregnancy (Table 3.6). The most common reason for weaning was that the child was of weaning age (65 percent). As expected, the proportion of children weaned for this reason increased with child's age. It should be noted,

however, that the premature introduction of complementary foods in Zambia may affect the duration of breastfeeding. Twenty-one percent of all children were weaned because of illness or death, suggesting a need to educate mothers and other caregivers on the need to breastfeed during illness. Extra feeding is crucial for sick children in order to achieve catch-up growth and reduce the chance of stunting or wasting. Pregnancy was the next most important reason for weaning (11 percent), followed by maternal factors (3 percent) and other factors (less than 1 percent).

Table 3.6 Reason for weaning

Percent distribution of the reasons for weaning for children born in the three years preceding the survey, by selected background characteristics, Zambia 1996

	Reason for weaning						
	Maternal reasons[1]	Child ill/Died	Child weaning age	Became pregnant	Other	Total	Number of children
Weaning age							
0-5 months	2.9	95.0	1.3	0.8	-	100.0	407
6-11 months	8.0	64.5	9.1	15.7	2.7	100.0	339
12-17 months	4.7	20.0	48.5	25.5	1.3	100.0	925
18-23 months	1.4	6.7	83.0	8.2	0.7	100.0	1,944
24-35 months	0.8	2.0	94.5	2.8	-	100.0	871
			p<0.001				
Residence							
Urban	3.2	19.2	66.1	10.1	1.3	100.0	1,847
Rural	2.2	22.2	64.3	11.0	0.3	100.0	2,663
			p<0.001				
Region							
Central	4.2	21.8	61.4	11.3	1.3	100.0	393
Copperbelt	3.5	17.2	64.9	13.0	1.5	100.0	853
Eastern	1.7	18.2	67.6	12.3	0.1	100.0	675
Luapula	1.5	26.9	64.0	7.6	0.0	100.0	444
Lusaka	3.3	21.5	67.3	7.2	0.8	100.0	702
Northern	1.5	18.6	72.6	6.7	0.6	100.0	522
North-Western	3.3	17.0	61.5	18.2	0.0	100.0	173
Southern	2.5	25.9	57.6	13.1	0.9	100.0	493
Western	1.6	26.5	61.1	9.9	0.8	100.0	255
			p<0.001				
Mother's education							
No education	2.3	22.6	61.9	13.1	0.1	100.0	617
Primary	2.2	22.0	65.0	10.5	0.4	100.0	2,889
Secondary +	3.8	17.1	67.2	9.6	2.3	100.0	1,004
			p<0.001				
Socioeconomic status							
Low	1.7	24.0	63.9	10.1	0.2	100.0	1,215
Medium	2.5	21.7	64.5	10.7	0.6	100.0	2,331
High	4.1	15.4	67.8	11.0	1.8	100.0	964
			p<0.001				
Total	2.6	21.0	65.0	10.6	0.8	100.0	4,510

[1]Mother ill/weak, nipple/breast problem, insufficient milk

3.7 Comparison with Other Sub-Saharan Countries

Data analysis shows that bottle-feeding is virtually non-existent in Zambia. Bottle-feeding rates are also low in most of its neighboring countries (e.g., Malawi, Tanzania), ranging between 3 and 8 percent. With respect to exclusive breastfeeding of children 0 to 5 months old, Zambia's prevalence (19 percent) is average compared with other sub-Saharan countries and its neighbors: Malawi (3 percent), Mozambique (38 percent), and Zimbabwe (17 percent). Nevertheless, the extent of exclusive breastfeeding in Zambia is far below that of central African countries such as Burundi and Rwanda, where levels are approximately 90 percent in the first four months.

In terms of complementary feeding among 6- to 9-month old infants, the rate in Zambia (94 percent) is slightly lower than levels observed in neighboring countries (ranging from 87 to 94 percent). Nevertheless, Zambia has a mid-range level relative to other sub-Saharan countries covered by the DHS. Although there is room for improvement in terms of infant feeding practices in Zambia, the extent of compliance with international standards exceeds many African countries.

3.8 Summary

Breastfeeding is widely practiced in Zambia; 98 percent of all children are reportedly breastfed. Despite this high prevalence, breastfeeding practices are not uniform across maternal background characteristics (access to health care and education). Nurses and midwives appear to be the best advocates of early breastfeeding, as reflected in 61 percent of babies born of nurse/midwife-assisted delivery being breastfed within the first hour of life. In contrast, only 39 percent of babies of doctor-assisted deliveries breastfeed within the first hour of life, thus highlighting a need to continue to promote breastfeeding and the Baby-Friendly Hospital Initiative in Zambia.

Even when breastfeeding is initiated, complementary foods and liquids are introduced early into Zambian infants' diets. The early age at which cereals and other foods are introduced increases the child's chances of becoming malnourished or ill. Thus, there is a need to raise awareness of the benefits of exclusive breastfeeding and age-appropriate weaning practices.

3.9 Recommendations

Recommendations for improving infant and child feeding practices are as follows:

<u>Breastfeeding and Child Nutrition</u>

Infant feeding practices: Raising awareness of mothers

- Promote early breastfeeding initiation, and emphasize exclusive breastfeeding and breastfeeding during illness.
- Educate families on the appropriate timing of introduction of complementary foods to the infant.

In improving infant nutritional status, address both health providers and community/culture factors

- Continue to expand and maintain compliance of all hospitals and clinics with standards of the International Baby-Friendly Hospital Initiative.
- Expand BFHI mother support groups for breastfeeding promotion nationwide.
- Establish programs that address the needs of children orphaned by parents with AIDS.

Geographic targeting

- Establish breastfeeding promotion campaigns in all provinces especially Luapula, where the prevalence and duration of exclusive breastfeeding are low.

Research

- Support qualitative research studies to investigate the following: factors influencing care-seeking behaviors, community perceptions of breastfeeding initiation, and exclusive breastfeeding duration.
- Conduct qualitative research studies to investigate factors that affect decisions about a) the early introduction of water and other liquids and b) the early introduction of complementary foods.
- Conduct research on breastfeeding mothers to determine how the new BFHI guidelines for women with and without HIV/AIDS have affected the practice of exclusive breastfeeding.

CHAPTER 4

MORBIDITY AND MORTALITY

In Zambia, one out of five children will die before his or her birthday. This mortality rate has drastic consequences for the health and educational status of citizens. This in turn makes a strong effect on the national economy. The high mortality rate is caused by infectious diseases such as malaria, measles, acute respiratory infection (ARI), diarrhea, and AIDS (Nsemukila, 1994). These most common childhood illnesses account for the greatest proportion of infant and under-five mortality (Jamison, 1993). Malnutrition compromises a child's health, making him or her more susceptible to illness and death (Briend, 1990). This chapter describes the prevalence of morbidity and mortality among Zambian children under 5 years of age. It also discusses correlates of infant and child mortality. The interaction between malnutrition and disease and its harsh effects on mortality is explained. These points demonstrate the importance of nutrition in improving child survival and reducing infant and child mortality.

4.1 Infant and Under-Five Mortality

The infant mortality rate (IMR), or the probability of death during the first year of life, is a commonly used measure of infant health. It is a sensitive indicator of socioeconomic conditions and the level of development in a country. The under-five mortality rate (U5MR). or the probability of dying before the child's fifth birthday, is another important indicator of infant and child survival. Both the IMR and U5MR are reported per 1,000 live births and are commonly used in international comparisons. In the 1996 ZDHS, IMRs and U5MRs are calculated for the five- and ten-year periods preceding the survey. The rates from the ten-year period preceding the survey are used to assess sociodemographic differences in mortality since they give stronger statistical validity to the analyses. It should be noted that the results reported in this section reflect associations between selected background characteristics and infant and child mortality. It is not possible to imply causality, given the cross-sectional nature of the ZDHS.

According to the Zambian DHS, the rate of infant mortality in Zambia has not changed over the past decade. The IMR for the 5 years preceding the survey is 109 per 1,000 live births, whereas the IMR from 1987 to 1991 was 106 per 1,000 live births (CSO, MOH, and MI, 1997). When calculating the infant mortality rates by background differentials, the IMR for the past ten-year period is used.

Rural infants have a higher IMR than their urban counterparts (118 versus 92 per 1,000) (Table 4.1). Infant mortality is significantly higher (158 per 1,000) in the rural northern province of Luapula than in the urban Lusaka province (100 per 1,000) (Table 4.1). The rural provinces have poor infrastructure, little access to health care, and poor economic conditions. In contrast, the relatively more wealthy Southern province has an IMR of only 66 per 1,000. There is also a gender differential in infant mortality in Zambia. Male infants have a higher IMR (116 per 1,000) than female infants (99 per 1,000).

Table 4.1 also shows that the rate of infant mortality decreases with increasing maternal education. The IMR for babies whose mother had a secondary education (82 per 1,000) is lower than the rate for infants whose mother had primary or no education (110 and 133 per 1,000, respectively). It is important to note that there are significant differences between urban and rural areas with respect to maternal educational status (see Appendix B), which may help to explain the urban-rural differential that exists in terms of infant mortality. It is suggested that educated mothers are more inclined to engage in preventive and health-promoting behaviors than less-educated women, and they may also have the resources to access services and/or information in the event of an illness (Stewart et al., 1997).

PREVIOUS PAGE BLANK

Young and old maternal ages at birth are associated with an increased risk of infant death. This corresponds with the U-shaped age pattern generally expected with higher mortality for children of younger and older mothers. Infants born when their mother was less than 20 years of age have the highest IMR (141 per 1,000). Infants born to a mother 40 years old or older also have a high IMR (138 per 1,000) compared with babies of a mother 20 to 39 years of age (IMR ranging from 84 to 102). This relationship between infant mortality and maternal age may reflect the advantage of delaying childbirth and limiting the number of children per family.

There is a significant association between infant mortality and the length of the previous birth interval; shorter birth intervals are associated with elevated mortality levels. As shown in Table 4.1, infants born less than 2 years after their previous sibling had an IMR of 165 per 1,000, which is close to twice the rates among infants born 2 to 4 and more than 4 years after their previous sibling (87 and 77 per 1,000, respectively). This finding highlights the importance of appropriate and effective methods of birth spacing for reducing mortality rates in Zambia.

The U5MR (based on the five-year period prior to the survey) appears to have deteriorated since the early 1980s. The U5MR of 1992-1996 is 197 per 1,000, compared with the U5MR of 1987-1991 at 187 per 1,000 (CSO, MOH, and MI, 1997). Child survival on the whole has deteriorated in Zambia since the mid-1980s. In Table 4.1, it is evident that rural children have higher U5MR (based on the ten-year period prior to the survey) than urban children (205 versus 173 per 1,000). Regional patterns in U5MR are slightly different than those for IMR. The Southern and North-Western provinces have the lowest U5MR (148 and 153 per 1,000). The urban provinces of Copperbelt and Lusaka have U5MR lower than the national average (175 per 1,000). The highest U5MR are found in the Eastern and Luapula provinces (235 and 254 per 1,000, respectively). U5MR is also highest for children born to a mother with no education and less than age 20 (222 and 234 per 1,000, respectively) as well as for babies born less than 2 years after their previous sibling (272 per 1,000). The gender differential observed among infants still remains in early childhood, the U5MR among males is 202, whereas it is 183 for females.

Table 4.1 Infant and under-five mortality rates

Infant and under-five mortality rates for the ten year period preceding the survey, by selected background characteristics, Zambia 1996

Background characteristic	Mortality rates (per 1,000) Infant	Under-five
Residence		
Urban	91.9	173.3
Rural	117.9	204.5
Region		
Central	94.6	164.5
Copperbelt	81.9	175.4
Eastern	131.1	235.4
Luapula	157.8	254.2
Lusaka	100.3	174.1
Northern	125.3	200.2
North-Western	91.1	153.0
Southern	66.2	148.3
Western	129.1	201.2
Mother's education		
No education	132.9	221.7
Primary	110.2	201.2
Secondary +	81.7	142.0
Mother's age at birth		
<20	141.3	234.0
20-29	101.9	186.7
30-39	83.6	161.0
40-49	137.5	203.5
Birth order		
1	121.2	200.3
2-3	114.1	203.2
4-6	95.9	183.0
7+	97.1	175.2
Previous birth interval		
<2 years	164.5	271.8
2-3 years	87.2	171.4
4 years+	76.7	135.9
Sex of child		
Male	116.3	201.6
Female	99.3	182.9
Total	107.7	192.1
Five-year rate	108.9	196.6

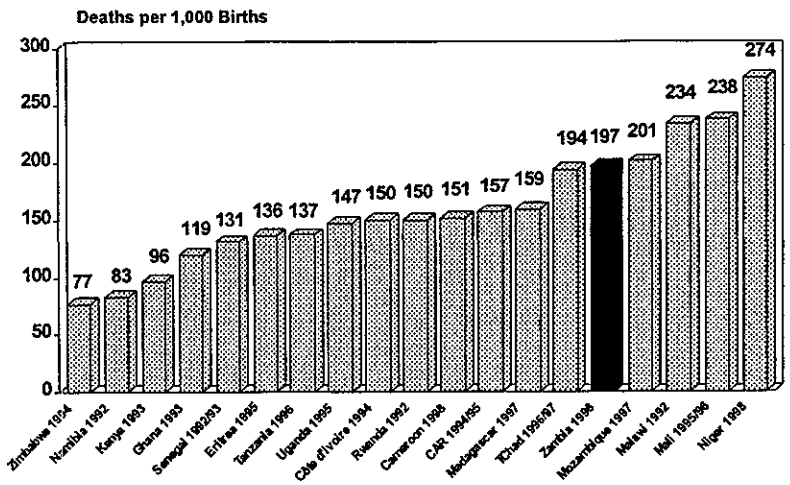
Note: *Infant mortality rate*: the probability of dying before the first birthday; *under-five mortality rate:* the probability of dying before the fifth birthday. Ten year rates are used to calculate mortality rates for specific background characteristics. Five-year rates are rates for 0-4 years before the survey. Rates based on less than 500 cases exposed to mortality risks are enclosed in parentheses.

4.2 Comparison with Other Sub-Saharan Countries

As seen in Figure 4.1, Zambia's U5MR of 197 is the fifth highest child mortality rate among the sub-Saharan countries surveyed by the DHS between 1991 and 1997. The neighboring countries of Zimbabwe, Namibia and Tanzania have significantly lower U5MRs. Zambia's U5MR is comparable to U5MRs in other neighboring countries such as Mozambique (201 per 1,000) and Malawi (234 per 1,000).

With respect to infant mortality, Zambia's five-year IMR of 109 per 1,000 live births is lower than Malawi's (134 per 1,000) and Mozambique's (135 per 1,000). Zambia's five-year IMR is higher than Zimbabwe's (53 per 1,000), Namibia's (57 per 1,000) and Tanzania's (88 per 1,000).

Figure 4.1 Under-five Mortality in Zambia Compared with Other Sub-Saharan Countries



Note: Under-five mortality rates are for the five-year period preceding the survey.

Source: DHS Surveys 1992-1998

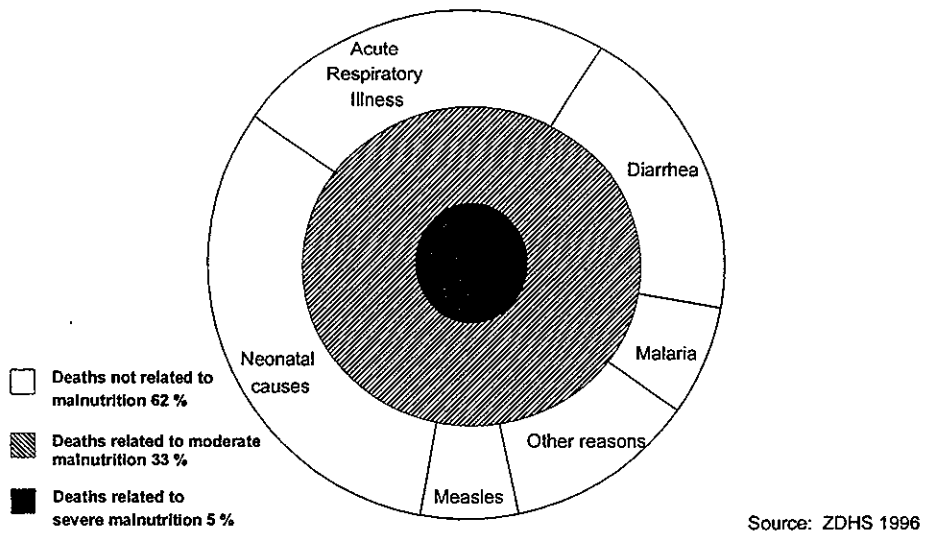
4.3 The Relationship between Malnutrition and Mortality

Children who suffer from malnutrition are generally at an increased risk of illness and death (El Samani et al., 1988). The prevalence of children underweight is often used as the most common indicator for malnutrition. These rates of child malnutrition in Zambia begin to rise to conspicuous levels by the age of six months (see figure 2.6). The level of malnutrition remains elevated into the fifth year of life. It is during this period from 21 to 59 months when malnutrition makes an impact on child mortality. The relationship between malnutrition and increased mortality is evident by rural-urban residence in Zambia. Rural areas have both a higher prevalence of chronic malnutrition and higher levels of infant and U5MR than urban areas. The remote northern province of Luapula has the highest prevalences of underweight (see Table 2.2) and the highest IMR and U5MR (see Table 4.1). Lusaka, Southern, and Copperbelt provinces have three out of four of the lowest provincial prevalences of children underweight and the lowest IMR and U5MR. These three provinces are the most urbanized in the country. Improved access to care may explain the lower mortality rates in urban areas. Pilot health programs often start in these regions and then expand to other provinces. The successful introduction of the WHO/UNICEF Integrated Management of Childhood Illness initiative first in the provinces of Lusaka and Copperbelt occurred in 1997 (BASICS, 1998).

4.4 Contribution of Malnutrition to Under-Five Mortality

The actual causes of mortality of children less than 5 years of age in Zambia are diarrhea, acute respiratory infections, malaria, and immunizable diseases. The role of nutrition is rarely recorded as a factor related to the death of the child. The synergistic relationship between malnutrition and disease is known to increase the risk of mortality (Lutter at al., 1989; Rosenberg et al., 1977; Scrimshaw et al., 1968). A formula developed by Pelletier et al. (1994) is used to quantify the potentiating effects of malnutrition on mortality of children under 5 years of age. In Zambia, 38 percent of under-five deaths are related to malnutrition (Figure 4.2). Moderate malnutrition accounts for a larger proportion of U5MR than severe malnutrition (33 percent versus 5 percent). This is likely due to the higher prevalence of moderate as opposed to severe malnutrition in Zambia. Figure 4.2 demonstrates that even a mild case of malnutrition may compromise a child's health, increasing the risk of death. Nutrition interventions focused on the prevention, detection, and timely treatment of all types of malnutrition, especially the mild-to-moderate cases, can have a positive impact on child survival in Zambia.

Figure 4.2 Contributing Effects of Malnutrition on Under-five Mortality, Zambia



Source: ZDHS 1996

4.5 Regional and Age-Specific Patterns of Morbidity

In the 1996 ZDHS, prevalence estimates of three common childhood conditions—diarrhea, acute respiratory infection, and fever—are based on maternal recall of symptoms during the two-week period before the interview. Table 4.2 indicates that 24 percent of children under age 3 had reported episodes of diarrhea during the two-week reference period. It is important to recognize that diarrheal disease is seasonally affected. The rainy season causes a great rise in the prevalence of diarrhea. The majority of data collection occurred during the hot, dry season. Mothers also reported that during the two-week reference period, 40 percent of children had a fever, and 13 percent had ARI (for the purpose of this analysis, defined as cough with rapid breathing). Despite these high levels of morbidity, results should be interpreted with caution, given the limitations associated with maternal recall (Haggerty et al., 1994b; Martorell et al., 1976). In addition, seasonality can influence nutritional status and play a significant role in the frequency and occurrence of conditions of illness in young children (Branca et al., 1993).

Table 4.2 Prevalence and treatment of diarrhea, fever, and cough with rapid breathing

Percentage of children under five years of age with diarrhea, fever, cough and cough with rapid breathing in the two weeks preceding the survey and the percentage for whom treatment was sought, by selected background characteristics, Zambia 1996

	Percentage of children with :				Sought treatment or advice for:			
Background characteristic	Diarrhea	Fever	Cough w/rapid breathing	Number of children	Diarrhea	Number of children	Cough w/rapid breathing	Number of children
Region								
Central	23.7	40.6	17.0	508	36.8	120	79.9	87
Copperbelt	20.8	36.2	11.1	1,171	41.6	244	93.3	130
Eastern	27.0	41.6	18.7	941	62.7	252	88.2	176
Luapula	20.9	39.5	5.2	545	36.8	112	(82.7)	28
Lusaka	28.7	38.8	12.5	909	66.5	258	88.2	113
Northern	21.8	44.5	9.7	744	45.5	162	74.4	72
North-Western	17.4	26.9	7.3	252	(69.9)	44	-	18
Southern	22.4	38.0	13.5	657	75.8	147	81.9	89
Western	23.3	54.7	15.6	381	76.0	87	69.3	59
	p<0.001	*p<0.001*	*p<0.001*		*p<0.001*		*p<0.001*	
Residence								
Urban	23.8	38.1	12.6	2,445	54.7	579	91.3	309
Rural	23.3	41.4	12.7	3,664	56.9	848	80.0	463
	ns	*p<0.01*	*ns*		*ns*		*p<0.001*	
Socioeconomic status								
Low	25.0	45.9	12.6	1,654	57.6	412	76.9	208
Medium	24.1	39.0	12.9	3,154	54.2	758	85.4	408
High	20.0	35.4	12.0	1,301	58.8	257	92.3	157
	p<0.01	*p<0.001*	*ns*		*ns*		*p<0.001*	
Sex of child								
Male	24.1	39.3	12.2	2,989	55.5	718	82.9	364
Female	22.9	40.8	13.1	3,120	56.6	709	85.9	408
	ns	*ns*	*ns*		*ns*		*ns*	
Total	23.5	40.1	12.7	6,109	56.0	1,427	84.5	772

Note: Level of significance determined using Chi-square test. Figures in parentheses are based on 25 to 49 cases. Figures calculated from less than 25 cases are not shown.
ns=Not significant

Table 4.2 indicates that in urban and rural areas, differences in morbidity occur for fever but not diarrhea or ARI. A slightly higher proportion of rural children than urban children had fever (41 versus 38 percent). There is no difference in diarrhea, fever, and ARI by urban and rural residence. Public-health initiatives are needed to address these illnesses in both urban and rural communities. In spite of these similar morbidity levels in areas of residence, the lower mortality levels in urban versus rural areas speak to the greater availability and accessibility of health services in urban areas (CIHI, 1995).

With respect to regional differences, the North-Western province had the lowest prevalence of diarrhea (17 percent) during the two-week reference period. The Lusaka province has the highest prevalence of diarrhea (29 percent). While this area containing the capital city has better access to health care, it also has highest concentration of people living in close quarters with poor sanitation. The highest prevalence of fever is found in the Northern and Western provinces (45 percent and 54 percent, respectively), which are on opposite ends of the country. The lowest prevalence of fever is in the North-Western province (27 percent).

