CHAPTER V
NUTRITIONAL STATUS OF CHILDREN

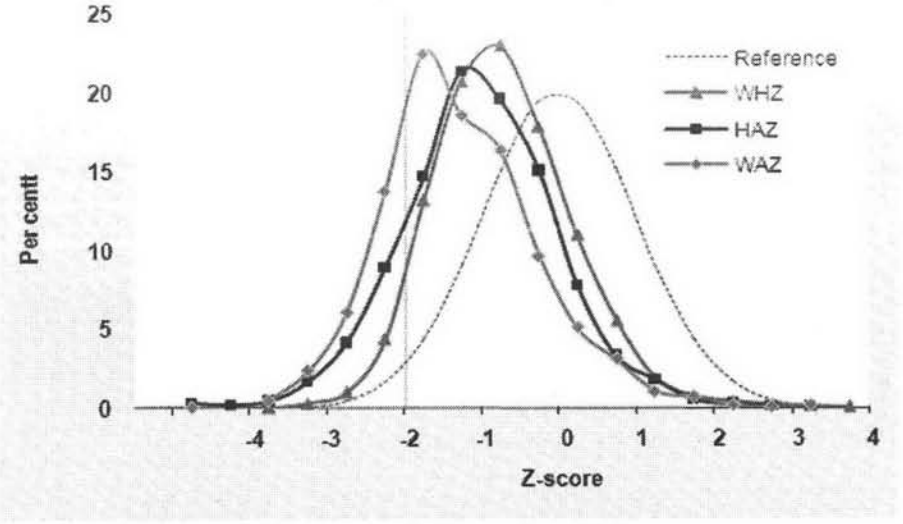
This chapter describes the nutritional status of children by province. .Differences in the nutritional status between boys and girls, among age groups, among household economic groups are also described in this chapter. Height-for-age Z-score (HAZ), weight-for-age Z-score (WAZ), weight-for-height Z-score (WHZ), stunting (HAZ <-2), underweight (WAZ<-2) and wasting (WHZ<-2) were used to reflect the status of nutrition in the whole population as well as among sub-groups.

5.1 Distribution of height-for-age, weight-for-age and weight-for-height Z-scores

By examining the Z-score curves for weight-for-age, height-for-age and weight-for-height, the quality of anthropometric measurements in a survey can be assessed. Figure 5 illustrates that the anthropometric data of the survey was reliable (the three Z-score curves are quite smooth and the shapes are appropriately normal).

The figure 5 also reveals that all of the three Z-score curves were shifted to the left of the WHO reference curve. As we know, the farther the distribution to the reference curve, the worst the nutritional status of the children in the population is. The Z-score curve for weight-for-height was closest to the reference curve. Conversely, weight-for-age Z-score curve was farthest from the reference curve.

Figure 5. WHZ, HAZ and WAZ distributions for surveyed children



5.2 Child nutritional status by province

5.2.1 – Height-for-age Z-score by province

Figure 6 provides information on HAZ distributions for the cohort of children by province. There were some extreme values in the data in every province. The box-plots also show that all of distributions were appropriately normal. Overall, HAZ of children in DaNang and BenTre were similar and were better than that in the others. Among the provinces, HAZ of children in LaoCai was worst. Illustrated in table 15 is the prevalence of stunting (HAZ<-2) across provinces. Table 15 presents information on numbers of children stunted (n) among the surveyed children, the percentages of stunted children in surveyed sample (crude %), the estimated prevalence of stunting in the population (adjusted %) and 95% confident intervals. The prevalence of stunted children aged 6-17 months in DaNang was 9.1 per cent (95%CI [8.3-9.9]) and that in BenTre was 10.9 per cent (95%CI [10.4-11.3]). Next were HungYen and PhuYen, where the prevalence was 14.3 per cent (95%CI [13.9-14.8]) and 18.7 per cent (95%CI [17.6-19.7]) respectively. The prevalence in LaoCai was extremely high (three times higher than that in DaNang), 32.2 per cent (95%CI [31.2-33.1]). Figure 7 shows the severity levels of the stunting in each province. Stunting is classified into 2 categories: moderate stunting (HAZ: -2.99 to <-2) and severe (HAZ ≤-3). The proportions of severe stunting (HAZ<-3) was very low in DaNang and BenTre (1 per cent), higher in HungYen and PhuYen (2 per cent and 3 per cent respectively). Like the general stunting, severe stunting in LaoCai was also very high (8 per cent of the population).

Figure 6. HAZ distributions for surveyed children by province

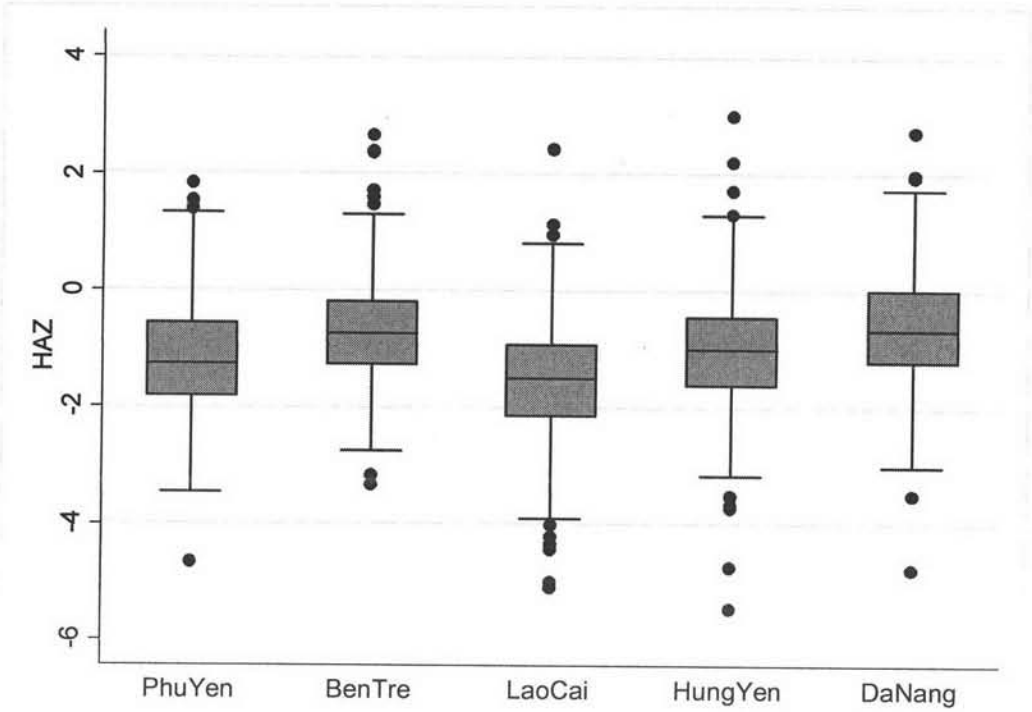
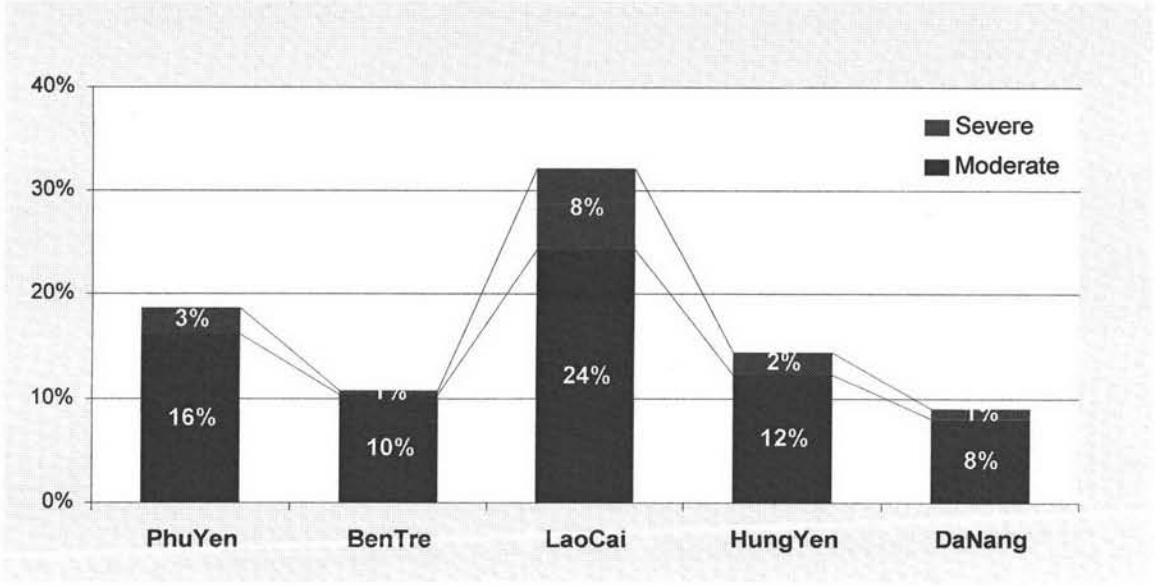


