CHAPTER 7

7. EFFECTS OF CERTAIN BIODEMOGRAPHIC, SOCIOECONOMIC, HEALTH AND ENVIRONMENTAL FACTORS ON CHILD MALNUTRITION

7.1 INTRODUCTION

Firstly, this chapter presents and discusses the descriptive statistics for the three countries individually. Secondly, descriptives for the selected variables from the combined three countries used in the regression model are then discussed. This discussion is followed by a presentation of the effects of socio-economic status, environment, biodemographic and health factors, and lastly by a discussion of the parameter estimates from the model. Chapter 8 provides findings, conclusions, policy implications, methodological limitations and future research possibilities.

The categorisation of the prevalence of malnutrition among children of less than 5 years of age in a population is made on the basis of the percentage of children with Z-scores below -2 using anthropometric measurements. Table 7.1 indicates the criteria used to classify malnutrition levels. The criterion is different for WHZ, WAZ and HAZ. For example, if the prevalence of malnutrition is less than 10 percent for WAZ among children under five, then the population is considered to have a low prevalence of malnutrition. The corresponding upper limits for low prevalence of malnutrition for WHZ and HAZ are 5 percent and 20 percent respectively.

Table 7.1: Criteria for prevalence of malnutrition on the basis of percentage of children under 5 years of age with Z-scores < –2

Index	Low	Medium	High	Very High
HAZ	<20.0%	20.0-29.9%	30.0-39.9%	≥40.0%
WAZ	<10.0%	10.0-19.9%	20.0-29.9%	≥30.0%
WHZ	<5.0%	5.0-9.9%	10.0-14.9%	≥15.0%

Source: World Health Organization (1995)

Since the results are based on data for children of less than 3 years of age, this type of classification for the CARs, which were the subject of this study, should not be made. However, assuming that the same rate of prevalence exists for the remainder of the children of less than 5 years of age certain observations may be made on the prevalence of malnutrition in the three republics.

One reason to use child anthropometric measurements is that they provide useful information about the living standards and wellbeing of households. Child anthropometric measurements assess body size and composition, and reflect inadequate or excess food intake, and disease. Martorell and Ho (1984) describe anthropometry as the single most universally applicable, inexpensive and non-invasive method available to assess the size, proportion and composition of the human body. Moreover, anthropometry offers many advantages over the other indicators of nutritional status. The foremost of these is that body measurements are sensitive over the full range of malnutrition. Data on body measurements are also highly reliable and are less expensive and easier to obtain than most nutritional data. A detailed description of anthropometric indices and their use may be found in Chapter 1.

7.2 DESCRIPTIVE STATISTICS

7.2.1 Kyrgyzstan

This section presents summary statistics describing the overall characteristics of the households in the survey. Table 7.2 shows that the prevalence of malnutrition in Kyrgyzstan is generally moderate. Chronic malnutrition (HAZ) is high in the east, moderate in the south, and low in the north and in the Bishkek area. Acute malnutrition (WHZ) is low in three of the provinces and moderate in one, whereas the incidence of overall malnutrition (WAZ) is moderate in the east and in the south, low in the north and in Bishkek. A comparison of the percentages of severely malnourished children ($Z<-3$) in the provinces shows that chronic cases of severely malnourished children are more frequent in the eastern province than in any of the other provinces. On average, the children in Kyrgyzstan are stunted.

A total of 252 children, representing 24.8 percent of the 1 015 children studied, are stunted, 11 percent are underweight, and 3.4 percent are wasted.

Table 7.2: Percentage of malnourished (Z-score<-2) moderately and severely malnourished (Z-score <-3) children in Kyrgyzstan by province

Province	HAZ	WAZ	WHZ
Bishkek[18]			
Malnourished (Z< -2)	10.3	4.3	1.7
Moderately malnourished (-3 ≤ Z < -2)	8.6	4.3	1.7
Severely malnourished (Z<-3)	1.7	0.0	0.0
North			
Malnourished (Z< -2)	18.0	6.0	2.1
Moderately malnourished (-3 ≤ Z <-2)	14.0	4.7	1.6
Severely malnourished (Z<-3)	4.0	1.3	0.5
East			
Malnourished (Z<-2)	32.4	12.3	7.1
Moderately malnourished (-3 ≤ Z <-2)	21.7	8.6	5.4
Severely malnourished (Z<-3)	10.7	3.7	1.2
South			
Malnourished (Z<-2)	28.9	14.0	3.9
Moderately malnourished (-3 ≤ Z <-2)	21.9	12.2	3.1
Severely malnourished (Z<-3)	6.9	1.8	0.8
Kyrgyzstan (total country)			
Malnourished (Z<-2)	24.8	11.0	3.4
Moderately malnourished (-3 ≤ Z <-2)	18.8	9.4	2.8
Severely malnourished (Z<-3)	6.0	1.7	0.7

The mean, standard deviation, and the minimum and maximum values of selected continuous variables for the analysis are presented in Table 7.3. The working sample consisted of 1 015 children aged 0-35 months. Other background characteristics of certain of the non-continuous variables included in the analysis may be found in Appendix 1. These include water facility, toilet

[18] Capital city of Kyrgyzstan

facility, mother heard of ORT,[19] and type of assistance received at delivery. The majority (70%) of the children in the sample lived in households that had piped water, and a traditional pit toilet (89%), while 75 percent of their mothers had received professional assistance at delivery. The mean HAZ score was –1.14, the mean WAZ score was –0.51, and the mean WHZ score was 0.25. The mean scores (not shown here) varied with the age of the child. The average age of the children in the sample was approximately 17 months. Education is defined as the number of years spent at school. Mothers had spent approximately 11 years at school. The mean preceding birth interval is about 41 months.

Table 7.3: Variable names, definition and descriptive characteristics (Kyrgyzstan)

Variable Definition	n	Mean	Standard Deviation	Minimum	Maximum
Age of child (months)	1 015	17.46	10.42	0	35
Z-score Height-for-age	1 015	-1.14	1.30	-5.34	5.59
Z-score Weight-for-age	1 015	-0.51	1.30	-5.06	5.09
Z-score Weight-for-height	1 015	0.25	1.22	-3.97	5.69
Preceding birth interval	727	40.62	25.41	9.00	220.00
Birth weight (kg)	995	3.27	0.50	1.40	5.50
Mother's education	1 015	10.66	1.72	0	16
Number in household	1 015	6.87	2.68	2.0	21.0
Child haemoglobin (g/dl)*	956	10.89	17.59	4.7	18.5
Household wealth	1 013	4.31	1.49	0	8
Number of inoculations	898	6.47	2.30	0	8
Number of children under five	1 015	1.80	0.91	0	6.
Birth order	1 015	2.70	1.69	1	11
Duration of breastfeeding (months)	1 015	11.31	7.00	0	34

*g/dl grams per decilitre

The mean number of family members per household was seven. The majority (73% not shown here) of the children came from households that had between 5

[19] ORT (Oral Rehydration Therapy) is a rehydration solution used to replace fluid loss in young children resulting from diarrhoea and vomiting. It is taken at certain intervals until diarrhoea and vomiting have stopped.

and 10 people per household. The mean birth weight (3.27 kg) of the children is above the acceptable normal weight at birth of 2.5kg. The mean haemoglobin level (10.89g/dl) of the children in the sample is within normal limits (10-10.9 g/dl). The majority of the households owned at least 4.30 of the nine items that were used to measure household wealth. On average, the children had received between six and seven of the eight inoculations that a child should have had by the age of 35 months. There were approximately 1.8 children under the age of five per household in the study sample. The mean duration of breastfeeding was about 11 months.

7.2.1.1 Distribution of nutritional status indicators

Figure 7.1 suggests that the distribution of height-for-age is skewed to the left, indicating the presence of a large proportion of stunted children in the target areas of Kyrgyzstan. The distribution of children based on weight-for-age and weight-for-height is close to normal. However, the curve for weight-for-age is displaced to the left of the reference median. These patterns indicate that a large proportion of the children in the sample have failed to achieve the reference median height and weight for their age. The curve for weight-for-height is closer to the reference population with a slight displacement to the right.

Figure 7.1 Kyrgyzstan Z-score frequencies

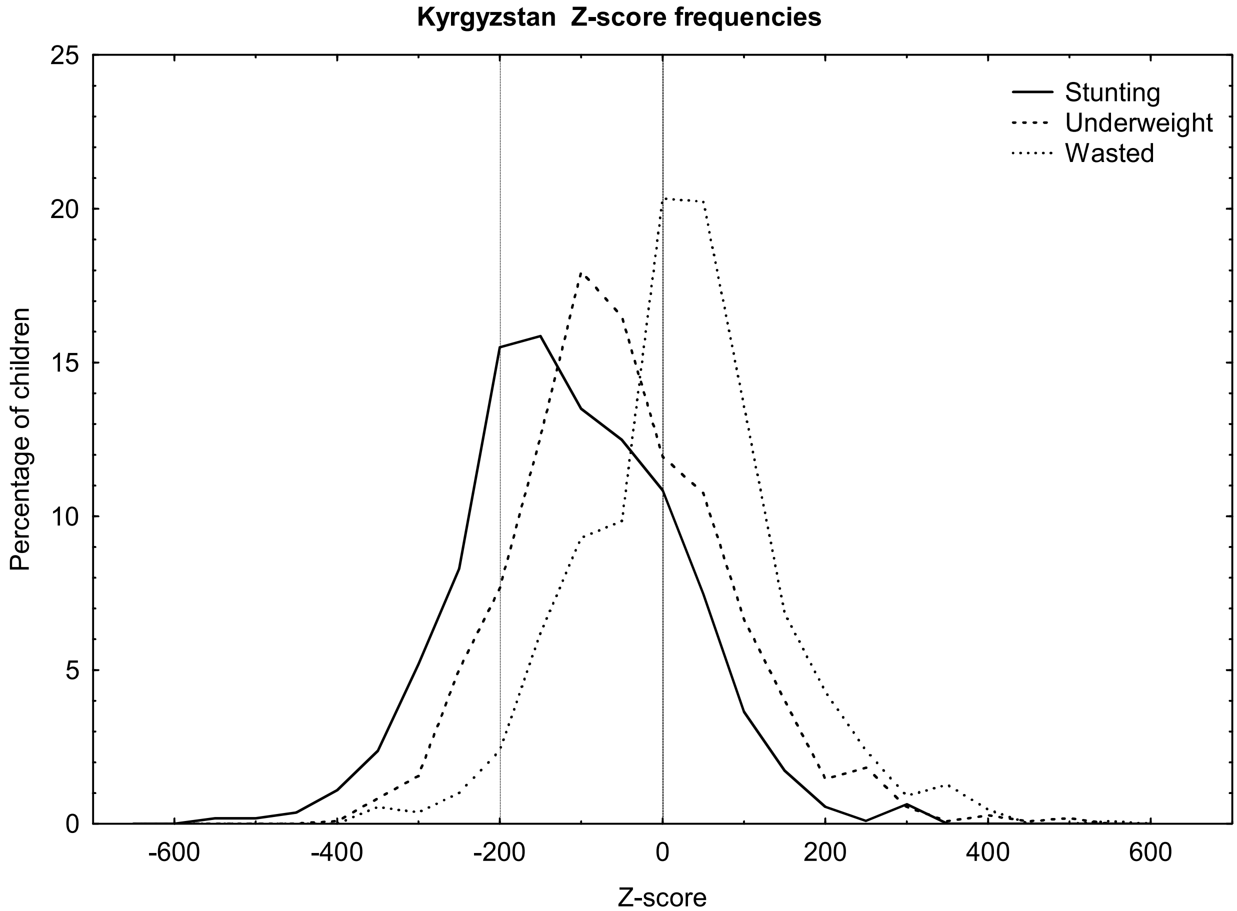
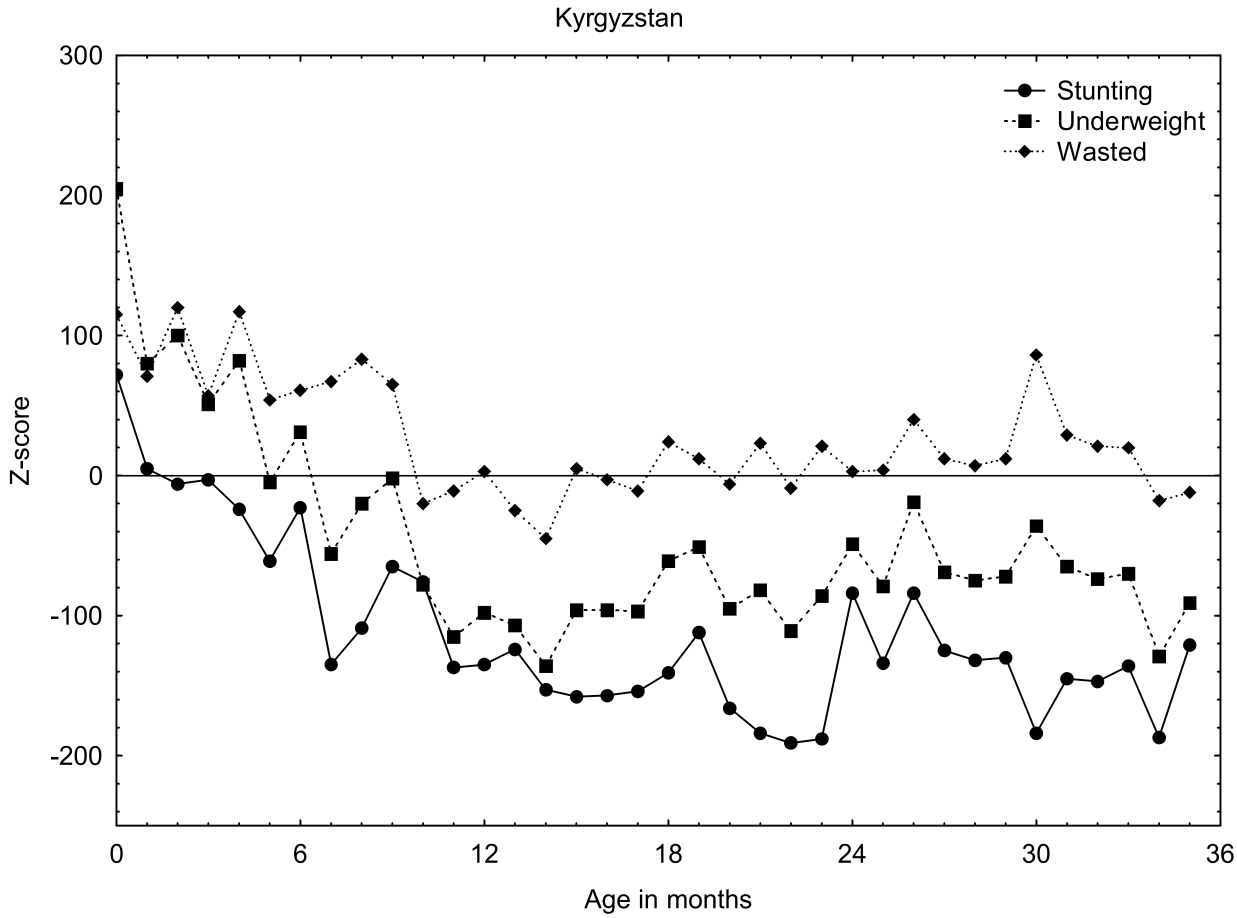