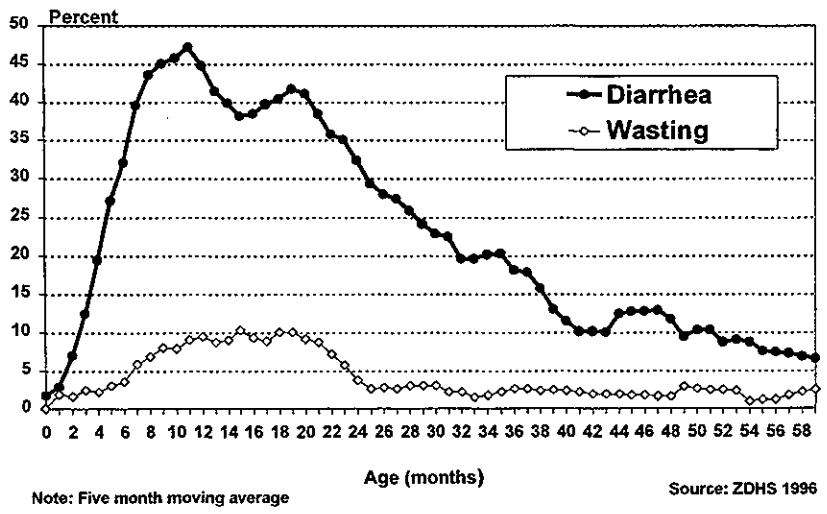
The highest prevalence of ARI is found in the Eastern and Central provinces (19 percent and 17 percent, respectively). The lowest prevalence of ARI is found in the Luapula provinces (5 percent). This

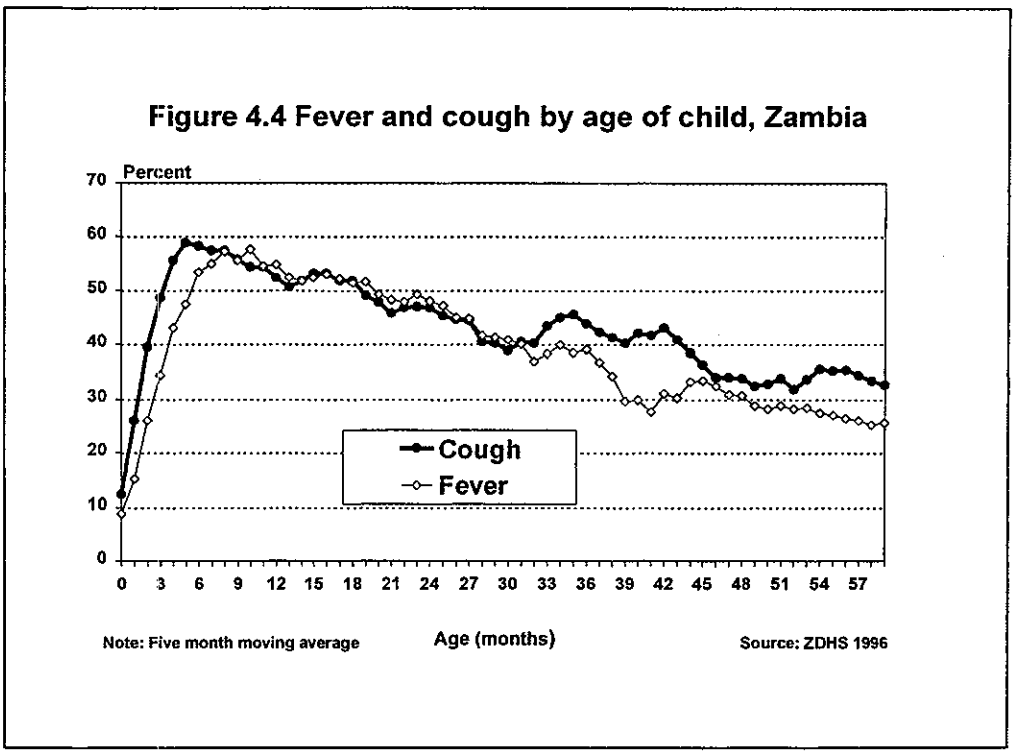
finding could reflect a reduced risk of respiratory illnesses in the Luapula province due to environmental factors, but since the neighboring Northern province does not have similar trends, this is questionable.

Similar to malnutrition, age differences exist in the prevalence of diarrhea, fever, and cough. Diarrhea follows the same pattern as wasting. The prevalence of wasting and diarrhea rise and fall at similar times. Diarrhea begins with an upward trend just after the age of 1 month. It rises quickly peaking at 12 months of age at 47 percent (Figure 4.3). It drops only to peak again at 20 months at a prevalence of 42 percent. After that point, it declines to 10 percent by the fourth year of life. Wasting rises to a peak at 12 months with a prevalence of 10 percent. By 20 months, it falls from 10 percent to a low level. Diarrhea frequently results in fluid loss and dehydration, decreased food and fluid intake due to anorexia and malabsorption and increased nutrient loss (Molla et al., 1983); therefore, it is common to find similar patterns between diarrhea and wasting. The very low level of wasting shows a slightly different pattern in Zambia. The increased prevalence of diarrhea during infancy may partially reflect the consequences of the early introduction of water and other liquids or foods. These foods or liquids could be contaminated due to poor water, inadequate sanitation services or unhygienic handling/preparation. In addition, with increasing mobility among older infants comes the risk of ingesting contaminated matter.

Prevalences of fever and cough are higher than that of diarrhea and have a different age pattern (Figure 4.4). Fever and cough almost follow the exact same age pattern. Both prevalences increase from the first month. Cough peaks at 5 months with a prevalence of 59 percent. Fever peaks at 8 months with a prevalence of 58 percent. After that point, both cough and fever begin a slow decline. By 3 years of age, they reach 40 percent. After 5 years, they fall to between 25 to 30 percent. These findings indicate the importance of controlling disease in infants beginning from the first months after birth.

Figure 4.3 Diarrhea and wasting by age of child, Zambia





4.6 Patterns of Care Seeking and Treatment for Common Childhood Illnesses

Mothers sought advice or treatment for more than half of all reported cases of diarrhea and almost 85 percent of cases of cough during the two-week reference period (Table 4.2). Urban mothers were just as likely as their rural counterparts to seek advice or treatment for their children's diarrhea. A significantly higher proportion of urban mothers than rural mothers sought care for ARI (91 versus 80 percent). This observation may reflect the greater access to health services in urban areas relative to rural areas. The Southern and Western provinces had the highest proportion of care seeking for diarrhea (76 percent). The Central and Luapula provinces had the lowest percentage of care seeking for diarrhea. These provinces also had the highest prevalences of wasting in Zambia. Given the association between diarrheal disease and malnutrition, this finding may reflect that the child malnutrition problem in the Luapula and Central provinces may be partially attributed to less than optimal care-seeking behavior. The Eastern province has the highest prevalence of ARI, and along with the Copperbelt and Lusaka provinces, has the highest percentage of mother's who sought treatment for their infected children. All provinces have treatment rates of 80 percent or higher for children with ARI. The source of treatment varies as described below.

Women from high socioeconomic backgrounds were more inclined to seek care or advice for children ill with ARI than women of low or medium socioeconomic status (Table 4.2). For children with diarrhea, there was no difference in treatment-seeking behavior by socioeconomic status. There is no gender differentiation of mother's care seeking behavior for illnesses. Among mothers who sought treatment for their children with diarrhea or ARI, more than two-thirds went to public facilities rather than to private or informal-sector providers (Table 4.3). For treatment of diarrhea, only 6 percent of sick children received treatment at private medical facilities, and 23 percent of sick children received treatment at nonmedical facilities. Concerning treatment of ARI, 12 percent of sick children received care at private facilities, while 18 percent received care from nonmedical facilities. Due to the poor economy, health facilities in Zambia are often unable to maintain adequate stocks of drugs (BASICS, 1998). These conditions in some regions cause people to seek care from pharmacies or traditional healers. The table shows that nonmedical facilities such as pharmacies, traditional practitioners, and shops are relied on for health care, particularly in the Northern, Luapula, and Central provinces.

Table 4.3 Source of treatment for diarrhea and cough with rapid breathing

Percent distribution of children under five years of age with diarrhea or cough with rapid breathing whose mothers sought treatment/advice from various sources, according to selected background characteristics, Zambia 1996

	Source of treatment for diarrhea					Source of treatment for cough with rapid breathing				
Background characteristic	Public medical facility	Private medical facility	Non-medical facility	Total	Number of children	Public medical facility	Private medical facility	Non-medical facility	Total	Number of children
Region										
Central	(47.9)	(0.0)	(52.1)	100.0	44	54.1	7.7	38.3	100.0	69
Copperbelt	52.0	23.0	25.0	100.0	102	59.3	29.7	11.0	100.0	122
Eastern	82.4	0.0	17.6	100.0	158	88.9	1.8	9.2	100.0	155
Luapula	(59.1)	(1.9)	(38.9)	100.0	41	-	-	-	100.0	24
Lusaka	71.5	13.2	15.3	100.0	172	66.7	7.6	25.8	100.0	100
Northern	43.4	0.0	56.6	100.0	74	63.4	4.4	32.2	100.0	53
North-Western	(86.9)	(0.0)	(13.1)	100.0	31	-	-	-	100.0	16
Southern	92.8	0.8	6.4	100.0	111	76.6	11.1	12.3	100.0	73
Western	81.1	0.0	18.9	100.0	66	(72.9)	(1.7)	(25.4)	100.0	41
		p<0.001					*p<0.001*			
Residence										
Urban	69.3	13.9	16.8	100.0	317	68.4	15.6	16.0	100.0	282
Rural	72.1	0.8	27.1	100.0	482	71.3	8.5	20.2	100.0	370
		p<0.001					*p<0.001*			
Socioeconomic status										
Low	68.8	0.0	31.2	100.0	237	75.6	7.0	17.4	100.0	160
Medium	75.5	3.2	21.4	100.0	411	72.9	6.7	20.5	100.0	348
High	62.4	23.0	14.7	100.0	151	57.3	28.4	14.4	100.0	145
		p<0.001					*p<0.001*			
Sex of child										
Male	73.0	6.4	20.6	100.0	398	67.3	11.9	20.8	100.0	302
Female	69.0	5.6	25.4	100.0	401	72.4	11.2	16.3	100.0	351
		p<0.001					*ns*			
Total	71.0	6.0	23.0	100.0	799	70.1	11.6	18.4	100.0	653

Note: Level of significance determined using Chi-square test. Figures in parentheses are based on 25 to 49 cases. Figures calculated from less than 25 cases are not shown. Public medical facility includes government hospital and government health center. Private medical facility includes private hospital/clinic, private doctor. Nonmedical facility includes traditional practitioner, private pharmacy, shop, other.
ns = Not significant

Significant variations of source of treatment exist by urban/rural residence and socioeconomic status (see Table 4.3). A higher percentage of children from low socioeconomic backgrounds received treatment from nonmedical facilities than those from higher socioeconomic backgrounds. A higher percentage of children from the high socioeconomic group received treatment from private medical facilities. Both rural and urban mothers rely primarily on public medical facilities to provide health care. Rural mothers are more likely to seek treatment from nonmedical facilities, while urban mothers are more likely to rely on private medical facilities. These findings probably reflect the dependence of poor mothers on traditional or informal-sector health providers.

There is no significant relationship between maternal age and maternal attitudes concerning care during diarrheal illness (see Table 4.4). Concerning attitudes on diarrhea care, the youngest mothers are the least informed about the need to increase intake of liquids during diarrhea. Among older mothers, there is little variation. This finding highlights the need to target young, inexperienced mothers in health promotion and disease prevention campaigns.

Table 4.4 Attitudes and practices concerning diarrhea care

Among children under five years of age who had diarrhea in the past two weeks, the percent distribution of their mothers' reported knowledge of appropriate liquid intake during diarrhea and the percent distribution of the actual change in their liquid intake, according to selected background characteristics, Zambia 1996

		Attitudes concerning appropriate change in liquids during diarrhea				Actual change in liquids during diarrhea			
Background characteristic	Knowledge of ORS	Less or same	More	Total	Number of children	Less or same	More	Total	Number of children
Mother's age									
15-19	92.0	33.1	66.9	100.0	143	48.9	51.1	100.0	143
20-24	96.8	29.9	70.1	100.0	440	43.2	56.8	100.0	449
25-29	95.4	19.4	80.6	100.0	351	40.6	59.4	100.0	351
30-34	94.0	22.4	77.6	100.0	249	38.8	61.2	100.0	250
35-49	95.2	25.2	74.8	100.0	233	42.5	57.5	100.0	237
	ns		*p<0.01*				*ns*		
Region									
Central	95.6	25.3	74.7	100.0	118	46.5	53.5	100.0	120
Copperbelt	98.1	22.0	78.0	100.0	243	43.0	57.0	100.0	243
Eastern	98.5	38.9	61.1	100.0	248	55.1	44.9	100.0	251
Luapula	88.7	22.0	78.0	100.0	114	44.7	55.3	100.0	114
Lusaka	100.0	13.0	87.0	100.0	260	29.5	70.5	100.0	261
Northern	90.1	30.2	69.8	100.0	159	47.5	52.5	100.0	162
North-Western	(91.8)	(18.8)	(81.2)	100.0	44	(39.6)	(60.4)	100.0	44
Southern	96.4	21.9	78.1	100.0	142	23.6	76.4	100.0	147
Western	81.1	40.5	59.5	100.0	88	55.1	44.9	100.0	89
	p<0.001		*p<0.001*				*p<0.001*		
Residence									
Urban	98.8	18.8	81.2	100.0	579	34.5	65.5	100.0	580
Rural	92.8	30.2	69.8	100.0	837	47.6	52.4	100.0	851
	p<0.001		*p<0.001*				*p<0.001*		
Mother's education									
No education	87.9	39.7	60.3	100.0	190	52.7	47.3	100.0	198
Primary	95.4	26.6	73.4	100.0	936	43.8	56.2	100.0	944
Secondary+	99.5	12.8	87.2	100.0	289	30.2	69.8	100.0	289
	p<0.001		*p<0.001*				*p<0.001*		
Total	95.2	25.5	74.5	100.0	1,416	42.3	57.7	100.0	1,431

Note: Level of significance determined using Chi-square test. Figures in parentheses are based on 25 to 49 cases. Figures calculated from less than 25 cases are not shown.
ns = Not significant

Urban mothers and mothers with a secondary education gave more fluids to their children than rural and uneducated mothers (see Table 4.4). Some of the rural-urban differences may be explained by differences in the level of maternal education. Formal education is linked to greater access to health and other information, and 19 percent of rural mothers compared with 6 percent of urban mothers are uneducated (see Appendix B). A slightly larger percentage of urban mothers are more knowledgeable about oral rehydration solutions than rural mothers, but more are aware of the need to increase liquid intake during a diarrheal episode.

4.7 Maternal Knowledge and Attitudes About Treatment of Diarrhea in Children

Current recommendations by WHO and UNICEF call for continued feeding along with increased intake of fluids during a diarrheal episode. Lactating mothers are encouraged to continue breastfeeding during the child's illness increasing the frequency of these feeds to ensure that the child receives adequate nutrients and liquids. Mothers should continue the increased feedings after the illness to allow catch-up growth. During the two-week reference period, 58 percent of diarrhea-affected children received increased amounts of fluids during their illness (Table 4.4); thus, almost half of Zambian children suffering from diarrhea do not receive adequate amounts of fluids during their illness. Table 4.4 also indicates the

incongruity between knowledge and behavior; 75 percent of mothers whose children experienced diarrhea are reportedly aware of the need for increased fluid intake during illness, but only slightly more than half actually gave their children increased fluids.

Maternal knowledge and attitudes about diarrhea treatment are important in ensuring that children receive timely and adequate treatment for their illnesses (Table 4.5). Of all mothers surveyed, 95 percent know about the use of oral rehydration salts (ORS) for treatment of diarrhea. This shows the significant success made by the Control of Diarrheal Diseases program since the 1980s. More urban and educated mothers know about ORS, which corresponds to the greater proportion of urban children who received the additional fluid intakes during their diarrheal episode. The province with the lowest reported knowledge of rehydrating liquids was the Western province, where only 76 percent of the mothers reported knowledge of ORS.

Table 4.5 Knowledge of diarrhea care

Percentage of women with births in the five years preceding the survey who know about oral rehydration salts (ORS) for treatment of diarrhea and the percent distribution of women by their opinions about appropriate feeding practices during diarrhea, according to selected background characteristics, Zambia 1996

	Know about ORS for treatment of diarrhea	Women's opinions about appropriate feeding practices during diarrhea						Number of women
		Liquids			Solids			
		Less or same	More	Total	Less or same	More	Total	
Age								
15-19	92.6	36.4	63.6	100.0	38.2	61.8	100.0	536
20-24	95.2	29.3	70.7	100.0	37.7	62.3	100.0	2,183
25-29	96.1	19.3	80.7	100.0	34.1	65.9	100.0	1,702
30-34	95.2	19.4	80.6	100.0	35.6	64.4	100.0	1,308
35-49	93.4	20.8	79.2	100.0	36.6	63.4	100.0	1,234
	p<0.01		*p<0.001*			*ns*		
Region								
Central	95.3	25.9	74.1	100.0	36.1	63.9	100.0	566
Copperbelt	99.1	23.1	76.9	100.0	46.9	53.1	100.0	1,340
Eastern	98.6	33.8	66.2	100.0	31.2	68.8	100.0	1,040
Luapula	92.9	17.6	82.4	100.0	31.9	68.1	100.0	663
Lusaka	99.5	15.5	84.5	100.0	29.1	70.9	100.0	1,063
Northern	90.4	23.2	76.8	100.0	37.4	62.6	100.0	836
North-Western	92.3	15.5	84.5	100.0	31.4	68.6	100.0	287
Southern	94.1	22.9	77.1	100.0	36.0	64.0	100.0	723
Western	76.1	40.6	59.4	100.0	41.4	58.6	100.0	446
	p<0.001		*p<0.001*			*p<0.001*		
Residence								
Urban	98.7	19.8	80.2	100.0	36.6	63.4	100.0	2,821
Rural	92.3	26.9	73.1	100.0	36.0	64.0	100.0	4,143
	p<0.001		*p<0.001*			*ns*		
Education								
No education	89.5	34.5	65.5	100.0	44.9	55.1	100.0	931
Primary	94.7	25.6	74.4	100.0	36.0	64.0	100.0	4,486
Secondary+	98.6	13.3	86.7	100.0	31.7	68.3	100.0	1,545
	p<0.001		*p<0.001*			*p<0.001*		
Total	94.9	24.1	75.9	100.0	36.3	63.7	100.0	6,963

Note: Level of significance determined using Chi-square test.
ns = Not significant

Seventy-six percent of all mothers with children under the age of 5 believe that more liquids should be given to a child during a diarrheal episode (Table 4.5). Only 64 percent of all mothers consider increasing food intake during diarrhea to be appropriate. A significantly higher percentage of urban than rural mothers thought to increase fluid intake during a diarrheal episode but not to increase solid foods. There is a significant association between maternal education and knowledge of appropriate feeding practices during diarrhea. Higher percentages of educated mothers believe increasing liquid and solid intake during diarrhea is appropriate. The Eastern and Western provinces are the two areas that have the lowest percentages of mothers with appropriate opinions on increasing liquids during diarrhea. The Copperbelt and Western provinces have the lowest percentages of mothers with appropriate opinions on increasing intake of solids. It is surprising that Copperbelt has a low percentage of mothers not well educated in diarrhea care, because it has high levels of maternal education and high levels of access to health care. This finding shows the need for more education on child care behavior for children with diarrhea on the national level.

Table 4.6 helps demonstrate the gap between knowledge and practice of diarrhea treatment with oral rehydration therapy. Whereas 95 percent of mothers of children who experienced diarrhea in the last two weeks claim familiarity with ORS, only 54 percent were using the packets to treat their children. There is very little supply of free ORS packets and low demand for purchasing the ORS packets. On the other hand, the recommended home fluids (RHF) made of domestically available products (usually sugar, salt, and potable water) were used by only 4 percent of mothers. One of either oral rehydration therapies

Table 4.6 Use of oral rehydration therapy for treatment of diarrhea

Percentage of children under five years of age who had diarrhea in the preceding two weeks whose mothers gave them oral rehydration salts (ORS), recommended home fluids (RHF), and oral rehydration therapy (ORT) either ORS or RHF, by selected background characteristics, Zambia 1996

Background characteristic	Given ORS[1]	Given RHF[2]	Given ORT[3]	Number of children
Region				
Central	49.0	5.7	53.1	120
Copperbelt	55.1	2.2	57.3	244
Eastern	48.8	3.1	51.1	253
Luapula	55.2	2.2	57.3	113
Lusaka	56.6	5.4	61.1	261
Northern	46.8	5.0	47.5	162
North-Western	59.5	4.7	61.9	44
Southern	64.9	1.8	66.7	147
Western	56.8	3.2	58.4	87
	p<0.05	*ns*	*p<0.05*	
Residence				
Urban	58.4	3.8	61.7	581
Rural	51.1	3.5	53.2	851
	p<0.01	*ns*	*p<0.001*	
Socioeconomic status				
Low	48.9	3.1	50.8	413
Medium	54.4	3.6	56.7	759
High	61.2	4.8	65.6	260
	p<0.001	*p<0.01*	*p<0.001*	
Sex of child				
Male	56.2	4.1	58.7	720
Female	51.9	3.2	54.5	712
	NS	*ns*	*NS*	
Total	54.1	3.7	56.6	1,432

Note: Level of significance determined using Chi-square test
ns = Not significant
[1]Solution prepared from ORS packet (oral rehydration salts)
[2]Recommended home fluids (i.e., sugar/salt/water solution)
[3]Oral rehydration therapy (ORS and/or RHF)

(ORS or RHF) was used by slightly more than half of mothers with children who had diarrhea in the previous two weeks. There was no gender difference in treating children with ORS or RHF therapy. Sixty-two percent of urban mothers gave their children an oral rehydration therapy (ORT) during the diarrheal episode. In contrast, only 53 percent of rural mothers administered some form of ORT. The Northern province had the lowest use of ORT in the country. ORT including ORS and RHF are only used in half to two-thirds of all cases of children with diarrhea within the different provinces. While these differences are statistically significant, they are not important. Even among the different levels of socioeconomic status, there is the same variation of between half and two-thirds of children who receive ORT when ill with diarrhea. This demonstrates the crucial need to increase ORT awareness, access, and use throughout all of the country.

4.8 Factors Associated with Diarrhea

The occurrence of diarrhea during the two-week reference period was significantly associated with a number of socioeconomic, biological, and behavioral factors (Table 4.7). Bivariate analyses indicate that diarrhea is more prevalent among children living in the capital province compared with other provinces. The North-Western province had the lowest prevalence (19 percent), whereas the Lusaka province had the highest prevalence of diarrhea (31 percent).

Socioeconomic status was significantly associated with childhood diarrhea. Children of lower socioeconomic status households were more likely to have diarrhea (27 percent) than those from households of higher socioeconomic status (20 percent). The age and gender of the child also were significantly associated with the prevalence of diarrhea. Children age 6-23 months have the highest prevalence of diarrhea. Male children were more likely to suffer from diarrhea (26 percent) than female children (24 percent). ARI in the previous two weeks and perceived size at birth are two other variables that were significantly related to the prevalence of diarrhea. Other variables had significant bivariate relationships but lost importance in the multivariate investigation. The following variables were found to be significantly associated with the prevalence of diarrhea in the past two weeks:

- Region
- Socioeconomic status
- Mother's age
- No access to latrine/flush toilet
- Child's age
- Parity
- Number of children under 5 years of age in the household
- Gender of child
- Childhood wasting
- ARI during the two weeks preceding the survey
- Perceived "small/very small" size at birth.

When exploring the relationship between infant/child feeding and diarrhea, all children were classified based on whether they were fed in compliance with age-appropriate standards issued by WHO and UNICEF (1990). Age-appropriate feeding is defined as follows:

- Among 0- to 5-month-olds, exclusive breastfeeding
- Among 6- to 23-month-olds, breast milk plus complementary foods
- Among children older than 24 months, breast milk and a mixed diet.

