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from Child Anthropometry?**

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Living Standards and Public Policy in Central Asia: What Can Be Learned from Child Anthropometry?

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Executive Summary

Most measurement of household living standards by economists and other social scientists focuses on quantifying poverty on the basis of households' incomes or their expenditures. This has been the usual approach to measuring living standards, for example, in the economies in transition of Central and Eastern Europe and the former Soviet Union. Recommendations for policy reform are then made on the basis of the patterns of living standards revealed by these measures.

This paper, which focuses on the most populous of the Central Asian republics, Uzbekistan, uses instead anthropometric measurements of children. The paper begins by explaining the attractions of such data. First, they refer to individuals and not to households, permitting direct observation of the welfare of children. Second, they provide information on nutritional status, an important aspect of individual welfare. Third, they provide a concrete and internationally comparable measure of living standards, avoiding many of the problems of collection and interpretation suffered by income and expenditure data. At the same time, anthropometric data are not without their own problems, and a section of the paper is devoted to discussing what such data can and cannot reveal.

The empirical analysis refers to data collected by a household survey in 1995 on 1,298 children aged over 6 months and under 7 years in three contrasting regions of Uzbekistan: the capital, Tashkent, a city of over 2 million persons; the autonomous republic of Karakalpakstan, bordering the Aral Sea; and the well-populated region of Fergana in the valley of the same name shared by three Central Asian republics. These regions provide a wide range of economic and geographical circumstances.

The overall prevalence of "stunting" (low height in relation to age) and of "wasting" (low weight in relation to height) among the survey children is found to be similar to that in neighbouring Kazakhstan—around 15 percent stunting and 3 percent wasting. These are levels similar to those found in several of the richer Latin American countries. There is marked regional and urban–rural variation. In the rural areas in the survey, the prevalence of stunting was two-and-a-half times that found in Tashkent and the other cities covered by the sample. No differences were found between girls and boys.

Three hypotheses concerning living standards and public policy are then tested with the data. The first is that controlling for differences in cash income, nutritional status is higher in rural than in urban areas, reflecting the much greater presence of sources of non-monetised income. This hypothesis is firmly rejected: nutritional status as measured by anthropometry is notably lower in the rural areas covered in the survey whether or not income is controlled for. In fact income is

found to have little association with anthropometric status. The second hypothesis is that attendance at state or enterprise kindergartens has a positive impact on nutrition. The data on the children's weight conditional on their height do provide some support for this. The third hypothesis is that a new means-tested social assistance scheme administered by local committees is more likely to be received by households where the children have lower nutritional status, indicating that, in this sense, it is "well targeted". Some evidence in favour of this is found in the data on the children's height.

The paper concludes by reviewing the implications of the work for various aspects of policy, including the provision of nutritional intervention and the systematic monitoring of anthropometry (where it is suggested that measurement on entry to elementary school would be a possibility).

Abstract

Data on weight and height of children are used to assess living standards and public policy in Uzbekistan, the most populous of the Central Asian republics. The paper begins by making the case for the use of such data, contrasting them with monetised measures of welfare based on household incomes or expenditures, before going on to review the problems of interpretation that anthropometry presents for the economist. The prevalence of stunting and wasting in three regions of Uzbekistan is compared with that in neighbouring Kazakhstan and with other countries from outside the region. Multivariate analysis is then used to test three hypotheses concerning rural–urban differences in living standards, the impact of kindergartens on nutritional status, and the targeting of means-tested social assistance.

Key words: nutrition, living standards, targeting, Uzbekistan

JEL classifications: I12, I32, J13



Introduction

Measurement of household welfare in transition economies such as those of Central Asia typically focuses on the measurement of poverty using monetised indicators in the form of income or expenditure. These indicators (after adjustment for differences in household size and composition) provide evidence on the relative incidence of poverty on different groups in the population, for example children or the old. Design of social assistance schemes and other policies to combat poverty can then take this information into account when targeting scarce public resources.

This paper takes a different route to the measurement of welfare in Central Asia and the assessment of public policy, by using information on child anthropometry—measurement of children’s body size.

Anthropometric indicators appear to offer three attractions. First, anthropometry provides information on *individuals*, in contrast to a “poverty profile” constructed from information on incomes or expenditures, which tells us only about the living standards of households. Use of household incomes or expenditures to infer anything about the welfare of individuals requires an assumption that household members pool and share all their resources. Children form a high proportion of the population of the Central Asian countries of the former Soviet Union. In the case of Uzbekistan, the most populous republic, with over 20 million inhabitants, and the focus of this paper, some 40 percent of the population is aged under 12. Concern about the population’s welfare in Central Asia is therefore in large measure a concern about the welfare of children and anthropometry is one way of assessing this directly.

Second, anthropometry is one way of measuring nutritional status. This is a subject of direct concern to the analysis of child welfare, summarising a variety of influences including food intake and infection. Much evidence suggests that low nutritional status in childhood may have an adverse impact on development and

hence health and productivity in later life, as well as increasing the risk of mortality and morbidity while still a child.

Third, use of anthropometry avoids the problems of measurement of monetised indicators of household welfare. These problems can be acute in transition economies. Not only is money income sometimes hard to measure, such as that from self-employment of various forms, but a substantial amount of economic activity is not monetised. The rural nature of much of Central Asia means that a great many households derive substantial amounts of income in kind from land in the form of food produced and consumed within the household. The measurement of these amounts and the imputation of their value is a far from trivial issue (Casley and Lury, 1987, Falkingham and Micklewright, 1997). In addition, prices may vary substantially within a country but the appropriate indices to adjust monetary welfare measures for regional price variation are often unavailable (Koen, 1997). To the extent that anthropometric status reflects household incomes and living conditions, data on body measurement therefore complement welfare indicators that are subject to errors of construction and interpretation. Moreover, the non-monetary nature of anthropometric data allows comparison of welfare in Central Asia with that in countries in other regions.

These attractions appear strong and increasing use has been made of anthropometric data by economic historians and development economists (e.g. Komlos, 1994, Steckel, 1995, Thomas et al, 1996). However, the apparent attractions of anthropometry must be tempered by an appreciation of the limitations of this form of information. In Section 2 we review the informational content of data on children's weight and height viewed from the standpoint of economic analysis, illustrating some aspects of the discussion with the data used in the rest of the paper.

The data we use refer to 1,298 children in a survey of households conducted in Uzbekistan in 1995. This covered three of the fourteen regions of the country, chosen to provide a wide range of economic and geographical circumstances. The collection of these data seems to be the first attempt to measure anthropometry in the country as part of a general household survey. Section 3 provides basic results on anthropometric status from the survey, using the data to shed light both on living standards in relation to those in other countries and the variation within Uzbekistan. The mixture of Soviet and Asian influences makes for a somewhat confusing picture of the absolute level of development and of living standards in the region (Falkingham et al, 1997). Nor is the variation clear within Uzbekistan and other Central Asian countries (Coudouel et al, 1997), with such basic issues as rural-urban differences not yet firmly established. In both cases the use of child anthropometry allows substantial progress to be made.

Section 4 uses multivariate analysis to test three hypotheses concerning living standards and public policy. First, that controlling for differences in cash income,

anthropometric status is higher in rural than in urban areas, reflecting the much greater presence of sources of non-monetised income. Second, that attendance at state or enterprise kindergartens has a positive impact on nutrition. Third, that a new means-tested social assistance scheme, aimed principally at families with children and administered by Mahalla local committees, is well targeted in terms of anthropometric status. Section 5 concludes.