Figure 7.2 depicts the magnitude of nutritional deficiencies at different ages of the child. Nutritional status changes when the child reaches seven months, especially in terms of stunting and underweight. The figure shows that nutritional status deteriorates sharply between eleven and eighteen months, deteriorates further between the ages of eighteen and twenty-three months, then improves until the child is about twenty-four months, and thereafter fluctuates.

Figure 7.2 Mean height-for-age (HAZ), weight-for-age (WAZ), and weight-for-height (WHZ) Z-scores by age of child in months (Kyrgyzstan)



7.2.2 Uzbekistan

Table 7.4 shows that the prevalence of malnutrition in Uzbekistan is generally very high. Chronic malnutrition (HAZ) is moderate in Tashkent, Province 1 and Province 3, and high in Province 2 and Province 4. Acute malnutrition (WHZ) is low in Tashkent, moderate in two provinces, high in one, and very high in Province 3, whereas the incidence of overall malnutrition (WAZ) is low in Tashkent, moderate in Provinces 1 and 3, and high in Provinces 2 and 4. A comparison of the percentages of severely malnourished children (Z<-3) in the provinces shows that chronic cases of severe malnourishment are low in all the provinces except Province 2. On average, the children in Uzbekistan are stunted. A total of 309 children, representing 31.3 percent of the 989 children studied, are stunted, 18.8 percent are underweight, and 11.6 percent are wasted.

Table 7.4: Percentage of malnourished (Z-score <-2) moderately and severely malnourished (Z-score <-3) children in Uzbekistan by province

Province	HAZ	WAZ	WHZ
Tashkent[20]			
Malnourished (Z<-2)	22.7	4.2	2.5
Moderately malnourished (3 ≤ Z <-2)	16.8	1.7	2.5
Severely malnourished (Z<-3)	5.9	2.5	0.0
Province 1			
Malnourished (Z<-2)	26.7	14.5	7.2
Moderately malnourished (3 ≤ Z <-2)	16.9	12.0	5.3
Severely malnourished (Z<-3)	9.9	2.6	1.9
Province 2			
Malnourished (Z<-2)	39.8	24.5	14.7
Moderately malnourished (3 ≤ Z <-2)	19.4	19.6	10.3
Severely malnourished (Z<-3)	20.3	4.9	4.4
Province 3			
Malnourished (Z<-2)	24.1	16.3	17.9
Moderately malnourished (3 ≤ Z <-2)	11.1	8.2	14.4
Severely malnourished (Z<-3)	13.0	8.1	3.5
Province 4			
Malnourished (Z<-2)	35.2	21.4	6.6
Moderately malnourished (3 ≤ Z <-2)	22.4	17.8	5.0
Severely malnourished (Z<-3)	12.8	3.6	1.6
Uzbekistan (total country)			
Malnourished (Z<-2)	31.3	18.8	11.6
Moderately malnourished (3 ≤ Z <-2)	17.3	13.8	9.0
Severely malnourished (Z<-3)	14.0	5.0	2.8

The mean, standard deviation, and the minimum and maximum values of selected variables for the analysis are presented in Table 7.5. The working sample consisted of 989 children aged 0-35 months. Other background characteristics of certain of the non-continuous variables included in the analysis may be found in Appendix 1. These include water facility, toilet facility, mother

[20] Capital city of Uzbekistan

heard of ORT, and type of assistance received at delivery. The majority (72%) of the children in the sample lived in households that had piped water, and a traditional pit toilet (89%), while 97 percent of their mothers had received professional assistance at delivery. The mean HAZ score was –1.05, the mean WAZ score was –0.62 and the mean WHZ score was 0.10. The mean scores (not shown here) varied with the age of the child. The average age of the children in the sample is around 18 months. Mothers had spent approximately 11 years at school. The mean preceding birth interval is approximately 36 months.

The mean number of family members per household was seven. The majority (64% not shown here) of the children came from households that had between 5 and 10 people per household. The mean birth weight (3.33 kg) of the children is above the acceptable normal weight at birth of 2.5kg. The mean haemoglobin level (10.56g/dl) of the children in the sample is within normal limits (10-10.9 g/dl). The majority of the households owned at least 4.68 of the items that were used to measure household wealth. The children had received about seven of the eight inoculations that a child should have had by the age of 35 months. There were about 1.98 children per household in the study sample. The mean duration of breastfeeding was about 12 months.

Table 7.5 Variable names, definition and descriptive characteristics (Uzbekistan)

Variable definition	n	Mean	Standard Deviation	Minimum	Maximum
Age of child	989	17.93	9.83	0	35.0
Z-score Height-for-age	989	-1.05	2.00	-5.93	5.70
Z-score Weight-for-age	989	-0.62	1.64	-5.81	5.56
Z-score Weight-for-height	989	0.10	1.75	-3.98	5.77
Preceding birth interval	675	35.94	21.02	0	161
Birth weight (kg)	952	3.33	4.51	1.90	5.50
Mother's education	954	10.51	1.69	3.00	16.0
Number in household	989	6.80	2.97	2.0	27.0
Child haemoglobin level (g/dl)	876	10.56	13.86	4.0	16.1
Household wealth index	989	4.68	1.80	0	9.0
Number of inoculations	989	7.02	1.82	0	8.0
Number of children under 5	989	1.98	0.94	0	6.0
Birth order	989	2.50	1.60	1	11.0
Duration of breastfeeding (months)	989	12.03	7.30	0	34.0

7.2.2.1 Distribution of nutritional status indicators

Figure 7.3 suggests that the distribution of height-for-age is displaced to the left, indicating the presence of a large proportion of stunted children in the target areas of Uzbekistan. The distribution of children based on weight-for-age is also displaced to the left, while the curve for weight-for-height appears normal. These patterns, as with Kyrgyzstan, indicate that a large proportion of the children in the Uzbekistan sample failed to achieve the reference median height and weight for their ages.

Figure 7.3 Uzbekistan Z-score frequencies

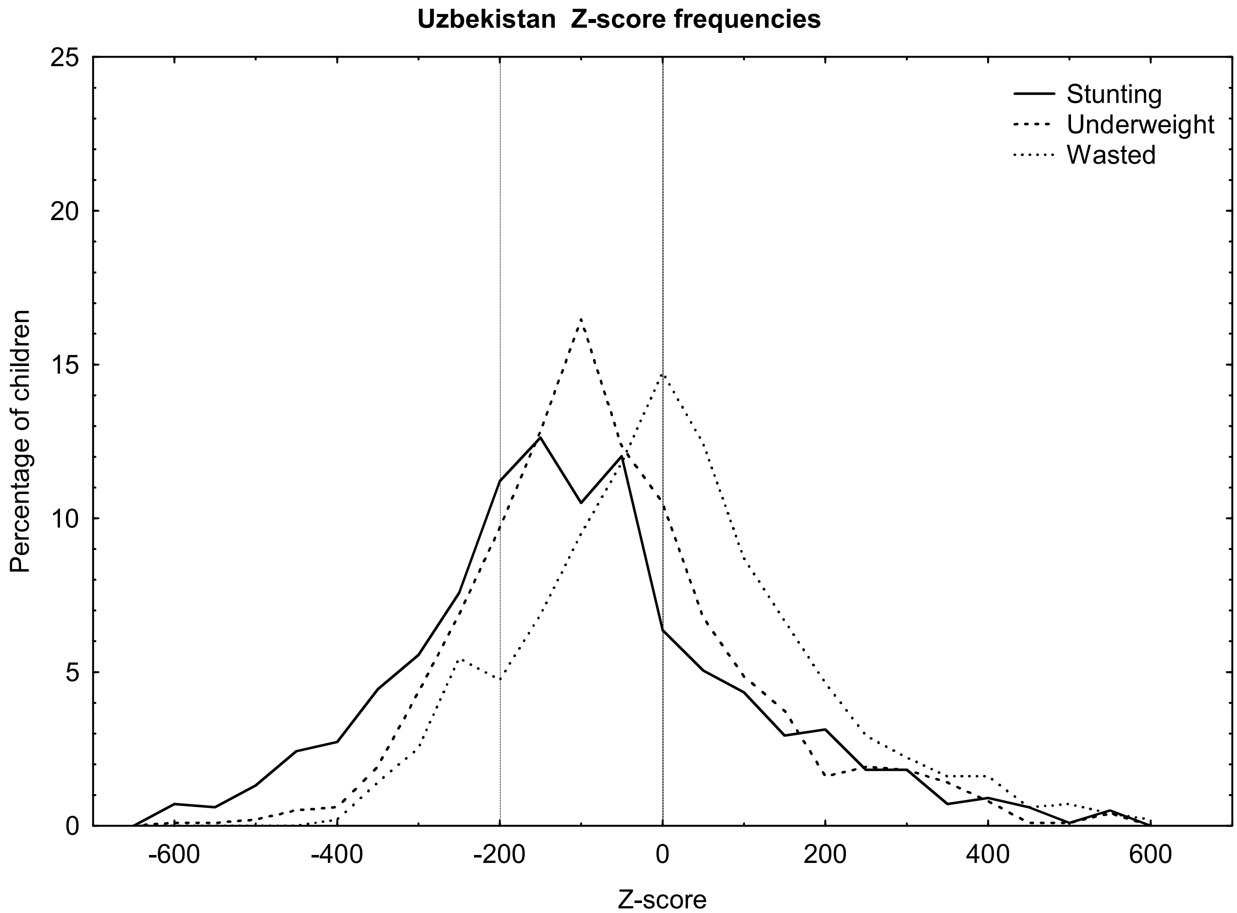
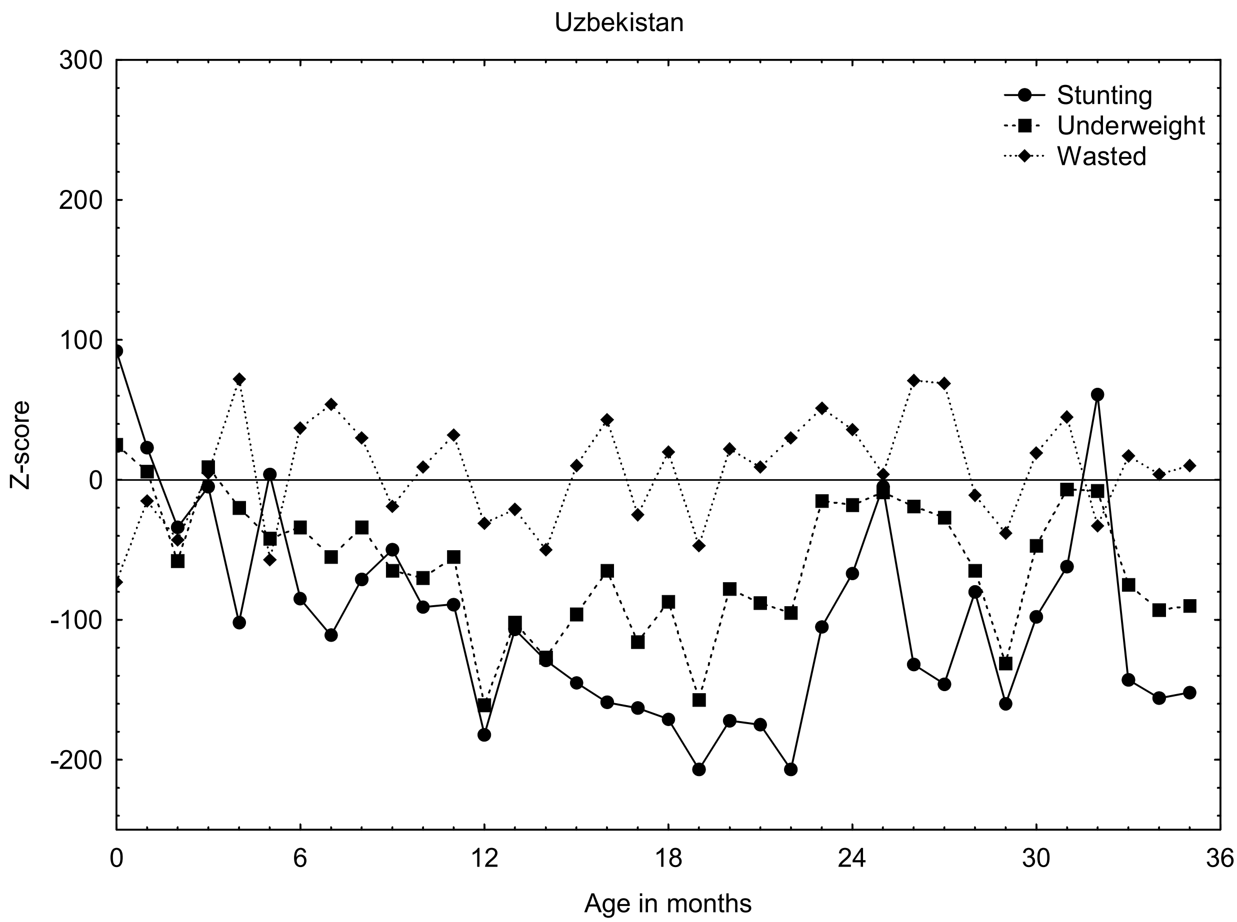