Table 15 Prevalence of stunting and 95% confidence interval by province

	PhuYen (N=339)	BenTre (N=339)	LaoCai (N=338)	HungYen (N=339)	DaNang (N=339)	Total (N=1994)
Stunting (HAZ<-2)						
n	73	37	124	58	26	318
Crude %	18.3	9.3	31.2	14.5	6.5	16.0
*Adjusted %**	18.7	10.9	32.2	14.3	9.1	17.7
95% CI	[17.6-19.8]	[10.4-11.3]	[31.2-33.1]	[13.9-14.8]	[8.3-9.9]	[17.3-18.2]

*Adjusted for sampling design by svy-command in STATA software

Figure 7. Prevalence of stunting by severity level and province



5.2.2 – Weight-for-age Z-score by province

Like HAZ distributions, WAZ distributions of the surveyed children were appropriately normal across provinces (Figure 8). Overall, weight-for-age of the children in DaNang was the best among 5 provinces. The WAZ distributions of children in PhuYen and LaoCai were more narrow and lower than that in the others.

Figure 8. WAZ distributions for surveyed children by province

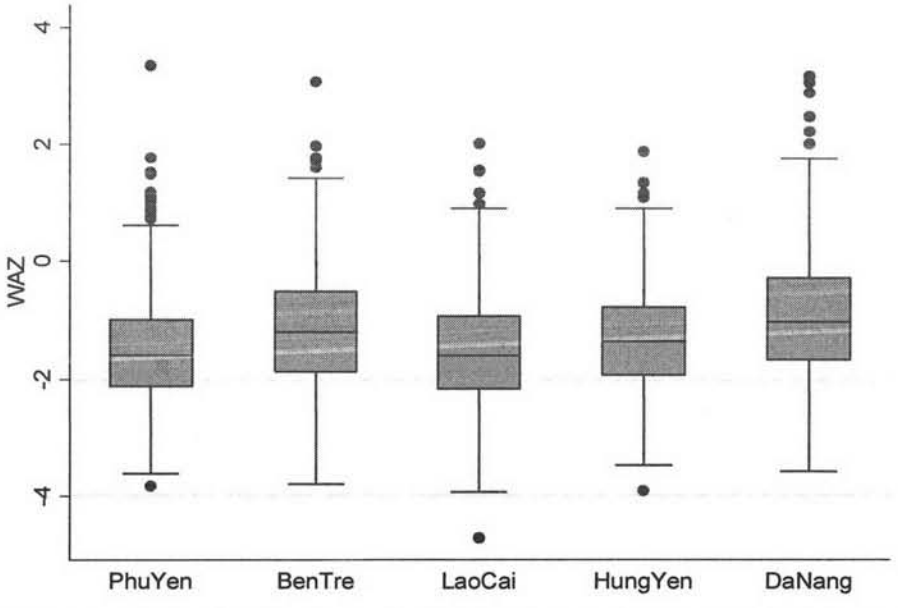
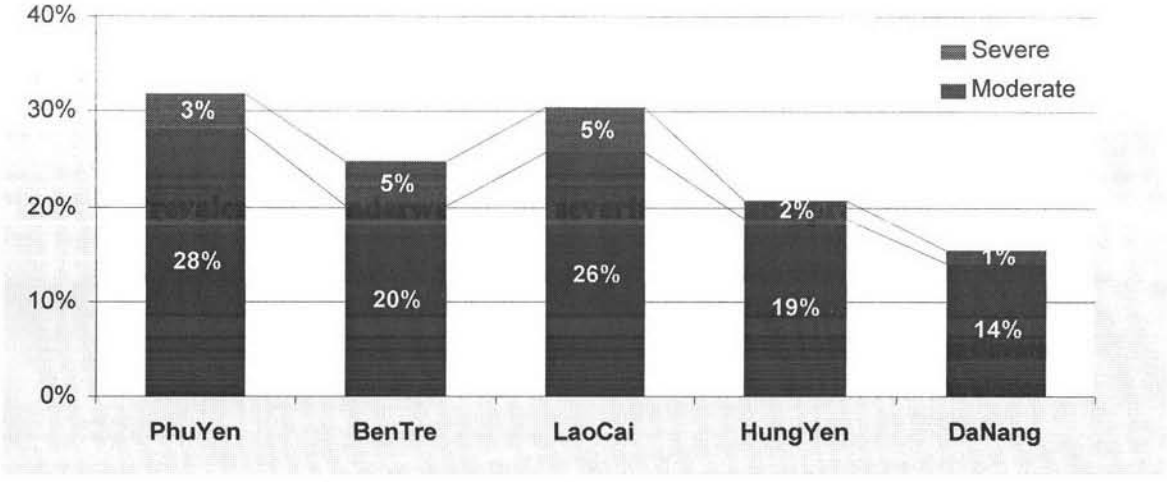