2. What Can Child Anthropometry Reveal About Living Standards?

What information on living standards is conveyed by an individual's weight and height? We note here some of the features of such data that the novice needs to be aware of.

Most obviously, body size is strongly influenced by genetic inheritance as well as by the "environmental" factors that we are interested in, such as family income and housing conditions. Indeed, the former explains most of the variance in individuals' heights (Tanner, 1994, p.1). The interaction of genetic and environmental factors appears to be complex and far from fully understood. For example, Eveleth and Tanner note that "two genotypes which produce the same adult heights under optimal environmental circumstances may produce different heights under circumstances of privation" (1976, p.222). This casts doubt on the often unstated assumption that genetic factors can be absorbed into an unobserved additive error term in regression equations explaining anthropometric status.

On one view, the influence of genetic inheritance is no constraint to the use of anthropometric data to measure human welfare. At the outset of his survey article on "Stature and the Standard of Living", Steckel (1995) urges that

newcomers to the idea that stature measures important aspects of living standards should not be side-tracked by genetic issues. Genes are important determinants of individual height, but genetic differences approximately cancel in comparisons of averages across most populations. (p.1903)

The averaging-out of genetic influence is particularly true of child populations—much evidence indicates that differences in the impact of genetic endowment on growth that are associated with ethnic group manifest themselves only in adolescence (e.g. WHO, 1995). Measurements of height and weight taken from any child population are therefore usually matched for age and sex with reference standards from the National Centre for Health Statistics/World Health Organisation (NCHS/WHO), which are based on a large sample of healthy US children. The most common indices calculated are height for age and weight for

height. The convention is for a child to be classified as “stunted” if height for age is beneath the two standard deviations of the median in the reference population and as “wasted” if the same condition applies to weight for height.¹

The use of international standards facilitates cross-country comparisons but there are limitations to such an exercise. Wasting is often rare even in countries at low levels of development unless they are undergoing an exceptional crisis in living standards. Stunting, which is more frequent, may be the better measure to compare but the same levels of either stunting or wasting in two different settings may be associated with different risks of mortality and morbidity on account of a variety of intermediating factors between malnutrition and outcome, including “epidemiology of certain diseases, access to health care facilities ... and behavioural differences in relation to household management of infection” (Tomkins, 1994, p.113). One might therefore argue that classification of stunting and wasting on the basis of international standards is not analogous to calculation of poverty on the basis of purchasing power parity dollars, since a given sum of the latter provides in principle the same command over resources in all countries. On the other hand, the same amount of purchasing power parity dollars may be associated with different living standards in different countries, due to varying levels of social services and facilities financed by the State.

The averaging-out of genetic differences means that anthropometry can be used to make statements about living standards by focusing on the between-group variation, for example between urban and rural areas. Opinions differ on whether much notice should be taken of the within-group variation. Those making the case for the study with anthropometry of historical changes in living standards naturally place little emphasis on this.² On the other hand, aid programmes in the developing world do use anthropometric status at the individual level as a basis for the targeting of intervention (e.g. United Nations, 1990, p.16). This stems in part from a focus on different measures. The economic historian uses data on height, while the emergency aid worker is more often interested in weight (conditional on height), which is subject to great change as a result of changes in the individual's health and access to food. Low weight relative to height provides a good measure of mortality risk at the individual level in situations of famine and is used as one basis for screening and intervention in the provision of food relief.

In general, however, deviant anthropometry provides imperfect information on living standards at the individual level on account of genetic factors. A child with

¹ The terminology is unfortunate since it implies that the conditions should always be seen in a negative light.

² Addressing the issue of noise in the data from genetic influence, Tanner argues firmly in his introduction to the use of height data to measure welfare that, “we are talking about the *mean heights of populations* or sub-populations ... we are not talking about the height of any individual” (1994, p.1, author's emphasis).

weight or height below two standard deviations of the reference standard for his or her age is *more likely* to be living in a household where conditions are not conducive to development than is a child with values at the median, but targeting of, say, cash social assistance on the basis of this classification would be subject to both Type I and Type II errors.³ Anthropometric status clearly does not provide a welfare ranking in the same sense as would an adequately measured full income variable.⁴

Genetically determined variation in height is also present among siblings (unless they are identical twins) and the genetic differences “exert, in general, much more force than environmental ones, unless one or more [of the siblings] has been for some reason subject to real starvation” (Tanner, 1994, p.2). This limits the potential of anthropometry to measure intra-household differences in child welfare. In our Uzbek data, 902 of the 1,298 measured children lived in households with more than one measured child. Over 40 percent of the variance in both height for age and weight for height (relative to the reference median) among these children was within households and it would clearly be wrong to associate all this variation in anthropometry with variation in individual welfare.

The nutritional science literature emphasises the use of anthropometry for one child to infer something about the household environment that may affect others in the household, including “a sibling yet to be born” (United Nations, 1990, p.10). Our Uzbek data certainly do reveal some correlation between anthropometric measures for children of the same household. The correlations for Z-scores of height for age and weight for height between successive pairs of children in the household are 0.27 and 0.24.⁵ (These figures rise to 0.36 and 0.33 if attention is restricted to siblings only.) Where the first child in any pair is classified as stunted, 38 percent of the second children are also so classified, compared to only 12 percent if the first child has height for age that is normal. This reflects Tanner’s observation that while most of the variation in height within two sets of brothers growing up under different household circumstances will be due to their genetic differences, the difference in means between the two sets “is a measure of the suitability of their respective environments for fostering growth” (Tanner, 1994,

³ Nor does a focus on change over time solve all problems of interpretation since the genetic impact cannot be treated as an additive error to be differenced out. That said, the problems do appear to be less than with one-off assessment and “growth monitoring” is a standard technique in measurement of child welfare in the developed as well as developing world. (Ulijaszek (1994) gives a good discussion of individual variation in the growth process and problems of interpretation stemming from this.)

⁴ A further difference is that, unlike income, the anthropometric index would not provide a monotonically increasing measure of welfare even if it were free of genetic noise; excessive weight is associated with increased health risk.

⁵ For the purposes of this calculation we order measured children within the household on age. Each child is then compared with the next child, so in a three-child household the second child is compared with both the first and the third.

p.2). There is a higher mean probability of stunting for the brothers in the poorer environment.

To the extent that child anthropometry conveys information about a household's living standards, are they those in the present or in the past? Low weight for height can develop rapidly and at any age. Hence wasting reflects current household and individual circumstances, including seasonality in food supply or the impact of a recent episode of disease. Stunting, on the other hand, develops more slowly, with deficits in attained height increasing throughout a child's growth period if conditions remain unfavourable. However, the impact on stature of circumstances detrimental to growth is most marked during the first two years of life, when the rate of growth is at its peak, and when the child is most vulnerable to nutritional insults of various kinds. Hence achieved stature may be thought of principally as reflecting a process of *failing* to grow in very young children and of *having failed* to grow in older children (United Nations, 1990, p.7). The greater is the extent of income mobility (in the sense of true income fully measured) the more noisy will be the information on current living standards conveyed by height data among older children.⁶ Cross-national comparisons of stunting among all children under 6 (the usual age group taken for comparison) therefore tell something about living standards in different countries averaged over several years, rather than for just the year in which the data were collected. And changes in stunting prevalence among this age group should be viewed as a lagged indicator of changes in living standards, something that is important to note in the context of the economic transition.