Figure 7.4 depicts the magnitude of nutritional deficiencies at different ages of the child. Nutritional status changes drastically when the child reaches twelve months, especially stunting and underweight. Z-scores become progressively worse with age. This may be expected, as stunting is a cumulative process. The figure shows that nutritional status deteriorates sharply between thirteen and twenty-two months, picks up until the child is approximately twenty-six months old, picks up again until the child is about thirty-two months, thereafter deteriorates sharply, and then fluctuates. A clear deterioration in nutritional status between the ages of eighteen and twenty-four months may be seen in the graph.

Figure 7.4 Mean height-for-age (HAZ), weight-for-age (WAZ), and weight-for-height (WHZ) Z-scores by age of child in months (Uzbekistan)



7.2.3 Kazakhstan

Table 7.6 shows that the prevalence of malnutrition in Kazakhstan is generally at a low level. Chronic malnutrition (HAZ) is low in all the provinces. Acute malnutrition (WHZ) is low in five of the six provinces, moderate in one province, while the incidence of overall malnutrition (WAZ) is low in all the provinces. A comparison of the percentages of severely malnourished children (Z<-3) in the provinces shows that chronic cases of severe malnourishment are low in all the provinces. About 10 percent of the 354 children studied are stunted, 4.6 percent are underweight, and 1.9 percent are wasted.

Table 7.6 Percentage of malnourished (Z-score<-2) moderately and severely malnourished (Z-score <-3) children in Kazakhstan by province

Province	HAZ	WAZ	WHZ
Almaty[21]			
Malnourished (Z<-2)	3.4	6.9	0.0
Moderately malnourished (3 ≤ Z <-2)	3.4	6.9	0.0
Severely malnourished (Z<-3)	0.0	0.0	0.0
South			
Malnourished (Z<-2)	8.2	4.5	2.0
Moderately malnourished (3 ≤ Z <-2)	6.5	4.5	2.0
Severely malnourished (Z<-3)	1.6	0.0	0.0
West			
Malnourished (Z<-2)	17.1	4.5	3.0
Moderately malnourished (3 ≤ Z <-2)	12.0	4.5	1.5
Severely malnourished (Z<-3)	5.1	0.0	1.5
Central			
Malnourished (Z<-2)	11.7	3.5	6.6
Moderately malnourished (3 ≤ Z <-2)	10.2	2.0	4.6
Severely malnourished (Z<-3)	1.5	1.5	2.0
North			
Malnourished (Z<-2)	9.4	6.4	0.0
Moderately malnourished (3 ≤ Z <-2)	2.9	3.2	0.0
Severely malnourished (Z<-3)	6.4	3.2	0.0
East			
Malnourished (Z<-2)	10.1	1.5	0.0
Moderately malnourished (3 ≤ Z <-2)	10.1	1.5	0.0
Severely malnourished (Z<-3)	0.0	0.0	0.0
Kazakhstan (total country)			
Malnourished (Z<-2)	9.8	4.6	1.9
Moderately malnourished (3 ≤ Z <-2)	7.1	3.9	1.5
Severely malnourished (Z<-3)	2.7	0.7	0.4

The mean, standard deviation, and the minimum and maximum values of the selected variables for the analysis are presented in Table 7.7. The working sample comprises 354 children aged 0-35 months. Other background

[21] Former capital city of Kazakhstan

characteristics of certain of the non-continuous variables included in the analysis may be found in Appendix 1. These include water facility, toilet facility, mother heard of ORT, and type of assistance received at delivery. The majority (60%) of the children in the sample lived in households that had piped water (60%), and a traditional pit toilet (72%), while almost all (99%) of their mothers had received professional assistance at delivery. The mean HAZ score was –0.53, the mean WAZ score was –0.29, and the mean WHZ score was 0.07. The mean scores (not shown here) varied with the age of the child and the educational level of the mother. The average age of the children in the sample is about 18 months. Mothers spent approximately 11 years at school. The mean birth interval is about 48 months.

Table 7.7 Variable names, definition and descriptive characteristics (Kazakhstan)

Variable Definition	n	Mean	Standard Deviation	Minimum	Maximum
Age of child	354	18.03	10.05	0	35
Z-score Height-for-age	354	-0.53	1.26	-4.82	3.82
Z-score Weight-for-age	354	-0.29	1.13	-3.62	2.72
Z-score Weight-for-height	354	0.07	1.01	-3.46	4.06
Preceding birth interval (months)	236	48.46	35.92	0	218
Birthweight (kg)	351	3.33	0.56	1.50	5.50
Mother’s education	354	10.69	1.95	0	16.0
Number in household	354	6.04	2.57	2	17.0
Child haemoglobin (g/dl)	321	10.99	20.06	5.0	17.4
Household wealth index	337	4.35	1.72	0	9.0
Number of inoculations	354	6.31	2.72	0	8.0
Number of children under 5	354	1.84	0.73	0	4.0
Birth order	354	2.41	1.43	1	7.0
Duration of breastfeeding (months)	327	10.15	7.07	0	35.0

The mean number of family members per household was six. The majority (62% not shown here) of the children came from households that had between 5 and 10 people per household. The mean birth weight (3.33 kg) of the children is above the acceptable normal weight at birth of 2.5 kg. The mean haemoglobin level (10.99g/dl) of the children in the sample is within normal limits (10-10.9 g/dl). The majority of the households owned at least 4.35 of the items that were used to measure household wealth. The children had received about six of the eight inoculations that a child should have had by the age of 35 months. There were approximately 1.84 children per household in the study sample. The mean duration of breastfeeding was about 10 months.

7.2.3.1 Distribution of nutritional status indicators

Kazakhstan presents a different picture of the nutritional status of children under the age of three years. Height-for-age and weight-for-age are slightly skewed to the left, and are actually closer to the reference median. The distribution of children based on weight-for-height appears normal. These patterns indicate that the majority of the children in this country have achieved the reference median height and weight for their ages.