Table 16 provides information on prevalence of underweight children. It is clear that the prevalence of underweight children in DaNang was much lower than that in the other provinces (15.4 per cent, 95%CI [14.7-16.1]). The prevalence in PhuYen and LaoCai was highest, 31.7 per cent (95%CI [30.5-33.0]) and 30.6 per cent (95%CI [30.0-31.1]) respectively. The severity level of underweight children is clarified in figure 9. The proportion of the severely underweight (WAZ<-3) in LaoCai and BenTre were 5 per cent, the highest among the 5 provinces. In DangNang was only 1 per cent were underweight

Table 16 Prevalence of underweight and 95% confidence interval by province

	PhuYen (N=339)	**BenTre (N=339)**	**LaoCai (N=338)**	**HungYen (N=339)**	**DaNang (N=339)**	**Total (N=1994)**
Underweight (WAZ<-2)						
n	117	80	122	91	51	461
Crude %	29.3	20.1	30.7	22.8	12.8	23.1
Adjusted %	31.7	24.8	30.6	20.6	15.4	25.2
95% CI	[30.5-33.0]	[24.1-25.5]	[30.0-31.1]	[19.9-21.4]	[14.7-16.1]	[24.7-25.6]

Figure 9. Prevalence of underweight by severity level and province



5.2.3 – Weight-for-height Z-score by province

The last anthropometric index, weight-for-height, reflects body weight relative to height. Figure 10 shows that this index was best in LaoCai, lower was DaNang and HungYen.and BenTre. That in PhuYen was worst. Table 17 presents the prevalence of wasting (WHZ<-2) in the 5 provinces. The prevalence in LaoCai was 2.2 per cent (95%CI [2.1-2.3]). Compared with LaoCai, the prevalence in PhuYen and BenTre were four and five times higher (9.4 per cent and 13.7 per cent). The proportion of severely wasted children (WHZ<-3) was 1 per cent in PhuYen and BenTre (figure 11). LaoCai, HungYen and DaNang had almost no severely wasted children.

Figure 10. WHZ distributions for surveyed children by province

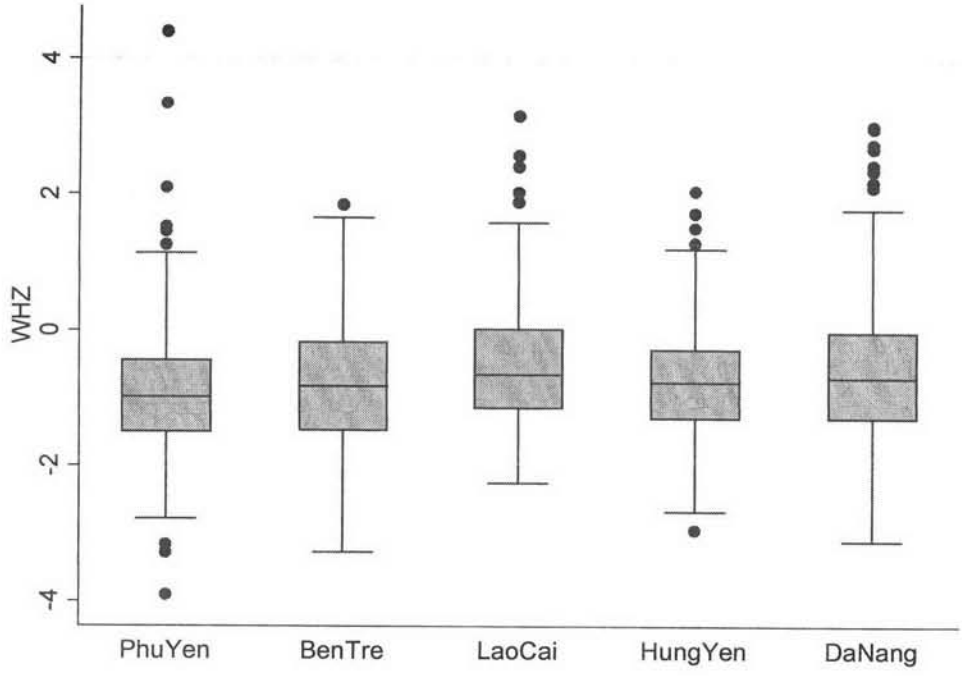
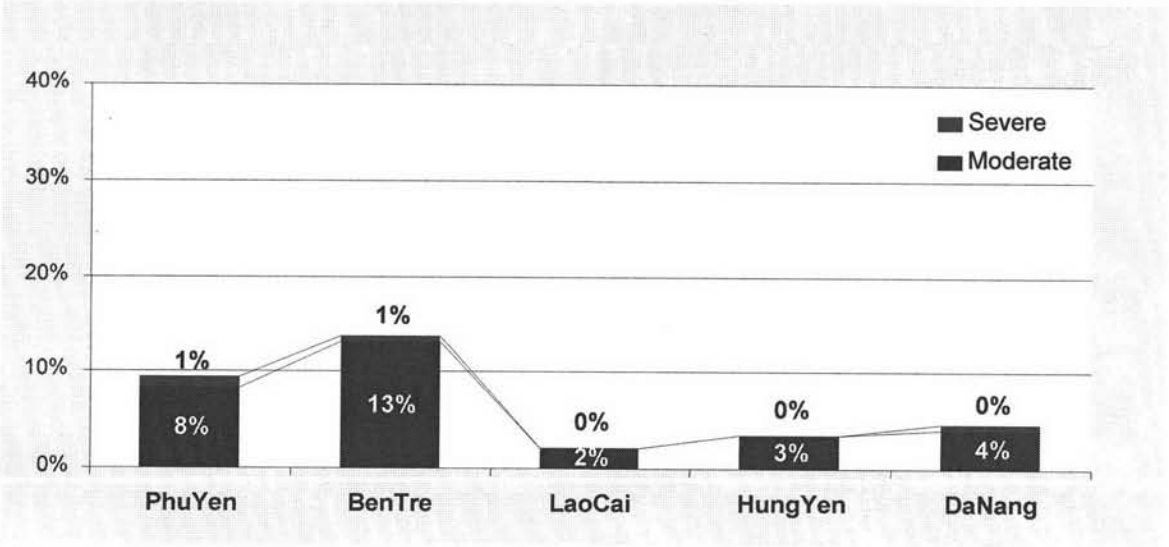


Table 17 Prevalence of wasting and 95% confidence interval by province

	PhuYen (N=339)	BenTre (N=339)	LaoCai (N=338)	HungYen (N=339)	DaNang (N=339)	Total (N=1994)
Wasting (WHZ<-2)						
N	38	34	8	17	19	116
Crude %	9.5	8.5	2.0	4.3	4.8	5.8
Adjusted %	9.4	13.7	2.2	3.4	4.6	6.7
95% CI	[8.6-10.2]	[13.0-14.3]	[2.1-2.3]	[3.3-3.6]	[4.4-4.8]	[6.3-7.1]

