

POLICY ALTERNATIVES FOR LIVESTOCK DEVELOPMENT IN MONGOLIA (PALD)

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**Human Nutrition in Mongolia
During Economic Liberalisation:
Available Data and Key Research
Issues**

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INTRODUCTION

Over the past two years, Mongolia has been attempting to move from a largely Soviet-inspired command economy to one which is led by market forces. Privatisation of the livestock, although not the grazing lands, of pastoralist collective farms has been proceeding to various degrees in different areas. This has taken place in a context in which, since the ending of Soviet subsidies to satellite Asian republics in early 1991, international trade in foodstuffs has been disrupted.

The consequences of this economic liberalisation for the nature of food supplies have differed between states. Meat, milk, fruit and vegetables have been hard to obtain in Kazakhstan, Kirghizstan, Tajikistan, Turkmenistan and Uzbekistan (the Central Asian Republics - CAR states), where consumption of bread and potatoes has risen sharply to compensate for shortages of these items (Chen et al. 1992). These changes broadly resemble those which have affected some Eastern European states since the late 1980s, notably Poland (Szostak and Sekula 1991) but also some other countries (Traill and Henson 1991). By contrast, in Mongolia the large livestock sector has permitted increasing dependence on meat and milk, to compensate for reductions in the absolute availability of flour and vegetable foods. In both regions, there has therefore been concern over the food security of groups vulnerable to poor health and nutrition. Baseline information is central to understanding the nutritional correlates of economic change in this case; and this paper therefore reviews available data concerning nutrition in Mongolia with the aim of identifying specific lines of inquiry for future nutritional research.

GENERAL VITAL STATISTICS

The basic data given in Table 1 compare a number of general health indicators available for the CAR states and Mongolia for 1989. For its relatively small population, Mongolia shows a rate of natural increase and balance between crude birth and death rates which resemble the values for the CAR states. The major contrast lies in the levels of the infant mortality rate (IMR) and maternal mortality rate (MMR), which are remarkably high; and the latter averaged 1.6 per thousand over 1985-1989. Mongolian data for 1992 suggest that these values have risen over the past three years (Gunsendorj and Oyunbileg 1992). In 1989, the high MMR was explained by haemorrhageing (32%), toxemia (21%), 'medical complications' (21%), sepsis and uterine rupture (26%) (Mongolia 1992). About 75% of the IMR results from acute respiratory infections and diarrhoeal disease, which exhibit contrasting seasonal incidences (Mongolia 1992).

Table 1. General vital statistics: Mongolia and the Central Asian Republics (CARs)

	Population (million)	CBR	CDR	Increase	TFR	IMR	MMR
Mongolia							
1989	2.1	36.4	8.0	28.4	5.3	61	1.2
1991	2.2	32.9	8.2	24.7	3.7	72	1.2
CARs							
1989	49.3	31.3	7.3	24.0	3.9	40	0.4

Note: Data for Mongolia from Gunsendorj and Oyunbileg (1992) and Ministry of Health (1992), those for the CARs from Chen et al. (1992). All vital rates are expressed per 1000 live-births.

Abbreviations as follows: CBR - crude birth rate; CDR - crude death rate; TFR - total fertility rate; IMR - infant mortality rate; MMR - maternal mortality rate.

Definitions: The CBR and CDR are expressed as births and deaths per 1000; the rate of increase is the CBR-CDR; the TFR is the total of the age-specific fertility rates of women; and the IMR and MMR are expressed as deaths per 1000 livebirths.

Closer examination suggests some inconsistencies between the reported demographic and health statistics, which may result from aggregating regionally variable data. Compared to the moderate crude death rate (CDR), the high Mongolian infant and maternal mortality rates suggest that those other than infants and mothers experience reasonably good health. However, the life expectancy at birth was estimated over 1985-1990 to be about 61.3, a comparatively low figure. On the other hand, the prevalence of babies of low birth weight (<2.5 kg) was small (4.5% in 1990) (Mongolia 1992). However, maternal mortality rates and the prevalence of LBW babies are known to be higher in rural than in urban areas, a pattern which is familiar from other parts of the world.