Weight for height and height for age may therefore convey different information about current living standards and the correlation between the two is often not strong. In our Uzbek data, the correlation of Z-scores was only 0.06 among all measured children (aged 6 to 83 months). But even in very young children aged up to 24 months, where the two indicators might be expected to be more closely related, the correlation was only 0.09. Recent studies have suggested that the nutritional factors associated with stunting and wasting may be quite different; Victora (1992) and other authors propose that while wasting may be due to a deficit in energy, stunting reflects rather the quality of the diet once the demand for energy has been satisfied, and may be due to a deficiency in one or more micronutrients.

⁶ There is considerable debate about the extent to which "catch-up growth" of height is possible if suitable interventions are provided or if the child's socio-economic conditions improve, leading to a better diet or reduced morbidity. (It goes without saying that catch-up growth of weight is possible.) Intervention at an early age appears to have the greatest positive impact (United Nations, 1990), although studies of the impact of late interventions are limited (Dasgupta, 1993, p.85). One example is that of Piyadasa (1996), who found that supplementation with milk or calcium increased the rate of growth in stunted Sri Lankan children aged 4–7 years by one fifth. The interpretation of height for age among older children as reflecting past circumstances clearly assumes that little catch-up is possible after the first two or three years of life.

A number of micronutrients have been proposed, but a recent study (Piyadasa, 1996) would seem to indicate that an adequate intake of calcium is crucial for optimal growth.⁷

Anthropometric data are best viewed as another instrument in the bag of welfare measurement tools.⁸ In some circumstances they are the best tool, as in assessment of the appropriate persons to receive emergency food aid in the situation of dire deprivation brought on by famine. In other circumstances they complement but do not necessarily dominate other tools. The genetic influence on body size introduces a lot of noise at the individual level but it does not mean that the data can tell us nothing about welfare below the household level. Focusing on the between-group variation, anthropometry can be used to investigate the welfare of groups of individuals—children in the case of this paper—as opposed to households. And investigation of anthropometry for different groups of individuals, in particular by gender, can shed light on average patterns of intra-household distribution.

3. Anthropometric Status of Children in Uzbekistan

Our investigation is based on the EUI/Essex Survey in Uzbekistan (EESU), which was conducted in the Summer of 1995. (Details of the survey are given in the Appendix.) This collected data on about 500 households in each of three regions that together contain over a quarter of the republic's population—the capital city of Tashkent, the important region of Fergana in the populous valley of the same name in the south-east of the country, and the autonomous republic of Karakalpakstan bordering the Aral Sea in the north-west. The three regions appear to contrast considerably in terms of average living standards (Coudouel et al, 1997). Tashkent, a city of over two million people and much the largest city in Central Asia, appears on economic indicators to be considerably ahead of all other regions in the republic. Karakalpakstan appears on the same indicators to be at the other end of the range and has suffered substantially from environmental degradation associated with the retreat of the Aral Sea. Fergana is sometimes viewed as a reasonably prosperous agricultural area (containing also some big urban areas) and scores relatively highly on several of the indicators based on

⁷ However, calcium intake is not the only nutritional factor involved and nutritional factors are by no means the only factors implicated in the aetiology of stunting; besides genetic potential, other factors include the frequency and severity of disease episodes, which in turn are related to a range of socio-economic factors such as educational level, hygiene practices, access to health services, clean water and good sanitation. The relative contributions of the various factors to promotion or retardation of growth in stature are likely to vary from one country to the next and, within a country, from one region to another.

⁸ The problems in collecting accurate anthropometric data, which we have not reviewed here, should not be overlooked. See, for example, Kostermans (1994).

Table 1: *Anthropometric status of children aged 7–83 months in three regions of Uzbekistan, Summer 1995*

Range	Tashkent city %	Fergana %	Karakalpakstan %	Total %
<i>(i) Height for age</i>				
≥ +1 S.D.	9.9	2.3	2.8	4.6
–1 to +1 S.D.	57.7	41.7	49.3	48.3
–2 to –1 S.D.	25.3	36.2	33.7	32.4
≤ 2 S.D.	7.1	19.8	14.2	14.7
Total	100.0	100.0	100.0	100.0
<i>(ii) Weight for height</i>				
≥ +1 S.D.	10.7	4.8	8.9	7.6
–1 to +1 S.D.	74.7	73.8	73.0	73.9
–2 to –1 S.D.	12.6	17.6	15.1	15.5
≤ 2 S.D.	2.0	3.8	3.0	3.0
Total	100.0	100.0	100.0	100.0
Number of children	253	469	576	1298

Notes: S.D.= standard deviation from median of NCHS/WHO reference standard. Weights are applied to the data from Fergana and Karakalpakstan to adjust for oversampling of urban areas and to all data so as to produce a sample in which the proportion of households in each region corresponds to that in the population. In the weighted data, the shares of children in each region are 29% in Tashkent, 44% in Fergana and 27% in Karakalpakstan. (The last row of the table gives the unweighted numbers.)

information derived from official sources, although Coudouel et al (1997) also record that EESU income data do not show much clear water between this region and Karakalpakstan. The use of the anthropometric data in the EESU provides an opportunity to shed more light on what is still a rather unclear picture of regional variation in living standards.

The basic anthropometric results for the 1,298 children aged 7–83 months who were measured in the EESU are given in Table 1. The data indicate that there was very little moderate or severe wasting in the sample of children from the three surveyed oblasts. Only 3 percent of children are more than two standard deviations below the reference median—barely more than in the NCHS reference population of healthy US children—although more than 1 in 6 children are between one and two standard deviations below and the mean Z-score (not shown) is –0.21, significantly different from zero ($t=7.5$). At the other end of the range, 8 percent of the children were at a level classified as overweight (more than one standard deviation above the reference standard). The prevalence of moderate and severe

stunting (two or more standard deviations below the reference median) is notably higher than for wasting; 15 percent of the children are in this position and another third of the sample were between one and two standard deviations below. Thus nearly one half of the distribution is below one standard deviation of the reference median compared to only 1 in 20 who are one standard deviation or more above it. (The mean Z-score is -0.89 .)

These results refer to the three regions taken together, weighted for their respective population sizes. However, Table 1 shows some substantial differences between the regions in height for age. Whereas only 7 percent of children in the capital are stunted, 20 percent are stunted in Fergana. Somewhat fewer children are stunted in Karakalpakstan than in Fergana—only 14 percent—but the hypothesis that the grouped Z-score distributions are the same in these two regions cannot be rejected on a chi-square test, and it is Tashkent city that stands out as being different from the other two. Weight for height shows little regional variation and it is notable, for example, how the grouped Z-score distributions are similar in the capital and in Karakalpakstan (mean Z-scores just differ at the 5 percent significance level), the two regions that on many welfare indicators are at opposite ends of the observed range.