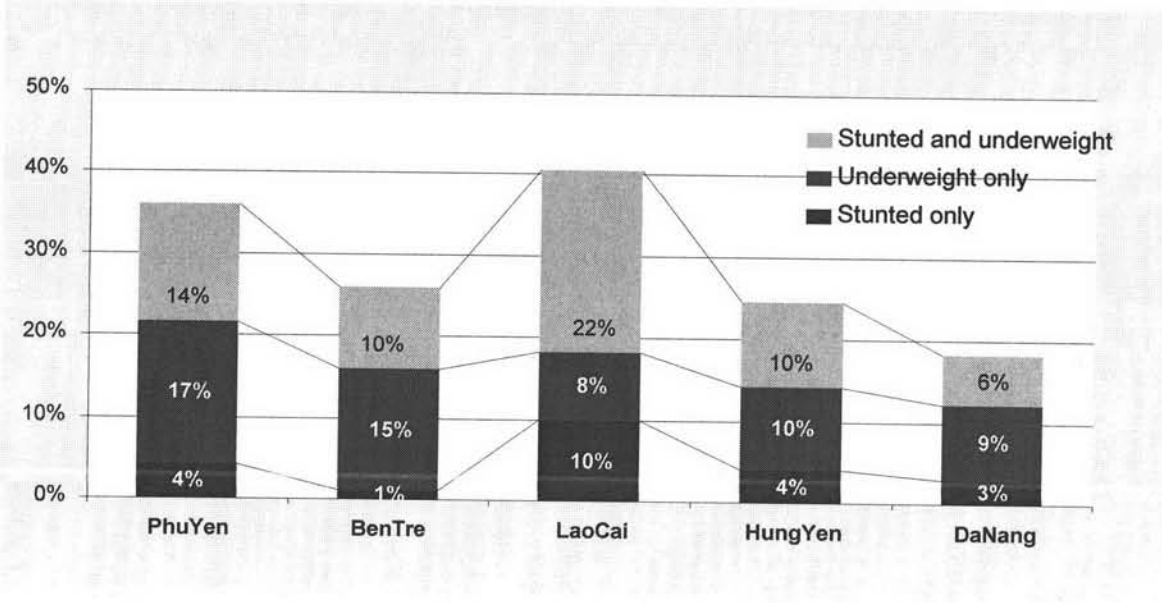
Figure 11. Prevalence of wasting by severity level and province



5.2.4 – Concurrent underweight and stunting by province

Figure 12 provides a two-way classification of underweight and stunting across provinces. The term "underweight only" refers to the child who has WAZ<-2 and HAZ≥-2. It means his/her weight is low but height is normal. The term "stunted only" refers to the child who is short (HAZ<-2) but weight is normal (WAZ≥-2). Concurrent underweight and stunting shows that the child is in serious under-nutrition situation. It means that the child is both short (HAZ<-2) and low weight (WAZ<-2). The proportion of stunted and underweight children in LaoCai was much higher than that in the others (22 per cent compared with 14 per cent in PhuYen, 10 per cent in BenTre and HungYen, and 6 per cent in DaNang).

Figure 12. Prevalence of stunting, underweight and concurrent stunting and underweight by province



5.3 Child nutritional status by child sex

Figure 13 to 15 shows the HAZ, WAZ and WHZ distributions for male and female children. All of the distributions were appropriately normal. The distribution for girls were slightly higher than that for boys, this means nutritional status of girls was better than that of boys. Table 18 presents the prevalence of stunting, underweight and wasting in boys, all of which were statistically significantly higher than that in girls. There were slightly higher proportions of girls than boys with severe stunting, severe underweight and severe wasting. However, the magnitudes of the differences (1 per cent in ever index) were not of public health importance. Figure 17 shows the prevalence of concurrent underweight and stunting. Consistent with the figures shown above, the prevalence of concurrent underweight and stunting in boys was significantly higher than that in girls (16 per cent of boys compared with 10 per cent for girls).