Figure 7. 5 Kazakhstan Z-score frequencies

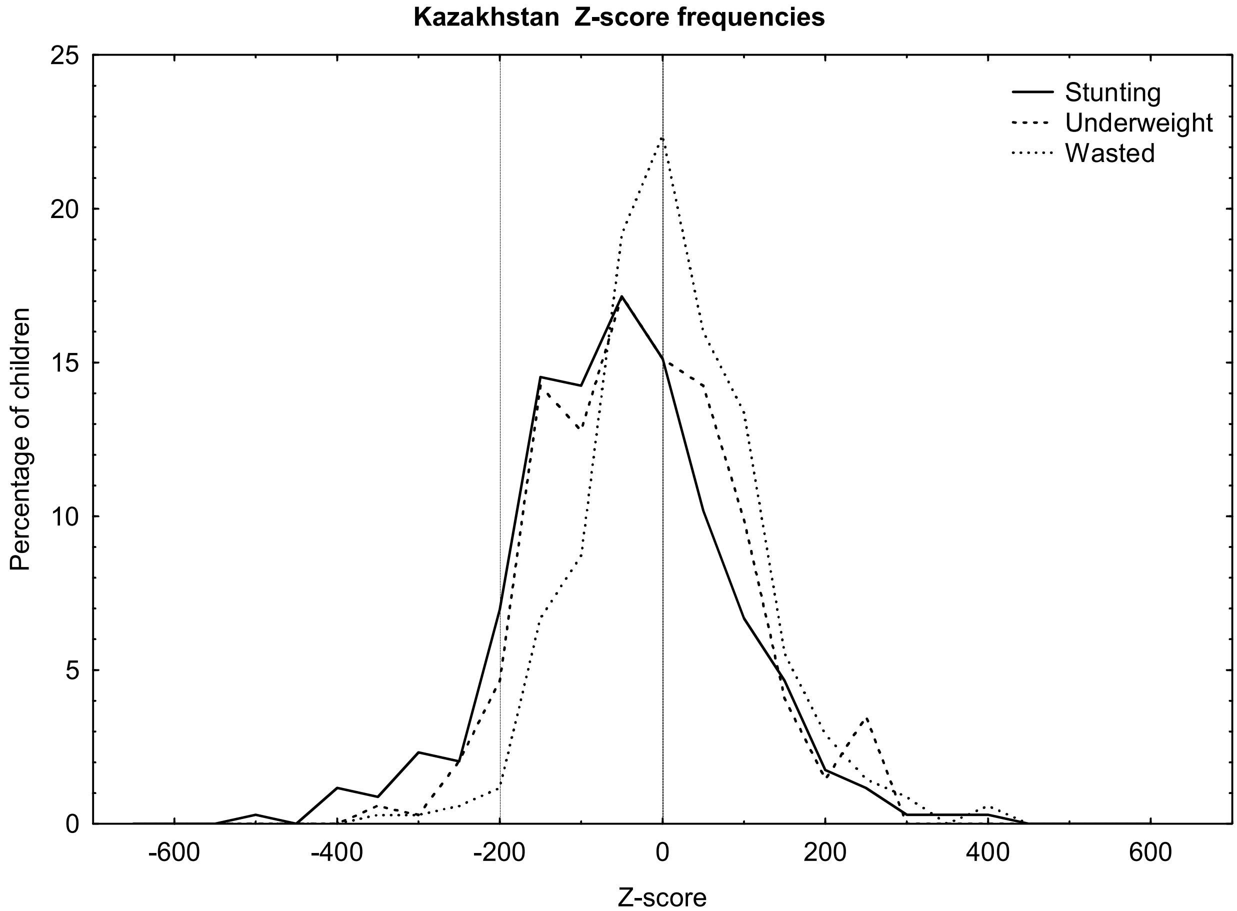
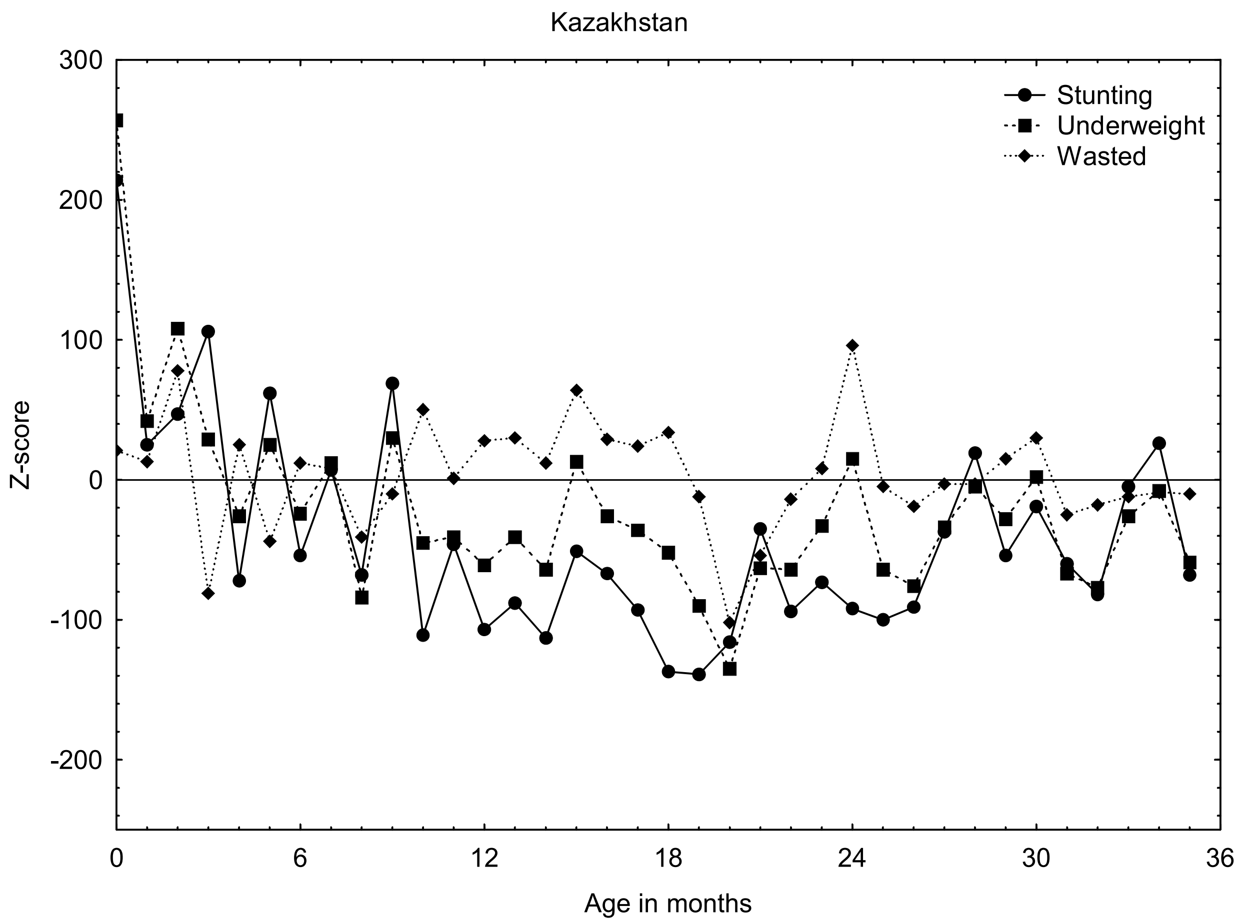


Figure 7.6 depicts the extent of the nutritional deficiencies at different ages of the child. Nutritional status changes when the child reaches nine months especially in terms of stunting and underweight. Thereafter it fluctuates between 0 and 1 standard deviation from the mean, but none of the children are below –2SDs.

Figure 7.6 Mean height-for-age (HAZ), weight-for-age (WAZ), and weight-for-height (WHZ) Z-scores by age of child in months (Kazakhstan)



7.3 BIVARIATE ANALYSES

In the previous sections, the different countries were discussed separately, while in Tables 7.8 to 7.10 the data of the three countries were combined in order to create a more usable dataset for multivariate analyses. This descriptive analysis was carried out on all relevant variables in order to obtain a better understanding of the dynamics involved in the data. Although the effect of all the other variables on a particular variable was not taken into account, this analysis will give some indication of the variables to be used in more sophisticated analyses.

The questions applicable in this study were the same in the different countries and therefore posed no problems in the merging process. Some authors (Vella et al., 1992) make a strong case for using weight-for-age as a better predictor of children at high risk of death than height-for-age or weight-for-height, while others (McMurray, 1996) have argued that for cross-sectional data weight-for-height is the best predictor of current malnutrition. However, the proportion of children who are wasted is too small for studies of determinants of undernutrition. The restriction of the regression analysis to weight-for-age and height-for-age z-scores is based on the above argument, as there were too few cases for weight-for-height data.

7.3.1 Weight for age z-scores descriptive statistics for the combined countries

In the descriptive statistics discussion, univariate analyses of the data were carried out separately for each of the three countries under discussion. We will now focus our attention on bivariate data analyses in which a combination of the three countries will be the input data. The questions applicable in this study were the same in the three different countries and therefore posed no problems in the merging process.

Table 7.8 presents the results of the bivariate analyses aimed at identifying factors associated with underweight.

7.3.2 Geographical distribution of weight-for-age Z-scores

Substantial disparities in underweight in terms of countries were found, for instance, children living in Kazakhstan fared much better than those living in Uzbekistan and Kyrgyzstan. Only 4.6 percent of the children in Kazakhstan were underweight (see Table 7.8), while child underweight increased fourfold in Uzbekistan and more than twofold in Kyrgyzstan.

Table 7.8: Underweight (<-2WAZ) and associated factors

Variables	<-2WAZ	≥-2WAZ	N
Country			
Uzbekistan	18.8	81.2	989
Kyrgyzstan	11.0	89.0	1015
Kazakhstan	4.6	95.4	354
Toilet facility			
Flush	8.6	91.4	309
Pit	14.1	85.9	2022
Water facility			
Piped	12.1	87.9	1621
Unpiped	16.4	83.6	714
Mother's education			
0-Part 2	14.3	85.7	263
Secondary	14.1	85.9	1825
Higher	6.9	93.1	272
Household wealth			
0-3 items	19.1	80.9	626
4 items	12.4	87.6	558
5 items	9.6	90.4	517
6-9 items	11.7	88.3	639
Number of people per household			
1-4	11.1	88.9	536
5-7	11.7	88.3	1064
8 and more	17.1	82.9	759
Number of children under five			
0-1	8.3	91.7	902
2	16.1	83.9	1035
3 and more	17.2	82.9	421
Child haemoglobin level			
Severe	19.4	80.6	41
Moderate	16.9	83.1	564
Mild	13.3	86.7	537
None	10.6	89.4	1935
Respondent ever heard of ORT			
No	17.1	82.9	308
Used	22.3	77.7	102
Yes	12.2	87.8	1914
Birth order			
1	9.9	90.1	719
2-3	13.3	86.7	1102
4 and more	17.8	82.2	537
Age of child (months)			
0-5	2.8	97.2	345
6-11	12.7	87.3	421
12-23	19.7	80.3	795
24-35	11.8	88.2	797
Birth weight			
≤ 2.5	25.6	74.4	130
> 2.5	12.2	87.8	2169
Duration of breastfeeding (months)			
0-6	7.6	92.4	586
7-12	13.6	86.4	729
13-35	17.0	83.0	960
Birth interval			
First	9.9	90.1	720
< 24 months	18.7	81.3	460
24-47	16.1	83.9	748
> 47	8.5	91.5	429
Number of Immunisations			
0-3	5.8	94.2	296
4-7	12.7	87.3	647
8 and more	15.5	84.5	1278
Sex of child			
Male	15.3	84.7	1194
Female	11.2	88.8	1164
Place of residence			
Urban	10.6	89.4	648
Rural	14.3	85.7	1710

The strong differentials observed between the countries may be due to differences in diet, access to health care, standards of living, and environmental pollution. The results further imply that decreased child malnutrition rates are more likely to occur in countries that have greater gross national product per capita, low poverty rates, and higher human development index (Figure 3.6 and Table 5.1).

7.3.3 Bivariate association between socio-economic and environmental factors and weight-for-age z-scores

The extent of malnutrition with respect to WAZ, which indicates a combined effect of both chronic and acute undernutrition, is higher (14.1% among children living in households that use a pit toilet than among children who live in a household with a flush toilet (8.6%). Several studies examining factors influencing child malnutrition in aggregate (national) populations conclude that good sanitation, especially the presence of a flush toilet facility, tends to reduce child malnutrition (Huttly, 1990; Daniels et al., 1991; Merchant et al., 1993; Ricci & Becker 1996; Jones et al., 2003). The availability of toilet facilities clearly influences the way a household disposes of children's stools. Households that had a piped water facility reported lower WAZ (12.1%) than those with an unpiped water facility (16.4%). A positive effect of maternal education on child nutritional status was noted on children born to mothers with a higher educational level. A higher level of education could be associated with lower malnutrition because it is a proxy for an increased command of resources, resulting in a better quality of life. This in turn means a better quality of clothing, shelter, nutrition, medical care, sanitary facilities and practices, and water supply (Barrera, 1990; Alderman & Garcia 1994; Lavy et al., 1996; Handa, 1999). Only 6.9 percent of the children whose mothers had higher education were underweight, compared to 14.3 percent whose mothers had either no education or primary education only (14.1%). Although it is known that, there is an association between education and infant mortality education is similarly strongly associated with child growth. The reasons for such a correlation may be related to differences in knowledge, power, and/or wealth among women with different levels of education.

A clear effect on nutritional status was also found in the case of household wealth, which is used as a proxy for the economic condition of the family. When a household owned less that three items, 19.1% of the children were underweight. This result mirrors the findings of Silva (2005) in a study he conducted on child malnutrition in Ethiopia. Very poor households do not usually acquire many durable goods and spend most of their income on consumption, particularly food consumption. However, the quality and distribution of the food within the household might be unequal, especially with regard to very young children and their mothers. Household size may affect the way in which household resources are distributed among household members, especially in poor households. The larger the household size the smaller the allocation of resources especially for children and women. Children who belonged to households that had less than seven people reported lower WAZ (11.1%) than those who belonged to households that had more than seven people.

The number of children under the age of five per household had a clear effect on the child nutritional status of children in the sample. As expected, a child who lives in a household with two or more children under the age of five suffers a risk of malnutrition (16.1%) which is higher than that of children in households with less than two children under the age of 5 or without other children under the age of five (8.3%). In Congo and Ethiopia (Delpeuch et al., 2000; Silva, 2005) found that the number of children under five years in a household increased the probability of the children being malnourished. A household with a relatively large number of children, especially when they are under five years, creates conditions that are conducive to the propagation of the transmission of micro-organisms, which lead indirectly to malnutrition. Moreover, in very poor households that experience food insecurity it is the children who suffer most.

7.3.4 Bivariate association between biodemographic and health factors and weight-for-age z-scores

The impact of anaemia status of the child and birth order is illustrated in Table 7.8. The results show that 19.4% children with severe levels of anaemia had lower WAZ than those with mild (13.3%), moderate (16.9%) or no anaemia (10.6%). Lack of iron in the diet, which is the main cause of anaemia, has been found to be more pronounced in undernourished children. High levels of anaemia, especially among children, have been found in Kazakhstan and Uzbekistan (Kort, 2004).