Fergana and Karakalpakstan both contain large urban centres and in Table 2 we identify these separately from towns (urban areas with less than 100,000 inhabitants) and rural areas. As far as height for age is concerned, there appear to be two clear groupings. First, the prevalence of stunting in the four regional cities

Table 2: *Stunting and wasting in the EESU by urban–rural location*

	Tashkent city	Other cities	Towns	Rural areas
<i>(i) Height for age</i>				
% ≤ -2 S.D.	7.1	6.0	19.2	19.9
mean height for age as % of median	98.2	96.7	95.6	95.5
<i>(ii) Weight for height</i>				
% ≤ -2 S.D.	2.0	2.1	2.7	3.9
mean weight for height as % of median	100.3	98.8	98.2	97.5
Sample size	253	173	259	613

Notes: "Other cities" are defined as those with a population over 100,000 and comprise Fergana (189,000), Marghilan (133,000) and Kokhand (186,000) in Fergana oblast and Nukus (186,000) in Karakalpakstan. (The population of Tashkent is 2,200,000.) "Towns" are all urban areas beneath 100,000 population. See also notes to Table 1 on weighting.

in our sample is no higher than that in the (much larger) capital. (There are no significant differences among the former.) Second, prevalence in towns and rural areas is almost identical, at around 1 in 5 children, and some two-and-a-half times that in the capital and other large urban centres. A focus on a simple “urban/rural” split would hide some of this difference, the prevalence of stunting in all urban areas being 10 percent, and 13 percent if we exclude Tashkent (which would get far less weight in a national sample).

A focus on stunting prevalence alone when considering height for age suggests that the better position of children in Tashkent compared to other regions is more to do with the capital being a large urban area than with it being the capital *per se*. However, the mean values of the heights for age as a percentage of the median, also shown in the table, *are* significantly higher in Tashkent than in the other cities ($t = 3.8$), which serves as a warning against an exclusive focus on the lower tail of the distribution. (There is no significant difference between the means for towns and rural areas.) A final point to make about the height data in Table 2 is that they hide what appear to be differences between the rural areas in Fergana and Karakalpakstan, which have an incidence of stunting of 23 percent and 13 percent respectively. Hence it is rural Fergana where the incidence of stunting is highest in the parts of Uzbekistan covered by the EESU and the contrast in this region between the situation in the cities and in the countryside is thus particularly marked.

The lower part of Table 2 gives the results for weight for height. These follow a similar pattern to those for height for age but the prevalence of wasting remains low in all types of location, reaching a maximum of 4 percent in rural areas, and neither the differences in wasting nor those in the mean weight for height are significant.

All the results in Tables 1 and 2 refer to boys and girls taken together. There are no significant differences in mean height for age or weight for height between the sexes or in the prevalence of stunting or wasting. (For example, stunting affects 14.6 percent of boys and 14.8 percent of girls.) Nor did the conclusion change when we conducted a more powerful test of the hypothesis of equal treatment of the two genders by focusing on differences between the sexes within households.⁹

The prevalence of stunting and wasting by age is shown in Figure 1, taking all three regions together. The pattern of change is consistent with the findings of many other studies: wasting is highest during the weaning period (6–20 months), when some 8 percent of children are affected—about double what is found in the reference population of this age—then decreases sharply as the child gets older;

⁹ We calculated mean height for age and weight for height (in Z-scores) separately by gender within each household. (Where, for example, there was one boy and two girls these means were equal to the boy's Z-score and the average of those for the two girls.) We then tested for differences in the average values of these means in those households with at least one measured boy and one measured girl. The mean Z-score of height for age for girls in such households was -0.991 and for boys -0.995 .

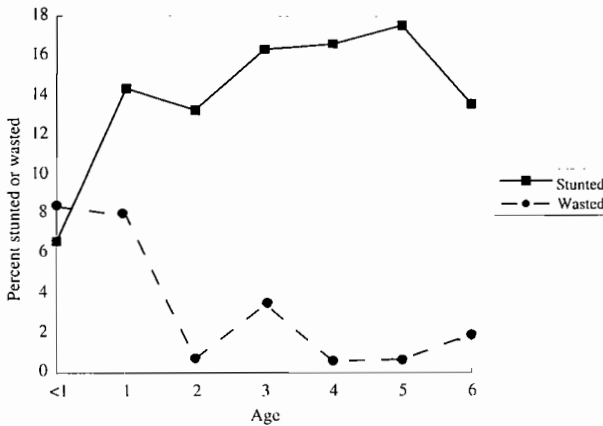


Figure 1: Variation of stunting and wasting by age in EESU data

Notes: see Table 1.

stunting on the other hand is lowest in the infant (<12 months) and no more prevalent in the EESU data at this age than is wasting, but then rises substantially over the next four to five years, with sometimes a partial recovery in the older child. The weaning age is a period of high nutritional risk for a child; nutrients from breastmilk alone become insufficient to support good growth, and supplementary weaning foods may be low in energy content, of poor dietary quality or prepared unhygienically. The weaning age is also the age when a child begins to explore his or her environment, thereby increasing exposure to risk of disease.

How does the prevalence of stunting and wasting in the EESU data compare with that elsewhere, and hence what can we say about absolute levels of child welfare in Uzbekistan using other countries as a yardstick? We first consider findings from outside Central Asia. Carlson and Wardlaw (1990) review findings on child anthropometry from nearly 70 countries at a low and medium level of development. About a third had levels of wasting below that recorded in the EESU and a quarter had lower prevalence of stunting.¹⁰ The combination of a moderate prevalence of stunting with a low prevalence of wasting found in Uzbekistan is typical of a number of the more developed Latin American countries. For example, 9.6 percent of children aged 0–71 months were stunted in Chile in 1986 and only

¹⁰ The studies reviewed by Carlson and Wardlaw refer in the main to the mid 1980s and in general to children aged 0–59 months.

0.5 percent wasted; figures for stunting among children aged 0–59 months were 15.9 percent in Uruguay in 1987 and 15.4 percent in Brazil in 1989 (with wasting at 2.0 percent), a Latin American country at a somewhat lower level of development (Carlson and Wardlaw, 1990, pp.85, 115, and De Onis et al, 1993, p.706). The figures for Uzbekistan are clearly far better than those for many countries in Africa and in South Asia (and for other South American countries) where the highest levels of both stunting and wasting are recorded. They do, however, repeat one marked feature of the results from many other countries, namely a higher prevalence of stunting in rural areas—Carlson and Wardlaw report that stunting prevalence was on average 1.5 times higher in rural areas and wasting prevalence 1.2 times higher (1990, p.23).

Table 3 compares the results for Uzbekistan with others available for Central Asia. National figures are available for Kazakhstan (the most populous country in Central Asia after Uzbekistan) for children aged under 3, from the 1995 Demographic and Health Survey (DHS). (Like the other surveys in the table, this survey was conducted in the Summer months.) We compare results with those for Fergana and Karakalpakstan only, dropping children aged over 35 months and in addition all those in Tashkent, who make up 25 percent of the weighted EESU sample. (By contrast, less than 5 percent of children in the DHS sample were from the Kazakh capital, and largest city, Almaty.) The results seem very similar. The overall level of stunting is around 15–16 percent in both countries and wasting is even less common in Kazakhstan than it is in the two Uzbek regions.¹¹ One difference is that the Kazakh data show a much sharper urban–rural gap in stunting incidence.

The second comparison is with three districts of the large Kazakh region of Kzyl-Orda, which borders Karakalpakstan to the north-east. Some interesting comparisons can be made here, between Kazalinsk and Karakalpakstan on the one hand and Fergana, Zhanakorgan and Djalagash on the other. Like Karakalpakstan, Kazalinsk borders on the Aral Sea and agriculture is similar in both areas, with a heavy emphasis on animal rearing. Zhanakorgan and Djalagash are fruit-growing regions, like parts of Fergana, and fewer households keep animals. (We exclude the four cities from the EESU data since urban areas of this size are not present in the three Kazakh districts concerned.) Table 3 shows that levels of stunting in Kazalinsk and Karakalpakstan are similar, as are the somewhat higher levels of stunting in Fergana, Zhanakorgan and Djalagash. The ranking of the Kazakh districts mirrors that of the Uzbek regions. Economic conditions in Kazalinsk and Karakalpakstan appear less favourable and both areas suffer from environmental degradation but the prevalence of stunting appears rather lower than in the other

¹¹ If infants aged 0–5 months are excluded from the Kazakh results, as they are from the EESU sample, the incidence of stunting rises by 2 percentage points (Macro International, 1996, p.129).