Figure 13. HAZ distributions for surveyed children by child sex

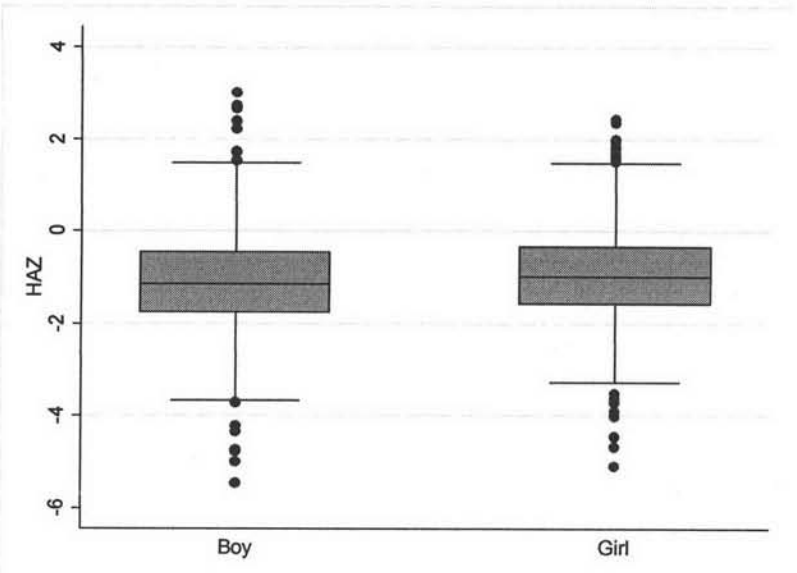


Figure 14. WAZ distributions for surveyed children by child sex

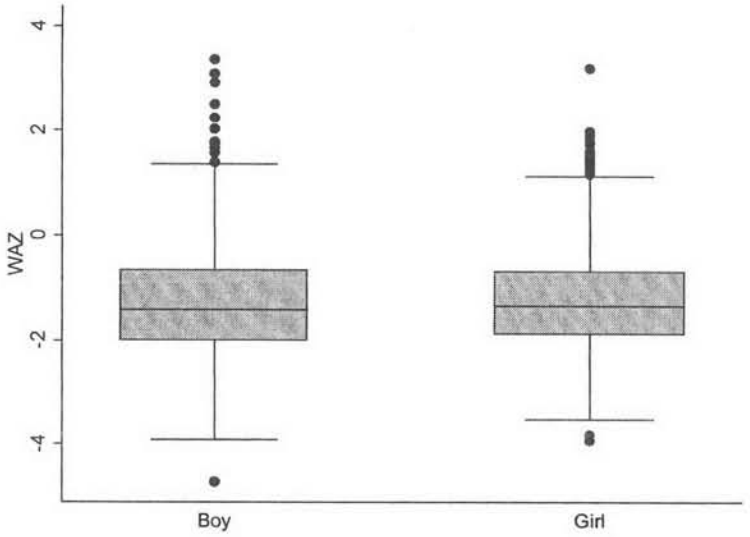


Figure 15. WHZ distributions for surveyed children by child sex

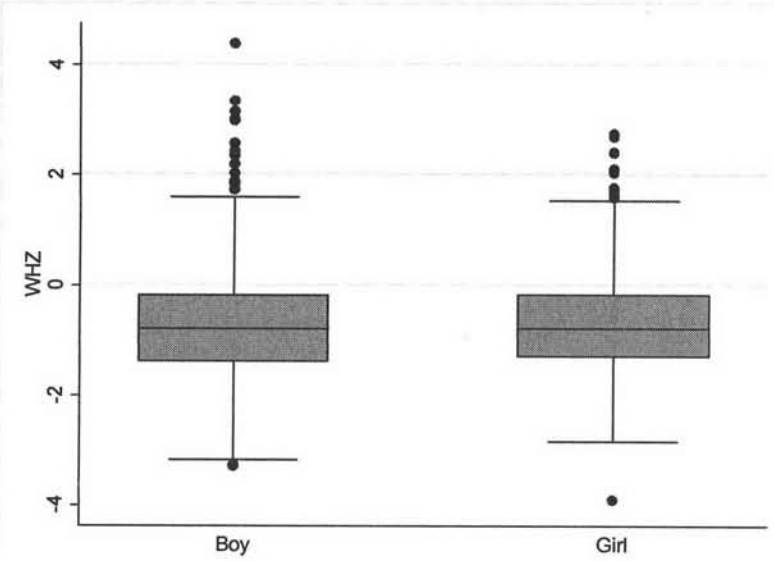


Table 18 Prevalence of wasting and 95% confidence intervals by child sex

	Male (N=1027)	Female (N=967)	Total (N=1994)
Stunting (HAZ<-2)			
n	188	130	318
Crude %	18.3	13.4	16.0
Adjusted %	20.8	14.3	17.7
95% CI	[20.2 - 21.3]	[13.9 – 14.7]	[17.3 – 18.2]
Underweight (WAZ<-2)			
n	264	197	461
Crude %	25.7	20.4	23.1
Adjusted %	27.9	22.1	25.2
95% CI	[27.4 – 28.4]	[21.6 – 22.6]	[24.7 – 25.6]
Wasting (WHZ<-2)			
n	67	49	116
Crude %	6.5	5.1	5.8
Adjusted %	7.9	5.3	6.7
95% CI	[7.3 – 8.6]	[5.1 – 5.5]	[6.3 – 7.1]

Figure 16. Prevalence of underweight, stunting and wasting by severity level and sex

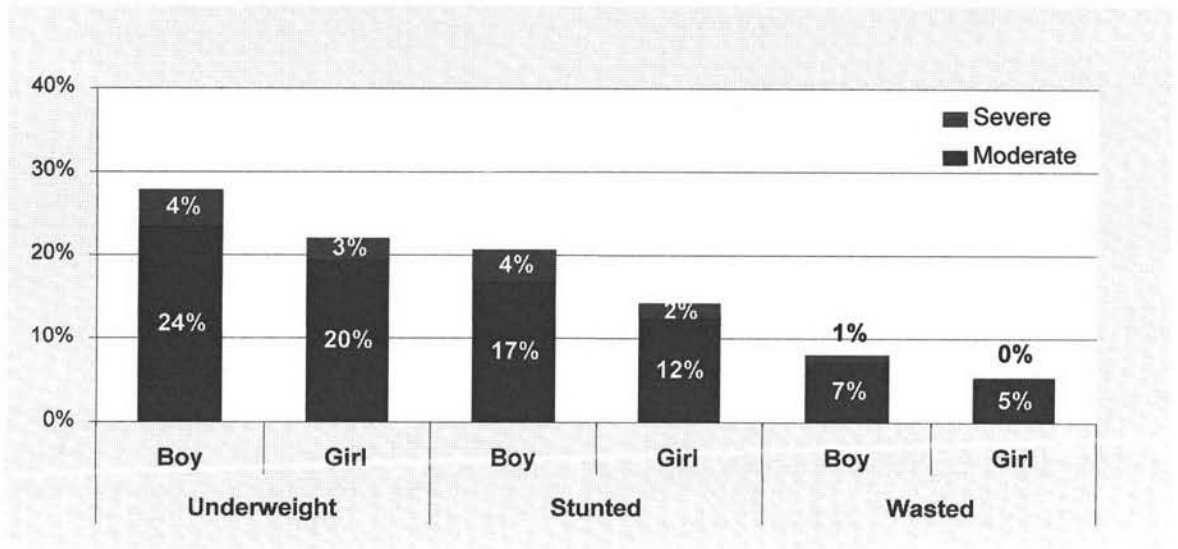
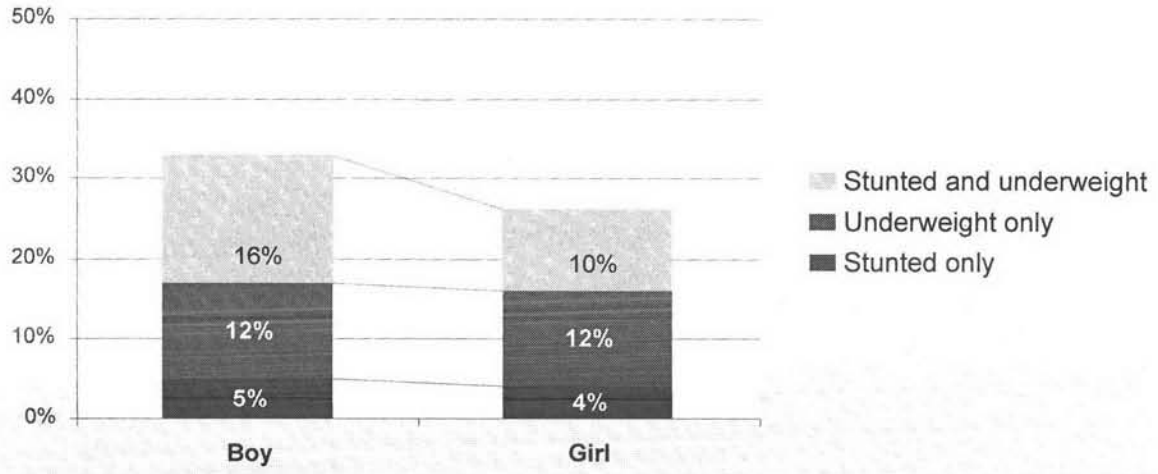


Figure 17. Prevalence of stunting, underweight and concurrent stunting and underweight by sex