Table 4.7 Prevalence and estimate of net relative odds of diarrhea among children under three years

Percentage of children 0-59 months who had diarrhea in the preceding two weeks and the net relative odds of diarrhea, by selected background characteristics, Zambia 1996

Background characteristic	Diarrhea prevalence	Net relative odds
Region		
Central	25.4	1.55[b]
Copperbelt	21.8	1.43[b]
Eastern	27.5	1.49[b]
Luapula	21.9	1.17
Lusaka	30.5	2.17[b]
Northern	22.5	1.13
North-Western	18.8	1.00[a]
Southern	24.4	1.25
Western	24.5	1.31
N=5443	*p<0.001*	
Socioeconomic status		
Low	26.5	1.33[b]
Medium	25.5	1.26[b]
High	20.4	1.00[a]
N=5443	*p<0.01*	
Age of child		
0-5 months	11.7	1.00[a]
6-9 months	42.2	6.91[b]
10-11 months	45.2	6.76[b]
12-15 months	42.2	6.19[b]
16-19 months	41.2	5.34[b]
20-23 months	37.8	4.62[b]
24 + months	16.7	1.67[b]
N=5443	*p<0.001*	
Gender of child		
Male	25.6	1.15[b]
Female	23.8	1.00[a]
N=5443	*ns*	
Stunting		
Not malnourished	24.4	1.00[a]
Moderate	22.9	0.91
Severe	28.2	1.31[b]
N=5443	*p<0.05*	
ARI in previous 2 weeks		
Yes	37.6	2.02[b]
No	22.7	1.00[a]
N=5443	*p<0.001*	
Perceived size at birth		
Average/large	24.1	1.00[a]
Small/very small	28.6	1.28[b]
N=5441	*p<0.05*	
All	24.7	
R squared		$R^2 = 0.15$

Note: Diarrhea prevalence level of significance determined using Chi-square test.
[a] p<0.05
[b] p<0.05 compared with the reference category
ns = Not significant at the p<0.05 level.

Using the above criteria, all children were classified as either improperly or properly fed. The bivariate relationship between the variable that depicts age-appropriate infant/child feeding and diarrhea is not statistically significant; however, infant feeding was included in the multivariate analysis, given its documented association with diarrhea in the literature.

Other factors with significant bivariate associations with diarrhea are also included in the multivariate logistic regression models in order to assess the effect of each factor on childhood diarrhea while controlling for the effects of other factors. Since a specific conceptual framework does not exist for diarrheal disease, the best possible model for Zambia was constructed based on commonly studied factors in the diarrhea literature. The multivariate analysis discussed in this chapter is an adaptation of an approach that was used by Mock et al. (1993) to study socioeconomic, environmental, demographic, and behavioral correlates of childhood diarrhea in the Republic of Congo. Although the Mock et al. study does not provide a hierarchical framework for the study of diarrhea, it does provide a classification system for its determinants. In the present analysis, variables with significant bivariate associations with diarrhea are classified as follows (reference categories are italicized):

Community-Level Factors

- Province of residence (Central, Copperbelt, Eastern, Luapula, Lusaka, Northern, *North-Western,* Southern, and Western)
- Urban-rural residence (urban, *rural*)

Maternal Sociodemographic and Health Factors

- Parity (*1*, 2, 3, 4, 5+)
- Preceding birth interval (9-23, 24-35, *36+ months*)
- Number of children under age 5 in the household (0, 1, 2, *3+*)
- Maternal education (*none*, primary, secondary)
- Paternal education (*none*, primary, secondary)
- Maternal occupation (not working, professional, *manual/agricultural*)
- Paternal occupation (not working, professional, *manual*, agricultural)
- Maternal place of employment (at home, *outside of home*)
- Maternal body mass index (<18.5, 18.5-24.99, *≥25.0*)
- Nature of marriage (not married, monogamous, *polygamous*)
- Sex of the household head (*male*, female)
- Socioeconomic status (low, medium, *high*)
- Exposure to mass media (*no exposure to mass media*, exposure to one or more sources)

Child Demographic and Health Factors

- Child's age (*0-5*, 6-9, 10-11, 12-15, 16-19, 20-23, 24+ months)
- Child's sex (male, *female*)
- Birth order (*1*, 2-3, 4-5, 6+)
- Stunting (*not stunted*, moderately stunted, severely stunted)
- Wasting (*not wasted*, moderately wasted, severely wasted)
- ARI in preceding two weeks (*no*, yes)
- Perceived size at birth (*average/large*, small/very small)

Environmental and Sanitary Factors

- Type of toilet facility (none/bush, *flush/latrine*)
- Source of drinking water (piped water, *well water*, surface water)

Child Care Factors

- Age-appropriate infant/child feeding (*proper feeding*, improper feeding)
- Caretaker (mother, *other individual(s)*)

Health Service Utilization

- BCG vaccination (*no*, yes)
- Measles vaccination (*no*, yes)
- Number of antenatal visits (*none*, 1-3, 4+)
- Antenatal care provider (doctor, nurse/midwife, TBA, *no one*)
- Type of delivery attendant (doctor, nurse/midwife, TBA, *other/no one*)

Generally speaking, the published literature does not contain information on the hierarchy of these factors. For the purpose of this analysis, each set of determinants ("Community-Level Factors," "Maternal Sociodemographic and Health Factors," etc.) was first considered as a separate regression model for diarrhea. For each group of determinants, the best possible set of variables was identified. This process yielded six different regression models, representing each of the six sets of determinants outlined above. As a final step, the variables from each "best set" were entered simultaneously within the same model to assess the effects of each variable on diarrhea, adjusting for other variables. Victora et al. (1997) have advocated for a similar analytic approach when studying infectious diseases using conceptual frameworks.

The multivariate analysis identified the following factors as statistically significant correlates of diarrhea during the two weeks preceding the survey (Table 4.6):

- Province of residence
- Socioeconomic status
- Child's age
- Child's gender
- Stunting
- ARI infection in the past two weeks
- Perceived size at birth

The 1996 ZDHS findings pertaining to diarrhea corroborate findings in the diarrhea literature. There are three variables that require special discussion despite their outcomes in the multivariate analysis.

With respect to the variables that are statistically significant in the multivariate analysis, infants residing in the Central, Copperbelt, Eastern, and Lusaka provinces are more likely to experience diarrhea than infants in the North-Western province. In particular, infants in Lusaka are almost two and one-fifth times more likely to have experienced diarrhea, compared with infants in North-Western province. Thus, even when controlling for other factors related to diarrhea, children in the Lusaka province are the most likely to fall ill with diarrhea. This is probably due to population density, poverty, and poor hygiene conditions of a large proportion of the population in the capital province.

The link between diarrheal illness and socioeconomic status remains significant when other factors are taken into account. Children whose households are in the lowest group were one-third more likely to experience a diarrheal episode than children from a high socioeconomic background. Children from a mid-level socioeconomic status have a one-quarter higher chance pf having a diarrheal episode (Table 4.7). This observation shows that conditions that encourage the spread of diarrhea can be found in mid to lower socioeconomic households.

In terms of the relationship between diarrhea and characteristics of the child, older children are more likely to have diarrhea than to 0- to 5-month-old infants (Table 4.7). The likelihood of diarrhea peaks between ages 6 to 9 months—at 7 times the level of 0- to 5-month-olds. The likelihood of diarrhea remains from 5 to 7 times higher than the comparison group of 0– to 5-month-olds until a child becomes 2 years of age. This observation possibly reflects the ingestion of pathogens by children in that age range, as well as their increased mobility, which heightens their exposure to contaminated matter. Substantial gender differences in diarrhea also remain even when other factors are taken into account. Boys are more than 15 percent more likely than girls to have experienced a diarrheal episode during the two-week reference period. This finding is difficult to explain yet is consistent with observations in other African contexts (Molbak et al., 1997; Mock et al., 1993).

Severely stunted children are one-third more likely to suffer from diarrhea than moderately stunted and nonstunted children. There is no significant difference in reporting of diarrhea between moderately stunted or nonstunted children. This suggests a threshold at severe malnutrition for diarrhea. Children who are severely malnourished have strongly impaired immunity to diarrheal disease, where moderately malnourished children are not much more likely to suffer from diarrhea than children who are not malnourished (Root, 1997). In the nutrition literature, diarrhea is usually highly correlated with wasting but not stunting. The temporal relationship between wasting and diarrhea in Zambia has been demonstrated (Figure 4.3). The prevalence of wasting is very low in Zambia, whereas stunting is very high

As seen in Table 4.7, children who were ill with ARI were twice as likely to experience diarrhea than children who did not have ARI. It is evident that there is a strong interactive effect of children who are ill with one disease succumbing to the other. The biological mechanism behind this relationship between ARI and diarrhea is unclear. Both illnesses are likely to be correlated with other factors inside and outside the analysis. Either disease could cause the child's immunity to decrease, thus becoming more susceptible to other infections.

Lastly, children who were perceived as "small" or "very small" at birth by their mother were 30 percent more likely to experience diarrhea than those perceived to be average- or large-sized. It is unclear, however, whether their small size compromised their health or whether mothers and caretakers responded differently to these children relative to average or large infants.

It is evident from the above discussion that there are a number of points of intervention, both short- and long-term. Factors that are more socioeconomic in nature, are less amenable to short-term solutions. Nevertheless, those factors warrant further attention. In addition, the significant association between ARI and diarrhea underscores the need to further explore the factors that influence both. This is of particular importance given the pervasiveness of both diarrhea and ARI among Zambian infants and children.

4.9 Summary

This chapter presents results that indicate high levels of infant and U5MR in Zambia (109 and 197 per 1,000, respectively). Rural infants and children appear to be at a particular disadvantage in terms of mortality risk. Rates of infant and child mortality are highest in the province of Luapula (158 and 254 per 1,000, respectively), where there are chronic household food insecurity problems, poor water and sanitation facilities, and inadequate health care systems (Callens and Phiri, 1998). Mortality rates in Luapula are stark contrasts to rates in the Southern province, where the IMR and U5MR are 66 and 148 per 1,000, respectively.

In Zambia, malnutrition contributes greatly to infant and child mortality: 38 percent of all deaths occurring before age 5 are related to malnutrition. The interaction of malnutrition and high prevalences of common childhood illnesses, namely, diarrhea (24 percent), ARI (13 percent), and fever (40 percent), in

the past two weeks also raises concern. Diarrhea, which may influence child nutritional status, is related to a number of factors that highlight possible points of intervention in reducing diarrheal disease, and ideally, nutrition-related morbidity in Zambia. The vast majority of the factors identified in the multivariate analysis speak to the less-than-optimal social and economic conditions that exist in Zambia, particularly in the capital province, where diarrhea prevalence is higher than in other areas.

4.10 Recommendations

Given the pervasiveness of morbidity and mortality among Zambian infants and children, key recommendations are as follows:

Infant/Child Nutrition

- Encourage optimal, age-appropriate feeding for all children.
- Communicate the need for increasing the amounts of liquids and solids given to children during diarrheal episodes. Advocate increased feedings to continue after illness to allow for catch-up growth of the child.
- Develop interventions that entail the timely identification and treatment of moderate malnutrition in children.

Improve Coverage of Child Survival Services

- Given the incongruity between levels of ORT knowledge and use in Zambia, intensify community outreach programs of Control of Diarrheal Diseases that a) improve community access to and acceptance of ORT and (b) educate caregivers on the proper use of ORT.
- Increase access in rural communities through involvement of private practitioners, traditional healers, and traditional birth attendants in promoting ORT use and diarrheal and ARI disease prevention.
- Communicate the need for increasing the amounts of liquids (for example, breast milk) and solid foods given to children during diarrheal episodes. Advocate increased feedings to continue after illness to allow catch-up growth for the child.
- Strengthen the control of diarrheal disease and growth monitoring programs.
- Expand the malaria control program with education and distribution of impregnated bednets.

Give Priority to Integrating Health, Nutrition, and Family Planning Services as Opposed to Establishing Vertical Programs

- Strengthen the integrated health and nutrition approach to intervention projects with family planning and primary health care components.
- Improve the capabilities of small rural outposts that focus primarily on primary and secondary prevention of malnutrition and illnesses in order to address the limited access to care.
- Recruit and train women in the community to be rural health outreach workers.
- Combine growth-monitoring with immunization services.
- Continue expansion of the rural health care infrastructure, with emphasis on the establishment of integrated "well child" services (e.g., nutrition and immunization services) and integrated management of childhood illness.

Information, Education, and Communication

- Use mass media to promote ideal standards for breastfeeding, prevention, and treatment of diarrheal disease.
- Intensify public health campaigns to promote the use of impregnated bednets to prevent malaria.

CHAPTER 5

FACTORS ASSOCIATED WITH MALNUTRITION

Malnutrition is directly related to poor dietary intake and morbidity, both of which are associated with a myriad of biological, demographic, and socioeconomic factors. This chapter is based on bivariate and multivariate analytic techniques and describes the relationships between various factors and child malnutrition in Zambia.

5.1 Biological and Health Characteristics of Stunting

As seen in Table 5.1, stunting and wasting are significantly associated with a number of biological and health characteristics. It should be noted, however, that relationships depicted in Table 5.1 do not control for confounding. Thus, results from the bivariate analysis do not speak to the exact nature of the relationship between these factors and stunting and wasting.

Based on the bivariate analysis (Table 5.1), stunting in children less than 5 years of age is significantly associated with the following biological and health factors:

- Child's age
- Mother's perception of the infant's size at birth
- Birth weight
- Single versus multiple birth
- Birth order
- Gender of child
- Current pregnancy status
- Length of the preceding birth interval
- Occurrence of diarrhea in the previous two weeks
- Occurrence of fever in the previous two weeks

For the first two years of life there is a positive relationship between child's age and stunting, whereby newborn infants have the lowest percentage stunted and 18- to 24-month-old children in the sample have the highest percentage stunted. Given that stunting is a cumulative process, this relationship is not surprising. Nevertheless, it should be noted that almost one quarter of children age 6-11 months are stunted, demonstrating that a strong increase in stunting can be observed during the first year of life. By age 18-23 months, almost 60 percent of all children are stunted, thus highlighting the first two years of life as a critical period in preventing childhood malnutrition. Stunting begins to plateau by the second year of life, and begins to slowly decline by after three and a half years.

Although information on weight at birth is only available for 43 percent of all children, low birth weight infants appear to be at a nutritional disadvantage later in childhood than normal birth weight children (Table 5.1). The prevalence of stunting among children who were LBW infants is 56 percent—significantly higher than that observed among children who were normal weight infants (33 percent). Maternal perception of birthweight proved to be significantly related to stunting and wasting. Children who were considered very small by their mothers have a higher prevalence of stunting (60 percent) compared with those who were considered normal size at birth (41 percent).

Table 5.1 Stunting and wasting by biological characteristics

Percentage of children under five years of age who are stunted or wasted by selected biological characteristics, Zambia 1996

Biological characteristic	Stunted	Wasted
Child's age (months)		
0-5	10.4	2.3
6-11	24.4	7.3
12-17	39.2	9.3
18-23	57.5	8.3
24-29	50.9	2.9
30-35	53.9	1.6
36-41	52.2	1.7
42-47	48.5	1.2
48-53	48.6	2.2
54-59	46.1	1.6
N=3588	p<0.001	p<0.001
Size at birth		
Average/Large	40.9	3.6
Small	51.0	7.5
Very small	59.9	11.5
N=5442	p<0.001	p<0.001
Birth weight		
Normal[1]	32.9	3.2
Low[2]	55.9	5.1
N=2379	p<0.001	*ns*
Single birth/Twin		
Multiple	58.7	6.2
Single	41.8	4.1
N=5442	p<0.001	*ns*
Birth order		
1	45.2	4.2
2-3	40.4	4.4
4-5	40.2	3.6
6+	44.7	4.3
N=5444	p<0.01	*ns*
Gender of child		
Male	43.1	5.0
Female	41.7	3.3
N=5444	*ns*	p<0.01

Continued

Table 5.1—*Continued*

Biological characteristic	Stunted	Wasted
Current pregnancy status of mother		
No/not sure	41.3	4.2
Yes	50.0	3.9
N=5444	*ns*	p<0.01
Preceding birth interval		
<24 months	43.6	4.0
24-35 months	43.3	4.1
36+ months	38.9	4.3
N=4364	p<0.05	*ns*
Proper feeding		
Yes	45.6	4.0
No	25.3	5.1
N=5438	p<0.001	*ns*
Diarrhea (2 weeks)		
No	42.1	3.5
Yes	43.1	6.0
N=5443	*ns*	p<0.001
Fever (2 weeks)		
No	41.3	2.8
Yes	43.8	6.0
N=5443	*ns*	p<0.001
Total	42.4	4.2

Note: Level of significance determined using Chi-square test.
ns = Not significant.
[1]Normal birth weight = 2500 grams or more
[2]Low birth weight = less than 2500 grams

Children born as twins are considered to be at risk for stunting. Sixty percent of twins were stunted compared with 42 percent of singleton children. In addition, a larger proportion of children who were born less than two years after their previous sibling are stunted (41 percent), compared with children whose siblings were 24-35 months and 36 months or older (37 and 32 percent, respectively). Birth order of the child is also found to be associated with stunting of children. Those children who were born first or sixth or higher are found to have a higher percentage stunted (45 percent) versus those born second through fifth (40 percent). Mother's pregnancy status is associated with child stunting. Pregnant mothers have a higher percentage of stunted children (50 percent) than nonpregnant women (41 percent). Neither diarrhea nor fever in the past two weeks were associated with stunting.

As in Chapter 4, all children were classified based on whether their diets were in compliance with UNICEF standards for age-appropriate feeding. Age-appropriate feeding is defined as follows:

- Among 0- to 5-month-olds, exclusive breastfeeding
- Among 6- to 23-month-olds, breast milk plus complementary foods
- Among children older than 24 months, a diet based on a variety of foods and liquids (child can be breastfeeding or weaned).

Using the above criteria, all children were classified as either improperly or properly fed. Surprisingly, children who were properly fed were more likely to be stunted than improperly fed children (46 percent versus 25 percent) (Table 5.1). This outcome could be due to the following reasons: a) The variable for proper feeding does not measure the quality or quantity of food. b) There is confounding due to age. Stunting increases rapidly in children age 6 to 24 months. Chronic malnutrition limits growth permanently. Children older than 24 months who consume a mixed diet (and are properly fed) who were stunted at a younger age are still stunted. Therefore, they would fall in the category of properly fed and still be stunted. c) The result may also be due to factors related to the collection of dietary recall data. The use of 24-hour recall data may not truly reflect actual feeding patterns (Piwoz et al., 1994). The use of seven-day feeding data may better describe proper feeding. It has also been observed that mothers of malnourished children are more likely to overestimate the actual amount of food intake in 24-hour recall dietary measures (Olinto et al., 1995).

5.2 Biological and Health Characteristics of Wasting

Generally speaking, the nature and magnitude of the associations between wasting and biological and health characteristics of the child are similar to those for stunting (Table 5.1). There are some exceptions to note, however. First, wasting prevalence peaks earlier than that of stunting—12-17 months versus 18-23 months—although the prevalence of wasting is much lower at all ages. Reasons for the high wasting prevalence among 12-to-17-month-olds in Zambia could be related to illness as reflected in the high prevalence of diarrhea, fever, and/or improper/inadequate feeding during illness.

Maternal perception of birthweight proved to be related to wasting. Children considered very small at birth have a 12 percent prevalence of wasting, while those who were considered average have a 4 percent prevalence of wasting. The gender of the child was found to be associated with wasting but not stunting. Five percent of male children were wasted compared with only 3 percent of female children. The prevalence of diarrhea and fever were also associated with wasting. Actual birth weight, single/twin status, birth order, currently pregnant, and preceding birth intervals were not related to wasting.

5.3 Socioeconomic and Demographic Characteristics of Stunting

Table 5.2 presents associations between stunting and socioeconomic and demographic factors. Some of these factors may be highly correlated with each other; therefore, results should be interpreted with caution. Nevertheless, results confirm the critical role that poverty plays in determining nutritional status in Zambian children. Rural children have a significantly higher stunting prevalence than urban

children (49 percent versus 33 percent). The lowest prevalence of stunting is found among the children of Lusaka and the Copperbelt provinces (30 and 31 percent), whereas the highest prevalence of stunting is found among the children of the Luapula and Northern provinces (almost 60 percent). This is expected as these provinces have poor infrastructure, and high rates of poverty (Callen and Phiri, 1998; Kumar et al., 1995).

As seen in Table 5.2, there is a protective effect of parental education on stunting. This is particularly evident in terms of maternal education. Children whose mothers have at least a secondary school education had a stunting prevalence of 31 percent, compared with 50 percent among children of uneducated women. The difference between children of uneducated and primary-school-educated women is less striking (50 versus 45 percent, respectively). A similar pattern exists with respect to educational level of the partner, though stunting differentials are not as large (Table 5.2). Among children whose mother or father had an agricultural occupation, the level of stunting was at least 50 percent. About 40 percent of children whose mother or father did not work were stunted. Children of professional parents had the lowest prevalence of stunting, but the prevalence rate was still high (36 percent).

Other noteworthy relationships between stunting and other socioeconomic indicators are presented in Table 5.2. For example, the prevalence of stunting among children from the poorest backgrounds (52 percent) is twice the prevalence among children from higher socioeconomic backgrounds (26 percent). No trained birth assistant at the time of delivery is associated with a higher prevalence of stunting in children. Children whose families do not have access to a flush toilet or latrine have a higher stunting prevalence than children whose family has such access (48 versus 40 percent). The expected relationship between drinking water source and stunting also exists. Although improved water and sanitation facilities may reflect higher income, they also have a direct impact on nutritional status because they reduce levels of infectious disease. Where water is not readily available, food hygiene is often less than adequate. Where sanitation is poor, there is an increased risk of food and water contamination. The percentage of stunted children from households with piped water is significantly lower than the percentage among children who drank well or surface water (32 percent versus 47 and 50 percent, respectively). There is also a significant difference in stunting between children whose home had rudimentary floors (15 percent) and those whose home had natural floors (50 percent).

A higher proportion of children from female-headed households are stunted (45 percent), compared with children from male-headed households (40 percent) (Table 5.2). The relationship between female-headedness and childhood stunting may be confounded because female-headed households tend to be poorer (ACC/SCN, 1997). In Zambia, 44 percent of female headed households are in the low socioeconomic group while only 25 percent of male headed households are classified in the low socioeconomic group (CSO, MOH, and MI, 1997). Females who are heads of households are responsible for generating income and other resources in order to sustain their family. As a result, less time may be available to spend on child care.

Children whose mother was exposed to various forms of media were less stunted than children whose mother had no exposure to media. As shown in Table 5.2, lower stunting prevalences are observed for children whose mother watched television weekly (28 percent), listened to the radio daily (34 percent), and read the newspaper weekly (30 percent), compared with children whose mother did not watch television (47 percent), listen to the radio (47 percent), or read the newspaper (45 percent). The relationship between mass media exposure and stunting is likely to be confounded by a number of factors. Access to a television or radio, in particular, is usually associated with household wealth, which in turn is positively associated with child nutritional status. Likewise, mothers who read the newspaper are clearly more educated. As stated previously, maternal education is associated with lower stunting. Frequent exposure to mass media may also provide mothers with helpful information on child care, health, and nutrition, and thus may be a possible means of behavior change in Zambia.