Table 3: *Stunting and wasting in Central Asia*

	Stunting %	Wasting %	Sample size
<i>(i) Comparison with Kazakhstan DHS, 1995 (0–35 months)</i>			
Kazakhstan			
Urban	7.5	3.7	300
Rural	21.8	3.0	417
Total	15.8	3.3	717
EESU, Fergana and Karakalpakstan (6–35 months)			
Urban	12.0	5.0	177
Rural	16.5	6.2	237
Total	15.0	5.0	414
<i>(ii) Comparison with Kyzl-Orda, Kazakhstan, 1994 (6–71 months)</i>			
Kyzl-Orda			
Kazalinsk (1994)	14.1	1.2	256
Djalagash	20.4	1.0	382
Zhanakorgan	21.4	1.9	267
EESU (town, rural)			
Fergana	22.5	4.2	308
Karakalpakstan	15.4	3.1	454
<i>(iii) Comparison with Muynak, Karakalpakstan, 1993 (6–59 months)</i>			
Muynak	25.9	3.6	532
EESU (town, rural)			
Karakalpakstan	14.9	3.5	369

Notes: See Table 1 for information on weighting of EESU data. The sample sizes refer to the unweighted data.

Sources:

(i) Kazakhstan Demographic and Health Survey (DHS): Macro International (1996), Table 10.7, p.129. The data were collected during May–September.

(ii) Kyzl-Orda: Ismail and Hill (1996). The data were collected during June–August.

(iii) Muynak: Morse (1994), Table 17, p.39.

areas taken for comparison. We referred earlier to the importance of calcium for linear growth and it may be that milk consumption is greater in Karakalpakstan and Kazalinsk on account of the relatively higher cattle ownership in these areas.

The final comparison is between the rural and small urban areas of Karakalpakstan in the EESU with Muynak, a remote district in the same region on

the shores of the Aral Sea. Wasting was again low in Muynak in 1993 but stunting in this case was as high as 26 percent, suggesting that child (and household) welfare in the remoter areas in Karakalpakstan may be notably lower than in other parts of the region.

Several general conclusions are suggested by these comparisons and by the earlier results in this section. First, the low prevalence of wasting in all the different studies indicates that there was no major problem of aggregate energy deficit in Uzbekistan or Kazakhstan at the time the data concerned were collected.¹² Second, stunting levels appear similar in the two countries, at around the level found in several more developed Latin American countries and this provides one marker for the Central Asian countries in terms of average living standards. Third, no differences in the anthropometric status of boys and girls emerged in the EESU data, a feature repeated in the other studies covered in Table 3; on this measure of individual welfare, neither gender appears to have an advantage over the other.¹³ Fourth, living standards as indicated by stunting prevalence appear markedly lower in rural areas than in urban areas (especially large cities), a finding that runs counter to the frequent claim that private plots enable rural households to maintain higher living standards than their urban counterparts.

4. Testing Hypotheses Concerning Living Standards and Public Policy

In this section we test the three hypotheses outlined in the Introduction concerning (i) living standards in rural and urban areas, (ii) the impact of kindergartens on nutritional status, and (iii) the targeting of the Mahalla social assistance scheme.

■ (i) *Living standards in rural and urban areas*

Height for age is clearly lower in the rural areas in the regions covered by the EESU than in the large urban areas, with small urban areas in an intermediate position. We now investigate these differences in more detail. Higher income can be expected to be associated with higher nutritional status (although the relationship is subject to debate (Alderman, 1993)). If when controlling for variation in observed cash income between urban and rural areas we find that

¹² National figures on the incidence of wasting are also available for Kyrgyzstan and show a somewhat higher level of 7 percent among 1,415 children aged under 7 in the World Bank-sponsored Kyrgyzstan Multipurpose Poverty Survey of Autumn 1993 (Popkin and Martinchik, 1994, Table 4). (Information on month of birth was not collected in the survey, precluding calculations of height for age.)

¹³ Carlson and Wardlaw find that in many less developed countries girls in fact enjoy slightly better anthropometric status than boys, the ratio of stunting and wasting prevalence between boys and girls for 39 countries averaging 1.1 and 1.3 respectively (1990, Table 6).

nutritional status in the latter is in fact higher, this will suggest that unmeasured non-cash income in rural areas, particularly food grown on agricultural plots and consumed within the home, is an important factor in sustaining household living standards in rural areas.¹⁴ This in turn would underline the danger of the State treating cash income as an adequate measure of household welfare when targeting cash and in-kind benefits.

Our strategy is to estimate multivariate equations, regressing anthropometric status of the child on the location indicators and progressively adding in a variety of control variables. We report results for both height for age and weight for height as percentages of the reference medians. The equations are estimated by GLS, allowing for an unobserved household-level random effect assumed constant across children in the same household (and uncorrelated with observable factors included in the regression).¹⁵ Results are given in Table 4 for the estimated coefficients on the location variables only. (We comment in the text on the impact of some of the control variables.)

The specification in column 1 contains only the five location variables, for which the base is Tashkent city. Mean height for age in rural Fergana is over 3 percentage points lower than in the capital, nearly 3 points less in the smaller urban areas (we refer to these as "towns"), and 2 points less in rural Karakalpakstan. The deficit in cities relative to the capital is between 1.5 and 2 percent. The variation across location in weight for height is similar in its pattern (although much smaller in relation to the standard deviation), with the noted exception of Nukus (the single Karakalpak city) where there is no difference from the capital.

Column 2 includes controls for household composition, including household size, the age of the child, and whether the household head is of Slav ethnicity. The mean values of all of these vary across location but their inclusion in the equations has no great impact, although the differences in mean height for age relative to that in the capital do all fall somewhat. One notable result is that a Slav household head is associated with a quite well-determined increase in height for age of 2 percentage points (but has no significant impact on weight for height). Height for age is lower in large households—by about 0.25 percentage points for each other child present aged under sixteen.

Column 3 includes measured cash income. This variable refers to all income in

¹⁴ Such a pattern is suggested by official budget survey data from pre-reform Uzbekistan, which show recorded calorie and protein intake in collective farm households as being higher than that in worker-employee households, holding cash income constant (Marnie and Micklewright, 1994, Figure 7).

¹⁵ This household error can be thought of as proxying a variety of unobserved influences including common "environmental" factors and shared genetic inheritance. (Our earlier discussion indicates that the major part of genetic inheritance will enter via the individual and not the household-specific error; and our treatment of genetic influences as additive is clearly unsatisfactory.) An LM test always rejected the hypothesis of no random effects.