As expected, the birth order of the child reveals that lower birth order children have a better nutritional status (9.9%) than higher birth order children. It has also been found that children with three or more older siblings are more likely to be malnourished than children from smaller families, most probably because competition for food increases with family size (Mishra & Retherford, 2000). Generally, older children are more likely to be stunted and underweight, probably indicating resource crowding as more children are born, and parents strive to maintain the health of the newly born and very young children. The older children would also be those who are already weaned from breastfeeding, and hence more vulnerable to malnutrition. The rate of underweight was 22.3% in children whose mothers had used ORT and lower among those whose mothers had knowledge of it or did not know about it. An explanation for this could be that children whose mothers had used ORT had had diarrhoea before the survey and had therefore lost weight due to the illness.

From Table 7.8 it may be deduced that the age of child, birth interval, the number of immunisations, duration of breastfeeding, birth weight, sex of child and place of residence all had a negative effect on the nutritional status of children under three years. On average WAZ decreased rapidly to reach the minimum at 12-23 months. Three factors may explain this decrease in WAZ. First, children at this age are consuming other foods as they are being weaned off the breast and may ingest contaminated food and liquids. This result confirms the findings of studies conducted in several developing countries on the role played by weaning in underweight, especially during the 12-23 month period (Waters et al., 2004; FANTA, 2003). Secondly, children of this age are more mobile and therefore may come into contact with potential hazards in their surroundings. Thirdly, poverty, coupled with a lack of nutritious food, may be the cause of malnutrition. The survey reported that children aged 0-5 months had the highest WAZ, probably because they are exclusively breastfed at this age. The size of the child at birth affected his nutritional status. Children with a low birth weight (<2.5kg), tended to have lower WAZ (25.6%) than those who weighed above 2.5kg at birth (12.2%). This could be due to premature birth or uterine undernutrition as compared to those of average or large birth size. Although there was no relationship between the BMI of the mother and underweight children, certain studies have highlighted the effect of maternal malnutrition on child nutritional status (Adair, 1987; Scholl & Hediger, 1994).

Children who were never breastfed or breastfed up to six months by the time of the survey were better off (7.6%) than those who were breastfed for longer than seven months. This difference may reflect the fact that the nutrients in the breast milk may only be sufficient for a child’s growth for a certain number of months, after which other food supplements are needed. Women who breastfeed for longer may be doing so because they lack the resources and nutritional knowledge to provide their children with adequate nutrition (Ukwuani & Suchindran, 2003). Another explanation for the negative relationship between breastfeeding and nutritional status beyond infancy which was observed is that of reverse causality, where mothers continue to breastfeed children who appear small for their age. The spacing pattern of the children shows that firstborn children and those who were born 47 months or more after their immediate elder sibling were better off than those whose preceding birth interval was less than 24 months or between 24 and 47 months. Bastien (1992) and Gubhaju (1986) reported that children spaced two or more years apart have a greater chance of being well cared for, of being breastfed for longer, and of being taller and heavier.

A child is considered to be fully vaccinated if he has received all eight standard immunisations. The relationship between child malnutrition and immunisation is expected to be such that when the number of immunisations increases the nutritional status of the child is supposed to be better. Immunisation protects the child against infectious diseases, which could lead to child malnutrition. It is therefore extremely surprising to find that the prevalence of undernutrition is higher (15.5%) for children who had received all eight expected immunisations than for those who had received fewer. On the other hand, Devi and Geervani (1994) found that although the immunisation given to a child did not have a significant association with chronic malnutrition, it emerged as a significant factor in terms of current nutritional status. This, however, was not the case for the three nutrition indicators in the three republics studied. This result could also be an indication that good healthcare services, as found in these Central Asian republics, do not necessarily translate into better nutrition. A negative association with WAZ was found. Female children had a lower WAZ score (11.2%) than the male child. Living in a rural area had a negative effect on underweight (14.3%).

7.3.5 Height-for-age z-scores descriptive statistics for the combined countries

Table 7.9 presents the results of the bivariate analyses aimed at identifying factors associated with stunting.

7.3.6 Geographical distribution of height-for-age Z-scores

A negative association was noted between country of residence and stunting levels (see Table 7.9). Levels of stunting are generally much higher than underweight levels in all three countries studied. The results show that children in Kazakhstan had the lowest stunting levels (9.5%), while HAZ increased more than threefold fold in Uzbekistan and more than twofold in Kyrgyzstan. The explanation given above for WAZ disparities is also applicable in this instance.

7.3.7 Bivariate association between socioeconomic and environmental factors and height-for-age z-scores

It may be deduced from Table 7.9 that in the case of stunted (HAZ) children the results are similar to those of underweight children (WAZ), with the exception of certain variables, namely, birth interval, mother heard of ORT and number of people per household, which had no association with stunting. Surprisingly, the type of water facility used by households had a positive effect on stunting, although it had no association with underweight. Households that had a piped water facility reported lower HAZ (23%) than those with an unpiped water facility (31%). One reason why safe water is related to stunting may be a lower likelihood of the child contracting illnesses such as diarrhoea. This result is common. Thomas and Strauss (1992) give a review of studies indicating a negative correlation between the quality of drinking water and child mortality rates. Stunting, which indicates the effect of chronic undernutrition, is more pronounced (27.1%) in children living in households with a pit toilet than in children who live in households with a flush toilet (15.5%). This result is similar to the result for underweight.

A higher level of maternal education should result in better child nutrition, reflecting various factors including a better knowledge of health and sanitation, and increased utilisation of health services (Thomas & Strauss, 1992).

Table 7. 9: Stunting (<-2HAZ) and associated factors

Variables	<-2HAZ	≥-2HAZ	N
Country			
Uzbekistan	31.3	68.7	988
Kyrgyzstan	24.8	75.2	1015
Kazakhstan	9.5	90.5	354
Toilet facility			
Flush	15.5	84.5	309
Pit	27.1	72.9	2021
Water facility			
Piped	23.0	77.0	1621
Unpiped	31.0	69.0	714
Mother's education			
0-Part 2	20.7	79.3	262
Secondary	27.1	72.9	1825
Higher	17.0	83.0	271
Household wealth index			
0-3 items	33.7	66.3	626
4 items	24.2	75.8	558
5 items	19.7	80.3	517
6-9 items	23.0	77.0	639
Number of people per household			
1-4	19.8	80.2	535
5-7	26.4	73.6	1063
8 and more	27.4	72.6	759
Number of children under five			
0-1	20.8	79.2	901
2	27.1	72.9	1035
3 and more	30.1	69.9	422
Child haemoglobin level			
Severe	34.3	65.7	41
Moderate	28.9	71.1	565
Mild	26.9	73.1	536
None	21.8	78.2	1036
Respondent ever heard of ORT			
No	28.7	71.3	309
Used	23.5	76.5	102
Yes	24.7	75.3	1914
Birth order			
1	21.8	78.2	719
2-3	24.3	75.7	1102
4 and more	31.7	68.3	537
Age of child (months)			
0-5	6.5	93.5	345
6-11	19.1	80.9	420
12-23	35.6	64.4	795
24-35	26.3	73.7	798
Birth weight			
≤ 2.5	37.6	62.4	130
> 2.5	24.1	75..9	2168
Duration of breastfeeding (months)			
0-6	14.4	85.6	585
7-12	25.5	74.5	729
13-35	32.6	67.4	959
Preceding birth interval			
First	21.8	78.2	720
< 24 months	28.1	71.9	460
24-47	28.8	71.2	749
> 47	21.7	78.3	429
Number of Immunisations			
0-3	10.5	89.5	296
4-7	21.3	78.7	647
8 and more	30.6	69.4	1278
Sex of child			
Male	27.7	72.3	1194
Female	22.7	77.3	1164
Place of residence			
Urban	21.0	79.0	648
Rural	26.8	73.2	1710

Contrary to the results for underweight a negative effect of maternal education on child nutritional status was noted in the case of children born to mothers with secondary school educational level (27.1%) rather than those born to mothers with lower or no education (20.7%). A possible explanation for this phenomenon could be that mothers with secondary education are gainfully employed, buy nutritional food, earn an income and are able to either employ other people to care for the children at home or to send the children to kindergarten. However, the children might not be well cared for by the care-givers, and the mother might not have sufficient time to care for her baby herself. On the other hand, those mothers with lower or no education could be stay at home mothers whose husbands are gainfully employed and financially supportive, and therefore the mothers are better able to care for their children.

An association was also found in the case of household wealth, which is used as a proxy for the economic condition of the family. The percentages of stunted children in all four categories measuring household wealth were higher than for underweight children. A generally lower impact of household wealth on stunting was expected, as stunting is a measure of chronic malnutrition reflecting the impact of the household's current as well as past wealth. As expected, the number of children under the age of five per household had an effect on the nutritional status of the children in the sample. Similar to the underweight results female children had a lower WAZ than male children, while living in a rural area also had a negative effect on stunting levels.

7.3.8 Bivariate association between biodemographic and health factors and height-for-age z-scores

As expected, the birth order of the child reveals that firstborns have a better nutritional status (21.8%) than do children of higher birth order births. This is contrary to the result for underweight. The following results are similar to the underweight results. The age of child, the number of immunisations, duration of breast-feeding, and birth weight all had a negative effect on the nutritional status of children under the age of three years.

Having had all eight routine immunisations had a negative association with height-for-age (30.6%). On average HAZ decreased rapidly to reach a minimum at 12-23 months. Children aged 0-5 months by the time of the survey reported the lowest stunting levels. Children who were never breastfed or were breastfed up to six months by the time of the survey were better off than those who were breastfed for longer than seven months. The size of the child at birth affected his nutritional status. From Table 7.9 it may be seen that an effect was also found in the case of the anaemia status of the child. Children with severe levels of anaemia (although very few) had higher HAZ than those with mild moderate or no anaemia.

7.3.9 Weight-for-height z-scores descriptive statistics for the combined countries

Although this measurement is not suitable to be used in a multivariate analysis, the bivariate analyses that follow will shed some light on the wasting levels associated with a number of characteristics.

7.3.10 Geographical distribution of weight-for-height Z-scores

An association was noted between country of residence and wasting levels. Levels of wasting are generally much lower than underweight and stunting levels in all three countries studied. The rate of wasting (1.9%) was lowest for children in Kazakhstan, while wasting increased almost twofold in Kyrgyzstan and more than six-fold in Uzbekistan. Again, the explanation given above for WAZ and HAZ disparities is applicable here as well.

Table 7.10: Wasting (<-2WHZ) and associated factors

Variables	<-2WHZ	≥-2WHZ	N
Country			
Uzbekistan	11.6	88.4	989
Kyrgyzstan	3.4	96.6	1015
Kazakhstan	1.9	98.1	355
Toilet facility			
Flush	5.5	94.5	309
Pit	6.9	93.1	2022
Water facility			
Piped	5.4	94.6	1621
Unpiped	9.6	90.4	714
Mother's education			
0-Part 2	8.4	91.6	262
Secondary	7.0	93.0	1824
Higher	2.7	97.3	271
Household wealth index			
0-3 items	9.7	90.3	627
4 items	5.3	94.7	557
5 items	5.4	94.6	517
6-9 items	6.0	94.0	638
Number of people per household			
1-4	6.8	93.2	536
5-7	6.2	93.8	1063
8 and more	7.1	92.9	759
Number of children under five			
0-1	4.8	95.2	901
2	6.9	93.1	1036
3 and more	9.8	90.2	421
Child haemoglobin level			
Severe	0.0	100.0	41
Moderate	7.4	92.6	565
Mild	5.3	94.7	537
None	7.5	92.5	1035
Respondent ever heard of ORT			
No	10.5	89.5	308
Used	11.9	88.1	102
Yes	5.8	94.2	1914
Birth order			
1	6.3	93.7	719
2-3	6.1	93.9	1102
4 and more	8.2	91.8	537
Age of child (months)			
0-5	7.3	92.7	345
6-11	6.7	93.3	420
12-23	8.5	91.5	796
24-35	4.5	95.5	797
Birth weight			
≤ 2.5	7.2	92.8	130
> 2.5	6.0	94.0	2169
Duration of breastfeeding (months)			
0-6	6.9	93.1	586
7-12	7.7	92.3	729
13-35	5.8	94.2	959
Preceding birth interval			
First	6.2	93.8	720
< 24 months	6.9	93.1	460
24-47	8.0	92.0	749
> 47	4.6	95.4	430
Number of Immunisations			
0-3	6.3	93.7	297
4-7	6.1	93.9	647
8 and more	7.4	92.4	1278
Sex of child			
Male	7.7	92.3	1194
Female	5.6	94.4	1164
Place of residence			
Urban	6.4	93.6	648
Rural	6.7	93.3	1710

*** ORT = Oral rehydration therapy**

Table 7.10: Wasting (<-2WHZ) and associated factors (continued)

Ethnicity			
Kazak	3.0	97.0	304
Kyrgyz	3.6	96.4	658
Uzbek	10.2	89.8	1108
Other	5.9	94.1	170
Russian	0.8	99.2	118
Body mass index (BMI)			
<18.5	11.8	88.2	212
18.5-29.9	6.4	93.6	2059
>30	0.0	100.0	81
Professional delivery assistance			
Assisted	6.3	93.7	2307
Not Assisted	24.5	75.5	49

7.3.11 Bivariate association between socioeconomic and environmental factors and weight-for-height z-scores

In this study it may be seen that not all the variables are equally important in determining whether a baby is underweight, or suffering from acute or chronic malnutrition. Surprisingly, variables that did not show any association with nutritional status in underweight and stunting (ethnicity, delivery assistance and BMI) had a negative association with underweight. The following results are similar to certain of the underweight and stunting results. The household wealth, the number of children under the age of five, maternal education, and knowledge of ORT all had a negative effect on the nutritional status of children under three years.