Table 5.2 Stunting and wasting by socio-economic characteristics

Percentage of children under three years who are stunted or wasted, by socio-economic characteristics, Zambia, 1996

Socioeconomic characteristic	Stunted	Wasted
Region		
Central	38.1	6.1
Copperbelt	31.4	4.3
Eastern	48.1	2.7
Luapula	57.7	6.5
Lusaka	30.2	3.0
Northern	57.3	4.8
North-Western	47.4	2.3
Southern	39.5	3.5
Western	44.9	5.3
N=4330	*p<0.001*	*p<0.01*
Residence		
Urban	32.7	3.1
Rural	48.7	4.8
N=5443	*p<0.001*	*p<0.01*
Mother's education		
No education	50.1	5.9
Primary	44.7	4.2
Secondary+	30.9	2.8
N=5442	*p<0.001*	*p<0.01*
Partner's education		
No educatione	48.9	5.5
Primary	48.3	4.0
Secondary+	36.1	3.7
N=5090	*p<0.001*	*ns*
Mother's occupation		
Not working	40.7	4.6
Professional[1]/ Services[2]	35.6	3.2
Manual labor[3]	42.1	2.3
Agricultural[4]	53.9	4.7
N=5439	*p<0.001*	*p<0.05*
Partner's occupation		
Not working	38.2	2.6
Professional[1]	36.3	3.3
Manual labor[3]	36.3	3.7
Agricultural[4]	50.0	4.7
N=5152	*p<0.001*	*ns*

Continued

Table 5.2 Continued

Watches TV weekly		
No	47.0	4.5
Yes	27.9	3.0
N=5443	*p<0.001*	*ns*
Listens to radio daily		
No	47.0	4.7
Yes	33.7	3.2
N=5444	*p<0.001*	*p<0.01*
Reads newspaper weekly		
No	45.3	4.4
Yes	30.3	3.2
N=5443	*p<0.001*	*ns*
Socio-economic status		
Low	52.3	5.1
Medium	43.9	4.1
High	25.8	3.1
N=5443	*p<0.001*	*p<0.05*
Assistance at delivery		
Doctor	31.0	2.6
Nurse/ midwife	36.1	3.4
Traditional birth att.	47.5	6.0
Other/ no one	48.1	4.6
N=5405	*p<0.001*	*ns*
Sex of household head		
Male	41.6	4.3
Female	46.5	3.3
N=5443	*p<0.001*	*ns*

Continued

Table 5.2 Continued

Number of children under five in household		
One	40.6	4.7
Two	43.7	4.2
Three	42.3	4.4
Four	44.1	3.0
Five or more	41.3	4.1
N=5432	*ns*	*ns*
Number of dead children of mother		
Zero	40.3	4.0
One	46.4	4.6
Two or more	44.7	4.1
N=5444	*p<0.001*	*ns*
Type of toilet		
Flush/latrine	47.8	4.8
None/bush	40.2	3.9
N=5415	*p<0.001*	*ns*
Drinking water source		
Piped water	32.4	3.2
Well water[5]	47.3	4.9
Surface water[6]	50.3	3.9
N=5429	*p<0.001*	*P<0.05*
Main floor material		
Natural[7]	50.0	4.8
Finished[8]	32.0	3.3
N=5431	*p<0.001*	*p<0.01*
Total	31.0	2.6

Note: Level of significance determined using Chi-square test
ns = Not significant
[1]Includes professional, technical, management
[2]Includes domestic, services, skilled manual
[3]Includes skilled and unskilled
[4]Includes self-employed and employed workers
[5]Includes public and private well
[6]Spring, river/stream, pond/lake, dam
[7]Earth, sand, dung
[8]Palm/bamboo, parquet/polished wood, vinyl/asphalt strips, ceramic tiles, cement, carpet

5.4 Socioeconomic and Demographic Characteristics of Wasting

Findings for wasting differ from those for stunting (Table 5.2). Unlike stunting, the following factors are *not* significantly associated with wasting: partner's occupation, television and newspaper exposure, assistance at delivery, sex of the household head, number of dead children of mother, and type of toilet facility. Urban children have a significantly higher wasting prevalence than rural children. As with stunting, however, Luapula has the highest prevalence of wasting (7 percent), highlighting this province as a priority geographic area for nutrition interventions.

Increased maternal education is associated with lower levels of wasting. Likewise, maternal educational, occupational, and socioeconomic status are generally higher in urban than in rural areas (see Appendix B). Mother's occupation is associated with wasting. Mother's who are not working or work in agriculture have children with the highest prevalence of wasting. Exposure to the radio has a positive effect on wasting. Children whose mothers listen to the radio have a lower prevalence of wasting (3 percent) versus those who do not listen to the radio (5 percent). Socioeconomic status, which is reflected in access to a radio, has the same type of relationship with wasting. Children of households with the lowest socioeconomic status are more likely to be wasted (5 percent) than those of the high socioeconomic status (3 percent).

Household characteristics such as source of drinking water and main floor material are associated with wasting in children. Children of households with piped water have lower rates of wasting (3 percent) than those with well water (5 percent) or surface water (4 percent). Children of households with natural floors made of earth, dung, or sand have a higher percent of wasting (5 percent) than children from households with finished floors (3 percent). The relationship with the above variables mirrors the association between socioeconomic status and wasting. Since the socioeconomic status measurement is partly based on household characteristics, the relationship between wasting and socioeconomic status is confounded by a number of the above factors.

5.5 Multivariate Regression Analysis

Using results from the bivariate analyses (Tables 5.1 and 5.2), a logistic regression model was created to explain a) stunting and b) wasting in Zambian children under the age of 5 (See Appendix G for an explanation of logistic regression models). Each model estimates the probability that stunting or wasting will occur according to each background characteristic, while controlling for the effects of all other background characteristics included in the model. Estimates of net relative risk greater than 1.0 indicate that the risk of malnutrition is greater than that for the reference category; estimates less than 1.0 indicate that the risk of malnutrition is less than that for the reference category.

The UNICEF framework for nutrition presented in Chapter 2 (see Figure 2.1) was used to construct the best possible explanatory models for stunting and wasting in Zambian children. Variables that have statistically significant bivariate associations with stunting or wasting are classified in the following manner according to the UNICEF framework:

BASIC CAUSES: POLITICAL, ECONOMIC, AND IDEOLOGICAL STRUCTURE
Data not available in the 1996 ZDHS

UNDERLYING SOCIAL AND ECONOMIC CAUSES

Residence

- Province (Central, Copperbelt, Eastern, Luapula, Lusaka, Northern, North-Western, Southern, and Western)
- Urban-rural residence (urban, rural)

Health Services
Data not available in the 1996 ZDHS

Employment
- Mother's occupation (not working, professional/service, agricultural/manual)
- Partner's occupation (not working, professional, manual, agricultural)

Water, Sanitation
- Source of drinking water (piped water, well water, surface water)
- Toilet facilities (none/bush, flush/latrine)

UNDERLYING SOCIAL AND ECONOMIC CAUSES

Household Assets
- Socioeconomic status (low, medium, high)
- Maternal exposure to mass media (no exposure, exposure to one or more sources)

Marital Status
- Sex of household head (male, female)
- Polygamy (not married, monogamous marriage, polygamous marriage)

Education
- Mother's education (no education, primary, secondary+)
- Partner's education (no education, primary, secondary+)

Food Availability
Data not available in the 1996 ZDHS

UNDERLYING BIOLOGICAL AND BEHAVIORAL CAUSES

Intrahousehold Food Distribution
Data not available in the 1996 ZDHS

Immunization, Health Care
- BCG vaccination (no, yes)
- Measles vaccination (no, yes)
- Assistance at delivery (doctor, nurse/midwife, TBA, other/no one)
- Place of delivery (home, health facility)

Maternal Fertility, Age, Time, Antenatal Care, Health Status
- Mother's age (15-19, 20-24,25-29, 30-34, 35-49)
- Parity (1, 2, 3, 4, 5+)
- Maternal body mass index (<18.5, 18.5-24.99, 25.0+)
- Number of antenatal visits (none, 1-3, 4+)
- Source of antenatal care (doctor, nurse/midwife, TBA, other/no one)
- Preceding birth interval (9-23, 24-35, 36+ months)
- Birth order (1, 2-3, 4-5, 6+)
- Age of child (0-5, 6-9, 10-11, 12-15, 16-19, 20-23, 24+ months)
- Perceived size at birth (average/large, small/very small)

UNDERLYING BIOLOGICAL AND BEHAVIORAL CAUSES

Feeding Patterns
- Age-appropriate infant/child feeding practices (improper feeding, proper feeding)

Hygiene Behavior
Data not available in the 1996 ZDHS

Child Care
- Child's primary caretaker (respondent, other individual)

IMMEDIATE CAUSES

Inadequate Food Intake
Data not available in the 1996 ZDHS

Disease
- Diarrhea in past two weeks (no, yes)
- Fever in past two weeks (no, yes)
- Acute respiratory illness (no, yes)

As indicated above, data are not available for some of the framework's components, namely "Political, Economic, and Ideological Structure," "Health Services," "Food Availability," "Intrahousehold Food Distribution," and "Hygiene Behavior." There are also a select number of variables for which data are available but are excluded nonetheless. Given the high percentage of currently married women in the sample (83 percent, see Appendix B), the effect of current maternal marital status on childhood malnutrition is not entered into the model. However, the above information is assessed in the multivariate analysis by using polygamous marital status, and gender of head of household. Low birth weight and select infant feeding variables such as reasons for weaning and duration of breastfeeding are also excluded from the analysis. The large amounts of missing data for these variables result in substantially reduced sample sizes, consequently reducing the statistical power of the multivariate analyses.

To obtain the best possible model for childhood stunting in Zambia, each level of the framework—"Underlying Social and Economic Causes (Block A)," "Underlying Social and Economic Causes (Block B)," "Underlying Biological and Behavioral Causes (Block A)," "Underlying Biological and Behavioral causes (Block B)," and "Immediate Causes"—was considered separately. That is, separate regression models were constructed for each level of the framework to identify the set of variables that best represents each component of the framework. A final model was derived by building a model comprised of variables from each level of the UNICEF conceptual framework.

5.6 Risk Factors for Stunting

The model constructed for stunting has good predictive power. According to the R square, the multivariate regression explains 22 percent of the variation that exists within the model. In the multivariate analysis, the following factors were statistically significant determinants of stunting in Zambian children:

- Province of residence
- Socioeconomic status
- Gender of head of household
- Mother's education
- Exposure to media

- Child's age
- Perceived size at birth
- Previous birth interval
- Number of dead children of mother
- Maternal body mass index
- Gender of child
- Proper feeding of child ,

Children residing in the Eastern, Northern, and Luapula provinces had significantly higher risks of stunting compared with children in the Central province (Table 5.3). The risk of stunting is highest in Luapula, where children were more than twice as likely as children in the Central province to be stunted. Poverty is a factor that puts children more at risk for stunting. Children of the low socioeconomic households were more than 50 percent more likely to be stunted than those in the highest group, while children from middle level socioeconomic households were 40 percent more likely to be stunted than those in the highest group.

Children from households that were headed by females have almost a 25 percent higher risk of stunting than children from households headed by males. In Zambia, almost 90 percent of female-headed households were often of the low- or mid-socioeconomic group, so poverty is likely to be a factor in the worse malnutrition found in women-headed households.

Mother's education is a strong factor correlated with child malnutrition (Smith and Haddad, 2000). Children of mothers who were not educated or educated up to the primary school level were more than 25 percent more likely to be stunted than children whose mother had attained a secondary school education (Table 5.3). The mother's exposure to the media that is related to education levels also demonstrates an effect on stunting levels of children. Children whose mother had no exposure to the media on a regular basis were almost 30 percent more likely to be stunted compared with children with a mother who was exposed to the media

It is very common for the mother's health conditions to be an influential factor in the children's health status (Table 5.3). In Zambia, undernourished children often have undernourished mothers; children whose mother had a BMI less than 18.5 were 90 percent more likely to be stunted than children whose mother had the highest BMI. Children of mothers with BMIs between 18.5 and 24.9 were also 25 percent more likely to be stunted than children of mothers with the highest BMIs. The finding shows that healthy mothers are also likely to have malnourished children indicating that this variable probably reflects socioeconomic factors.

Women who have children in rapid succession are at a much higher risk of poor health. The pregnancy and birthing process puts large demands on the woman. If she spaces her children, allowing her body to recover between each birth, she will be in better health if she becomes pregnant again. In Zambia, children of women with birth intervals less than two years and women with no previous births have an increased risk of stunting. Children who start at a disadvantage at birth have a larger chance to become stunted later. Children of mothers who have one or more dead children have a 15 percent higher risk of becoming stunted. This relationship reflects the same problem of poor maternal health putting children at a disadvantage, which is manifested by stunting.

Table 5.3 also indicates that children who are perceived as born small or very small by their mother are 75 percent more likely than average- or large-sized children to be stunted. It is not possible, however, given the limitations of the data, to determine whether this observation is due to the child's inability to feed (small infants may not be able to suckle) or the mother's perception of the child's viability, which may ultimately affect her child care or feeding practices. This outcome should be interpreted with care since for those children who have a recorded low birth weight, half were considered normal size at birth.

Table 5.3 Estimated net relative odds of stunting and wasting

Estimated net relative odds of stunting and wasting for children under three years, by background characteristics, Zambia 1996

Background characteristic	Stunted	Wasted
Region		
Central	1.00[a]	2.76[b]
Copperbelt	1.07	2.25[b]
Eastern	1.37[b]	0.90
Luapula	2.14[b]	3.01[b]
Lusaka	0.93	1.31
Northern	1.92[b]	1.99
North-Western	1.32	1.00[a]
Southern	0.92	1.08
Western	1.00	1.85
Socioeconomic status		
Low	1.56[b]	
Medium	1.39[b]	
High	1.00[a]	
Gender of head of household		
Male	1.00	
Female	1.29[b]	
Media		
Not exposed	1.27[b]	
One source	1.26[b]	
Two or more sources	1.00[a]	
Mother's education		
No education	1.28[b]	2.11[b]
Primary	1.11	1.32
Secondary	1.00	1.00
Child's age (months)		
0-5	1.00[a]	1.00[a]
6-9	1.77[b]	2.66[b]
10-11	3.41[b]	3.68[b]
12-15	4.67[b]	3.20[b]
16-19	14.98[b]	3.24[b]
20-23	9.17[b]	2.88[b]
24 +	7.97[b]	0.90[b]

Continued

Table 5.3 Continued

Background characteristic	Stunted	Wasted
Perceived birth size		
Average/ large	1.00	1.00
Small/ very small	1.77[b]	2.24[b]
Previous birth interval		
No previous child	1.44[b]	
9-23 months	1.33[b]	
24-35 months	1.30[b]	
36 months or more	1.00[a]	
Number of dead children		
0	1.00	
1 or more	1.15[b]	
Mother's BMI		
Below 18.5	1.89[b]	1.96[b]
18.5 to 24	1.24[b]	1.53
24 or higher	1.00[a]	1.00
Gender		
Male	1.15[b]	1.59[b]
Female	1.00	1.00
Proper feeding		
Yes	1.39[b]	
No	1.00	

Note: Variables with no output were entered into the model but not significant in the multivariate regression (ex. type of toilet).
[a] Total $p<0.05$
[b] $p<0.05$ compared with reference category

Stunting is a cumulative process that occurs over the course of many individual episodes of nutritional deprivation and/or illness, the risk of stunting increases sharply with age. Children between 0 and 5 months of age have the lowest risk of stunting. At this age, breastfeeding provides adequate nutrition for the majority of children. Stunting becomes prevalent after the first year of life: the risk ranges between 3 to 15 times the reference population, peaking at 20-23 months. The dramatic rise with age reflects the cumulative effects of repeated illness, inadequate nutrient intake, and most importantly their negative interactive effect during this critical period of child development.

Males are found to be 15 percent more likely to be stunted than females. It is not well understood what causes these differences between males and females. Similar findings were noted previously in Zambia (Kumar, 1995) and in Kenya (Ngare and Muttunga, 1999).

A counterintuitive result was found for the proper feeding variable. The children who were properly fed were 40 percent more likely to be stunted than those who were improperly fed. The variable is unlikely to be representative of the actual situation because the majority of children are considered to be fed properly. The largest number of cases of children who are improperly fed fall into two groups; the 0-5 month and 19-23 month age categories. Those in the youngest age group mostly are not stunted. Stunting sets in after the expected period of exclusive breastfeeding (4-5 months of age). The second group that is reported as improperly fed includes children from 19-23 months of age. In Zambia, weaning is very common at this age. WHO breastfeeding guidelines state that a child should breastfeed until 2 years of age. If a child's diet was adequate at 19-23 months, then being weaned would not be a negative factor. Only if the child's diet is poor will weaning cause a negative impact. This outcome is based partly on these children from 19-23 months of age who are weaned. Half of these children are not stunted. These two age groups make up a small part of the sample and are responsible for the counterintuitive relationship between proper feeding and stunting.

5.7 Risk Factors for Wasting

Unlike the model for stunting, the model constructed for wasting has limited predictive power. According to the R square, the multivariate regression explains only 12 percent of the variation that exists within the model. As seen below, the modeling following the UNICEF framework for malnutrition identifies a smaller number of statistically significant determinants of wasting compared with stunting, which may reflect the difficulties in studying an acute phenomenon like wasting. Some of the determinants for which no data are available, namely, food availability and hygiene behavior, may be significant predictors of childhood wasting. Nevertheless, based on the 1996 ZDHS, the following variables are statistically significant determinants of childhood wasting in Zambia (Table 5.3):

- Province of residence
- Maternal education
- Child's age
- Perceived size at birth
- Maternal body mass index
- Gender of child.

Three provinces stand out in terms of their elevated risks of childhood wasting compared with children in North-Western province: Central, Copperbelt, and Luapula provinces. The risk of wasting is highest in Luapula, where children are twice as likely to be wasted compared with children from North-Western province. Thus, even when socioeconomic, biological, and health factors are taken into account, Luapula stands out as a high-risk area for child malnutrition. Mother's education is also a factor that is related to wasting. Children of mothers with no education are two times as likely to be wasted and children of mothers with a primary education are 30 percent more likely to be wasted compared with children of mothers with a secondary education.

The risk of wasting increases with the child's age, and there is a notable increase after the sixth month of life when the likelihood increases by 2 and 2/3 of that of the 0- to 5-month-olds. The results

indicate that children age 10-23 months are 3 times more likely than 0- to 5-month-olds to be wasted. It is noteworthy, that the pattern of wasting loosely mirrors that of diarrhea, which is very widespread from 2 to 22 months of life (see Chapter 4). Maternal perception of infant size at birth was significantly related to wasting, with the small and very small infants being 2 and 1/2 times more likely to be wasted at the time of the survey than those perceived to be born average or large-sized.

Children of mothers who are malnourished have a higher likelihood of being wasted. Malnourished women's children are two times more likely to be stunted than children of overweight mothers. If the mother in the household is malnourished, it is possible that there is a problem of food security within that household. In Zambia, children of mothers who are not malnourished also have an elevated risk of wasting (50 percent more likely), compared with children of overweight mothers. In Zambia, higher socioeconomic status is associated with higher maternal BMI, indicating that maternal nutritional status is likely to be reflecting socioeconomic conditions. Overweight status of the mother has a protective effect against wasting on the child, possibly because the household has adequate access to food. As noted on the framework for nutrition, consistent food supply and positive child care practices contribute to reducing wasting.

As with stunting, gender is a significant factor associated with acute malnutrition. Male children are 60 percent more likely to be wasted than female children. In Zambia, this finding has been noted previously (Kumar et al., 1995). There was no discussion to explain this condition. It is not known whether it represents real conditions.

Wasting is a growing issue for children with the HIV/AIDS virus. In 1996, when the data for the survey was collected, wasting was not a significant focus for health research due to its very low prevalence. The interaction of diarrhea, HIV/AIDS, and wasting is now receiving more attention.

5.8 Summary

Many of the determinants of stunting and wasting are socioeconomic in nature, reflecting the role that worsening social and economic conditions have played on the nutritional status of children in Zambia. There are also a number of biological factors such as age, previous birth interval, gender, and perceived size at birth that are significantly related to childhood malnutrition. The importance of these factors are likely to be related to infant feeding and caring practices, which may be more amenable to short-term interventions than socioeconomic factors. The limited ability to explain wasting with the available data speaks to the need to collect information that yields more sensitive indicators of determinants of nutritional status.

5.9 Recommendations

Economic Access to Available Food

- Improve rural infrastructure (e.g., roads, water supply, health facilities, and schools) using labor-intensive employment programs targeting food-insecure and displaced individuals.
- In urban areas where households buy and trade food rather than rely on subsistence farming, provide means of income generation through skills training or business development through micro-credit loans.

Geographic Targeting

- Identify the underlying causes of infant/child malnutrition in high-risk provinces such as Luapula and Northern provinces, and plan interventions accordingly.

Research

- Research the causes of stunting in children of the most vulnerable age of 4-21 months.

CHAPTER 6

NUTRITIONAL STATUS OF WOMEN

The nutritional status of women prior to conception and during pregnancy is an important indicator of women's general health. It is also a major predictor of maternal and infant health outcomes. Less-than-optimal dietary intakes, infectious diseases such as malaria, and the large nutritional costs associated with pregnancy and lactation make women in the developing world highly susceptible to malnutrition and micronutrient deficiencies such as anemia (WHO, 1992a; WHO, 1991; Liljestrand et al., 1986). A compromised nutritional state in the mother often results in adverse birth outcomes such as low birth weight (LBW) and perinatal mortality (Mavalankar et al., 1992; WHO, 1992a; WHO, 1992b; Krasovec, 1991).

It is important to examine the extent and correlates of poor maternal nutritional status and subsequently identify ways to improve health and nutritional outcomes of mothers and their children. This chapter presents findings from anthropometric data on Zambian women who at the time of the interview, had at least one child under the age of 5 years.

6.1 Background

The nutritional cost of pregnancy is approximately 85,000 kcals. This figure assumes that women will store 35,000 kcals of fat for lactation (Hytten, 1980). Recent research suggests that the energy cost of pregnancy is closer to 55,000 kcals (IOM, 1990). Nevertheless, the U.S. Recommended Dietary Allowances (USRDA) suggest that pregnant women should consume an additional 300 kilocalories per day during their second and third trimesters based on Hytten's estimate. The USRDA also recommends that lactating women consume an additional 300 kcal per day. These additional kcals must be consumed above a woman's regular food intake in order to maintain energy balance. Women who were well-nourished before pregnancy are usually equipped to cope with the additional demands of lactation; however, lactating women who are poorly nourished require even higher daily caloric intakes than their well-nourished counterparts (Krasovec, 1991). Unfortunately, this is rarely achieved for women in developing countries. In spite of the nutritional demands placed on lactating women in developing countries, the fertility-reducing and child health benefits of sustained breastfeeding probably outweigh the risk of maternal depletion solely through lactation (Huffman, 1991).

Increased energy requirements during pregnancy are necessary to promote healthy fetal growth and development. Countries with high levels of malnutrition or micronutrient deficiencies in women also tend to have large proportions of babies who are born with low birth weight (Mavalankar et al., 1992; WHO, 1992a; WHO, 1992b; Krasovec, 1991; Labbok, 1991; Kramer, 1987; Liljestrand et al., 1986). As a result, LBW is often used as an indirect reflection of maternal nutritional status.

In less developed countries, intrauterine growth retardation (IUGR) is the most common cause of LBW. IUGR, which has its roots in poor maternal nutritional status, increases the risk of perinatal mortality (deaths between week 22 week of gestation and the first week of life) and mortality through late infancy (WHO, 1996; Berendes, 1993; Kessel et al., 1985; Villar and Belizan, 1982; Llewellyn-Jones, 1965). Nutritional factors alone account for more than half of the difference between industrialized and less developed countries in rates of IUGR (Krasovec and Anderson, 1991). Other factors such as malaria, which may have adverse effects on nutrition, also explain much of the disparity between poor and richer countries (Kramer, 1987). Unlike in developing countries, preterm birth (PTB) accounts for the majority of LBW in industrialized countries. Although many of the causes of PTB are unknown, it appears to be more closely linked to maternal behaviors such as smoking, rather than to nutritional factors (Kramer, 1987).