Table 4: *Location effects and nutritional status: GLS regression results*

	(1) No controls	(2) + Household composition	(3) + Cash income	(4) + Dwelling characteristics and agricultural assets
<i>(i) Height for age as a percentage of reference median (mean = 96.3, S.D. = 4.4)</i>				
City Fergana	-1.53 (2.9)	-1.30 (2.4)	-1.34 (2.5)	-1.16 (2.0)
City Karakalpakstan	-1.88 (2.8)	-1.54 (2.3)	-1.55 (2.3)	-1.38 (2.0)
Town	-2.70 (6.4)	-2.32 (5.4)	-2.34 (5.4)	-1.89 (3.3)
Rural Fergana	-3.28 (8.3)	-3.04 (7.5)	-3.07 (7.5)	-2.08 (3.3)
Rural Karakalpakstan	-1.97 (4.8)	-1.43 (3.4)	-1.49 (3.5)	-0.23 (0.3)
<i>(ii) Weight for height as a percentage of reference median (mean = 98.7, S.D. = 8.4)</i>				
City Fergana	-1.93 (1.8)	-1.90 (1.8)	-1.66 (1.6)	-1.61 (1.4)
City Karakalpakstan	0.54 (0.4)	-0.08 (0.1)	-0.02 (0.1)	-0.46 (0.3)
Town	-1.70 (2.0)	-1.67 (2.0)	-1.54 (1.8)	-1.65 (1.5)
Rural Fergana	-3.27 (4.2)	-3.30 (4.1)	-3.08 (3.8)	-1.89 (1.5)
Rural Karakalpakstan	-1.54 (1.9)	-1.75 (2.1)	-1.42 (1.7)	-0.76 (0.5)

Notes: T-statistics are given in brackets; sample size is 1,298 children. The base for the location dummies is Tashkent city. The specification in column 2 includes 6 age dummies, dummies for low maternal education (failure to complete secondary school), a dummy for Slav head of household, and variables measuring the numbers of adults and children in the household. The specification in column 3 includes in addition a variable $Y/H^{0.5}$ where Y is the total household cash income in the last month (whether or not actually received) and H is the number of persons in the household. The specification in column 4 includes (in addition to variables in the previous specifications) dummies for running water and central drainage, plot ownership, ownership of cattle, sheep, fruit trees, vines and for receipt of cash income from sales of agricultural produce from the plot in the previous month.

the previous month whether it was received or not, the latter including wages or cash benefits due in that month which were not actually paid. Information on cash incomes in the EESU was collected in considerable detail, with each adult separately questioned about a wide range of different possible sources. The inclusion of the cash income variable (which is equivalised by dividing by the square root of household size) has no impact on the estimated location coefficients for height for age. Those for weight for height fall but only by about one tenth. Even the simple correlation between household cash income and individual nutritional status is very low—the two measures of welfare appear to be weakly related. The hypothesis that the correlation coefficient between equivalised income and height for age is zero cannot be rejected. That between weight for height and income is significant at the 1 percent level but the estimated value is only 0.09. Similarly, in the regressions reported in Table 4, where we control for other factors, equivalised income has a completely insignificant impact on height for age. The estimated impact on weight for height is significant at the 5 percent level but is very small; an increase in income of one standard deviation raises weight for height by only 0.5 percentage points.¹⁶ The greater impact of cash income in the last month on weight for height makes sense, since this is a short-run measure of nutritional status. The lack of association with height for age may be interpreted in various ways; one is that cash income over a month is a poor indicator of permanent or full income.

The agricultural asset variables entered into the specification in the final column are intended to pick up important sources of other aspects of full income for households. Here we do find a substantial change in the estimated impact of the location variables. The difference between rural Karakalpakstan and Tashkent now disappears for both nutritional indicators and as far as weight for height is concerned there are no differences in any of the location types from the capital. However, when we look at the estimated coefficients on the agricultural asset variables we find that a number of them are negative. (In fact this must be the case in order to account for the change in the location impacts given that the cash income variable does so little.) For example, children in households with any cash income from crop or stock sales in the last month are estimated to have height for age and weight for height that are lower by about 0.7 and 1.3 percentage points respectively than for other children, although these effects are barely significant at the 10 percent level. (The income itself from this source is included in the cash income variable and the agricultural income dummy is intended to pick up households with sufficient involvement in private agriculture to engage in selling to others.) Larger private agricultural plots are associated with lower height for age.

¹⁶ These results are not changed much when we allow the effect of income to vary by oblast although there is some suggestion that the impact on weight for height is higher in Tashkent.

Overall, the conclusion seems to be a rejection of the null hypothesis with which we started—anthropometric status is lower in rural areas even when we control for cash income. Further controls do help explain some of the apparent rural “effects”. The specification in column 4 also includes some housing condition dummies; running water in the household, which is typically present in urban areas and typically absent in rural areas, is significantly associated with an increase in weight for height of 1.5 percentage points.

■ (ii) *The impact of kindergartens on nutritional status*

The impact of kindergartens on nutritional status is of considerable policy interest. As elsewhere in Central Asia (Klugman et al, 1997) kindergarten enrolment has fallen significantly in Uzbekistan, from 35 percent of the relevant age-group in 1991 to 26 percent in 1995.¹⁷

These falls in enrolment have in all probability reflected both demand and supply side factors, the latter including closure of some enterprise facilities. Whatever the explanation, the issue is whether this falling enrolment is a cause for concern for public policy. Kindergartens have a number of functions and hence positive impacts on household welfare. One possible effect is that of enhancing nutritional status among children, through provision of food that would not otherwise be eaten.

We investigate this issue by inserting a dummy variable for kindergarten attendance in the regression equations described above. About a quarter of the children in the EESU sample were in kindergartens. Table 5 reports the coefficient on the kindergarten dummy in regressions of height for age and weight for height under two different treatments of unobservable factors. Column 1 reports GLS regressions in which the control variables follow the specification in the final column of Table 4. This assumes unobservables to be uncorrelated with observable factors. However, unobserved factors may indeed be correlated with the kindergarten dummy, which in this case would partly proxy those factors. For example, “good” mothers (in some unobserved sense) may provide their children with more food and better living conditions but they may also be more likely to send their children to kindergarten so as to take advantage of the benefits offered. In this case a positive impact of the kindergarten dummy in a GLS regression of nutritional status could merely be proxying the unobservable factor of having a “good” mother.

The estimates in column 2 try to allow for this and are obtained with the fixed-effects estimator, exploiting the fact that we often observe more than one child per household. With a two-child household this technique is equivalent to regressing the difference in nutritional status between the two children on the difference in

¹⁷ Information supplied by the Ministry of Labour.

Table 5: *The effect of kindergarten attendance on nutritional status*

Dependent variable	Coefficient on kindergarten dummy	
	(1) GLS	(2) Fixed effects
Height for age as % of reference median	-0.20 (t = 0.65)	-0.03 (t = 0.05)
Weight for height as % of reference median	1.19 (t = 2.01)	1.68 (t = 1.53)
Sample size	1,298	765

Note: The results in column 1 are obtained by GLS regression on the full sample of 1,298 children in an equation containing all the control variables listed in the notes to Table 3 as well as the dummy variable for kindergarten attendance. The results in column 2 are obtained by OLS on a transformed equation in which the dependent and independent variables are adjusted by subtracting their household-specific mean values and which is estimated on the 765 multi-child households.

their kindergarten attendance. Unobserved household factors such as a “good” mother which are common to the children drop out of the equation (their difference is zero) thus leaving an estimated kindergarten effect that should be uncontaminated. The disadvantage of this technique is that the kindergarten impact is estimated only from the within-household variation in kindergarten attendance, and not from that between households. The amount of such variation is low—in only 72 households was there at least one child under 7 attending kindergarten and one who was not. We cannot therefore hope for well-determined estimates.