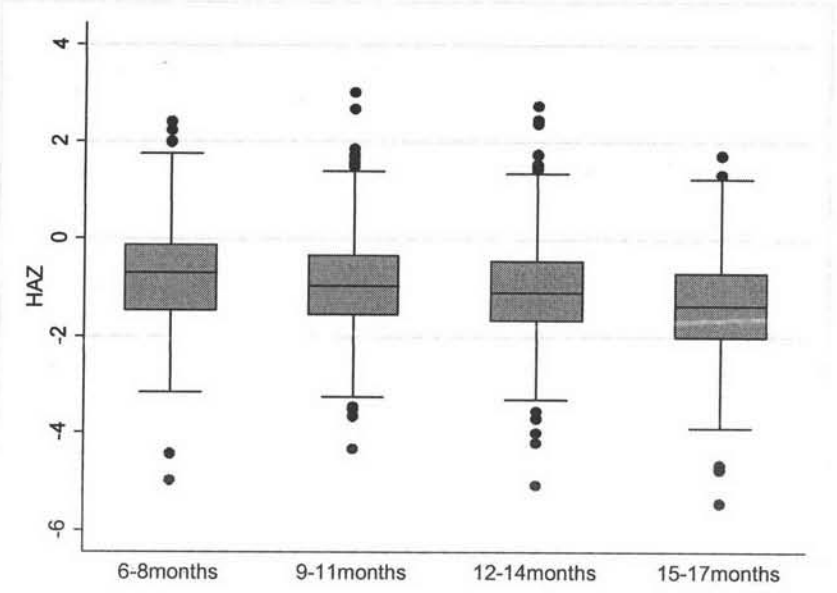
5.4 Child nutritional status by child age

5.4.1 – Height-for-age Z-score by child age

Figure 18 shows the HAZ distributions for 3-month old surveyed children. All of the distributions of this anthropometric indicator were shifted significantly below zero, the expected value of the reference distribution. The higher the ages of the

children, the farther the distribution was shifted below zero. This shows an apparent trend of decreasing HAZ by increasing age.

Figure 18. HAZ distributions for surveyed children by child age

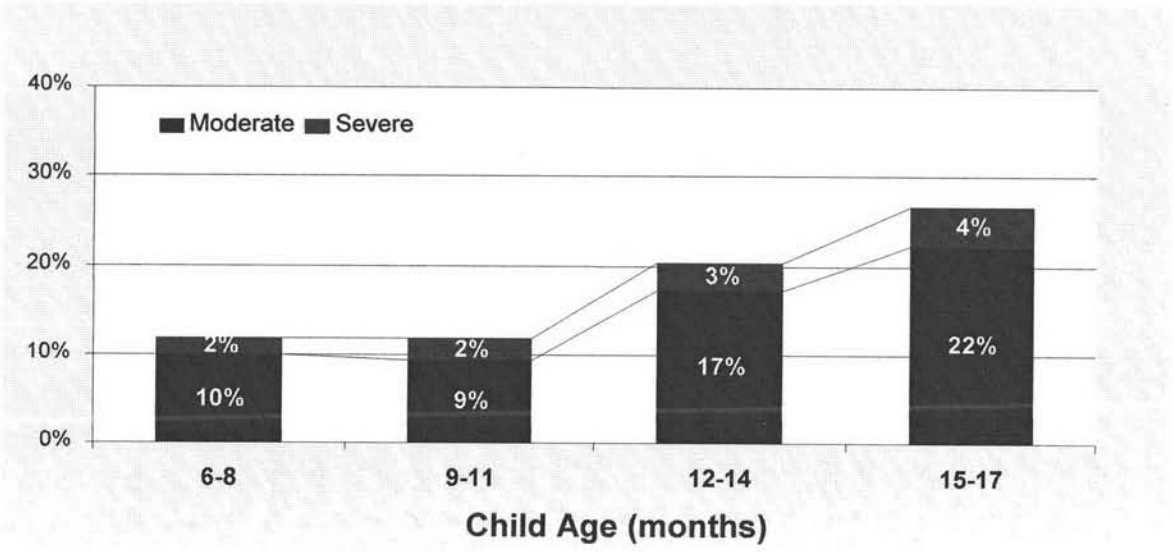


As seen in Figure 18, there was a continuing increase in the prevalence of stunting of children aged 6 to17 months. The prevalence of stunting in children aged 6 to 8 months was 12 per cent. The prevalence in children aged 15 to 17 months was about 27 per cent (two times the first group). Figure 19 shows the increasing of proportions of severe stunting by age (2 per cent in the first age group to 4 per cent in the last age group).

Table 19 Prevalence of stunting and 95% confidence intervals by child age group

	Age of child (months)				Total (N=1994)
	6-<9 (N=398)	9-<12 (N=573)	12-<15 (N=582)	15-<18 (N=441)	
Stunting (HAZ<-2)					
n	36	67	103	112	318
Crude %	9.1	11.7	17.7	25.4	16.0
Adjusted %	11.8	11.9	20.4	26.7	17.7
95% CI	[11.2 – 12.4]	[11.4-12.3]	[19.8-21.0]	[25.9-27.5]	[17.3-18.2]

Figure 19. Prevalence of stunting by severity level and child age



5.4.2 – Weight-for-age Z-score by child age

Like height-for-age, weight-for-age was worsened as the age of the surveyed child increased (Figure 20). However, the changes were much sharper than the changes in HAZ. Table 20 shows the prevalence of underweight by age. Again, there was a marked increasing in the prevalence from children aged 6-8 months to 15-18 months (9 per cent to 38 per cent). The proportion of the severely underweight also increased from children aged 6-8 months to 15-18 months (1 per cent to 5 per cent)