As stated in Chapter 2, maternal nutritional factors such as low caloric intake, gestational weight gain, prepregnancy weight, and height are the most important determinants of fetal growth and gestation in agrarian societies (Kramer, 1987). Prepregnancy weight, in particular, is an important determinant of birth weight in both developed and developing countries (IOM, 1990). Maternal gestational weight gain is also an important determinant of fetal growth, with the optimal gestational weight gain based on prepregnancy weight-for-height. To minimize poor pregnancy outcomes, women with low prepregnancy weight-for-height have higher gestational weight gain requirements than other pregnant women. The recommended weight gain ranges for pregnant women are shown in Table 6.1. The recommended high pregnancy weight gains for women with low prepregnancy weight may be unrealistic for many women in developing countries (Krasovec and Anderson, 1991). It is therefore important to address the health of pregnant women and improve the nutritional status of all females in order to reduce their chances of entering pregnancy in a nutritionally disadvantaged state. It should also be noted that although many pregnant women in poor countries do not gain enough weight, too much weight gain during pregnancy also carries increased health risks. Pregnant women who gain more weight than that indicated for their prepregnancy weight-for-height are more likely to deliver high birth weight babies, with resulting increased rates of prolonged labor, shoulder dystocia, caesarean delivery, and birth trauma (IOM, 1990).

Table 6.1 Recommended total weight gain ranges for pregnant women

Recommended total weight gain ranges for pregnant women, by prepregnancy body mass index (BMI)

Prepregnant weight-for-height category	Recommended total gain (kg)
Low (BMI < 19.8)	12.5-18.0
Normal (BMI of 19.8 to 26.0)	11.5-16.0
High (BMI > 26.0 to 29.0)	7.0-11.5

Source: IOM, 1990

Malnutrition in women is linked to fertility as well as food availability. Many women in the developing world have depleted nutritional stores due to improperly spaced births (Labbok, 1991; Merchant and Martorell, 1988). In less developed countries such as Zambia, a high total fertility rate (TFR), or the average number of children born per woman, is correlated with poor women's health status. Zambia's TFR is 6.1; that is, on average, a Zambian woman bears approximately 6 children during her lifetime. A TFR of this magnitude is often suggestive of severely compromised women's health status. This is reflected in high levels of nutritional and reproductive morbidity, as well as mortality (WHO, 1992a; Liljestrand et al., 1986).

Maternal sociodemographic characteristics such as education, occupation, and income are very often linked to maternal nutritional status and thus are important determinants of child health outcomes.

6.2 Data Collected

Maternal height and weight indicators were collected from women who had at least one child under 5 years of age at the time of the survey. This selection criteria produces a sample that is biased toward women who are between 20 and 34 years of age because between those ages, women are most likely to have a child under 5 years (Table 6.2). Consequently, women age 15-19 and 35-49 are underrepresented in this sample.

Table 6.2 Distribution of mothers' ages

Percent distribution of mothers' ages, Zambia 1996

Age	Percent
15-19	10.4
20-24	30.1
25-29	22.5
30-34	18.2
35-39	11.1
40-44	5.5
45-49	2.1
Total	100.0
Number of women	4,564

For the purposes of the ZDHS, women were weighed on a digital scale and weight was recorded in kilograms to the nearest 100 g. Height was measured using a standard measuring board specifically made for the survey and recorded to the nearest millimeter. A total of 4,509 women were measured for height. The total number of women measured for weight was 4,520, of whom 847 (19 percent) were pregnant or less than 2 months postpartum, 2,144 (47 percent) were lactating, and 1,529 (34 percent) were neither pregnant nor lactating at the time of survey. Since pregnancy does not affect height, height data are presented in Tables 6.3 and 6.4 for all women. Weight, however, is affected by pregnancy and by the stage of pregnancy (on which no data were collected); therefore, weight data are presented separately for nonpregnant lactating and nonlactating women (Table 6.3).

Table 6.3 Height, weight, and body mass index (BMI) of pregnant and nonpregnant mothers

Anthropometric variables	All women					
	Mean	SD	Median			
Height	158.0	6.0	158.0			
Number of women	4,509					
	Nonpregnant women					
	Lactating			Nonlactating		
	Mean	SD	Median	Mean	SD	Median
Weight (kg)	54.2	9.2	53.0	56.8	18.6	54.8
BMI	21.7	2.9	21.3	22.3	3.6	21.7
Number of women	2,138			1,526		

6.3 Indicators of Maternal Nutritional Status

To date, the assessment of nutritional status in nonpregnant women has been based on normative distributions (Krasovec and Anderson, 1991). Commonly used anthropometric references for adult women represent averages of the healthy populations studied and should not necessarily be interpreted as "ideal" or desirable for each individual.

In general, *weight* reflects current nutritional status and is often used as an indicator of overall health and nutritional status. The appropriate levels of weight at different stages of the life cycle are still unknown, however.

Unlike weight, *height* reflects past nutritional status as well as the genetic potential of the individual. It is also a measure of the cumulative effect of social and economic status over generations. No international standard exists for adult women's height; however, women whose height falls below 145 cm have been found to be at a greater risk of maternal mortality than taller women. Short stature is correlated with increased risks of miscarriage, LBW, and stillbirth (Krasovec and Anderson, 1991). Short women or women with small pelvic size are at increased risk of pregnancy complications. A young, pregnant woman may still have an immature pelvis, which can lead to cephalopelvic disproportion, a major obstetric complication that often results in prolonged obstructed labor and may ultimately result in maternal and/or infant death (Kliegman and Behrman, 1987; Liljestrand, 1985; WFPHA, 1983).

Body mass index (BMI), also known as the Quetlet Index, is weight in kilograms divided by height in meters squared (kg/m^2). Like weight and height, BMI can be used to assess women's nutritional status. It was originally developed to diagnose obesity, but James et al. (1988) have advocated its use for assessing chronic energy deficiency (CED). James et al. (1988) defined CED "as a steady state at which a person is in energy balance although at a 'cost' either in terms of risk to health or as an impairment of functions and health."

The key advantage in using BMI to assess maternal nutritional status is that it is a self-contained ratio and does not require reference tables. Data from well-nourished populations show that a normal-range maternal BMI is between 21.5 and 23.1. The upper limit for CED based on BMI is 18.5. The International Dietary Energy Consultative Group suggests that BMIs between 17.0 and 18.4 are indicative of Grade I (mild) CED, those between 16.0 and 17.0 indicate Grade II CED, and those below 16 indicate Grade III (severe) CED (James et al., 1988). A BMI of 12 is the absolute lower limit compatible with life. At the other extreme, BMI may also be used to assess overweight. Women who are 20 percent overweight have BMIs between 25.8 and 27.3, whereas those who are severely overweight (at least 40 percent overweight) have BMIs between 30.1 and 32.3. For the purpose of this analysis, overweight is defined as a BMI of at least 25.0.

Information on maternal weight, height, and BMI are available in the 1996 ZDHS; however, the maternal nutrition literature suggests the use of additional indicators of adult nutritional status. For example, mid-upper arm circumference (MUAC) may be used to screen for underweight in adults or may be used in addition to BMI to identify preferential loss of fat and protein in peripheral tissue stores (Ferro-Luzzi and James, 1996; James et al., 1994). Various cut-points can be applied to MUAC to reflect gradations in adult underweight. Huffman et al. (1994) advocate for the use of MUAC in determining maternal nutritional status because it requires little training and less-costly equipment (tape measures as opposed to scales) relative to more conventional indicators such as weight or height. Other studies have also used weight or height separately, in addition to biomarkers such as hemoglobin levels, to assess nutritional status (Huffman et al., 1985).

6.4 Height, Weight, and Body Mass Index

Table 6.4 presents the distribution of heights for all women with children under the age of 5. Only 1.2 percent of women have heights below 145 cm and thus are at an increased risk of maternal and fetal-infant mortality. The mean height in the ZDHS sample is 158 cm (Table 6.3).

Table 6.4 Distribution of mothers' height

Percent distribution of mothers' heights in centimenters, Zambia 1996

Height (cm)	Percent
< 145	1.2
145-149.9	6.7
150-154.9	21.7
155-159.9	33.2
160-164.9	24.1
165-169.9	10.3
170+	2.8
Total	100.0
Number of mothers	4,509

Table 6.3 indicates that the average weight among nonlactating women is slightly higher than that of lactating women (57 kg versus 54 kg). Differences according to lactational status are more striking when one examines weight distribution (Table 6.5). Approximately 8 percent of nonlactating mothers have weights below 45 kg, compared with 10 percent of lactating mothers. Note, however, that the two groups are very similar with respect to the proportion of women in the lowest weight category (1.3 and 1.0 kg in nonlactating and lactating women, respectively).

Table 6.5 Distribution of mother's weight and BMI

Among nonpregnant mothers with children born in the past five years, percent distribution of nonlactating mothers and percent distribution of lactating mothers, by weight and body mass index (BMI), Zambia 1996

	Nonpregnant mothers		
Indicator	Nonlactating mothers	Lactating mothers	Total
Weight (kg)			
< 40	1.3	1.0	1.1
40-44.99	6.8	8.9	8.0
45-49.99	18.3	24.2	21.7
50-54.99	24.3	26.6	25.7
55-59.99	22.0	19.2	20.4
60+	27.2	20.2	23.1
Total	100.0	100.0	100.0
Body mass index (kg/m^2)			
< 16	1.2	0.3	0.7
16-16.99	1.2	0.9	1.0
17-18.49	6.3	8.2	7.4
18.5-24.99	74.9	80.2	78.0
25-26.99	8.2	5.6	6.7
27+	8.2	4.7	6.2
Total	100.0	100.0	100.0
BMI <18.5	8.5	9.3	9.0

Since weight typically varies by height, examination of BMI may be more informative in terms of assessing women's nutritional status. Table 6.3 indicates that there is little difference between nonlactating and lactating women in terms of mean BMI (22.3 and 21.7, respectively). Table 6.5 presents the distribution of BMIs using the James et al. (1988) classification. Using a BMI less than 18.5 to denote undernutrition (CED), 9 percent of both the nonlactating and the lactating, nonpregnant Zambian women are chronic energy deficient. Using a BMI greater than or equal to 25.0 to indicate overweight, 16 percent of nonlactating mothers and 11 percent of lactating, nonpregnant Zambian women are

overweight. The vast majority (78 percent) of nonpregnant Zambian women have BMIs within the normal range of 18.5 to 24.99, although a higher percentage of lactating women fall within this category compared with nonlactating women (80 percent versus 75 percent).

Given previously documented associations between maternal background characteristics and maternal nutrition, relationships between various socioeconomic, biological, and behavioral factors and low BMI (less than 18.5) are explored in Table 6.6. The bivariate analyses identified a number of variables that have significant associations with low BMI. These variables are presented in the first column of Table 6.6 and were included in multivariate logistic regression analyses in order to determine their net effect on low BMI (CED). Odds ratios generated during the logistic regression analysis were used to estimate the net relative risks of each factor for maternal CED.

The UNICEF framework for child nutrition has been modified to create a model for maternal nutrition (Johnson-Welch, 1999). It is structured in the same hierarchical order from the basic causes such as the political and economic situation to the immediate causes of malnutrition which are inadequate food intake and disease prevalence and severity. A number of intermediate (underlying) causes such as residence, household assets, and education act through other factors to impact nutritional status. For example, residence and household income (proxied by household assets) have a direct effect on food security, which in turn impacts food intake. Fertility varies by residence, socioeconomic status, and education, which is reflected by both the number (parity) and the spacing (birth interval) of births. A biological link between child feeding behaviors and fertility also exists through lactational amenorrhea.

Socioeconomic factors such as residence and household assets are related to accessibility of health care services, which in turn affects both the prevalence and severity of disease. In addition, through the provision of adequate or inadequate water and sanitation services, residence and household assets (a proxy for income) also impact the disease environment. In a modified Johnson-Welch model on the level of underlying factors, the adapted UNICEF framework also suggests that a bidirectional relationship exists between child care and health services/environment. An unhealthy environment could require more time devoted to child care; however, the quality of child care will also affect the child's exposure to diseases. Child care quality is also affected by maternal education (a proxy for both knowledge of disease causes, prevention and appropriate hygiene practices) as well as maternal work status, primary caretaker, and the number of children under age 5 within the household.

In the present analysis, variables with significant bivariate associations with maternal CED (indicated by a BMI less than 18.5) are organized according to the nutrition framework. For each variable, the reference category is italicized.

LEVEL ONE (SOCIOECONOMIC CONTEXT)

Residence

- Region (Central, Copperbelt, Eastern, Luapula, Lusaka, Northern, North-Western, Southern, and Western)
- Urban-rural residence (*urban*, rural)

Household Structure

- Type of marriage (not married, *monogamous*, polygamous)
- Gender of head of household (*male*, female)

Household Assets

- Socioeconomic status (low, medium, *high*)
- Type of toilet facility (none/bush, *flush/latrine*)
- Source of drinking water (*piped water*, well water, surface water)
- Maternal exposure to mass media (no exposure, *exposure to one or more sources*)

Table 6.6 Prevalence and estimated net relative odds of low body mass among nonpregnant mothers by background characteristics

Percentage of nonpregnant mothers age 15 to 49 years who have low body mass and the estimated net relative odds of having low body mass by background characteristics, Zambia 1996

	BMI<18.5	
Background characteristic	Percentage with low body mass	Net relative odds
Mother's age		
15-19	10.8	
20-24	9.6	
25-29	8.1	
30-34	7.7	
35-49	9.5	
N=3805	*ns*	
Number of live births[1]		
1-2	10.0	
3-6	8.7	
7+	8.0	
N=3805	*ns*	
Region		
Central	6.4	1.0[a]
Copperbelt	7.5	1.6
Eastern	6.7	1.3
Luapula	9.3	2.2[b]
Lusaka	6.7	1.4
Northern	10.2	2.4[b]
North-Western	13.2	3.4[b]
Southern	10.5	2.5[b]
Western	18.9	5.7[b]
N=3804	*p<0.001*	
Partners occupation		
Professional	9.2	1.3[a]
Manual labor	8.2	1.2
Agricultural	9.2	1.0
Services/other	5.9	0.4[b]
N=3464	*ns*	
Media		
0 sources	10.1	
1 source	7.7	
2+ sources	8.0	
N=3806	*p<0.05*	
Number of household members		
2 to 6 members	10.0	1.4[b]
7+ members	8.1	1.0
N=3804	*p<0.05*	
Socioeconomic status		
Low	11.9	
Medium	8.4	
High	6.9	
N=3805	*p<0.001*	
Total	9.0	
R square		$R^2 = 0.09$

Note: Level of significance determined using Chi-square test
[1] All of the women included had given birth in the past five years.
[a] Total p<0.05
[b] p<0.05 compared with reference category
ns = Not significant

Husband/Partner's Education
- Husband/Partner's education (no education, *primary*, secondary+)

Woman's Education
- Mother's education (no education, *primary*, secondary+)

LEVEL TWO (INTERMEDIATE CAUSES OF MALNUTRITION), BLOCK A

Food Security
Data not available in the 1996 ZDHS

Fertility
- Parity (*1*, 2, 3, 4, 5+)
- Preceding birth interval (9-23, *24-35*, 36+ months)

Household Size
- Total number of household members (≤ 6, *7+*)
- Number of household members who are under 5 years of age (0, 1, 2, *3+*)

**NOTE: Under "Household Size," the highest groups were chosen to be reference categories because those groups (surprisingly) had the lowest rates of maternal undernutrition.*

Disease Environment
Data not available in the 1996 ZDHS

Mother's Work Status
- Mother's occupation (*not working*, professional/service, agricultural/manual)

Husband/Partner's Work Status
- Husband/partner's occupation (professional, manual, agricultural, service/other)

LEVEL TWO (INTERMEDIATE CAUSES OF MALNUTRITION), BLOCK B

Food Availability
Data not available in the 1996 ZDHS

Child Feeding Behavior
- Current lactation status (not breastfeeding, *currently breastfeeding*)

**NOTE: Despite its potential effect on fertility, frequency of breastfeeding is not included in the model because it is only documented for infants under the age of 6 months.*

Health Care Services
- BCG vaccination (no, *yes*)
- Measles vaccination (no, *yes*)
- Number of antenatal care visits (none, 1-3, *4+*)
- Antenatal care provider (doctor, *nurse/midwife*, TBA/auxiliary midwife/other, no one)
- Assistance at delivery (doctor, *nurse/midwife*, TBA, other/no one)
- Place of delivery (home, *health facility*)

Child Care

- Child's primary caretaker (respondent, *other individual*)

UNDERLYING BIOLOGICAL

Maternal Age

- Mother's age (15-19, *20-24*, 25-29, 30-34, 35-49)

LEVEL THREE (IMMEDIATE CAUSES)

Maternal Food Intake

Data not available in the 1996 ZDHS

Diseases of Mother

Data not available in the 1996 ZDHS

6.5 Maternal Chronic Energy Deficiency

Based on the multivariate analysis, the following factors are important determinants of chronic energy deficiency in Zambian women: region of residence, husband/partner's occupation, and number of members of the household (Table 6.6).

When other factors are taken into account, significant regional differences remain. The Luapula, Northern, North-Western, Southern, and Western provinces stand out as high-risk areas for maternal undernutrition. In particular, mothers of the Western province have almost six times the odds of CED, compared with mothers of the Central province. The Western province has some of the highest prevalences of children underweight and stunted as noted in Chapter 2. It is evident that long-term malnutrition has been very severe in that region.

The other two significant factors explaining maternal CED are husband/partner's occupation and number of household members. Mothers with partners who work in the professional sector (professional, clerical, and sales occupations) are 30 percent more likely to be malnourished than mothers with husband/partners who work in agriculture. The other two categories of husband/partner's occupation were not found significant. Mothers from households with less than six members are more than 40 percent more likely to suffer from CED. This could be due to larger household sizes having more resources that are shared among household members. The smaller households are found in the rural provinces of Luapula and North-Western.

The nutrition framework cites the direct indicators of socioeconomic status as determinants of maternal nutritional status. The effects of such variables (household assets, water and sanitation variables, type of roof) were not significant in the present analysis.

Unlike in Zambia, studies in Asia have generally found increasing levels of maternal undernutrition with increasing maternal age (Ahmed et al., 1998; Baqui et al., 1994). The link between maternal age and undernutrition is usually attributed to maternal depletion due to high parity. In a study in Bangladesh, Huffman et al. (1985) provided additional insight into the relationship between maternal age and undernutrition, stating that high undernutrition among older women may also reflect greater growth deficits during childhood than in younger women. Despite the purported negative effect of frequent child births on maternal nutritional status, parity was not significantly associated with maternal CED in Zambia. Findings in Zambia are similar to those observed in other sub-Saharan countries covered by the DHS. In a cross-country comparison of DHS data on maternal and child nutritional status in sub-Saharan Africa, Rutstein (1996) found that maternal BMI increased with age, although this association was not significant.

The observed lack of association between various factors and maternal CED in the present analysis is not due to the nature of their relationships to nutritional status but rather to the nature of the data. Given the cross-sectional nature of the 1996 ZDHS and the lack of data on women's dietary intake, household food security, and past nutritional and health status (particularly during childhood), the 1996 ZDHS may not sufficiently explain CED in Zambian women. It is not possible to assess the effect of past undernutrition on current nutritional status within the present study. In addition, it is not possible to address micronutrient deficiencies such as anemia without the measurement of key biomarkers such as hemoglobin levels.

6.6 Summary

Malnutrition in Zambia is not limited to children. Women of reproductive age are victims as well: 9 percent of nonpregnant Zambian women suffer from chronic energy deficiency, which poses a significant risk to their health and the health of their children. Six percent of nonpregnant Zambia women are overweight. Factors associated with maternal CED are region of residence, husband/partner's occupation, and number of household members. It is noteworthy that regions with the highest risk of child malnutrition, for example, the Western province, also have the highest risk of maternal CED. This observation underscores the link between the nutritional status of children and that of their mothers.

6.7 Recommendations

Influencing Low Birth Weights through Improved Health Status of Women of Reproductive Age

- Improve nutrition of women of reproductive age through specific programs of supplementation of their diet with iron/folic acid and the Safe Motherhood Program. Target these programs to the women in the provinces with the poorest conditions.
- Address iron/folic acid deficiency, malaria, and other infectious diseases in women. These conditions have been documented to cause anemia (which is linked low birth weight) in women of reproductive age.
- Support the Safe Motherhood and other reproductive health programs that are involved in the prevention and timely detection and treatment of sexually transmitted diseases. Given the high prevalence of STDs in Zambia (UNICEF, 1994), efforts aimed at their reduction may have a positive impact on reducing adverse pregnancy outcomes that are STD-related (e.g., low birth weight).

Family Planning

- Increase access to and utilization of family planning as a means of delaying the timing of first pregnancies and consequently, reducing the physical toll of early childbearing on women.

Information, Education, and Communication

- Strive to close the gap between knowledge and practice of prevention of HIV/AIDS and STDs. Continue to advocate and monitor contraceptive use that prevents the spread of disease.
- Continue to emphasize the positive impact of birth spacing on the livelihood of mothers and children.

Research

- Support research that derives population-based estimates of the level of anemia and other micronutrient deficiencies in women of reproductive age.
- Explore the relationship between physical activity and nutritional status in women.

CHAPTER 7

KEY RECOMMENDATIONS

Given the multidimensional nature of the nutrition problem in Zambia, the recommendations presented in this chapter have been organized into six sections: 1) food security, 2) women's welfare, 3) primary health care, 4) breastfeeding and child nutrition, 5) information, education, and communication, and 6) research

7.1 Food Security

The main thrust of any effort to improve the nutritional status of women and children in Zambia will involve improving food security.

Food Availability

- Teach farmers methods of food preservation and long-term grain storage.
- Maintain reserve food stocks at district, provincial, and national levels.
- Strengthen food supplementation programs that are means-tested and geographically targeted to women and children in need.

Economic Access to Available Food

- Improve rural infrastructure (e.g., roads, water supply, health facilities, and schools) through labor-intensive employment programs targeting food-insecure and displaced individuals.
- In urban areas where households buy and trade food rather than rely on subsistence farming, provide means of income generation through skills training or business development through micro-credit loans.

7.2 Women's Welfare

Improvements in nutrition will entail addressing all aspects of Zambian women's well-being: social, economic, and health-related.

- Given the negative relationship between low maternal education and adverse child nutritional outcomes, expand educational opportunities for females and employ mechanisms to retain girls in school through the secondary level at the minimum.
- Increase women's self-provisioning capacity by improving access to technology and other resources.
- Increase availability and accessibility of family planning methods.
- Within the National Program for Women and Children, incorporate a subdivision that addresses women's nutritional and health status beyond the purview of motherhood and reproduction.
- Intensify micronutrient supplementation programs (e.g., iron, folate, vitamin A) that target pregnant and lactating women.

7.3 Primary Health Care

Monitoring growth and nutrition status.

- Increase the practice of weighing infants at birth to identify "at-risk" infants in a timely manner, especially in rural areas.

- Given the low percentage of facility-based births, intensify training traditional birth attendants and other community health workers in growth monitoring and nutrition surveillance. Establish birth weight assessment as a normative practice among birth attendants in the community.
- Address logistical constraints in weighing children in areas with poor infrastructure, namely rural areas.

Influencing low birth weights through improved health status of women of reproductive age.

- Improve nutrition of women of reproductive age through specific programs of supplementation of their diet with iron/folic acid and the Safe Motherhood Program. Target these programs to the women in the provinces with the poorest conditions.
- Address iron/folic acid deficiency, malaria, and other infectious diseases in women. These conditions have been documented to cause anemia (which is linked to low birth weight) in women of reproductive age.
- Support the Safe Motherhood and other reproductive health programs that are involved in the prevention and timely detection and treatment of sexually transmitted diseases (STDs). Given the high prevalence of STDs in Zambia (UNICEF, 1994), efforts aimed at their reduction may have a positive impact on reducing adverse pregnancy outcomes that are STD-related (e.g., low birth weight).

Improve coverage of child survival services.

- Given the incongruity between levels of ORT knowledge and use in Zambia, intensify community outreach programs of Control of Diarrheal Diseases that a) improve community access to and acceptance of ORT and b) educate caregivers on the proper use of ORT.
- Increase access in rural communities through involvement of private practitioners, traditional healers, and traditional birth attendants in promoting ORT and diarrheal and ARI disease prevention.
- Communicate the need for increasing the amounts of liquids (for example, breast milk) and solid foods given to children during diarrheal episodes. Advocate increased feedings to continue after illness to allow catch up growth for the child.
- Strengthen the Control of Diarrheal Disease and growth-monitoring programs.
- Expand the malaria control program with education and distribution of impregnated bednets.