The results show that with neither the GLS nor the fixed-effects estimator is there any impact of kindergarten status on height for age. However, it does seem that weight for height, the more short-term nutritional indicator, may be affected positively by kindergarten attendance. The GLS results indicate that weight for height is about 1 percent higher where the child is in a kindergarten, controlling for other observables factors (including, for example, age which is strongly correlated with kindergarten attendance), a difference which is just significant at the 5 percent level. The fixed-effect estimator yields an estimate which is similar in size but as expected it is poorly determined and significant at only the 13 percent level, although it is worth noting that a Hausman test fails to reject the hypothesis of no fixed effects. A considerably larger sample size would be needed to estimate the kindergarten effect with more precision.

■ (iii) *The targeting of the Mahalla social assistance scheme*

As part of its moves to provide more targeted support to those in need, the Uzbek government introduced a new means-tested social assistance scheme in the Autumn of 1994.¹⁸ A key feature of this scheme is that support is administered by committees of the “Mahalla”, a pre-Soviet traditional community organisation that has been revived under the government’s auspices. There are several thousand Mahalla in the republic as a whole. The scheme is an important form of support for households. Initially granted a budgetary allocation of about 0.5 percent of GDP, some 1 in 5 households were apparently granted benefit under the scheme in 1995 for renewable periods of three months, at a level which is intended to be between 1.5 and 3 times the minimum wage.

The scheme combines on the one hand firm rules regarding applications and procedures for assessing them with, on the other, a large element of discretion for the Mahalla committees. Clear guidelines lay down the information that the Mahalla committees should take into account in assessing need but there is no attempt made by the central authorities to define when support must or must not be given and the committees’ decisions are not subject to appeal.

The guidelines for assessing need indicate that the committees should collect information on a wide range of indicators that might be thought of as determining the household’s “full” income, including household composition, labour force status of adults, cash incomes, durable good ownership and agricultural plot size and use. The guidelines also indicate examples of types of households which may be expected to benefit from the scheme, among which households with large numbers of children head the list.

The Mahalla scheme is designed to take into account the usual sort of information on income and assets relevant to the assessment of need but also to allow local committees discretion, tailoring decisions to the local situation and other available knowledge of the circumstances of applicants. However, a strong discretionary element brings with it the risk of errors in targeting—discretion may be inappropriately applied both to exclude the needy and to include those not genuinely in need. In addition, ignorance of the scheme or a reluctance to publicly display need (Mahalla committee recommendations are voted on in a monthly public meeting) may lead to a failure to claim benefit.

We use the data on anthropometric status in the EESU to conduct a simple test of the targeting of the Mahalla scheme, simply comparing mean height for age and weight for height in households with and without support from the Mahalla (Table 6). Among households in the EESU with children for whom anthropometric data

¹⁸ The introduction of the Mahalla scheme coincided with a phasing-out of remaining food subsidies, in particular those on bread and flour.

Table 6: *Mean anthropometric status within households by receipt of social assistance from the Mahalla*

	Height for age as % of the reference median (mean of household minimum)		Weight for height as % of the reference median (mean of household minimum)	
	with social assistance	without social assistance	with social assistance	without social assistance
Tashkent	96.64 (t = 1.31)	98.04	95.56 (t = 1.55)	98.60
Fergana	93.45 (t = 2.45)	94.89	94.11 (t = 0.99)	95.18
Karakalpakstan	94.24 (t = 1.64)	95.13	95.90 (t = 0.47)	96.39
All households	94.29 (t = 3.62)	95.70	95.19 (t = 1.75)	96.43

Note: The results refer to the average values across households with and without social assistance of the minimum value within each household of height for age and weight for height among all measured children. The total number of households is 765 (159 in Tashkent, 289 in Fergana and 317 in Karakalpakstan). The t-test in brackets is of the hypothesis that the means are equal.

were collected, 16 percent reported receiving social assistance from the Mahalla in Tashkent, 24 percent in Fergana, and 28 percent in Karakalpakstan. The unit of analysis is the household and the measures we take are the minimum values among measured children in each household of height for age and weight for height as a percent of the reference median.

Looking first at the results for all households, the data indicate a clear difference in height for age. Households receiving assistance from the Mahalla have a minimum measured height for age which is on average 1.4 percent lower and the difference is quite strongly significant. Weight for height is also lower, by 1.2 percent but the difference is only significant at the 10 percent level. The data appear to indicate that on average Mahalla support goes to households with at least one child of significantly lower anthropometric status. The separate results for each oblast provide mixed support to this finding. The means in every case and for both measures are lower for households receiving support from the Mahalla. The differences are often not significant but the much smaller sample sizes at the oblast level need to be taken into account.¹⁹

¹⁹ For example, the Tashkent sample is less than a quarter of the size of the overall sample, so standard errors that are over twice as large are to be expected.

In the case of weight for height, the more short-term measure of nutritional status, the possibility cannot be ruled out that receipt of social assistance has allowed weight to improve due to the household having a greater command over food resources as a result of the higher income provided by the scheme (although the very modest income effects found earlier in this section need to be noted). On this argument the finding of lower weight for height in households receiving support is quite a strong result since it will have emerged despite any positive impact of the support on nutritional status.

5. Conclusions and Policy Implications

This paper has used measurements of children's body size to quantify individual and household welfare and to investigate public policy. We began by giving the reasons for using such data and the problems of interpretation that arise. In these conclusions we concentrate on the substantive results for Uzbekistan and their implications for policy.

■ (i) *Overall nutritional status*

With moderate levels of stunting and the virtual absence of wasting in the Uzbek data, it is reasonable to assume that energy deficiency is not a serious nutritional problem in the regions covered in the survey. However, the quality of the diet may be poor, with deficiencies in one or more micronutrients. The results on anthropometric status for the three Uzbek regions appear to be broadly in line with those found in Kazakhstan and provide an absolute measure of child welfare for the purposes of international comparison. We noted Latin American countries with a similar prevalence of stunting and wasting.

As in many developing countries, the weaning age appears to be a particularly vulnerable period of a child's life in Uzbekistan. A nutrition education programme should thus be considered to address the question of diet quality and child feeding during the weaning age. This would need to take into consideration regional food consumption patterns, as well as regional food availability and food prices. No information on morbidity was gathered in the Uzbek survey; if the situation is similar to that found in the Kzyl-Orda region of Kazakhstan, sanitation, hygiene and levels of morbidity are likely to be unsatisfactory in rural areas and in small towns. Public health programmes need to address these issues.

■ (ii) *Urban-rural variation and growth monitoring*

We found wide variation in anthropometric status between large cities, small towns and rural areas. On the one hand this suggests that nationwide programmes

of nutritional intervention are not necessary, and that considerable savings in expenditure on interventions can be made with appropriate targeting. On the other hand it suggests that there are some parts of the country that are probably in need of quite urgent attention. Furthermore, while the situation is not yet serious in some areas, in the face of rapid economic change it is certainly advisable to consider some form of nutrition monitoring.

A number of options for monitoring are available, ranging from a full-scale national surveillance system to monitoring of nutritional status indicators only at selected “sentinel” sites. An option that may be particularly appropriate for Central Asia is the routine measuring of heights and weights of all children at entry to elementary school, which remains universal. Measurements could be taken either by teachers or by mobile teams of health personnel. With basic training (and periodic re-training) and investment in good equipment, such data are easy to gather and analyse and would indicate those areas of the country in need of further investigation to select suitable social, economic, health or nutrition interventions.