Figure 20. WAZ distributions for surveyed children by child age

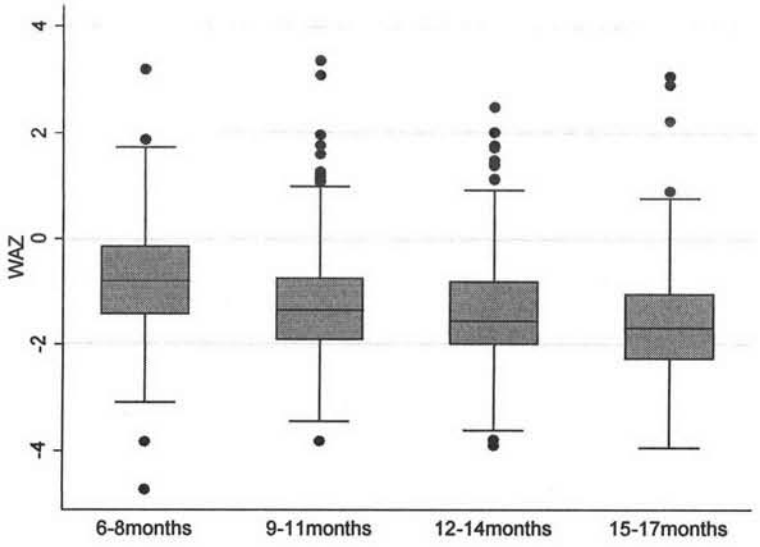
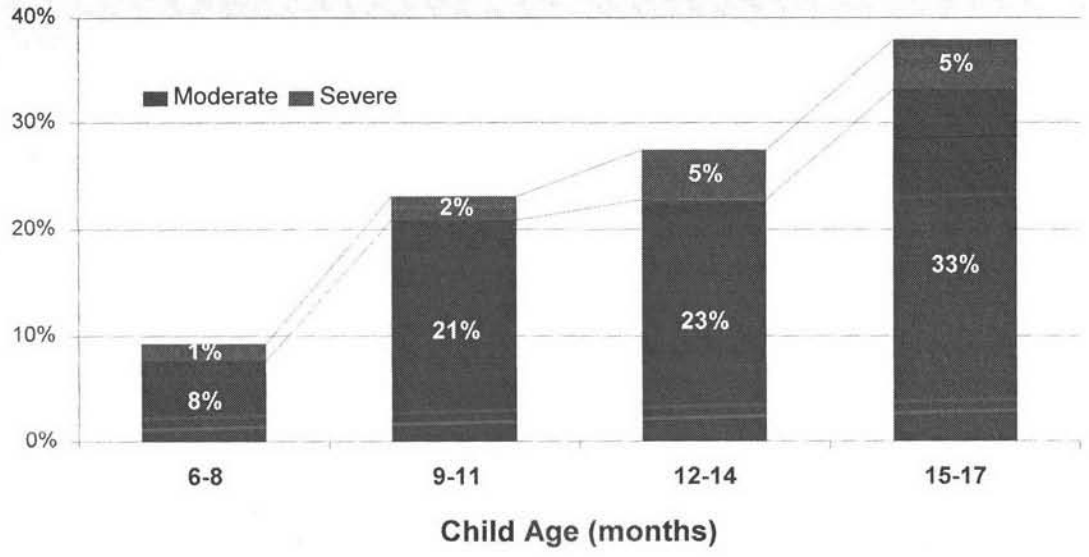


Table 20 Prevalence of underweight and 95% confidence intervals by child age group

	Age of child (months)				Total (N=1994)
	6-<9 (N=398)	9-<12 (N=573)	12-<15 (N=582)	15-<18 (N=441)	
Underweight (WAZ<-2)					
N	31	124	148	158	461
Crude %	7.8	21.6	25.4	35.8	23.1
Adjusted %	9.2	23.1	27.5	37.9	25.2
95% CI	[8.7-9.7]	[22.7-23.6]	[26.8-28.1]	[37.3-38.4]	[24.7-25.6]

Figure 21. Prevalence of underweight by severity level and child age



5.4.3 – Weight-for-height Z-score by child age

Similar to the previous anthropometric indices, weight-for-height of the children decreased when age increased. Figure 22 shows that the distribution of children aged 6-8 months was appropriate reference distribution. However, the distribution of the older children moved well below zero. Table 21 provides information on the prevalence of wasting (WHZ<-2). The prevalence of wasting in children aged 6-8 months was 1 per cent. That prevalence was much higher in children aged 15-17 months (12.8 per cent).

Figure 22. WHZ distributions for surveyed children by child age

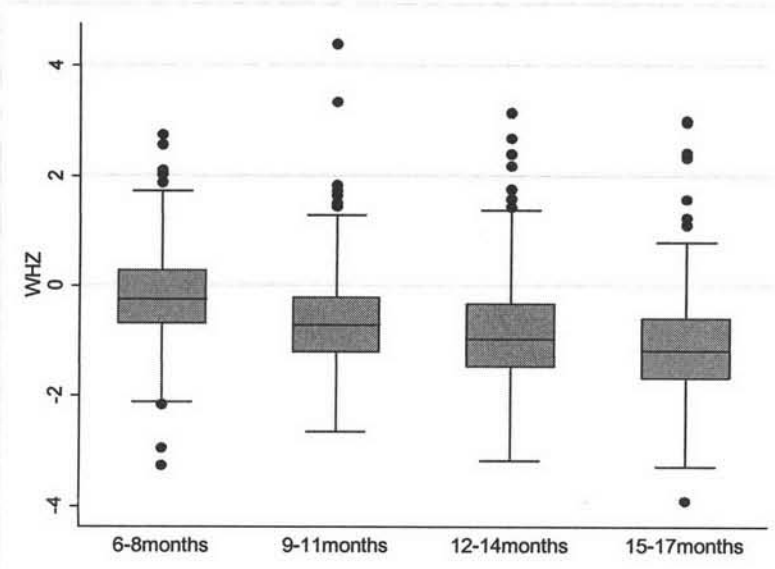


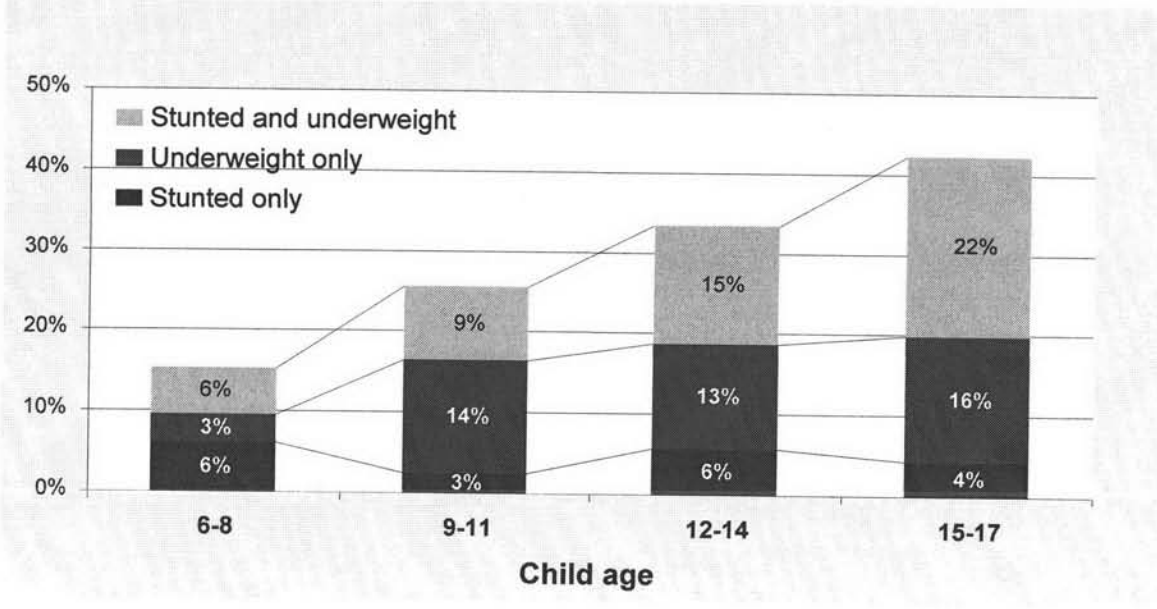
Table 21 Prevalence of wasting and 95% confidence intervals by child age group

	Age of child (months)				Total (N=1994)
	6-<9 (N=398)	9-<12 (N=573)	12-<15 (N=582)	15-<18 (N=441)	
Wasting (WHZ<-2)					
n	6	18	43	49	116
Crude %	1.5	3.1	7.4	11.1	5.8
Adjusted %	0.9	4.3	8.1	12.8	6.7
95% CI	[0.8-1.0]	[3.7-4.9]	[7.5-8.6]	[12.3-13.3]	[6.3-7.1]

5.4.4 – Concurrent underweight and stunting by child age

As illustrated in Figure 23, there was a continuing increase in the prevalence of concurrent of stunting and underweight from children aged 6-8 months to 15-17 months (from 6 per cent to 22 per cent). A difference to note is the change of prevalence of underweight only in children aged 6-8 months (3 per cent) to that in children aged 9-11 months (14 per cent).