The extent of malnutrition with respect to WHZ, which indicates a short-term nutritional deficiency, is higher (9.6%) among children living in households that use unpiped water than in children who live in households that use piped water (5.4%). Lack of running water in the household has an effect on weight-for-height, presumably indicating poor hygiene and exposure to infections. The positive effect of maternal education on child nutritional status was noted in respect of children born to mothers with higher educational levels. Only 2.7 percent were malnourished compared to 7.0 percent and 8.4 percent for children born to mothers with secondary and lower or no education respectively.

A clear effect on nutritional status was also found in the case of household wealth, which is used as a proxy for the economic condition of the family. An association was found between child nutritional status and ownership of less than three items. The number of children under the age of five per household had a negative effect on the child nutritional status of children in the sample. Approximately 9.8 percent of the children that were wasted came from households with more than two children under the age of five while about 4.8 percent came from households with only one child. Children whose mothers had used ORT had lower WHZ than those whose mothers either had knowledge of it or did not know about it. None of the other variables that had a significant relationship with nutritional status in stunting and underweight revealed any association with wasting.

7.3.12 Bivariate association between biodemographic and health factors and weight-for-height z-scores

Differences found for children who are wasted were mainly related to ethnicity, BMI, and delivery assistance. As explained earlier wasting is a short-term nutritional deficiency, so the lack of a considerable difference with the expected health variables might be due to the fact that the impact of illness in Central Asia is long term rather than short term. Ethnicity has a marked effect on wasting. The prevalence of wasting prevalence reached 10.2 percent among Uzbek children, compared to 0.8 percent among Russian children. There is no particular reason to expect Russian ethnicity to have an impact (genetic differences associated with race that determine final weight-for-height should manifest themselves in adolescence and not at the preschool age). However, the fact that the Central Asian Republics were the poorest republics under Soviet Rule could be a reason for differences in weight-for-height. This result may be influenced by the fact that the majority of the children in the sample are Uzbeks, while the minority are Russian. Ethnicity has generally been found to be a strong predictor of malnutrition in the Central Asian republics studied. The results of the three DHS in this study reveal that children of ethnic Kazakhs, Uzbeks and Kyrgyz have higher levels of malnutrition than children from other ethnic groups (not shown here).

On average, children whose mothers' BMI was less than 18.5 kg/m^2 (the critical value) reported the highest weight-for-height z-scores (11.8%). Since a low BMI is a reflection of current nutritional status it may come as a surprise that this measure affects wasting only. BMI is based on the weight-to-height ratio, which is considered a good index of body fat and protein stores. Body stores are of interest because they reflect the stores needed to cope with physiological stress due to reduced food intake and increased demands due to increased activity, pregnancy and diseases (Cogill, 2003). The results in Table 7.9 suggest that the degree of utilisation of professional delivery assistance is positively associated with wasting.

7.4 LOGISTIC REGRESSION

A binary logistic regression analysis estimating models using the stepwise forward method (based on Wald statistics) on the pooled dataset was carried out controlling socio-economic, health and environmental characteristics. A separate analysis was carried out to study the chances of being underweight and stunted among children in the target population. Analyses for the possibility of being wasted were not performed because the percentage of wasted children was too low.

As mentioned in the section on method the statistical analysis of the logistic regression is used to identify groups that have a higher or lower risk of under-nutrition in the population under review. The odds ratio is greater in cases where the variable causes the response to increase more than that of the reference category. Otherwise the value is less than or equal to one.

Tests for co-linearity (see Appendix 1.1 and 1.2 in Appendix 1) were performed in order to identify independent variables for inclusion in the regression model that displayed high co-linearity with the dependent variable. Bivariate analyses were used to evaluate the associations between the selected independent variables and the dependent variables in order to decide upon the variables to be used in the logistic regression. In order to assess the differences between the two groups Chi-square tests and Cramer’s V tests were used to test the homogeneity with regard to the relevant dependent variable.

Chi-square tests were performed to test the null hypothesis of no relationship (see Cramer’s V values in Appendix 1.3 and 1.4 in Appendix 1) in order to be sure that no independent variables were included in the multivariate analyses that have a strong relationship with other predictor (independent) variables.

7.4.1 Logistic regression: standardised weight-for-age

The following variables were used as input in the standardised weight-for-age logistic regression analyses: toilet facility, maternal education, household wealth, number of people in household, number of children under the age of five, birth order, birth interval, number of immunisations, age of child, duration of breastfeeding, birth weight, child haemoglobin, mother heard of ORT, country, water facility, and professional delivery assistance, but only those variables that fulfilled the entry criteria of the logistic regression are presented in Table 7.11.

Table 7.11 presents the regression results for child nutritional status for the pooled data for the three countries under review. The first column in the table contains the odds ratio for the explanatory variables employed in the logistic regression. The second column details the significance values for the Wald statistic, while the upper and lower confidence levels of the odds ratios are noted in the third and fourth columns in each table.

A number of variables that showed a significant association with child nutritional status in the univariate analyses did not show any relationship in the logistic regression analyses. There are two possible explanations for this phenomenon. Firstly, there may be no causal relation between these variables and child malnutrition in the context of the countries studied due to various other reasons beyond the scope of this study, although significant associations between these variables and child malnutrition have been found in many studies conducted in developing countries. On the other hand, the consistency of the background characteristics could be responsible for the lack of association. More than 80 percent of the children (not shown here) in the study came from households that use pit latrines; the use of sanitary latrines such as pit latrines demonstrates improved household hygiene and subsequent better health. Breastfeeding is almost universal in Central Asia – more than 95 percent of the children in the study were breastfed. The duration of breastfeeding was approximately 12 months, while anaemia levels were normal at 11g/dl.

High levels of anaemia have been found in the area around the Aral Sea in Kazakhstan and Uzbekistan. In the individual country analyses anaemia showed a high correlation with nutritional status but this disappeared when the data was pooled, possibly due to lower levels of anaemia in Kyrgyz children. As discussed earlier (Chapter 2) health services, although poor, are easily accessible and certain of the services, including pre- and postnatal care, are free. More than 80 percent of the mothers in the study had received professional delivery care. About 98 percent of all the children under the age of 1 year had received all eight immunisations as expected. Fertility levels in Central Asia are low (see Chapter 2, p21). This could account for the lack of a significant relationship with child nutritional status – children might not be exposed to maternal depletion syndrome.

Table 7.11 shows the results of the logistic regression for weight-for-age indicating the odds of being underweight in various categories of the population observed. It is noted that living in Uzbekistan has an effect on the prevalence of underweight children. The logistic regression analysis shows that children living in Uzbekistan were 4.4 times more likely to be underweight than children living in Kazakhstan. A child living in a household with one to four persons is 55 percent less likely to be underweight in comparison with a child living in a household with between five and seven people.

It was observed that ownership of durable household goods used as a proxy for economic condition has an effect on the prevalence of underweight children.

Table 7.11 Odds of being below –2SD for weight-for-age for pooled data: 95% confidence intervals

Factors	e^{β}	P value	95 % confidence for e^{β}	
			Lower	Upper
Country(reference: Kazakhstan)				
Uzbekistan	4.415	0.000	2.492	7.823
Kyrgyzstan	2.196	0.009	1.217	3.960
Number of people in household (reference: >7)				
1-4 persons	0.452	0.000	0.305	0.670
5-7 persons	0.836	0.311	0.591	1.182
Household wealth index (reference 6-9 items)				
0-3 items	1.613	0.009	1.125	2.311
4 items	0.990	0.960	0.663	1.478
5 items	0.796	0.289	0.522	1.214
Birth weight (reference <=2.5kg)				
> 2.5kg	0.363	0.000	0.220	0.591
Age of child (reference > 24 months)				
0-5 months	0.244	0.000	0.122	0.487
6-11 months	1.199	0.376	0.803	1.789
12-23 months	1.922	0.000	1.396	2.646
Heard of ORT (reference Yes)				
No	1.119	0.579	0.752	1.665
Used	2.119	0.010	1.20`	3.700

The odds of a child being underweight in a household that owns 0-3 durable household items is 1.6 times higher in comparison with households that own 6-9 durable items. Another important determinant of weight-for-age was the birth weight of the child. Children whose birth weights were more than 2.5 kg were 64 percent less likely to be underweight in comparison with children that weighed 2.5 kg and less at birth.

Poor nutritional growth was observed as the age of the child increased. Strangely, the odds of being underweight are 2.1 times higher for those children who had used ORT in comparison with those whose mothers had only heard of ORT. The questionnaire had posed the question to the mothers whether they had heard of ORT, had used it in the preceding two weeks or had never heard of it. The use of ORT two weeks prior to the survey is indicative of a child having suffered from diarrhoea, which could have led to weight loss.

7.4.2 Logistic regression: standardised height-for-age

The results of the logistic regression for height-for-age are given in Table 7.12. The following variables were used as input in the standardised height-for-age logistic regression analyses: toilet facility, water facility, maternal education, household wealth, number of children under the age of five, birth order, number of immunisations, age of child, duration of breastfeeding, birth weight, child haemoglobin, country, but only those variables that fulfilled the entry criteria for the logistic regression are presented in Table 7.12.

As is the case with weight-for-age, living in Uzbekistan has a significant impact on the stunting of children. The odds of being stunted are 3.7 times higher for children in Uzbekistan compared with children living in Kazakhstan. The same result was found when comparing Kyrgyzstan and Kazakhstan, although the odds of being stunted are lower.

Exposure to malnutrition peaks for the 12-23 months age group with an odds ratio of 1.57 compared with children above the age of 24 months. This means that the 12-24 month group are 1.57 times more likely to have a low height-for-age value when compared with children older than 24 months. These results are consistent with the findings of past studies that child nutritional status declines significantly with age, reflecting the typical deterioration of linear growth in children aged 1 to 3 years – the most vulnerable age category (Ndiaye, 2002).

Table 7.12: Odds of being below-2SD for height-for-age for pooled data: 95% confidence intervals

Factors	e^{β}	P value	95 % confidence for e^{β}	
			Lower	Upper
Country (reference: Kazakhstan)				
Uzbekistan	3.691	0.000	2.441	5.580
Kyrgyzstan	2.733	0.000	1.811	4.123
Number of children under 5 (reference: >2)				
0-1 children	0.596	0.001	0.439	0.809
2 children	0.774	0.078	0.583	1.030
Household wealth index (reference: 6-9 items)				
0-3 items	1.346	0.055	0.933	1.825
4 items	0.970	0.849	0.707	1.330
5 items	0.788	0.144	0.573	1.085
Birth weight (reference: <= 2.5kg)				
>2.5kg	0.422	0.000	0.272	0.655
Age of child (reference: 24 months)				
0-5 months	0.188	0.000	0.116	0.305
6-11 months	0.669	0.014	0.486	0.922
12-23 months	1.579	0.000	1.236	2.018
Mother's education (reference: Higher)				
0-part 2	1.839	0.017	1.117	3.029
Secondary	1.868	0.001	1.271	2.744
Water facility (reference: piped)				
Unpiped	1.408	0.006	1.102	1.799

The odds of a child being stunted in a household that owns more than six durable household items is 1.3 times higher in comparison with a household that owns 6-9 durable household items. Children with a birth weight of 2.5kg and less are more than twice as likely to be stunted in comparison with children with a birth weight of more than 2.5 kg. The same conclusions were reached in respect of weight-for-age. It would also seem that the number of children per household plays a significant role in respect of stunting. An only child is approximately 40 percent less likely to be stunted than a child living in a household with more than two children. The odds of being underweight for children living in a household with unpiped water are about 1.4 times higher in comparison with those children who live in a household with piped water.