These data suggest that the primary focus of future nutritional work should be on factors contributing to the risk of maternal and infant mortality, and the relatively low life expectancy exhibited in this population. The following discussion considers evidence of poor nutrition derived from recent anthropometric, clinical and dietary studies; and identifies three broad areas of future research.

LOCAL DATA SOURCES

District level hospitals conventionally record birth weights. The babies are weighed weekly for the first month post partum, then monthly for the first year of life. This appears to be the sole form of regular nutritional surveillance in Mongolia. There is clinical monitoring of weight growth in provincial children's hospitals, but not growth in height for which measuring instruments and training are lacking. Weight-for-age is compared to norms. These are apparently Russian, and are currently being revised with UNICEF assistance. Where considered appropriate, children aged 4-12 months are recommended by a paediatrician for daily milk supplements obtainable from local 'milk kitchens'. Supplies are variable.

Local district (somon) physicians are required to report the prevalence of a wide variety of conditions in periodic returns to the regional centres. The average values for all districts of a province combined are then sent to the Ministry of Health in Ulaanbaator. District reports are apparently kept in provincial archives and are in principle accessible to research workers. The nutritionally relevant data include numbers of cases of anaemia, alcoholism, diabetes, dental caries, malnutrition (unspecified), hypertension and coronary heart disease (CHD). However, there are doubts as to the consistency of definition of certain of these conditions, when they have been identified by doctors who receive specialised training (as obstetricians, stomatologists, paediatricians) and are not general 'family' practitioners or have no specifically nutritional expertise. Further, at

the settlement ('brigade') level, some data appear to be collected by paramedical staff with limited training, who are termed Feldshers; and this adds to the uncertainty.

In Ulaanbaator, summary statistics can be obtained disaggregated by province (aimag). These reveal, for example, that the national prevalence of hypertension has doubled, and that of CHD has risen 2.5-fold, between 1986 and 1991. These apparent increases have been biased by including data for the three cities (Ulaanbaator, Darkhan, and Erdenet), in which the changes have been rather more marked (mostly between 4 and 11-fold) than in rural areas. Few substantial attempts appear to have been made to analyse these epidemiological data or the data on the body weights of infants, whether regionally, at district level, or over time.

Thus it would appear that there is a well-established official system of data collection, with considerable scope for further development through expansion and analytical training. For research purposes, there may therefore be a substantial source of baseline epidemiological information but it is of unclear quality.

RECENT ANTHROPOMETRIC DATA

There have been three recent anthropometric surveys in Mongolia, in 1989, 1990-91 and 1992. Two have covered small samples of urban children, and a third nomadic children and adults of Hovd province. Table 2 shows results of the urban surveys for growth in stature. These indicate that growth performance of children living in tents is poorer than that of flat-dwellers; and that there is a peak in the prevalence of relatively short stature in children aged between 1 and 3 years. Mongolia is essentially ethnically homogeneous. It is probable that tent-dwellers are therefore in some respects poorer social-economically than those living in flats, and that tent-dwellers are more susceptible to certain types of living-density-dependent infection. Unfortunately, the data from each survey are expressed in distinct ways and are therefore not directly comparable (Waterlow et al. 1977). However, the general magnitude of these values is lower than would be expected in, for example, sub-Saharan Africa, or in East Malaysia where the percentage below 90% H/A approximates 24-39%, and that below -2SD H/A is 43-64% in the age range 12-48 months (Strickland and Ulijaszek 1992).