Figure23. Prevalence of stunting, underweight and concurrent stunting and underweight by child age



5.5 Child nutritional status by household economic status

Figure 24 – Figure 26 reveal distributions of the three anthropometric indices for the surveyed children among household economic quintiles. There was an apparent trend (increasing) in all of the indices, except WAZ, across from the quintile 1 (one fifth poorest) to the quintile 5 (one fifth richest). Table 22 shows that the prevalence of stunting and prevalence of underweight was inversely proportional to household economic status. The proportion of stunting in the poorest group was three times greater than that in the richest group and the proportion of underweight children in the poorest group was two times greater than that in the richest group. It seems that wasting was not depended on household economic status.

Figure 24. HAZ distributions for surveyed children by household economic status

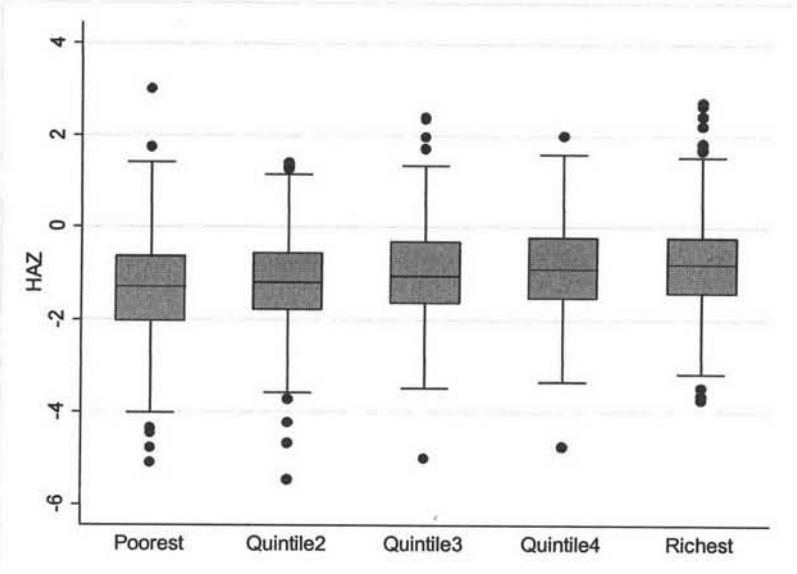


Figure25. WAZ distributions for surveyed children by household economic status

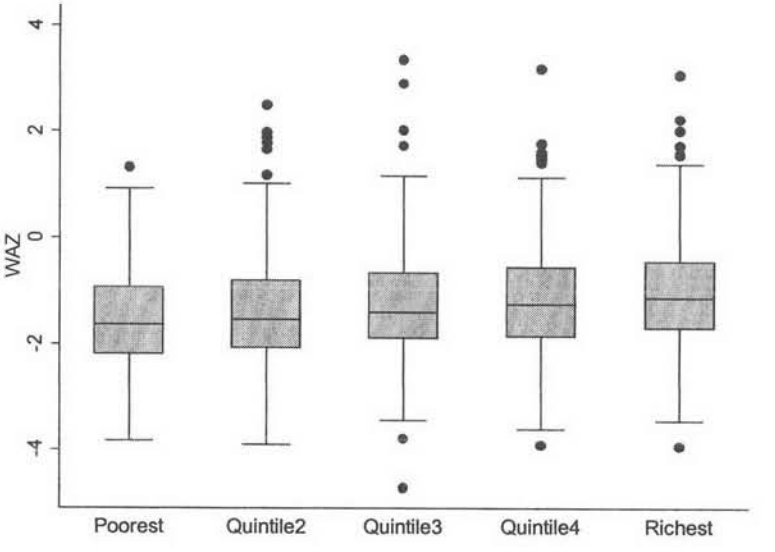


Figure 26. WHZ distributions for surveyed children by household economic status

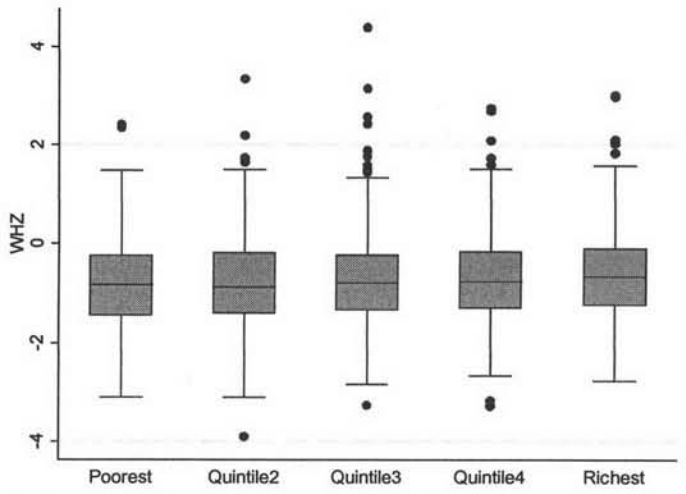


Table 21 Prevalence of stunting, underweight, and 95% confidence intervals by household economics status

	Household economics					Total (N=1994)
	Poorest (N=406)	Poor (N=397)	Average (N=397)	Better off (N=399)	Richest (N=395)	
Stunting (HAZ<-2)						
n	103	73	60	48	34	318
Crude %	25.4	18.4	15.1	12.0	8.6	16.0
Adjusted %	29.2	18.7	16.6	13.7	10.4	17.7
95% CI	]28.4-30.1]	[18.2-19.3]	[16.3-17.0]	[13.3-14.2]	[9.9-10.9]	[17.3-18.2]
Wasting (WHZ<-2)						
n	23	29	21	22	21	116
Crude %	5.7	7.3	5.3	5.5	5.3	5.8
Adjusted %	4.6	8.3	7.1	6.5	7.0	6.7
95% CI	[4.2-4.9]	[7.9-8.8]	[6.4-7.9]	[6.1-6.9]	[6.5-7.6]	[6.3-7.1]
Underweight (WAZ<-2)						
n	128	112	84	77	60	461
Crude %	31.5	28.2	21.2	19.3	15.2	23.1
Adjusted %	35.2	30.3	21.4	21.8	17.4	25.2
95% CI	[34.5-35.9]	[29.8-30.7]	[20.9-21.9]	[21.4-22.2]	[16.4-18.6]	[24.7-25.6]