Priority should be given to integrating health, nutrition, and family planning services as opposed to establishing vertical programs.

- Strengthen the integrated health and nutrition approach to intervention projects with family planning, nutrition, and primary health care components.
- To address the limited access to care, improve the capabilities of small rural outposts that focus primarily on primary and secondary prevention of malnutrition and illnesses.
- Recruit and train women the community to be rural health outreach workers.
- Combine growth-monitoring with immunization services.
- Continue expansion of the rural health care infrastructure, with emphasis on the establishment of integrated "well-child" services (e.g., nutrition and immunization services) and integrated management of childhood illness.

7.4 Breastfeeding and Child Nutrition

In improving infant nutritional status, address both supply-side (health facility/provider) and demand-side (community, culture) factors.

- Continue to expand and maintain compliance of all hospitals and clinics with standards of the International Baby-Friendly Hospital Initiative.
- Expand BFHI mother support groups for breastfeeding promotion nationwide.
- Encourage breastfeeding of infants, even among malnourished women.
- Establish programs that address the needs of children orphaned by parents with AIDS.

7.5 Information, Education, and Communication

- Strive to close the gap between knowledge and practice of prevention of HIV/AIDS and STDs. Continue to advocate and monitor contraceptive use that prevents the spread of disease.
- Continue to emphasize the positive impact of birth spacing on the livelihood of mothers and children.
- Use mass media to promote ideal standards for breastfeeding, prevention, and treatment of diarrheal disease.
- Intensify public-health campaigns to promote the use of impregnated bednets to prevent malaria.

7.6 Research

Conduct both quantitative and qualitative studies to measure certain phenomena and health outcomes and to explain why those phenomena exist.

- Support research that aims to ascertain which underlying condition—preterm birth or intrauterine growth retardation—is responsible for LBW in Zambia, and plan interventions accordingly.
- Support qualitative research studies that investigate the following: factors in care-seeking, community perceptions of breastfeeding initiation, and exclusive breastfeeding duration.
- Conduct qualitative research studies to investigate factors that affect decisions about a) the early introduction of water and other liquids and b) the early introduction of complementary foods.
- Research the causes of stunting in children of the most vulnerable age of 4 to 21 months.
- Expand research and record collection on maternal child transmission of HIV/AIDS to help develop programs to reduce transmission.
- Conduct research on breastfeeding mothers on how the new BFHI guidelines for women with and without HIV/AIDS have affected the practice of exclusive breastfeeding.
- Explore the relationship between physical activity and nutritional status in women.

REFERENCES

Administrative Committee on Coordination/Subcommittee on Nutrition (ACC/SCN). 1997. *Nutrition and poverty.* ACC/SCN symposium report, Nutrition policy paper #16. Geneva, Switzerland: United Nations.

Ahmed, S.M., A. Adams, A.M.R. Chowdhury, and A. Bhuiya. 1998. Chronic energy deficiency in women from rural Bangladesh: Some socioeconomic determinants. *Journal of Biosocial Science* 30:349-358.

BASICS. 1997. Zambia integrates the nutrition minimum package into its essential health care package. *BASICS Highlights.* Washington, DC: U.S. Agency for International Development

Baqui, A.H., S.E. Arifeen, S. Amin, and R.E. Black. 1994. Levels and correlates of maternal nutritional status in urban Bangladesh. *European Journal of Clinical Nutrition* 48:349-357.

Berendes, HW. 1993. Maternal determinants of perinatal mortality and of intrauterine growth retardation and preterm delivery. In *Birth Risks* (J.D. Baum, ed.), pp. 47-56. New York: Raven Press, Ltd.

Branca, F., G. Pastore, T. Demissie, and A. Ferro-Luzzi. 1993. The nutritional impact of seasonality in children and adults of rural Ethiopia. *European Journal of Clinical Nutrition* 47:840-850.

Briend, A. 1990. Is diarrhoea a major cause of malnutrition among the under-fives in developing countries? A review of available evidence. *European Journal of Clinical Nutrition* 44:611-628.

Brown, K.H., R.Y. Stallings, H. Creed de Kanashiro, G. Lopez de Romana, and R.E. Black. 1990. Effects of common illnesses on infants' energy intakes from breast milk and other foods during longitudinal community-based studies in Huascar (Lima), Peru. *American Journal of Clinical Nutrition* 52:1005-1013.

Brozek, J., and B. Schurch. 1984. *Malnutrition and behavior: Critical assessment of key issues.* Nestle Foundation Publication Series, Vol. 4. Lausanne, Switzerland: Nestle Foundation.

Callens, K., and E.C. Phiri. 1998. *Household food security and nutrition in the Luapula Valley, Zambia.* Food Nutrition and Agriculture, No. 22. Rome, Italy: Food and Agriculture Organization.

Center for International Health Information (CIHI). 1995. *Zambia: Country health profile 1995.* CIHI Country Health Profile Series. Arlington, VA: Center for International Health Information.

Central Statistical Office (CSO) [Zambia], Ministry of Health (MOH) [Zambia], and Macro International Inc. [MI]. 1993. *Zambia Demographic and Health Survey (ZDHS) 1992.* Calverton, Maryland: Central Statistical Office (Zambia) and Macro International Inc.

Central Statistical Office (CSO) [Zambia], Ministry of Health (MOH) [Zambia] and Macro International Inc. (MI). 1997. *Zambia Demographic and Health Survey (ZDHS) 1996.* Calverton, Maryland: Central Statistical Office (Zambia) and Macro International Inc.

Clemens, J.D. and B.F. Stanton. 1987. An educational intervention for altering water-sanitation behaviors to reduce childhood diarrhea in urban Bangladesh. 1. Application of the case-control method for development of an intervention. *American Journal of Epidemiology* 125(2):284-291.

PREVIOUS PAGE BLANK

Cohen, R.J., K.H. Brown, J. Cnahuait, L.L. Rivera, and K.G. Dewey. 1994. Effect of age of introduction of complementary foods on infant breastmilk intake, total energy intake, and growth: a randomized intervention study in Honduras. *Lancet* 334(8918):288-293.

Daga, S.R., Daga, A.S., Dighole, R.V., and R.P. Patil. 1993. Anganwadi worker's participation in rural newborn care. *Indian Journal of Pediatrics* 60:627-630.

de Carvalho, M., S. Robertson, A. Friedman, and M. Klaus. 1983. Effect of frequent breastfeeding on early milk production and infant weight gain. *Pediatrics* 72(3):307-311.

Dickin, K.L., K.H. Brown, D. Fagbule, M. Adedoyin, J. Gittlesohn, S.A. Esrey, and G.A. Oni. 1990. Effect of diarrhoea on dietary intake by infants and young children in rural villages of Kwara State, Nigeria. *European Journal of Clinical Nutrition* 44(4):307-317.

Economist Intelligence Unit (EIU). 1998. Country reports—Zambia. (http://www.eiu.com/)

El Samani, E.F.Z., W.C. Willett, and J.H. Ware. 1988. Association of malnutrition and diarrhea in children aged under five years. *American Journal of Epidemiology* 128(1):93-105.

Esrey, S.A., R.G. Feachem, and J.M. Hughes. 1985. Interventions for the control of diarrheal diseases among young children: Improving water supplies and excreta disposal facilities. *Bulletin of the World Health Organization* 63(4):757-772.

Ferro-Luzzi, A., and W.P.T. James. 1996. Adult malnutrition: Simple assessment techniques for use in emergencies. *British Journal of Nutrition* 75:3-10.

Fletcher P.D., D.T. Simeon, and S.M. Grantham-McGregor. 1992. Risk indicators of childhood undernutrition in Kingston, Jamaica. *Transcripts of the Royal Society of Tropical Medicine and Hygiene* 86(5):566-9.

Foster, G. 1998. Today's children--challenges to child health promotion in countries with severe AIDS epidemics. *AIDS Care* 10(Suppl 1):S17-23.

Fylkesnes, K., Z. Ndhlovun, R. Musonda, and M. Sichone. 1998. Studying dynamics of HIV epidemic: Population-based data compared with sentinel surveillance in Zambia. *AIDS* 12:1227-1234.

Gernaat, H.,W. Dechering, and H. Voorhoeve. 1996. Physical growth of children under five years of age in Nchelenge, Zambia: Results from a district survey. *American Journal of Physical Anthropology* 100:473-485.

Habicht, J.P., R. Martorell, C. Yarbrough, R.M. Malina, and R.E. Klein. 1974. Height and weight standards for preschool children. How relevant are ethnic differences in growth potential? *Lancet* 1(858):611-614.

Haggerty, P.A., K. Muladi, B.R. Kirkwood, A. Ashworth, and M.N. Mannu'Ebo. 1994a. Community-based hygiene education to reduce diarrheal disease in rural Zaire: Impact of the intervention on diarrheal morbidity. *International Journal of Epidemiology* 23(5):1050-1059.

Haggerty, P.A., M.N. Mannu'Ebo, A. Ashworth, K. Muladi, and B.R. Kirkwood. 1994b. Methodological approaches in a baseline study of diarrheal morbidity in weaning-age children in rural Zaire. *International Journal of Epidemiology* 23(5):1040-1049.

Hautvast, J.L., L.J. van der Heijden, A.K. Luneta, W.A. van Staveren, J.J. Tolboom, and S.M. van Gastel. 1999. Food consumption of young stunted and non-stunted children in rural Zambia. *European Journal of Clinical Nutrition* 53(1):50-9.

Hosmer, D., and S. Lemeshow. 1989. *Applied logistic regression*. New York: John Wiley and Sons.

Hoyle, B., M. Yunus, and L.C. Chen. 1980. Breastfeeding and food intake among children with acute diarrheal disease. *American Journal of Clinical Nutrition* 33(11):2365-2371.

Huffman, S.L., M. Wolff, and S. Lowell. 1985. Nutrition and fertility in Bangladesh: Nutritional status of nonpregnant women. *American Journal of Clinical Nutrition* 42:725-738.

Huffman, S.L., and C. Combest. 1990. Role of breastfeeding in the prevention and treatment of diarrhea. *Journal of Diarrheal Disease Research* 8(3):68-81.

Huffman, S.L. 1991. Maternal malnutrition and breastfeeding: Is there really a choice for policy makers? *Journal of Tropical Pediatrics* 37(Suppl):19-22.

Huffman, S.L., and L. Martin. 1994. Child nutrition, birth spacing, and child mortality. *Annals of The New York Academy of Sciences* 709:236-48

Hunt, Simon, Chongo Kaite, Peter Kasonde, and Fiona Campbell. 1992. *The nutrition and food security analysis of Zambia: Priority survey I.* Lusaka, Zambia: The Study Fund of the Social Recovery Project, World Bank.

Hytten, F.E. 1980. Nutrition. In *Clinical physiology in obstetrics*, ed. F.E. Hytten and G. Chamberlain. Oxford, England: Blackwell Scientific Publications. 163-192.

Institute of Medicine (IOM). 1990. *Nutrition during pregnancy*. Washington, D.C.: National Academy Press.

Institute of Medicine (IOM), Committee to Study the Prevention of Low Birthweight. 1985. *Preventing low birthweight*. Washington, D.C.: National Academy Press.

Islam, M.A., M.M. Rahman, and D. Mahalanabis. 1994. Maternal and socioeconomic factors and the risk of severe malnutrition in a child: A case-control study. *European Journal of Clinical Nutrition* 48:416-424.

James, W.P.T., G.C.N. Mascie-Taylor, N.G. Norgan, B.R. Bistrian, P.S. Shetty, and A. Ferro-Luzzi. 1994. The value of arm circumference measurements in assessing chronic energy deficiency in Third World adults. *European Journal of Clinical Nutrition* 48:883-894.

James, W.P.T., A. Ferro-Luzzi, and J.C. Waterlow. 1988. Definition of chronic energy deficiency in adults: Report of a working party of the International Dietary Energy Consultative Group. *European Journal of Clinical Nutrition* 42: 969-981.

Jamison, D.T. 1993. Disease control priorities in developing countries: An overview. In *Disease control priorities in developing countries*, ed. D.T. Jamison, W.H. Mosley, A.R. Measham, and J.L. Bobadilla. New York: Oxford University Press.

Johnson-Welch, Charlotte. 1999. *Focusing on women works: Research on improving micronutrient status through food-based interventions.* ICRW/OMNI Research Program—Synthesis Paper.

Jonsson, U. 1995. Ethics and child nutrition. *Food and Nutrition Bulletin* 16(4):293-298.

Kessel, E., S. Sastrawinata, and S.D. Mumford. 1985. Correlates of fetal growth and survival. *Acta Paediatrica Scandinavica,* 319:(suppl) 120-127.

Kliegman, R.M. and R.E. Behrman. 1987. High risk pregnancies. In *Nelson textbook of pediatrics, 13th Edition*, ed. R.E. Behrman and V.C. Vaughan, pp. 365-367. Philadelphia, PA: W.B. Saunders.

Kramer, S. 1987. Intrauterine growth and gestational duration determinants. *Pediatrics* 80(4):502-511.

Krasovec, K. 1991. The implications of poor maternal nutrition status during pregnancy for future lactational performance. *Journal of Tropical Pediatrics* 37: Suppl 3-10.

Krasovec, K. and M. Anderson. 1991. *Maternal nutrition and pregnancy outcomes: Anthropometric assessment.* PAHO Scientific Publications No. 259, Washington, D.C.: Pan American Health Organization.

Kumar, Shubh, Chongo Kaite, Peter Kasonde, and Mutinta Hambaye. 1995. *The nutrition and food security analysis of Zambia: Priority survey II.* Lusaka, Zambia: The Study Fund of the Social Recovery Project, World Bank.

Labbok, M.H. 1991. Breastfeeding and borderline malnutrition in women. *Journal of Tropical Pediatrics* 37: Suppl. 23-24.

Labbok, M., R. Pérez-Escamilla, A. Peterson, and S. Coly. 1997. *Breastfeeding and child spacing country profiles.* Washington, DC: Institute for Reproductive Health.

Liljestrand, J., S. Bergstrom, and S. Westman. 1985. Maternal height and perinatal outcome in Mozambique. *Journal of Tropical Pediatrics* (6): 306-310.

Liljestrand, J., S. Bergstrom, and G. Birgegard. 1986. Anaemia of pregnancy in Mozambique. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 80(2): 249-55.

Llewelyn-Jones, D. 1965. Severe anaemia in pregnancy (as seen in Kuala Lumpur, Malaysia). *The Australian and New Zealand Journal of Obstetrics and Gynaecology* 5:191-197.

Luo, C., C.M. Mwela, and J. Campbell. 1997. *National baseline survey on prevalence of vitamin A deficiency in Zambia.* Lusaka, Zambia: University Teaching Hospital.

Luo, C., C.M. Mwela, and J. Campbell. 1999. *National baseline survey on prevalence of anemia in Zambia: A random cluster community survey involving children, women, and men.* Lusaka, Zambia: University Teaching Hospital.

Lutter, C.K., J.O. Mora, J.P. Habicht, K.M. Rasmussen, D.S. Robson, S.G. Sellers, C. Super, and M.G. Herrera. 1989. Nutritional supplementation: Effects on child stunting because of diarrhea. *American Journal of Clinical Nutrition* 50(1):1-8.

Martorell, R., J.P. Habicht., C. Yarbrough, A. Lechtig, and R.E. Klein. 1976. Underreporting in fortnightly recall morbidity surveys. *Journal of Tropical Pediatric Environmental Child Health* 22(3):129-134.

Mavalankar, D.V., R.H. Gray, and C.R. Trived. 1992. Risk factors for preterm and term low birthweight in Ahmedabad, India. *International Journal of Epidemiology* 21(2):263-272.

Merchant, K.M., R. Martorell, and J.D. Haas. 1991. Nutritional adjustments in response to reproductive stresses within Guatemalan women. *Journal of Tropical Pediatrics* 37: Suppl. 11-22.

Merchant, K., and R. Martorell. 1988. Frequent reproductive cycling: Does it lead to nutritional depletion of mothers? *Progress in Food and Nutrition Science* 12:339-369.

Mock, N.B., T.A. Sellers, A.A. Abdoh, and R.R. Franklin. 1993. Socioeconomic, environmental, demographic, and behavioral factors associated with occurrence of diarrhea in young children in the Republic of Congo. *Social Science and Medicine* 36(6):807-816.

Molbak, K., H. Jensen, L. Ingholt, and P. Aaby. 1997. Risk factors for diarrheal disease incidence in early childhood: A community cohort study from Guinea-Bissau. *American Journal of Epidemiology* 146(3):273-282.

Molla, A., A.M. Molla, S.A. Sarker, and M. Khatun. 1983. Whole-gut transit time and its relationship to absorption of macronutrients during diarrhea and after recovery. *Scandinavian Journal of Gastroenterology* 18:537-543.

Moore, M., and M. Favin. 1990. *Behavioral determinants of maternal health care choices in developing countries.* MotherCare Working Paper No. 2. Arlington, Virginia: MotherCare/JSI.

Ng'andu, N.H., and K.S. Baboo. 1990. The significance of socio-cultural factors in child malnutrition in urban Zambia. *Journal of Tropical Pediatrics* 36(4): 201-203.

Ng'andu, N.H., and T.E. Watts. 1990. Child growth and duration of breast feeding in urban Zambia. *Journal of Epidemiology and Community Health* 44: 281-285.

Ng'andu, N.H., B.M. Nkowane, and T.E. Watts. 1991. The health status of rural primary schoolchildren in Central Zambia. *Journal of Tropical Medicine and Hygiene* 94: 169-174.

Ngare, D.K. and J.N. Muttunga. 1999. Prevalence of malnutrition in Kenya. *East African Medical Journal* 76(7):376-80.

Nsemukila, Geoffrey. 1994. *Maternal and childhood mortality in Zambia: Determinants and trends 1965-1992.* Lusaka, Zambia: UNICEF-Zambia.

Olinto, Maria Teresa, C. Gomes Victora, F. C. Barros, and D. Petrucci Gigante. 1995. Twenty-four-hour recall overestimates the dietary intake of malnourished children. *American Journal of Nutrition* 125(4):880-884.

Pelletier, D.L., E.A. Frongillo, and J.P. Habicht. 1994. Epidemiologic evidence for a potentiating effect of malnutrition on child mortality. *American Journal of Public Health* 83:1130-1133.

Perez-Escamilla, R., S. Segura-Millan, J. Canahuati, and H. Allen. 1996. Prelacteal feeds are negatively associated with breastfeeding outcomes in Honduras. *Journal of Nutrition* 126(11):2765-73.

Piwoz, Ellen G., H. Creed de Kanashiro, G. Lopez de Romaña, R. E. Black, and K. B. Brown. 1994. Potential for misclassification of infants' usual feeding practices using 24-hour dietary assessment methods. *Journal of Nutrition* 125: 57-65.

Rahaman, M.M., and M.A. Wahed. 1983. Direct nutrient loss and diarrhea. In *Diarrhea and malnutrition: Interactions, mechanisms, and interventions*, ed. L.C. Chen and N.S. Scrimshaw. New York: Plenum Press. 155-160.

Righard, L., and M.O. Alade. 1990. Effect of delivery room routines on success of first breast-feed. *Lancet* 336(8723):1105-1107.

Riley, B., G. Eele, A. Morton, and M. Wang. 1996. *Towards improved food security in Zambia.*, Lusaka, Zambia: World Bank.

Root, G.P. 1997. Evidence of malnutrition having a threshold effect on the risk of childhood diarrhea in Zimbabwe. *Central African Journal of Medicine* 43(7):185-8

Rosenberg, I.H., N.W. Solomons, and R.E. Schneider. 1977. Malabsorption association with diarrhea and intestinal infections. *American Journal of Clinical Nutrition* 30:1248-1253.

Rutstein, S. 1996. *Factors influencing the nutritional status of mothers and children in sub-Saharan Africa: An analytical report based on the Demographic and Health Surveys.* Calverton, MD: Macro International Inc.

Sachdev, H.P.S., J. Krishna, R.K. Puri, L. Satyanarayana, and S. Kumar. 1991. Water supplementation in exclusively breastfed infants during summer in the tropics. *Lancet* 337(8747):929-933.

Sachs, J. 1999. Helping the poorest. *The Economist.* August 14-20. p. 27-30.

Sanghvi, T. 1997. *Strategy for technical interventions for nutrition components of health.* Washington, DC: BASICS.

Scrimshaw, N.S., C.E. Taylor, and J.E. Gordon. 1968. *Interaction of nutrition and infection.* World Health Organization Monograph Series, No. 57. Geneva: World Health Organization.

Smith, Lisa C. and Lawrence Haddad. 2000. Overcoming child malnutrition in developing countries—Past achievements and future choices. International Food Policy Research Institute, Discussion Paper, February.

Steel, A. 1997. *Nutrition components of health: The need for improved nutrition counseling at the health center in Zambia.* Washington, DC: BASICS.

Stewart, M.K., C.K. Stanton, and O. Ahmed. 1997. *Maternal health care.* Demographic and Health Surveys Comparative Studies, No. 25. Calverton, MD: Macro International Inc.

Thonneau, P., B. Toure, P. Cantrelle, T.M. Barry, and E. Papiernik. 1992. Risk factors for maternal mortality: Results of a case-control study conducted in Conakry (Guinea). *International Journal of Gynaecological Obstetrics* 39(2):87-92.

UNICEF. 1990. *Strategy for improved nutrition of children and women in developing countries*. New York: UNICEF.

UNICEF. 1994. *Safe motherhood in Zambia: A situation analysis.* Lusaka, Zambia: UNICEF.

UNICEF. 1998. *The state of the world's children 1999.* New York: UNICEF.

UNICEF. 1999. *Baby-friendly hospital initiative: Case studies and progress report.* New York: UNICEF Programme Division.

UNICEF and World Health Organization (WHO). 1992. *Low birth weight: A tabulation of available information.* Geneva: WHO.

United Nations Development Program (UNDP). 1996 Trends in economic performance. In *Human Development Report.* New York: Oxford University Press.

Victora, C.G., S.R. Huttly, S.C. Fuchs, and M.T.A. Olinto. 1997. The role of conceptual frameworks in epidemiological analysis: A hierarchical approach. *International Journal of Epidemiology* 26(1):224-227.

Victora, C.G., J.P. Vaughan, C. Lombardi, S.M. Fuchs, L.P. Gigante, P.G. Smith, L.C. Nobre, A.M. Teixeira, L.B. Moreira, and F.C. Barros. 1987. Evidence for protection by breastfeeding against infant deaths from infectious diseases in Brazil. *Lancet* 2(8554):319-322.

Villar, J. and J.M. Belizan. 1982. The relative contribution of prematurity and fetal growth retardation to low birth weight in developing and developed countries. *American Journal of Obstetrics and Gynecology* 143:793.

World Bank. 1993. *World development report 1993.* New York: Oxford University Press.

World Federation of Public Health Associations (WFPHA). 1983. *Maternal nutrition: Information for action resource guide*. Prepared by UNICEF. Washington, D.C.: American Public Health Association.

World Health Organization (WHO). 1979. *A guideline for the measurement of nutritional impact of supplementary feeding programs aimed at vulnerable groups*. Geneva: World Health Organization.

World Health Organization (WHO). 1991. *Maternal and perinatal infections: Report of a WHO Consultation*. Geneva: World Health Organization.

World Health Organization (WHO). 1992a. *The prevalence of anemia in women: A tabulation of available information*. Geneva: WHO.

World Health Organization (WHO) 1992b. *Low birth weight: A tabulation of available information.* Geneva: WHO.

World Health Organization (World Health Assembly). 1994. Infant and child nutrition. Resolution 47.5 of the 47th World Health Assembly, Geneva, 9 May 1994. Geneva: World Health Organization.