Data on weight and height can be used to differentiate thinness (low weight-for-height) from shortness of stature (low height-for-age). Thinness is a measure sensitive to short-term changes in nutritional health, such as those which are likely to occur with common childhood infections. Accumulated episodes of thinness are likely to entail permanent shortness of stature, if catch-up growth in height does not occur before the age of about 5 years. Short stature is therefore often used as a measure of chronic poor health. Table 2 shows that, unlike shortness of stature, thinness does not occur with a prevalence greater than would be expected in any random sample of a healthy population. Is chronic undernutrition therefore a major problem for Mongolian children?

Table 2. Height-for-age (H/A) and weight-for-height (W/H) in Mongolian children (per cent below reference value)

		Age (months)			
		<6.0	6-11.9	12-23.9	24-47.8
H/A					
1989 < 90%	Flat	0	5	10	11
	Tent	0	2	10	15
1992 <-2SD	Flat.....	23.....			
	Tent.....	28.4...			
	All	18.9	22.9	34.5	29.1
W/H					
1989 < 80%	All	0	0	0	0
1992 <-2SD	All	3.0	2.4	1.9	0.7

Note: Data for 1989 refer to Ulaanbaator and Omnogov provincial centre, from UNICEF (Mongolia) 1990; data for 1992 refer to 3 cities and 4 provinces, from UNICEF/Ministry of Health (Mongolia) 1992, and refer to all age groups combined where disaggregated by dwelling.

The answer to this question depends on the relationship between wasting and stunting which may vary with differences in body composition and proportion characterising distinct populations (Victoria 1992). However, the answer also depends on the interaction between infection, diet and the climatic environment during growth. Efficiency of thermoregulation in cold environments would seem to favour a high ratio of body weight to surface area, and therefore a short stature. Thus, there is a reasonably well established relationship between cooler climates and a relatively short-limbed, squat physique in humans, and between warmer climates and a taller, more linear body form; and the centripetal pattern of fat deposition in Mongolian nomads appears to be consistent with this theory (Beall and Goldstein, 1992). However, the question of whether this pattern is a consequence of natural selection in the human gene pool (Tanner 1978), or of the independent effects of thermal environment, diet and disease (Marshall 1981) remains to be resolved conclusively. For the purposes of national nutritional surveillance and monitoring, therefore, there probably needs to be further justification for developing growth reference values solely for Mongolian use, rather than relying upon the presently recommended NCHS references. On the other hand, in a clinical context where screening for the treatment of individuals is required, longitudinal growth reference data on healthy Mongolians would probably be desirable (Goldstein and Tanner 1983).

Measures of body size are only a general guide to health or nutritional status; and it is therefore useful to examine more specific measures of nutritional plane in this population.

SPECIFIC NUTRITIONAL DEFICIENCY DISORDERS

The available data concern the prevalence of iodine deficiency, anaemia, and rickets. Table 3 shows that, over the period 1967 to 1987, between 23 and 47% of samples of Ulaanbaator school-children aged 7-12 y exhibited

palpable goitres. These are high prevalences, and there is some suggestion that they may have risen towards the late 1980s (Gunsendorj and Oyunbileg 1992).

Table 3. Prevalence of iodine deficiency disorders in Ulan Bator school-children aged 7-12 y

Year	1967	1968	1969	1971	1972	1987	1987
% Palpable goitres	33	30	31	23	35	47	44

Source: Gunsendorj and Oyunbileg 1992.

There appears to be marked regional variation in the prevalence of iodine deficiency disorders (IDD), with anecdotal evidence of concentrations in certain of the Northern provinces but little in the South (Gunsendorj and Oyunbileg 1992). Iodine is a nutrient essential to production of thyroid hormone, which exerts regulatory influence on energy turnover, mediates adaptive changes in basal metabolic rate, and is important in the metabolic response to environmental temperature (Dauncey 1990). IDDs are associated with poor growth performance and in severe cases with endemic cretinism (Pharoah 1976). There appear to be no survey data on cretinism in Mongolia, but it is possible that marginal iodine deficiency contributes to the short stature of children, and enables them to subsist on relatively low energy diets by increasing the metabolic efficiency of muscular work (Wiles et al. 1979; Nwoye et al. 1982; Strickland and Ulijaszek 1990). Studies of energy turnover in children and adults are needed to quantify these relationships.