■ (iii) *Urban–rural variation and the measurement of welfare*

The anthropometric status of Uzbek children is notably lower in the rural areas covered by the EESU data, and our analysis does not indicate that this is mediated to any substantial degree by cash income. Cash income was found to have a low positive correlation with weight for height and no association at all with height for age. Rural children have worse nutritional status than urban children in most developing countries, and this has been associated with a variety of factors including lack of access to health care and a low level of education. While health care is widely available in rural Uzbekistan, it is possible that the quality of care is poorer than in urban areas although we have no information on this. Basic education has been virtually universal, as in other former socialist states, and our results gave no indication that lower levels of maternal education in rural areas were an explanatory factor.

These results both underline the existence of lower living standards in rural areas and the limitation of monthly cash income as a measure of household welfare.

■ (iv) *The impact of kindergarten attendance*

Controlling for other observable factors, attendance at kindergartens had no positive association with height for age. However, the data did suggest a positive association of weight for height with kindergarten attendance. This association was not very well determined but seemed moderately robust to changes in the econometric treatment of the data. This result is consistent with the hypothesis that kindergartens have a positive impact on energy intake of children, which has a bearing on government policy on pre-school education.

■ (v) *The targeting of social assistance*

Nutritional status as measured by height for age was significantly lower for at least one child in households receiving means-tested support from the social assistance scheme administered by the Mahalla. On the face of it, this gives an encouraging picture of targeting in this new social assistance scheme, which has a substantial discretionary element. Weight for height is less obviously lower in households receiving support but we cannot rule out that this reflects in part the positive impact of receiving social assistance on this short-term nutritional measure.

Appendix

The European University Institute and University of Essex Survey in Uzbekistan (EESU) collected data on a range of household and individual characteristics via interviews conducted in the early Summer of 1995. There were questionnaires for the head of the household, for each person in the household aged 16 or over, and for mothers of children aged under 7 in respect of each child of this age. Information was obtained on a range of subjects including demographic characteristics, housing conditions, employment, cash incomes in different forms, and agricultural assets and activity. (No information was collected on expenditure or consumption.) Anthropometric measurements of children aged less than 7 were collected in separate visits from the main interviews. The survey was conducted by EXPERT Centre, Tashkent, and the anthropometric measurements were made by persons receiving training from a team from the London School of Hygiene and Tropical Medicine.

In all, 1,581 households responded to the EESU, representing an overall response rate of 85 percent. Refusals accounted for just under a third of non-response. (Details of sampling and response are given in Coudouel, 1997.) 851 responding households contained children aged over 6 months and under 7 but in 10 percent of these collection of anthropometric data proved impossible for one reason or another, including refusal to be measured. Measurement was successfully carried out on 1,298 children in 765 households.

References

- H Alderman (1993), "New Research on Poverty and Malnutrition: What are the Implications for Policy?", in M Lipton and J van der Gaag (eds), *Including the Poor*, The World Bank.
- D J Casley and D A Lury (1987), *Data Collection in Developing Countries*, (2nd edition), Oxford University Press.
- B A Carlson and T M Wardlaw (1990), "A Global, Regional and Country Assessment of Child Malnutrition", UNICEF Staff Working Paper Number 7, New York.
- A Coudouel (1997), "Living Standards in Transition: The Case of Uzbekistan", PhD Thesis, European University Institute, Florence.
- A Coudouel, S Marnie, J Micklewright and G Shcherbakova (1997), "Regional Differences in Living Standards in Uzbekistan" in J Falkingham, J Klugman, S Marnie and J Micklewright (eds.), *Household Welfare in Central Asia*, Macmillan.
- P Dasgupta (1993), *An Inquiry into Well-Being and Destitution*, Oxford University Press.
- M De Onis, C Monteiro, J Akre and G Clugston (1993), "The Worldwide Magnitude of Protein Energy Malnutrition: An Overview of the WHO Global Database on Child Growth", *Bulletin of the WHO*, 71(6):703-12.
- P B Eveleth and J M Tanner (1976) *Worldwide Variation in Human Growth*, Cambridge University Press.
- J Falkingham and R Ackland (1994), "A Profile of Poverty in Kyrgyzstan, October to November 1993", mimeo, World Bank.
- J Falkingham, J Klugman, S Marnie and J Micklewright (1997), "Household Welfare in Central Asia: An Introduction to the Issues", J Falkingham, J Klugman, S Marnie and J Micklewright (eds.), *Household Welfare in Central Asia*, Macmillan.
- J Falkingham and J Micklewright (1997), "Surveying Households in Central Asia: Problems and Progress" in J Falkingham, J Klugman, S Marnie and J Micklewright (eds.), *Household Welfare in Central Asia*, Macmillan.
- S Ismail and H Hill (1996). "Final Report of a Survey on Anaemia in Three Districts of Kyzl-Orda, Kazakhstan", Human Nutrition Unit, London School of Hygiene and Tropical Medicine.
- J Klugman, S Marnie, J Micklewright, and P O'Keefe (1997), "The Impact of Kindergarten Divestiture on Household Welfare in Central Asia", in J Falkingham, J Klugman, S Marnie and J Micklewright (eds.), *Household Welfare in Central Asia*, Macmillan.
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- J Komlos (ed) (1994), *Stature, Living Standards, and Economic Development*, University of Chicago Press.
- K Kostermans, (1994), "Assessing the Quality of Anthropometric Data: Background and Illustrated Guidelines for Survey Managers", LSMS Working Paper 101, World Bank.
- Macro International (1996), *Kazakhstan Demographic and Health Survey 1995*, Calverton, Maryland: National Institute of Nutrition and Macro International Inc.

- S Marnie and J Micklewright (1994), "Poverty in Pre-Reform Uzbekistan: What do Official Data Really Reveal?", *Review of Income and Wealth*, 40(4), pp395–414.
- C Morse, (1994), "A Study of the Prevalence and Causes of Anaemia in Muynak District, Karakalpakstan, The Republic of Uzbekistan", CROSSLINK International.
- B Popkin and A Martinchik, (1994), "Nutritional Conditions of the Kyrgyz Population, 1993", mimeo, World Bank.
- A G D Piyadasa (1996), "Linear Growth Retardation (Stunting) in Sri Lankan Children and the Role of Dietary Calcium", PhD Thesis, Human Nutrition Unit, London School of Hygiene and Tropical Medicine, University of London.
- R H Steckel (1995) "Stature and the Standard of Living", *Journal of Economic Literature*, vol 33 no 4 pp1903–40.
- J M Tanner (1994) "Introduction: Growth in Height as a Mirror of the Standard of Living" in J Komlos (ed), *Stature, Living Standards, and Economic Development*, University of Chicago Press.
- D Thomas, V Lavy and J Strauss (1996), "Public Policy and Anthropometric Outcomes in the Cote d'Ivoire", *Journal of Public Economics*, vol61, no2, pp155–192
- A Tomkins (1994), "Growth Monitoring, Screening and Surveillance in Developing Countries", in S J Ulijaszek and C G N Mascie-Taylor (eds), *Anthropometry: the Individual and the Population*, Cambridge University Press.
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- United Nations, (1990), *Appropriate Uses of Anthropometric Indices in Children*, ACC/SCN Nutrition Policy Discussion Paper 7, Geneva.
- C G Victora (1992), "The Association between Wasting and Stunting: An International Perspective", *Journal of Nutrition*, 122, pp1105–10.
- WHO (1995), *Physical Status: The Use and Interpretation of Anthropometry*, WHO Technical Report Series, 854, Geneva.

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