Those children with mothers having 0-Part 2 education are nearly twice as likely to be stunted as children with mothers who have a secondary and higher than secondary education.

7.5 Summary

The results form the nutritional status models concur in part with other research results from developing countries (e.g., Smith & Haddad, 2000). Stunting levels within and between the three countries were higher than both underweight and wasting. Child nutritional status varies according to province of residence as indicated in the bivariate results for individual countries. The bivariate results for the combined countries indicate the variation in child nutritional status by country of residence. The regression results confirm that socio-economic, health and environmental factors significantly affect child nutritional status.

CHAPTER 8

8. FINDINGS AND CONCLUSIONS

8.1 SUMMARY OF FINDINGS

The first section in this chapter reiterates the results presented in the previous chapter and highlights important findings from the study. In the second section, reference to the theoretical tools used in Chapters 4 and 5 will be made in analyzing the results in Chapter 7.

After the breakup of the FSU, the poorer republics of Central Asia were faced with problems relating to child health, including child malnutrition, with the malnutrition rates ranking among the worst in the CIS. While this has been documented in official national surveys, the reasons behind this are still not properly understood. This thesis addressed this gap by conducting a secondary analysis of the data from the DHS' conducted in these former republics in 1996, 1997 and 1999. Accordingly, attention was paid to the role played by socioeconomic, environmental and health factors in child malnutrition.

The main results identify province of residence within a country, the country of residence, number of people in a household, household wealth, birth weight, age of child, mother's knowledge of ORT, maternal education, number of children under the age of five years, and source of drinking water as strong predictors of child nutritional status in the three Central Asian Republics. Furthermore, it has been shown that chronic malnutrition, which is long-term undernutrition, is most prevalent in all three countries.

Though largely consistent with findings from malnutrition studies in other developing countries, the results of the secondary data analysis with respect to religion, marital status, and ethnicity are less robust, because of confounding factors, such as a lack of variation in the variables. The majority of the population is Muslim, marriage is universal, and the majority of the natives in the three countries under review (Uzbekistan, Kazakhstan and Kyrgyzstan) are Uzbeks, Kazakhs or Kyrgyz.

The main questions that this study addressed include the following:

- What is the variation of the prevalence of stunting, underweight and wasting among the three countries and within the three countries under review?
- Which factors explain differences in stunting, underweight and wasting among the three nations?
- What role does the economic development of a country play in the modification of child malnutrition status?
- What role do structural factors play in child nutritional status?

The findings are summarised along the following lines:

- Malnutrition rates in the CARs, which were the focus of the study rank among the highest CIS, with the exception of Kazakhstan, which has the lowest rate. Uzbekistan and Kyrgyzstan have rates similar to those of certain of the world's poorest developing countries. This study clearly suggests that factors influencing child nutrition vary from country to country. This is most probably due to geographic diversity and the unbalanced economic development in these countries. The proximity of Uzbekistan and Kyrgyzstan to neighbouring Afghanistan, Tajikistan and Pakistan, all countries which are fraught with uprisings, civil wars and instability, could have a negative effect on the economic stability of these two countries. Provinces bordering Tajikistan and China have higher than national average malnutrition levels. In addition, provinces close to the Aral Sea, which has contributed to a host of environmental health problems, especially in the case of the children, also had high malnutrition levels in both Kazakhstan and Uzbekistan.

- Inequalities in stunting, underweight and wasting were statistically significant in Uzbekistan and Kyrgyzstan. Stunting inequalities were greater than inequalities in underweight, which tended to be higher than inequalities in wasting. Kazakhstan did well in terms of both the average (prevalence of malnutrition) and the distribution (equality). Uzbekistan and Kyrgyzstan had higher levels of stunting and underweight while Uzbekistan had the highest levels of malnutrition of all three countries (see Tables 7.2, 7.4 and 7.6). Figures 7.1, 7.3 and 7.5, which show the distribution of the nutritional status indicators, further confirm the results from the provinces. In Uzbekistan and Kyrgyzstan, a large proportion of the children failed to achieve the reference median height and weight for their age while in Kazakhstan the majority of the children in the sample had achieved the reference median height and weight for their age.

- Provincial differences within each country were also distinguished. With the exception of Kazakhstan, this five-country region is mainly rural, with the highest concentrations of malnutrition observed in the southern oblasts (provinces) of the other four countries. Approximately 64 percent of the inhabitants of Central Asia reside in rural areas. The high proportion of population residing in the rural areas of Central Asia reflects the regional investment policies of the FSU (Buckley, 1998:71). Tables 7.2, 7.4 and 7.6 indicate the disparities within the provinces in each country. In Kyrgyzstan, children who live in the provinces to the east and to the south displayed the highest prevalence of malnutrition. The rates of stunting, underweight and wasting from these two provinces were higher than the national average. A similar picture was evident in Uzbekistan. Children who live in provinces 2 and 4 displayed the highest incidence of malnutrition and had higher than national average prevalence rates of malnutrition. Although Kazakhstan had the lowest overall malnutrition rates the disparities within the provinces were large. The stunting levels in the western, central and eastern provinces were higher than the national average, while the province to the north had higher than national average underweight levels. The central and western provinces had higher than national average wasting levels.

- The geographic location variables for each country (not shown here) also provide an interesting insight into the pattern of child health in the three Central Asian Republics. Children living in densely populated, mountainous and predominantly rural provinces with harsh climatic conditions, and suffering from all forms of malnutrition displayed higher than national average rates in all three countries as indicated in the individual country data analyses. The combined bivariate analyses indicate disparities in the underweight and stunting levels of children by area of residence. These findings suggest that the relative advantage enjoyed by children living in cities over their rural counterparts as indicated in the bivariate analyses may be mediated by household socio-economic characteristics (see Tables 7.4, 7.6 and 7.8).

Among the variables used in the bivariate analysis which were not entered into the regression model ethnicity, body mass index and professional delivery assistance showed a significant correlation with wasting. Birth order, the number of immunisations, breastfeeding and child haemoglobin level were significantly associated with both underweight and stunting, while birth interval and toilet facility were significantly associated with underweight only.

- In Central Asia children born less than 24 months after the last sibling are more likely to be underweight than those born 47 months after the last sibling. Similar results were observed in Nepal, the Philippines, and Ethiopia (Gubhaju, 1986; Ricci & Becker, 1996; Frost et al., 2005). Children born at short birth intervals may create huge burdens biologically and in respect of childcare and these may result in reduced nutritional status. Gubhaju (1986:444) found previous birth interval to be the most important factor affecting infant mortality in Nepal. In the Philippines (Ricci & Becker, 1996:970-971) found a short birth interval to be a risk factor for stunting and wasting.

- An unexpected finding is the high probability that fully vaccinated children were likely to be underweight and stunted compared to children who were partially vaccinated. Similar results were found in Ethiopia by Yimer (2000:289). On the other hand Macro International Inc. in Senegal (1996:5-12) and Uganda (1996:7-10) found a negative association between chronic malnutrition and the vaccination status of children. Since stunting appears in early ages in Central Asian children many of the children in this study may have been stunted before they received all the recommended vaccinations. This could also be influenced by the poor nutritional status of the mother who is not able to provide nutritious breast milk.

- The birth order of the child showed a significant association with stunting and underweight. Similar results have been reported in a number of studies. In Sri Lanka Aturupane et al. (2006:3) found a very clear pattern of child malnutrition rates increasing with the birth order of children. For sixth and higher order children the risk of malnutrition was nearly twice as great as that for first-born children. Recent studies indicate that stunting increases as birth order increases (Forste, 1998:122; Mishra & Retherford, 2000:4).

- Breast-feeding, especially in children older than six months, had an association with stunting and underweight. Similar results have been reported in a number of studies conducted in developing countries (Rao et al., 2004; Sasisaka, 2006). In Nicaragua, Sasisaka (2006:405) identified a breast-feeding duration of more than twelve months to be a risk factor for underweight. Rao et al. (2004:50) studied nutritional status in North East

India and found that children who were still being breastfed beyond the first birthday had highly significantly lower z-scores compared to those who had stopped breast-feeding.

- Access to a flush toilet had positive significant effects on underweight only in Central Asia. Merchant et al., (2003), Daniels et al., (1991), Huttly (1990), Ricci and Becker (1996), Magnani et al. (1993) found an association between good water and sanitation and improved nutritional status in studies conducted in various developing countries.

- Haemoglobin level is an important base for determining the health of children and the study confirms that the nutritional status of anaemic children was poor. A larger number of children who suffered from mild to moderate anaemia in Central Asia were stunted and underweight than those who did not. The main reason for the prevalence of anaemia in Central Asia is the iron deficiency in the diet due to nutritional deficiency and the structural problems as discussed in Chapter 2. Scrimshaw (2001:3-5) reports that the anaemia rates for children under the age of three years in Kazakhstan and Uzbekistan in 1995 and 1996 respectively ranged between 50 and 75 percent. In India, anaemic children tended to have poor nutritional status and it was highly significant (Rao et al., 2004:50).

- The relationship between ethnicity and child malnutrition is inconclusive: certain studies have reported higher malnutrition levels among indigenous children than among non-indigenous children, while others have found the opposite. In Nepal, Sah (2004:7) found a higher proportion of underweight and stunted children for Dalit (indigenous) than non-Dalit children under the age of three. Conversely, Hotchkiss et al. (2002:180), using the approach of Strickland and Tuffrey (1997), found that Mongoloid children had higher weight and height measurements than non-Mongoloid children.

Other factors could be responsible for the apparent ethnic differences found in Central Asia, especially the fact that the majority of the children are indigenous to the three countries.

- To a large extent the wellbeing of a child depends on the health of the mother. However, the standard, availability, accessibility and affordability of healthcare offered determine the wellbeing of the mother. The availability of professional healthcare for pregnant women in Central Asia had an association with wasting, although either a nurse or a doctor delivered nearly all the children in the study sample.

- Commonly found in many developing countries is the association between stunting and low BMI. Other studies have found an association between BMI and underweight (Silva, 2005:20). In this study low BMI had an unusual association with wasting. Children of nourished mother were 40 percent less likely to be wasted compared to children of acutely malnourished mother. Rayhan and Khan (2006:560) found similar results in Bangladesh. Sanghvi et al. (2001:352) found infant birth weight and maternal BMI were significant risk factors for current child wasting status in India. Children of well-nourished mothers had a lower risk of being underweight compared to children of acutely malnourished mothers. The reason may be that thin or malnourished mothers are not able to provide sufficient breast milk because of their nutritional deficiency. In India, the nutritional status of children born to mothers with a BMI below the critical value of 18.5 kg/m2 was significantly poor (Rao et al., 2004:51).

The regression analysis uncovered that the underlying determinants of the nutritional status of children under the age of three in Central Asia beyond toilet facility, child haemoglobin level, birth order, duration of breast-feeding, birth interval, number of immunisations are household wealth, age of child, birth weight, number of people in household, water facility, mother's education, number of children under the age of five and whether the respondent had ever heard of ORT.

- As regards the assessment of the economic situation of the household, it is important to note that the variables used in computing the wealth index tend to reflect the permanent living conditions of the household rather than the current cash availability. A low economic level thus indicates medium to long-term poverty. It is, however, clear that, as the economic situation of a household improves (indicated in this study by household wealth index used as proxy for income) the nutritional level of children may improve. Correspondingly, chronic malnutrition levels among children who live in 'poor' households were lower than acute malnutrition levels for children living in similar households. Ukwuani and Suchindran (2003:2119) found that, among children under the age of six in Nigeria children born to mothers in wealthy households were less likely to be stunted than children born to mothers in poor households. Silva (2005:20) found that in Ethiopia household wealth had a greater impact on stunting than on underweight.

- Similarly, better growth is assured if the child belongs to a household consisting of four or fewer people. However, family size does not seem to have an effect on chronic malnutrition, as indicated by stunting. The finding on household size is consistent with Sahn's (1994:52) study of nutritional status in Cote d'Ivoire and Ndiaye's (2002:111) study in Niger.