Prevalences of anaemia in children are thought to be around 10% in those below 2 y age (Gunsendorj and Oyunbileg 1992). Table 4 shows the most recent sample survey findings for children below 4 y old. These estimates were derived from combining qualitative signs of pallor and the condition of the tongue. Colorimetric measures of blood haemoglobin in children are now being made in a Ministry of Health sample survey.

Table 4. Prevalence of anaemia in pre-school children (1992)

	Age (months)			Total
	<12	13-24	25-48	
Anaemic (%)	5.1	7.3	4.3	5.5
N	567	531	581	1679

Source: UNICEF/Ministry of Health 1992.

Estimates of the prevalence of anaemia in pregnant women vary from 26% to 80% in different areas (FAO 1992). However, the diagnostic criteria forming the basis for these judgements are not specified; and the figures are therefore uninterpretable. It is perhaps surprising that there should be high rates of anaemia in Mongolia. The diet is relatively rich in red meat, a good source of iron; and in areas of higher altitude it could be expected

that hypoxia would have favoured greater oxygenation capacity of the blood. If there is widespread anaemia then this could result from parasitic infections. In theory, this could also result from a high milk diet, poor in iron, of the kind investigated in East African pastoralists: their rates of anaemia in children below 5 years' age have been estimated to be 7 to 10 times greater than those of the Mongolian children, although those of adult women in this study were at the lower end of the range cited for Mongolians during pregnancy (Nestel and Geissler 1986). Thus, there is no reason to suppose that anaemia is a peculiarly pastoralist problem. However, in the absence of data there can only be speculation.

Rickets is thought to be a major problem, primarily affecting children under 1 y age. Estimates of the prevalence in the whole state were 8.0% in 1985 and 7.0% in 1988, figures which were based on samples of around 60,000 infants (FAO 1992). Table 5 shows the findings of the most recent sample survey, which suggest slightly higher rates in cities than in provincial areas. There is a peak prevalence in the second year of life, which probably helps to explain the high level of short stature in this age group (see Table 2). It is possible that rickets in girls results in pelvic deformities which later cause difficulties in childbirth, and thus contribute to the high maternal mortality rate.

Table 5. Prevalence of rachitic signs by area and age group

		Prevalence (%)	Range (%)
Cities		46.8	42.4-68.4
Provinces		43.4	38.7-48.6
Age (mo)	<6	34.8	
	7-12	48.5	
	13-24	54.8	
	25-48	38.2	

Source: UNICEF/Ministry of Health 1992.

The prevalences of the diagnostic criteria on which judgement of rickets was based in this survey are shown in Table 6. Approximately half of the children diagnosed to have rickets exhibited bowed legs, the remainder showing craniotabes with or without leg deformities. However, these are weak diagnostic criteria, the effectiveness of which needs to be judged by comparison with radiological examination of wrist and ankle epiphyses together with plasma concentrations of 25-OH vitamin D. In a recent study of Egyptian children, for example, Lawson et al (1987) found that leg deformities identified only 30% of subjects aged below 3 y showing true signs of rickets clinically defined in this way, and characterised 4% of controls without rickets. None of the subjects with rickets presented with craniotabes. Thus the true prevalences in Mongolia remain a matter for speculation.

Table 6. Prevalence of rachitic signs in pre-school children.

Sign	Total prevalence (%)	N
Craniotabes	11.7	197
Leg deformities	21.7	380
Both combined	10.3	172
Total	43.7	749

Source: derived from data in UNICEF/Ministry of Health 1992.