World Health Organization (World Health Assembly). 1994. Infant and child nutrition. Resolution 47.5 of the 47th World Health Assembly, Geneva, 9 May 1994. Geneva: World Health Organization.

World Health Organization (WHO). 1996. *Perinatal mortality: A listing of available information.* Geneva: WHO.

World Health Organization (WHO) and UNICEF. 1990. Meeting on Breastfeeding in the 1990s: A Global Initiative. Innocenti Declaration on the Protection, Promotion, and Support of Breastfeeding. Florence, Italy, 1 August, 1990. New York: UNICEF.

APPENDIX A

SAMPLE DESIGN

APPENDIX A

SAMPLE DESIGN

The ZDHS was carried out in Zambia's nine provinces: Central, Copperbelt, Eastern, Luapula, Lusaka, Northern, North-Western, Southern and Western provinces. The ZDHS sample was designed to be representative on the national, provincial, and rural-urban level. From Census information, the country was divided into census supervisory areas (CSAs). Each CSA was divided into standard enumeration areas (SEAs) of approximately equal size. The sample selection was carried out in three stages. In the first stage, primary sampling units were selected with the probability proportional to the size of the area. In the second stage, one SEA was selected from the CSA again with the probability proportional to the size. The listing of households in each selected CSA was used as the frame to randomly select households for the last stage.

The nine sample regions were divided into 18 strata by dividing each sample region into rural and urban. Of the 309 enumeration areas selected, 138 were located in the urban areas, and 171 were in the rural areas. The third-stage sample of households consisted of about 20 to 25 randomly selected households in urban areas and 30 to 35 randomly selected households in rural areas. For all selected households, all household members were listed in the household questionnaire, and all women between the ages of 15 to 49 were identified and interviewed using the detailed woman's questionnaire.

A total of 8,016 households were selected, of which 7,923 were identified at the time of the survey. From the households identified, a total of 7,287 households were successfully interviewed, yielding a household response rate of 90.9 percent. The survey identified 8,298 eligible women, of whom 8,024 were successfully interviewed, yielding an individual woman response rate of 96.7 percent.

Mortality data were collected for all children born to the woman interviewed, and health and immunization data were collected for 7,159 children born since January 1991 (age 0-59 months) to women interviewed. Questions on recent morbidity, nutrition, and health care data were completed for 6,109 surviving children; these questions included breastfeeding history, feeding patterns, and the occurrence and treatment of diarrhea, fever, and cough in the two weeks preceding the survey. This report is based on the subsample of 5,443 living children for whom complete anthropometric data are available.

PREVIOUS PAGE BLANK

APPENDIX B

HOUSEHOLD AND RESPONDENT BACKGROUND CHARACTERISTICS

PREVIOUS PAGE BLANK

APPENDIX B

HOUSEHOLD AND RESPONDENT BACKGROUND CHARACTERISTICS

A total of 5,443 living children under the age of 5 years who had complete anthropometric data were included in the analyses presented in Chapters 2 through 5 of this report. Unless noted otherwise, the tables in this appendix show the distribution of all children within the sample by various background characteristics, according to region and residence.

As seen in Table B.1, almost two-thirds of children resided in rural areas. Only the two provinces of Lusaka and Copperbelt have a majority of urban population. The remaining provinces are predominantly rural. Among primarily rural provinces, Eastern province has the lowest proportion of urban residents (9 percent).

Table B.2 shows the sex distribution and total number of children with complete anthropometry. On average, three-quarters of all children had complete anthropometry. The Western province had the lowest percentage of children with complete measurements (71 percent). Generally there was an equal distribution of male and female children with complete anthropometry in all regions.

There was a slightly higher number of rural children living at home than urban children living at home at the time of the survey (3.1 to 3.0 children per household, respectively) (Table B.3[1]). In the total sample, there is an average of 3.0 children ever born. Regionally, Lusaka and Western provinces had the lowest number of children ever born (on average, 3.8 per woman). North-Western and Southern provinces have the lowest number of children to die (0.5 and 0.6 dead children per woman, respectively), while Luapula had the highest average number of children ever born (4.7) and the highest average number of dead children (1.1).

Table B.4 shows the distribution of children by mother's age. Overall, there were fewer children with very young mothers (15-19 years old) relative to other maternal age groups. Over half of all children had mothers from the two groups of age 20-24 and 25-29.

Fourteen percent of all mothers had no formal education (Table B.5). The vast majority (64 percent) of educated mothers were primary-school-educated. Not surprisingly, urban mothers were significantly more educated than rural mothers; almost one-fifth of rural mothers were uneducated, compared with only 6 percent of urban mothers. Central province had the highest proportion of educated mothers; 94 percent had a primary or higher education. In contrast, more than 30 percent of all mothers in Eastern province had no formal education—the highest proportions in the country.

As indicated in Table B.6, 47 percent of all mothers were not working at the time of the interview. There is no real difference in maternal unemployment between urban areas and rural areas. Urban areas had a significantly higher proportion of mothers in the professional sector. This was most evident in Lusaka and Copperbelt provinces, where 40 percent of mothers were professionals. Not surprisingly, a higher proportion of rural mothers were in the agricultural sector, compared with urban mothers (34 versus 3 percent). Only in North-Western province did more than 10 percent of mothers work as manual laborers.

[1] Unlike all the other tables in this appendix, Table B.3 includes all children under 5 years of age, regardless of whether they are currently dead or living and whether or not they have complete anthropometric data.

PREVIOUS PAGE BLANK

Table B.7 shows that more than three-quarters of mothers took care of their children themselves, with friends or institutions being the next most common caretakers (10 percent). Significant urban-rural and regional differences exist. Eighty percent of rural children had their mothers as the main caretakers versus 73 percent in urban areas. In contrast, 23 percent of rural children in Luapula province had other friends or institutions as the primary caretakers. Generally speaking, there is little reliance on children or other relatives as caretakers in Zambia; less than 3 percent of all children received childcare from those sources (Table B.7).

Table B.8 shows the distribution of children by the sex of the household head. Most children resided in male-headed households (84 percent), although a significantly larger proportion of rural than urban children had female heads of households (17 versus 15 percent). This proportion was highest in the Western province; where close to 30 percent of children came from female-headed households. Northern province had the highest proportion of children from male-headed households (85 percent).

As shown in Table B.9, 83 percent of children's mothers were married. Eighty-seven percent of mothers in Eastern province were married—the highest proportion in the country. Urban areas had a slightly higher proportion of never-married mothers than rural areas (6 versus 4 percent). This percentage was highest in Western province (18 percent) and lowest in Luapula (2 percent).

With respect to partner's education, only 7 percent of mothers' partners were uneducated, although significant urban-rural and regional differences exist (Table B.10). Two percent of urban partners, compared with 11 percent of rural partners were uneducated. Copperbelt and Lusaka provinces had the lowest percentage of uneducated partners (3 percent) and the highest proportion of secondary-school-educated partners (71 and 63 percent, respectively). Urban areas had significantly greater proportions of children whose mothers' partner was secondary-school-educated (72 percent) than rural areas (30 percent).

In terms of partner's occupation, Table B.11 shows that less than 1 percent of all partners were unemployed, although this proportion is highest in North-Western province (3 percent). The majority of partners (47 percent) worked in the agricultural sector. As expected, rural areas had a significantly higher proportion of agricultural workers than urban areas (73 versus 6 percent). Manual work was more common in urban than in rural areas (44 versus 11 percent).

Tables B.12 and B.13 show the distributions of children by the water and sanitation facilities in their households. More than 27 percent of children lived in households with no toilet facilities (Table B.12). Only 53 percent had access to latrines and about 20 percent had access to flush toilets. There were marked regional differences: almost 90 percent of children in the North-Western province had access to latrines, whereas only 19 percent of children in the Southern province had such access. The Copperbelt province also had the highest proportion of children with access to flush toilets (61 percent). In terms of sources of drinking water, slightly more than one-third of children lived in households with piped water facilities, 47 percent drank well water, and 16 percent drank surface water (Table B.13). A significantly higher proportion of urban children had piped water facilities (79 percent), compared with rural children (8 percent). The vast majority of children in the Copperbelt province (82 percent) drank piped water, whereas only 8 percent of children from Luapula drank piped water. More than one-third of children in the Northern and Southern provinces drank surface water.

The percent distribution of children by the type of floor in the household loosely mirrors that of drinking water facilities. Eighty-five percent of children in the Copperbelt and Lusaka provinces and 15 percent of children in the Eastern and Western provinces lived in homes with finished floors (Table B.14). Significant rural-urban differences exist: five times as many rural children as urban children had natural floors, with the highest percentages in Eastern, Western, and Luapula provinces. Natural floors are found in almost two-thirds of homes (Table B.14).

Table B.15 shows the distribution of children by their mother's exposure to mass media such as radio, television, and newspaper. The mothers of 35 percent of children listened to the radio daily, 24 percent watched television weekly, and 20 percent read the newspaper weekly. Frequent exposure to radio, television, and newspapers was, not surprisingly, much more common in urban than in rural areas and in the Copperbelt and Lusaka provinces, compared with any other province. Regional differences were marked, particularly in terms of television exposure. The proportion of urban women who watched television regularly was almost 11 times higher than that of rural women (Table B.15).

The distribution of children according to household socioeconomic status is described in Tables B.16. There are almost two times as many children in the medium socioeconomic status compared with low socioeconomic status (52 versus 28 percent); only 21 percent of children were from high socioeconomic backgrounds. Significant urban-rural and regional differences exist, particularly for the extremes of socioeconomic status. For example, a higher proportion of rural children than urban children were poor (41 versus 7 percent), whereas the reverse exists for the most privileged group. Only 3 percent of rural children compared with 46 percent of urban children come from high socioeconomic backgrounds. The highest proportion—at least one half of all children—in high socioeconomic backgrounds reside in the Copperbelt and Lusaka provinces.

Tables B.17 and B.18 show the distribution of children by their mother's access to health services for antenatal and delivery care. Only four percent of children were born to mothers who had no recognized antenatal care provider (Table B.17). More rural than urban mothers sought no antenatal care (6 versus 1 percent), with the highest proportion in the Northern province (12 percent). Ninety-three percent of mothers saw a nurse or midwife during the antenatal period. Overall, only 3 percent saw a doctor and less than 1 percent saw a TBA/auxiliary midwife. Five percent of children in the Central, Copperbelt, and Lusaka provinces had mothers who received antenatal care from a doctor.

Doctor-assisted deliveries are rare in Zambia. Overall, 4 percent of all mothers sought delivery care from doctors (Table B.18). Rates are significantly higher in urban than in rural areas (8 compared with 1 percent), however, with the highest rate in Lusaka (10 percent). Note, that 43 percent of all births were delivered by nurses or midwives, with almost two-thirds of births in the Copperbelt and Lusaka provinces being delivered by nurses or midwives. Urban areas, in general, had a higher percentage than rural areas (70 versus 25 percent). The proportion of rural babies delivered by other individuals or no one at all was significantly higher than the proportion among urban babies (66 versus 21 percent). Only 5 percent of all babies in the sample were delivered by TBAs.

Table B.1 Distribution of children by residence

Percent distribution of children under five years of age by urban-rural residence, according to region, Zambia 1996

Region	Residence			Number of children
	Urban	Rural	Total	
Central	34.6	65.4	100.0	587
Copperbelt	84.1	15.9	100.0	1,347
Eastern	9.3	90.7	100.0	1,103
Luapula	18.3	81.7	100.0	671
Lusaka	86.0	14.0	100.0	1,076
Northern	12.2	87.8	100.0	863
North-Western	18.2	81.8	100.0	287
Southern	18.9	81.1	100.0	764
Western	15.1	84.9	100.0	460
		p<0.001		
Total	39.9	60.1	100.0	7,159

Note: Level of significance determined using Chi-square test

Table B.2 Anthropometric measurement of children

Percentage of children under five years old for whom complete anthropometric data are present, and percent distribution of these children by sex, according to residence and region, Zambia 1996

Residence and region	Complete anthropometric data	Complete anthropometric data			Number of children
		Male	Female	Total	
Residence					
Urban	75.5	49.6	50.4	100.0	2,159
Rural	76.4	48.6	51.4	100.0	3,284
		ns			
Region					
Central	77.9	47.9	52.1	100.0	458
Copperbelt	78.0	50.1	49.9	100.0	1,051
Eastern	78.5	48.8	51.2	100.0	866
Luapula	74.2	47.7	52.3	100.0	498
Lusaka	73.1	50.6	49.4	100.0	786
Northern	77.7	46.0	54.0	100.0	671
North-Western	77.8	48.9	51.1	100.0	224
Southern	73.8	50.2	49.8	100.0	564
Western	70.9	49.4	50.6	100.0	326
		p<0.01			
Total	76.0	49.0	51.0	100.0	5,443

Note: Level of significance determined using Chi-square test
ns = not significant

Table B.3 Mean number of living and dead children

Among women with children less than five years of age, the mean number of children living at home, the mean number of dead children per mother, the mean total number of children ever born, and the standard deviation (SD) of each mean, by residence and region, Zambia 1996

Residence and region	Children at home		Dead children		Children ever born		Number of children
	Mean	SD	Mean	SD	Mean	SD	
Residence							
Urban	3.0	0.04	0.7	0.02	3.9	0.05	2,858
Rural	3.1	0.03	0.9	0.02	4.4	0.04	4,301
ANOVA		*p<0.01*		*p<0.001*		*p<0.001*	
Region							
Central	3.1	0.08	0.7	0.04	4.2	0.11	587
Copperbelt	3.1	0.06	0.7	0.03	4.0	0.07	1,347
Eastern	3.1	0.05	1.0	0.04	4.5	0.08	1,103
Luapula	3.1	0.08	1.1	0.05	4.7	0.11	671
Lusaka	2.8	0.06	0.7	0.03	3.8	0.07	1,076
Northern	3.3	0.07	0.9	0 04	4.4	0.09	863
North-western	2.7	0.10	0.5	0.05	4.0	0.14	287
Southern	3.0	0.07	0.6	0.03	4.2	0.09	764
Western	2.6	0.09	0.7	0.05	3.8	0.12	460
ANOVA		*p<0.001*		*p<0.001*		*p<0.001*	
Total	3.0	0.02	0.8	0.01	4.2	0.03	7,159

Note: Level of significance determined using Chi-square test

Table B.4 Mother's age

Percent distribution of children under five years of age by mother's age, according to residence and region, Zambia 1996

Residence and region	Mother's age in years						Number of children
	15-19	20-24	25-29	30-34	35-49	Total	
Residence							
Urban	7.6	30.8	26.9	19.1	15.6	100.0	2,858
Rural	7.8	31.8	22.8	18.8	18.7	100.0	4,301
			p<0.001				
Region							
Central	7.8	30.1	23.1	19.8	19.3	100.0	587
Copperbelt	8.2	31.7	25.0	19.6	15.6	100.0	1,347
Eastern	7.3	30.4	24.7	18.7	18.9	100.0	1,103
Luapula	5.8	31.3	23.0	19.7	20.2	100.0	671
Lusaka	7.6	31.6	27.7	18.0	15.1	100.0	1,076
Northern	7.8	32.3	21.3	18.5	20.0	100.0	863
North-Western	6.9	32.5	27.9	20.2	12.5	100.0	287
Southern	7.9	31.6	26.1	20.1	14.2	100.0	764
Western	11.1	31.9	19.3	15.6	22.1	100.0	460
			p<0.001				
Total	7.8	31.4	24.4	18.9	17.5	100.0	7,159

Note: Level of significance determined using Chi-square test

Table B.5 Mother's education

Percent distribution of children under five years of age, by level of mother's education, according to residence and region, Zambia 1996

Residence and region	Mother's education				Number of children
	No education	Primary	Secondary +	Total	
Residence					
Urban	5.7	55.9	38.4	100.0	2,858
Rural	19.1	69.9	11.0	100.0	4,300
		p<0.001			
Region					
Central	6.3	68.7	25.0	100.0	586
Copperbelt	7.6	55.7	36.6	100.0	1,347
Eastern	30.8	60.8	8.4	100.0	1,103
Luapula	16.0	70.3	13.8	100.0	671
Lusaka	7.7	58.9	33.4	100.0	1,076
Northern	10.7	74.8	14.5	100.0	863
North-Western	19.1	64.7	16.2	100.0	287
Southern	10.6	71.6	17.8	100.0	764
Western	18.3	64.4	17.3	100.0	460
		p<0.001			
Total	13.7	64.3	22.0	100.0	7,158

Note: Level of significance determined using Chi-square test

Table B.6 Mother's occupation

Percent distribution of children under five years of age by mother's occupation category, according to residence and region, Zambia 1996

Residence and region	Mother's occupation					Number of children
	Not working	Professional/ Services	Manual labor	Agricultural	Total	
Residence						
Urban	46.0	44.8	6.7	2.5	100.0	2,858
Rural	47.5	13.3	5.5	33.7	100.0	4,297
			p<0.001			
Region						
Central	40.4	28.8	4.8	26.0	100.0	587
Copperbelt	53.1	40.0	5.7	1.2	100.0	1,347
Eastern	71.0	9.1	8.6	11.4	100.0	1,101
Luapula	21.6	16.8	2.5	59.1	100.0	671
Lusaka	50.8	40.1	6.2	3.0	100.0	1,076
Northern	27.2	19.3	4.7	48.8	100.0	862
North-Western	18.8	19.7	16.0	45.4	100.0	287
Southern	63.1	26.4	4.6	5.8	100.0	763
Western	34.6	16.3	5.0	44.1	100.0	460
			p<0.001			
Total	46.9	25.9	6.0	21.3	100.0	7,155

Note: Level of significance determined using Chi-square test

Table B.7 Usual caretaker of children of women working outside the home

Percent distribution of children under five years of age whose mothers have worked in the past 12 months by person who took care of child, according to residence and region, Zambia 1996

Residence and region	Child care provider (if mother worked in last 12 months)					Number of children
	Respondent	Relatives	Friend/ Institution	Other child	Total	
Residence						
Urban	73.4	3.3	13.6	1.2	8.5	2,234
Rural	80.2	1.3	7.9	1.1	9.6	3,511
			p<0.001			
Region						
Central	68.6	2.9	14.6	2.4	11.4	465
Copperbelt	81.3	1.1	9.5	1.4	6.7	1,067
Eastern	95.0	06	2.8	-	1.7	897
Luapula	50.2	2.0	22.9	2.1	22.8	572
Lusaka	76.6	4.4	13.3	1.1	4.6	828
Northern	78.6	1.8	6.2	1.2	12.2	691
North-Western	73.4	05	15.7	05	9.9	194
Southern	84.4	2.6	6.3	04	6.3	638
Western	69.1	2.1	7.9	1.4	19.4	391
			p<0.001			
Total	77.5	2.0	10.1	1.1	9.2	5,745

Note: Level of significance determined by Chi-square test

Table B.8 Sex of household head

Percent distribution of children under five years of age by sex of household head, according to residence and region, Zambia 1996

Residence and region	Sex of household head			Number of children
	Male	Female	Total	
Residence				
Urban	84.9	15.1	100.0	2,858
Rural	82.9	17.1	100.0	4,301
		p<0.05		
Region				
Central	85.5	14.5	100.0	587
Copperbelt	87.2	12.8	100.0	1,347
Eastern	79.6	20.4	100.0	1,103
Luapula	83.0	17.0	100.0	671
Lusaka	84.4	15.6	100.0	1,076
Northern	85.2	14.8	100.0	863
North-Western	81.3	18.7	100.0	287
Southern	88.4	11.6	100.0	764
Western	71.3	28.7	100.0	460
		p<0.001		
Total	83.7	16.3	100.0	7,159

Note: Level of significance determined using Chi-square test

Table B.9 Mother's marital status

Percent distribution of children under five years of age by mother's marital status, according to residence and region, Zambia 1996

Residence and region	Mother's marital status: Never married	Married/ in union	Widowed	Divorced/ Separated	Total	Number of children
Residence						
Urban	6.0	81.4	4.1	8.5	100.0	2,858
Rural	4.4	84.2	2.4	9.0	100.0	4,299
			p<0.001			
Region						
Central	3.8	83.8	2.3	10.0	100.0	587
Copperbelt	5.3	83.5	4.4	6.8	100.0	1,347
Eastern	3.4	87.1	1.9	7.5	100.0	1,101
Luapula	1.7	85.1	2.9	10.3	100.0	671
Lusaka	4.5	81.6	4.9	9.0	100.0	1,076
Northern	2.7	86.4	1.9	9.0	100.0	863
North-Western	4.2	81.0	2.5	12.4	100.0	287
Southern	6.4	84.4	1.7	7.5	100.0	764
Western	17.9	64.5	4.5	13.1	100.0	460
			p<0.001			
Total	5.0	83.1	3.1	8.8	100.0	7,158

Note: Level of significance determined using Chi-square test

Table B.10 Mother's partner's education

Percent distribution of children under five years of age by their mother's partner's education, according to residence and region, Zambia 1996

Residence and region	Partner's education: No education	Primary	Secondary +	Total	Number of children
Residence					
Urban	2.0	26.5	71.5	100.0	2,653
Rural	10.3	60.2	29.5	100.0	4,035
		p<0.001			
Region					
Central	5.7	42.8	51.5	100.0	558
Copperbelt	2.7	26.1	71.2	100.0	1,249
Eastern	19.1	57.2	23.8	100.0	1,055
Luapula	5.0	61.0	34.0	100.0	653
Lusaka	2.7	34.8	62.5	100.0	1,011
Northern	3.5	59.2	37.3	100.0	806
North-Western	9.5	51.4	39.1	100.0	274
Southern	3.9	56.2	40.0	100.0	714
Western	15.9	53.4	30.6	100.0	366
		p<0.001			
Total	7.0	46.9	46.2	100.0	6,688

Note: Level of significance determined using Chi-square test

Table B.11 Mother's partner's occupation

Percent distribution of children under five years of age by mother's partner's occupation, according to residence and region, Zambia 1996

Residence and region	Partner's occupation					Number of children
	Not working	Professional	Manual labor	Agricultural	Total	
Residence						
Urban	1.0	48.5	44.4	6.1	100.0	2,674
Rural	0.4	15.3	11.3	73.0	100.0	4,100
			p<0.001			
Region						
Central	1.4	29.5	18.2	50.8	100.0	565
Copperbelt	0.3	37.3	52.5	9.8	100.0	1,269
Eastern	0.6	15.6	8.8	75.0	100.0	1,057
Luapula	0.3	19.6	11.6	68.6	100.0	660
Lusaka	0.8	48.1	37.7	13.4	100.0	1,021
Northern	0.7	20.6	9.7	69.1	100.0	839
North-Western	2.6	30.9	21.3	45.2	100.0	274
Southern		20.2	15.2	64.6	100.0	715
Western	1.1	25.3	20.6	53.0	100.0	374
			p<0.001			
Total	0.7	28.4	24.3	46.6	100.0	6,774

Note: Level of significance determined using Chi-square test

Table B.12 Toilet facility

Percent distribution of children under five years of age by type of toilet facilities in household, according to residence and region, Zambia 1996

Residence and region	Type of toilet facilities				Number of children
	Flush	Latrine	None/Other	Total	
Residence					
Urban	45.9	49.9	4.2	100.0	2,831
Rural	2.0	55.2	42.8	100.0	4,269
		p<0.001			
Region					
Central	12.9	59.1	28.0	100.0	584
Copperbelt	61.3	37.1	1.6	100.0	1,330
Eastern	2.5	42.0	55.5	100.0	1,094
Luapula	3.1	82.6	14.2	100.0	663
Lusaka	30.5	58.1	11.4	100.0	1,074
Northern	5.1	84.8	10.1	100.0	856
North-Western	2.0	89.3	8.7	100.0	286
Southern	7.1	19.4	73.4	100.0	763
Western	3.3	37.8	58.9	100.0	451
		p<0.001			
Total	19.5	53.1	27.4	100.0	7,100