- The positive effect of maternal education on child nutritional status found in this study is consistent with other studies on factors affecting child health, such as those conducted in India, Nepal, Bangladesh, and Russia (Choudhury & Bhuiya, 1993; Mishra & Retherford, 2000, Sah, 2004; Fedorov & Sahn, 2005). Mishra and Retherford (2000:3) found, among children under the age of age four in India, that those whose mothers had a certain degree of education but had not completed middle school were much less likely to be malnourished than were children whose mothers were illiterate. In Nepal, Sah (2004:10) found maternal education to have an effect on the nutritional status of children under three years. Analysing the effects of biosocial variables on changes in nutritional status in Bangladesh, Choudhury and Bhuiya (1993:354) observed a decrease in the proportion of severely malnourished children with an increase in the mother's level of education after controlling for other socioeconomic and geographical factors. In Russia, Fedorov and Sahn (2005:492) found that the education of the mother had a very strong impact on child's health. Overall, the results confirm the importance of maternal education for child health and development.

- The positive nutritional effect of clean water found in this study is also consistent with other studies conducted in developing countries (Thomas & Strauss, 1992; Pongou et al., 2004; Silva, 2005). Silva (2005:21), in a study conducted in Ethiopia examining the impact of externalities associated with access to basic environmental services such as water and sanitation, found that there were significant externalities associated with access to water at the community level. In Cameroon, Pongou et al. (2004:27) found that drinking water was significantly associated with child nutritional status both at the national and at the rural-urban levels. Focusing on the impact of the community infrastructure on the height of children in Brazil, Thomas and Strauss (1992:321) found that water facilities significantly affected the height of children, especially in urban areas. Several reports from Central Asia identify waterborne diseases (mainly diarrhoea) as one of the major contributors to the diseases suffered by children, especially those living around the Aral Sea. Contamination means that drinking water is a major health problem in this region. Even when water is piped it is not necessarily safe. There are high concentrations of chlorine in the water in certain areas (Carpenter, et al., 2006:364).

- Measures of the mothers' knowledge concerning disease treatment and prevention and nutritional requirements are limited in the DHS. Maternal knowledge and use of oral rehydration therapy is commonly used as an indirect measure of general health knowledge. The negative association between use of ORT and underweight in this study could be explained in two ways. Bhuiya et al., (1990); Boerma et al., (1990) concluded that a lack of an understanding of infections as a cause of disease and improper use of ORT to treat diarrhoea negatively affected child nutritional status.

- The number of children under the age of five in the household is significantly associated with stunting – the greater the number of under-fives in the household the higher the possibility of stunting. This is not surprising since, as the number of children under five years of age increases, so may the strains on the inelastic resources in the household. In India, Mishra and Retherford (2000:4) found that children with three or more older siblings were more likely to suffer from stunting than are children from smaller families, probably because competition for food increases with family size. In the Congo, Delpeuch et al. (2000:46) found that the number of preschool children in a household had an effect on wasting, which was less likely when there was only one child below the age of six years in the household. When analysing levels and risk factors of malnutrition among children in South Ethiopia, Yimer (2000:289) found that the number of children in a household was significantly associated with the long-term nutritional status of children.

- Although a common result in many studies conducted in developing countries the significant effect of the age of the child on stunting and underweight highlights the first two years of life as the most nutritionally vulnerable for children in the study area, thus suggesting that the first two years of life are critical periods for public health intervention. Figures 7.2, 7.4 and 7.6 further confirm the bivariate analyses results. Similar results were found in Niger (Ndiaye, 2002:107). Using data from 39 different countries Shrimpton, et al., (2001:5) found that growth faltering in length starts immediately after birth. This conclusion was supported by studies on the growth of individual children. These studies showed that most of those malnourished at ages 3-5 years had already presented anthropometric deficits at the end of their first year of life. In Sri Lanka, Aturupane, et al., (2006) found that malnutrition for a large proportion (about a fifth) of children begins after the first six months of life. Reasons for this include low birth weights, inadequate breastfeeding, poor weaning practices and insufficient consumption of nutritious food. The risk of malnutrition increases sharply in the second year of life (beginning at age 12 months), when most children stop breastfeeding and begin relying almost exclusively on solid foods.

- Birth weight is significantly associated with both underweight and stunting. Examining factors causing child malnutrition in Bangladesh Rayhan and Khan (2006:560) found that very small and smaller than average size children at birth were at a higher risk of stunting, underweight and wasting compared with children who were average size or larger at birth. Pongou et al. (2004:30) in Cameroon reported that the size of the child at birth affected the child's nutritional status. Children of low birth weight tended to have lower weight-for-age z-scores compared to those of average or larger birth weight. Other studies have found an association between birth eight and maternal socio-economic status, weight and nutritional status (Tinker & Ransom, 2002:3). Certain data suggests that, in India, better-nourished larger children receive more care (Arya, 1989:38). A study in Mexico found that mothers interacted more with better-nourished and larger children compared to smaller children (Allen et al., 1992:279).

These findings have important implications for policy and represent a further step towards gaining an improved understanding of the complex determinants of child (mal) nutrition in Central Asia.

8.2 STRUCTURAL FACTORS

The nutritional challenges facing the countries of Central Asia may be attributed largely to the ramifications of structural violence experienced by these countries under Soviet rule, unfinished policy reforms, and changes in the institutional structure of the countries. Policies and programmes to combat the food and nutritional deficiencies in children and women begun in the late 1990s need to be accelerated. Adequate policy analysis based on data regularly collected on the indicators and causal factors of food insecurity and malnutrition must be carried out. Food and nutrition policies, which are designed without adequate information on these parameters, may result in negative or unintended consequences for the food security of vulnerable households.

8.2.1 Sociopolitical transformations

Public policy may do much to improving child nutritional status in Central Asia. However, political stability within the countries and in the provinces must be achieved at the basic level before any policy may be instituted. Without political stability, it is more difficult for governments to develop and implement sound and sustained economic and social policies. The results of this study demonstrate that policies aimed at improving household economic status, living standards, and health environment could help to reverse the high child malnutrition levels in the Central Asian Republics. Greater efforts to improve child nutrition might be more useful if concentrated in the provinces where the problem is particularly severe.

8.2.2 Socio-environmental transformations

8.2.2.1 Alleviation of poverty

The level of poverty is high in the three CARs, affecting over 46% of the population (Table 5.1). Most of the poor live in rural areas (Figure 5.4). It is essential to take action to eradicate poverty because poverty is one of the most influential underlying determinants of the nutritional status of women, which is, in turn, linked to child nutritional status. In the short-term targeted social welfare allowances to the unemployed and the poorest sections of the populations, social and infrastructure services, and increased food entitlements will provide a measure of immediate relief and create a safety net.

In the long-term improvements in the macro-economic environment through wage earnings, employment rates, decreased income inequality and living standards must be brought about. Off-farm income generating activities must be promoted, especially in rural areas where there has been an influx of the many urban unemployed looking for work on the state farms. This would reduce the number of members per household, especially in the poor homes, where already inelastic resources are further stretched. Moreover, this would also lessen the pressure of agricultural activity on the already nutrient depleted soils. This could be achieved by facilitating access to capital at the community and individual level, without gender and age discrimination, as is currently the case in these countries.

Employment opportunities and earnings could be increased through skills training. This would help bridge the gap created by the emigration of skilled Russians and Germans after independence. A revitalisation of the educational system in these countries would also help increase the income of households. It is critical that these governments support the creation of new jobs for educated citizens, especially the young new graduates and the skilled workers, in order to prevent the inevitable emigration of educated and skilled citizens. Therefore, the strengthening of institutional capacity and the creation of an enabling environment for faster economic growth is essential.

8.2.2.2 Access to adequate and safe drinking water

The governments of the countries in the study should invest in social amenities, thus increasing the proportion of people with access to potable water, especially in Uzbekistan, which has critical water shortages. There should also be a concerted effort on the part of the three governments for better coordination and efficient use of water, desalination of water, and reduction of pollution of water sources. The quality of drinking water is a major problem, water is not properly distributed, and sources are exposed to various types of surface and underground contamination.

Threats to the health of children should be addressed and reduced as much as possible through the provision of safe and adequate drinking water. In this respect the dissemination of information on water management and education on water, especially in Uzbekistan where there is high contamination and pollution of water, is vital. Policies that address trade offs between Kyrgyzstan on the one hand, and Uzbekistan and Kazakhstan on the other hand, in respect of the supply of water to the latter two countries by Kyrgyzstan, and the exchange with fossil fuels by the other two, should be implemented.

8.2.2.3 Care of children

Particular attention should be paid to infant feeding. In the short-term targeted supplementary feeding needs to be offered to all infants who come from poor homes, and to those who display signs of growth deficiency as result of, for example, low birth weight from an early age. The dramatic rise of stunting with age up to the second year of life reflects the cumulative effect of repeated illness and inadequate nutrient intake. Therefore, supplementary feeding programmes should focus particularly on children between 6 and 24 months.

In the long-term, major efforts need to be made to improve the health knowledge of mothers as well as that of the caregivers. Private caregivers could be trained through child healthcare programmes initiated by government. Governments could create employment by either subsidising women to provide childcare or re-opening the kindergartens that once looked after the children of Central Asia under Soviet Rule so well, so that children may be professionally cared for while their mothers are at work. Kindergartens provide childcare for mothers, and this allows the mothers to work and thus earn an income. The kindergartens also provide food that would not otherwise be available in the home. The relationship between educational status and child malnutrition reflects the deteriorating educational levels of young mothers, as well as a lack of health knowledge on the part of both the educated and uneducated. The value of education for girls could be stressed to families and communities through consistent social mobilisation and gender awareness activities.

8.2.2.4 Care for mothers

Programmes to improve the nutritional status of children in developing countries must give priority to women because improving the nutritional status of women enhances child nutritional status. In the short term an acceleration of the nutrient intake programme targeting pregnant women that is already in place in these countries could help reduce low birth weight. In order to be ultimately successful prenatal intervention programmes need to focus on both nutrient deficiency prevention and treatment, particularly iron and iodine deficiencies.

This study has shown that the deterioration in economic status, health environment, and the status of women as indicated by the higher level of malnutrition among children whose mothers had either no education at all or only went to primary school level, has led to a substantial decline in child nutritional status in Central Asia. Reversing the decline would necessitate improvements in all of these areas. In view of the fact that these countries are still experiencing the political and economic transitions that many other countries completed decades ago there are significant benefits to improving the nutritional status of the next generation of leaders of these countries.

8.3 CONTRIBUTIONS OF STUDY

This study shows the complexity of determining which factors influence child nutritional status and how this influence is realised. The study shows that child nutritional status is concomitantly influenced by national, community and household factors, and cannot be reduced to one factor alone. A comparative study of the three countries, as well an analysis of the combined data from the three countries, contributes to the universal validity of empirical relationships that are observed in the pooled data.

In spite of the worsening nutritional status in the three CARs during the transition period, the rate of malnutrition has remained much lower than the rates found in many developing countries that have been independent from their colonial rulers for decades. It was, however, important to find out what factors were responsible for the high malnutrition levels in these countries. Determining which socioeconomic, environmental, health and geographic location features were linked to different types of malnutrition was of vital importance in this study. An assessment of whether the conceptual and theoretical framework used in this study of child malnutrition was valid in this context was performed.

The bivariate analyses indicate very high child malnutrition levels in certain provinces and very low levels in other provinces. Ironically, in both Uzbekistan and Kyrgyzstan, higher than national average underweight, stunting and wasting levels were concentrated in the same provinces, raising a concern about the determinants of malnutrition in these provinces. In Kazakhstan, children from the West province suffered from higher than national average stunting, underweight and wasting, while those from the Central province had higher than national average stunting and wasting levels.

The explanation why Kyrgyzstan and Uzbekistan have a higher prevalence of malnutrition than Kazakhstan may be due to the ramifications of structural violence factors (poor economic development, health care delivery, high unemployment levels etc.) perhaps to factors that are not easy to quantify. The large variability in the prevalence of stunting and underweight between the three countries and among provinces within a country means that whether or not children are malnourished is as much or more a consequence of factors at the national and provincial level than a consequence of individual household circumstances. The implication of this result is that, although interventions at the household level are clearly important, interventions at the national and subnational level are also important because of determining effects on the conditions faced by households.

In order to help determine policy directions factors that have been identified as relating to stunting and underweight should be targeted as a priority in dealing with malnutrition in this region. Improvement in any of the factors identified by this study would require various initiatives on the part of government. There is considerable evidence in broad terms that changes in structural factors such as improved health care delivery, education of mothers, environment and food security result in improvements in the wellbeing of children. However, closer attention to regional/provincial factors would do much to address malnutrition in the CARs. Furthermore, the empowerment women by improving their health may prove to be one of the best approaches to promoting the heath and wellbeing of children in Central Asia.