Note: Level of significance determined using Chi-square test

Table B.13 Source of drinking water

Percent distribution of children under five years of age by source of household drinking water, according to residence and region, Zambia 1996

Residence and region	Source of drinking water					Number of children
	Piped water	Well water	Surface water	Other	Total	
Residence						
Urban	79.3	17.0	1.9	1.9	100.0	2,840
Rural	8.2	66.1	25.4	0.3	100.0	4,287
			p<0.001			
Region						
Central	29.5	57.4	13.1	-	100.0	585
Copperbelt	81.8	17.1	1.1	-	100.0	1,336
Eastern	11.0	70.4	18.7	-	100.0	1,101
Luapula	7.6	70.5	21.3	0.6	100.0	664
Lusaka	70.3	20.6	4.8	4.3	100.0	1,074
Northern	12.7	48.0	38.5	0.8	100.0	863
North-Western	15.4	73.1	11.5	-	100.0	287
Southern	20.0	47.1	31.7	1.3	100.0	763
Western	23.4	67.1	9.5	-	100.0	455
			p<0.001			
Total	36.5	46.5	16.0	0.9	100.0	7,127

Note: Level of significance determined using Chi-square test

Table B.14 Type of floor

Percent distribution of children under five years of age by type of floor in household, according to residence and region, Zambia 1996

Residence and region	Main floor material				Number of children
	Natural	Rudimentary	Finished/Other	Total	
Residence					
Urban	13.9	0.3	85.8	100.0	2,832
Rural	86.3	0.1	13.6	100.0	4,279
		p<0.001			
Region					
Central	64.9	-	35.1	100.0	585
Copperbelt	13.5	0.1	86.4	100.0	1,336
Eastern	85.2	0.3	14.5	100.0	1,096
Luapula	83.0	-	17.0	100.0	662
Lusaka	14.9	0.6	84.5	100.0	1,071
Northern	81.4	0.3	18.3	100.0	860
North-Western	81.5	-	18.5	100.0	287
Southern	74.2	-	25.8	100.0	761
Western	85.3	-	14.7	100.0	453
		p<0.001			
Total	57.5	0.2	42.3	100.0	7,111

Note: Level of significance determined using Chi-square test

Table B.15 Exposure to the mass media

Percentage of children under five years of age whose mothers read a newspaper or watch television on a weekly basis or listen to the radio on a daily basis, according to residence and region, Zambia 1996

Residence and region	Read newspaper weekly	Listen to radio daily	Watch TV weekly	Number of children
Residence				
Urban	33.0	59.0	53.0	2,858
Rural	10.9	19.2	4.6	4,301
	p<0.001	p<0.001	p<0.001	
Region				
Central	8.3	40.1	21.2	587
Copperbelt	31.6	56.4	56.4	1,347
Eastern	17.1	19.6	3.2	1,103
Luapula	4.9	23.6	4.4	671
Lusaka	38.5	63.4	53.7	1,076
Northern	4.5	14.8	5.6	863
North-Western	10.5	21.0	6.7	287
Southern	27.1	24.6	11.0	764
Western	5.4	17.9	7.4	460
	p<0.001	p<0.001	p<0.001	
Total	19.7	35.1	23.9	7,159

Note: Level of significance determined using Chi-square test

Table B.16 Socioeconomic status

Percent distribution of children under five years of age by the socioeconomic status of their household, according to residence and region, Zambia 1996

Residence and region	Socioeconomic status				Number of children
	Low	Medium	High	Total	
Residence					
Urban	7.3	46.3	46.3	100.0	2,858
Rural	41.4	55.2	3.4	100.0	4,301
		p<0.001			
Region					
Central	24.0	60.3	15.7	100.0	587
Copperbelt	6.5	42.4	51.1	100.0	1,347
Eastern	36.6	59.5	3.8	100.0	1,103
Luapula	48.7	46.6	4.7	100.0	671
Lusaka	5.2	51.1	43.7	100.0	1,076
Northern	45.0	50.5	4.4	100.0	863
North-Western	36.1	57.4	6.6	100.0	287
Southern	26.0	65.8	8.2	100.0	764
Western	61.5	32.8	5.7	100.0	460
		p<0.001			
Total	27.8	51.7	20.5	100.0	7,159

Note: Level of significance determined using Chi-square test

Table B.17 Antenatal care provider

Percent distribution of births in the past five years by mother's antenatal care provider, according to residence and region, Zambia 1996

Residence and region	Antenatal care provider					Number of births
	Doctor	Nurse/Midwife	TBA/Auxiliary midwife/Other	No one	Total	
Residence						
Urban	5.0	94.1	0.1	0.9	100.0	2,837
Rural	1.2	91.9	1.0	5.9	100.0	4,065
			p<0.001			
Region						
Central	5.5	88.9	0.4	5.2	100.0	579
Copperbelt	5.1	94.2	-	0.6	100.0	1,339
Eastern	0.5	96.3	0.1	3.0	100.0	1,045
Luapula	0.4	90.4	3.8	5.5	100.0	617
Lusaka	4.8	93.5	-	1.7	100.0	1,073
Northern	2.6	83.8	1.9	11.8	100.0	810
North-Western	0.5	95.6	-	3.8	100.0	283
Southern	1.0	97.5	-	1.5	100.0	752
Western	0.3	94.3	-	5.3	100.0	403
			p<0.001			
Total	2.8	92.8	0.6	3.8	100.0	6,902

Note: Level of significance determined using Chi-square test

Table B.18 Assistance at delivery

Percent distribution of births in the past five years by the type of assistance at delivery, according to residence and region, Zambia 1996

Residence and region	Assistance at delivery					Number of births
	Doctor	Nurse/ Midwife	Trained or traditional birth attendant	Other/ No one	Total	
Residence						
Urban	7.6	69.6	1.4	21.4	100.0	2,829
Rural	1.0	25.0	8.1	65.8	100.0	4,267
			p<0.001			
Region						
Central	3.2	34.5	1.7	60.7	100.0	582
Copperbelt	7.2	68.5	2.2	22.0	100.0	1,338
Eastern	1.2	31.3	8.8	58.8	100.0	1,086
Luapula	0.5	25.8	11.8	62.0	100.0	664
Lusaka	9.7	64.9	0.7	24.8	100.0	1,069
Northern	0.5	22.8	10.7	65.9	100.0	858
North-Western	1.4	54.8	8.6	35.2	100.0	284
Southern	0.9	26.9	5.3	67.0	100.0	760
Western	1.9	34.9	1.8	61.4	100.0	456
			p<0.001			
Total	3.6	42.8	5.4	48.1	100.0	7,096

Note: Level of significance determined using Chi-square test

APPENDIX C

ANTHROPOMETRIC DATA VERIFICATION

APPENDIX C

ANTHROPOMETRIC DATA VERIFICATION

Table C.1 Characteristics of children with missing anthropometric data

Percent distribution of children born in the five years preceding the survey by completeness of anthropometric data, according to selected background characteristics, Zambia 1996

Background characteristic	Incomplete anthropometric data	Complete anthropometric data
Residence		
Urban	40.7	39.7
Rural	59.3	60.3
Total	100.0	100.0
Region		
Central	7.6	8.4
Copperbelt	17.3	19.3
Eastern	13.8	15.9
Luapula	10.1	9.2
Lusaka	16.9	14.4
Northern	11.2	12.3
North-Western	3.7	4.1
Southern	11.7	10.4
Western	7.8	6.0
Total	100.0	100.0
Socioeconomic status		
Low	30.4	27.0
Medium	51.2	51.8
High	18.4	21.2
Total	100.0	100.0
Perceived size at birth		
Average +	81.7	87.7
Small	11.9	9.6
Very small	5.2	2.7
Don't know/Missing	1.1	0.0
Total	100.0	100.0
Mother's education		
No education	13.1	13.9
Primary	65.9	63.8
Secondary +	20.9	22.3
Total	100.0	100.0
Number of children	1,716	5,442

Of the 7,159 children under 5 years of age who took part in the survey, 76 percent (5,443 children) were weighed and measured. Table C.1 indicates that 59 percent of children with incomplete anthropometric data resided in rural areas. The rural North-Western province accounted for only 4 percent, whereas the rural Copperbelt and Lusaka provinces accounted for 17 percent each. In addition, half of the children with incomplete data were of medium socioeconomic status. A surprisingly high percentage of children with highly educated mothers had incomplete anthropometric data (21 percent). Eighty-two percent of children with incomplete data were perceived by their mothers as average- or large-sized at birth.

As shown in Table C.2, there appears to be a preference in the choice of digits for the height data. Heights are particularly concentrated around values ending in the integers 0 and 5. Note, however, that digit preference in weight reporting is not as apparent. Nevertheless, a higher proportion of children had reported weights ending in 0 compared with other integers.

PREVIOUS PAGE BLANK

Table C.2 Digit preference in anthropometric data

Percentage of weight and height data falling as specific integers, Zambia 1996

	Height		Weight	
Decimal integer	Percentage	Number of children	Percentage	Number of children
0	23.5	1,681	8.8	627
1	4.5	319	7.6	542
2	9.1	653	7.8	561
3	6.1	436	8.5	609
4	5.1	365	7.7	553
5	14.2	1,020	8.3	591
6	5.3	379	7.9	566
7	4.7	335	7.8	555
8	3.3	233	7.5	538
9	2.8	203	7.2	518
Missing	21.4	1,536	20.9	1,500
Total	100.0	7,159	100.0	7,159

APPENDIX D

MALNUTRITION AMONG CHILDREN UNDER FIVE YEARS OF AGE ZAMBIA 1996

APPENDIX D

MALNUTRITION AMONG CHILDREN UNDER FIVE YEARS OF AGE ZAMBIA 1996

Table D.1 Malnutrition by region and age

Percentage of children under five years of age who are stunted, wasted, and underweight, by region and age, Zambia 1996

Region and age	Stunted	Wasted	Underweight	Number of children
Central				
0-5	11.0	4.5	2.6	58
6-11	22.7	8.6	16.4	48
12-17	45.4	7.4	30.6	41
18-23	38.4	11.6	25.9	42
24-29	45.7	5.3	29.1	57
30-35	43.8	2.9	19.0	52
36-41	49.5	4.9	14.8	38
42-47	39.6	7.0	18.6	32
48-53	49.3	5.0	22.9	53
54-59	43.6	5.3	22.3	36
Total	38.1	6.1	19.9	458
Copperbelt				
0-5	7.3	0.0	3.6	110
6-11	12.2	5.6	13.2	132
12-17	23.0	15.8	29.7	110
18-23	45.8	11.9	25.4	118
24-29	37.0	1.2	21.0	108
30-35	42.0	1.4	13.8	97
36-41	39.3	0.0	18.4	109
42-47	37.2	0.0	10.8	99
48-53	45.6	4.0	21.6	84
54-59	33.6	0.0	13.6	84
Total	31.4	4.3	17.2	1,051
Eastern				
0-5	6.7	1.9	1.9	98
6-11	20.8	7.9	26.2	84
12-17	51.9	3.2	40.7	117
18-23	57.8	6.8	30.8	97
24-29	58.9	1.1	43.2	89
30-35	61.7	1.0	28.9	93
36-41	60.5	0.0	20.3	66
42-47	49.3	1.4	16.8	67
48-53	65.6	2.3	21.9	83
54-59	53.0	0.0	21.4	72
Total	48.1	2.7	26.0	866
Luapula				
0-5	12.8	3.1	3.1	51
6-11	35.8	15.7	34.2	57
12-17	51.0	11.0	41.6	67
18-23	82.4	15.4	57.4	52
24-29	60.0	3.7	32.5	65
30-35	72.8	1.9	43.1	41
36-41	65.8	0.0	28.4	54
42-47	81.3	2.0	41.2	39
48-53	65.1	4.6	27.9	35
54-59	66.7	2.1	12.4	39
Total	57.7	6.5	32.7	498

PREVIOUS PAGE BLANK

Table D.1 Malnutrition by region and age (continued)

Percentage of children under five years of age who are stunted, wasted, and underweight, by region and age, Zambia 1996

Region and age	Stunted	Wasted	Underweight	Number of children
Lusaka				
0-5	15.2	6.3	6.3	85
6-11	18.8	1.1	16.3	97
12-17	21.7	8.2	27.8	95
18-23	46.6	6.0	20.3	90
24-29	42.3	3.5	23.8	77
30-35	44.4	0.0	15.4	68
36-41	24.3	0.0	13.5	59
42-47	28.2	0.0	8.5	78
48-53	34.7	0.0	8.8	76
54-59	29.9	1.8	10.3	62
Total	30.2	3.0	15.5	786
Northern				
0-5	6.2	1.6	4.9	71
6-11	44.1	13.2	38.2	80
12-17	49.2	9.9	40.3	94
18-23	80.7	6.0	50.2	79
24-29	72.9	1.6	29.8	75
30-35	70.4	1.4	33.5	60
36-41	70.2	3.8	26.9	61
42-47	76.4	1.6	38.2	56
48-53	50.7	0.0	13.0	45
54-59	59.1	2.3	26.9	50
Total	57.3	4.8	31.5	671
North-Western				
0-5	13.2	0.0	.0	27
6-11	35.1	0.0	18.2	31
12-17	41.3	4.3	32.9	23
18-23	62.9	7.6	37.5	20
24-29	46.3	3.6	37.6	29
30-35	64.1	3.1	45.4	17
36-41	70.6	4.6	38.9	22
42-47	54.1	0.0	15.6	20
48-53	54.3	0.0	25.8	20
54-59	53.7	0.0	29.8	15
Total	47.4	2.3	27.1	224
Southern				
0-5	10.8	1.5	4.6	58
6-11	24.3	6.3	20.4	56
12-17	33.2	6.7	34.9	80
18-23	57.6	3.0	25.9	59
24-29	44.7	2.8	27.0	63
30-35	46.8	3.5	10.5	51
36-41	54.9	4.1	21.3	65
42-47	42.8	0.0	19.9	47
48-53	31.8	1.9	15.5	46
54-59	51.0	2.3	22.8	39
Total	39.5	3.5	21.1	564

Table D.1 Malnutrition by region and age (continued)

Percentage of children under five years of age who are stunted, wasted, and underweight, by region and age, Zambia 1996

Region and age	Stunted	Wasted	Underweight	Number of children
Western				
0-5	19.7	0.0	3.6	39
6-11	24.6	8.1	34.7	34
12-17	48.2	16.6	53.3	42
18-23	54.3	6.8	40.7	31
24-29	51.9	7.4	42.6	38
30-35	54.7	1.9	35.8	37
36-41	59.0	2.6	41.0	27
42-47	60.5	3.1	39.4	23
48-53	43.6	0.0	12.4	34
54-59	41.8	3.2	12.8	22
Total	44.9	5.3	32.1	326
Zambia				
0-5	10.4	2.3	3.7	597
6-11	24.4	7.3	22.9	618
12-17	39.2	9.3	36.3	670
18-23	57.5	8.3	33.0	587
24-29	50.9	2.9	30.5	601
30-35	53.9	1.6	24.2	516
36-41	52.2	1.7	22.4	502
42-47	48.5	1.2	20.3	461
48-53	48.6	2.2	18.3	474
54-59	46.1	1.6	18.1	418
Total	42.4	4.2	23.5	5,443

APPENDIX E

RESIDENCE, GENDER, AND SOCIOECONOMIC DIFFERENCES IN THE PREVALENCE OF MALNUTRITION BY CHILD'S AGE, ZAMBIA 1996

PREVIOUS PAGE BLANK

APPENDIX E

RESIDENCE, GENDER, AND SOCIOECONOMIC DIFFERENCES IN THE PREVALENCE OF MALNUTRITION BY CHILD'S AGE, ZAMBIA 1996

Table E.1 Malnutrition by residence, sex, and age

Percentage of children under five years of age who are stunted, wasted, and underweight, by residence, sex, and age, Zambia 1996

Residence, sex, and age	Stunted	Wasted	Underweight	Number of children
Urban				
0-5	10.6	2.8	4.1	230
6-11	15.5	3.5	14.1	237
12-17	27.6	8.7	27.4	263
18-23	46.4	7.2	22.0	232
24-29	37.8	1.8	23.9	223
30-35	45.7	1.5	14.7	197
36-41	41.1	0.6	18.1	196
42-47	34.4	0.8	12.7	210
48-53	39.5	1.3	12.0	192
54-59	34.6	0.6	12.6	178
Total	32.7	3.1	16.5	2,159
Rural				
0-5	10.4	1.9	3.4	367
6-11	30.0	9.7	28.5	381
12-17	46.6	9.6	42.0	407
18-23	64.7	9.1	40.1	355
24-29	58.7	3.5	34.5	378
30-35	59.0	1.7	30.0	319
36-41	59.3	2.5	25.2	306
42-47	60.4	1.6	26.7	251
48-53	54.7	2.8	22.6	282
54-59	54.7	2.3	22.2	239
Total	48.7	4.8	28.0	3,284
Male	30.0	9.7	28.5	381
0-5	11.1	3.0	3.6	310
6-11	24.0	8.2	24.3	306
12-17	45.2	10.7	42.6	320
18-23	58.5	11.7	36.8	281
24-29	51.1	2.9	32.4	301
30-35	57.5	1.9	22.6	248
36-41	47.2	1.6	17.6	228
42-47	49.4	2.2	21.9	222
48-53	48.0	2.8	19.2	251
54-59	48.9	1.6	18.3	198
Total	43.1	5.0	24.5	2,665
Female				
0-5	9.7	1.5	3.7	287
6-11	24.8	6.4	21.6	312
12-17	33.7	7.9	30.5	349
18-23	56.5	5.3	29.4	306
24-29	50.8	2.8	28.7	299
30-35	50.6	1.4	25.6	268
36-41	56.3	1.8	26.5	274
42-47	47.7	0.3	18.8	239
48-53	49.2	1.5	17.3	223
54-59	43.6	1.6	17.9	220
Total	41.7	3.3	22.5	2,778

PREVIOUS PAGE BLANK

Table E.2 Malnutrition by socioeconomic status and age

Percentage of children under five years of age who are stunted, wasted, and underweight, by socioeconomic status of household and child's age, Zambia 1996

Socioeconomic status and age	Stunted	Wasted	Underweight	Number of children
Low				
0-5	7.9	1.3	1.9	178
6-11	34.5	10.1	31.9	185
12-17	52.4	10.4	51.0	168
18-23	66.5	10.3	44.7	175
24-29	60.6	4.6	41.1	159
30-35	66.0	2.5	36.1	142
36-41	65.4	1.7	28.1	127
42-47	66.8	0.0	26.6	109
48-53	60.9	2.3	24.6	121
54-59	63.9	2.6	27.4	104
Total	52.3	5.1	31.7	1,468
Medium				
0-5	11.0	2.9	3.8	291
6-11	23.4	6.3	21.1	319
12-17	38.0	8.8	34.3	384
18-23	59.9	9.1	34.6	278
24-29	53.1	2.2	28.1	318
30-35	56.2	1.1	23.7	261
36-41	54.5	2.4	23.1	270
42-47	51.6	1.7	22.9	237
48-53	52.6	2.1	18.5	246
54-59	48.6	1.2	15.6	218
Total	43.9	4.1	23.2	2,821
High				
0-5	12.7	2.1	5.8	128
6-11	11.1	5.4	13.6	115
12-17	24.0	9.1	21.7	117
18-23	40.8	4.3	14.4	135
24-29	32.9	2.2	23.3	124
30-35	33.3	1.9	10.1	113
36-41	30.4	0.0	13.9	106
42-47	25.0	1.3	9.0	116
48-53	25.2	2.3	10.7	106
54-59	21.1	1.2	13.7	96
Total	25.8	3.1	13.7	1,154
Total				
0-5	10.4	2.3	3.7	597
6-11	24.4	7.3	22.9	618
12-17	39.2	9.3	36.3	670
18-23	57.5	8.3	33.0	587
24-29	50.9	2.9	30.5	601
30-35	53.9	1.6	24.2	516
36-41	52.2	1.7	22.4	502
42-47	48.5	1.2	20.3	461
48-53	48.6	2.2	18.3	474
54-59	46.1	1.6	18.1	418
Total	42.4	4.2	23.5	5,443

APPENDIX F

FEEDING PRACTICES BY AGE

APPENDIX F

FEEDING PRACTICES BY AGE

Table F.1 Feeding practices by age

Percent distribution of children under 24 months by feeding practices, according to age, Zambia 1996

Age in months	Breastfed and: Nothing	Water	Other liquids	Solids	Fully weaned	Total	Number of children
0-1	34.5	54.3	6.3	4.4	0.5	100.0	190
2-3	20.3	33.8	8.0	37.9	-	100.0	258
4-5	5.2	16.5	5.9	71.7	0.7	100.0	222
6-7	1.4	4.7	2.5	90.8	0.6	100.0	191
8-9	-	1.1	1.0	96.3	1.7	100.0	205
10-11	-	1.8	0.5	94.0	3.7	100.0	250
12-13	0.3	0.8	0.3	94.7	3.7	100.0	270
14-15	-	0.9	1.2	92.9	5.0	100.0	225
16-17	-	0.6	-	86.2	13.2	100.0	221
18-19	-	1.8	-	76.4	21.8	100.0	185
20-21	0.6	-	-	55.0	44.4	100.0	223
22-23	-	-	-	31.0	69.0	100.0	220

PREVIOUS PAGE BLANK

APPENDIX G

LOGISTIC REGRESSION ANALYSIS

PREVIOUS PAGE BLANK

APPENDIX G

LOGISTIC REGRESSION ANALYSIS

Logistic regression analysis is used when the dependent (or outcome) variable is dichotomous; that is, it has only two outcomes: it either occurs or it does not occur. A logistic regression model estimates the probability that the event occurs. For each explanatory variable, there is a reference category against which all other categories of that variable are compared.

In this report, multivariate logistic regression techniques are used to explain (or predict) the following outcomes in Zambian children and their mothers:

- Childhood diarrhea
- Childhood stunting
- Childhood wasting
- Low maternal body mass (chronic energy deficiency [CED]).

The logistic regression models estimate the probability of a) having diarrhea in the two weeks prior to the survey, b) being stunted, c) being wasted, and d) having low maternal body mass. A forward step-wise regression procedure was used to construct the best possible model, given the available data. Conceptual frameworks were used to guide the process of selecting those variables that best explained each of the outcomes. The 1990 UNICEF Framework for Malnutrition (UNICEF, 1990) was used for the stunting and wasting regression models. Since a similar conceptual framework does not exist for diarrhea, the diarrhea literature was consulted to identify common variables included in multivariate analyses of childhood diarrhea. A Congolese study by Mock et al. (1993) was particularly useful in classifying variables into various types of determinants of childhood diarrhea (e.g., "Maternal Socio-demographic and Health Factors," "Child Demographic and Health Factors," "Environmental and Sanitary Factors") and identifying those variables that best represented each type of determinant. With respect to low maternal body mass, Rutstein (1996) adapted the 1990 UNICEF Malnutrition Framework to allow for the study of maternal nutritional outcomes. For the present analysis, his analytical framework was further adapted to study low maternal body mass in Zambia.

The regression coefficients in a logistic regression analysis represent the log odds of the effect of each explanatory factor on the outcome variable, controlling for the effects of all other factors in the model. These log odds can be converted into odds ratios by exponentiating the regression coefficients. The odds ratios are used as approximations of the relative risk of experiencing the outcome. This report presents the statistically significant relative risks of the dependent variable for a number of independent variables, for example, the relative risk of having diarrhea for children living in different regions of the country. For each explanatory variable in the model, the relative risk for the reference category is assigned a value of 1.00, and relative risks for other categories are compared with the reference category. A relative risk greater than 1.00 indicates an increased risk for the outcome, compared with the reference category, while a relative risk less than 1.00 indicates a lower risk for the outcome, compared to the reference category.

PREVIOUS PAGE BLANK