It is plausible to suppose that poor exposure to sunlight is a major factor disposing tightly swaddled Mongolian infants to develop rickets (UNICEF and Ministry of Health 1992), where individual requirements are particularly high (O'Hara-May and Widdowson 1976). In many cases this is a probable explanation (Fraser 1983). In Mongolia, the aetiology of rickets would presumably have a seasonal dimension which is not clear from the way in which the available data have been presented. The vitamin D status of infants at birth is, however, strongly correlated with that of their mothers (Fraser 1983, Fairney et al. 1987), and it appears that the adequacy of an infant's vitamin D supplies will depend on maternal resources during pregnancy rather than lactation (Fraser 1983).

However, it has been suggested that poor dietary calcium availability may also play a role in the aetiology of rickets, through consequent hepatic inactivation and degradation of 25-OH vitamin D which has been shown experimentally to induce deficiency states (Clements et al. 1987). Mongolian physicians have speculated that depleted calcium in breast milk may be implicated in childhood rickets (FAO 1992). Mongolian data on dietary intakes of calcium are limited. It has been estimated that pregnant women consume 626 ± 18 mg/d, children under 3 y 122 mg/d (Ministry of Health, unpublished data from 1978-1987). Estimated requirements in the West are of the order of 400-600 mg/d in children and adults, and 1000-1200 mg/d in pregnant and lactating women. However, it is acknowledged that some populations subsist apparently adequately on intakes of 200-300 mg/d in Sri Lanka and regions of Africa; this is approximately the level of calcium intake from milk in healthy, exclusively breast-feeding babies under 6 months' age (Davidson et al. 1979).

It can be speculated that Mongolian diets containing high concentrations of protein, whether seasonally or throughout the year, may contribute to poor calcium availability through calciuretic effects of this nutrient (Margen et al. 1974, Hegsted and Linkswiler 1981). If this is shown to be a seasonally significant factor, then it may become more important as families are forced to depend increasingly on highly proteinaceous diets of meat and the products of milk from their livestock throughout the year.

Quantitative dietary intake data for Mongolians are almost nonexistent. There are weighed intake data for one day on 10 children less than 3 y old measured in early 1992; and the intakes of an unspecified number of adults, including some pregnant women, observed for an unstated period, were estimated in 1984 by an undescribed method. These sources suggest protein intakes of the children were on average 37.4 g/d, which is about 3 times the average expected requirement (Dept of Health (U.K.) 1991). The intakes

of pregnant women were about 85 g/d, approximating 16% calories. The values estimated to apply to other adults in this study are even higher, ranging between 131 g/d in the gobi desert area and 137 g/d in the forested zones, and comprising about 16-18% protein-calories.

The percentages of calories from protein appear to be moderate and within the range 15-20% expected for western populations. However, marked seasonal and regional variation may be expected; and if Mongolian adults have a body mass approximating 62 kg in men 55 kg in women (Beall and Goldstein, 1992), then these estimates of protein intake would exceed by about 50% the 'safe limit' of 1.5 g/kg/d, which has recently been stipulated in the U.K. (Dept of Health 1991).

Protein-rich diets in Mongolia also appear to contain 35-40% calories as fat. High levels of fat consumption may dispose certain, particularly sedentary urban groups to develop central obesity, with attendant risks of hypertension and coronary heart disease. In a rural context, it has been argued that such central fat patterning is likely to have thermoregulatory advantages in severe cold (Beall and Goldstein, 1992). As indicated above, however, the prevalences of hypertension and coronary heart disease have risen considerably over the past decade. This may be important in the onset of diabetes mellitus and in the aetiology of gestational diabetes, both of which are associated with high birth weights. Thus, together with maternal age and parity, this factor may also contribute to the reported high maternal mortality rates.

For all these reasons, it follows that problems of perinatal mortality, rickets, and cardio-vascular disease may be inter-related; and that increasing dependence on animal foodstuffs with economic liberalisation should be viewed with concern.

SECURITY OF FOOD AND NUTRITION

The definition of food security is a controversial issue which needs extended discussion with detailed field survey data, and it cannot be considered here. However, nutritional deficiency states give a guide to the nature, distribution and severity of deficits of energy and nutrients. After accounting for effects of infections and congenital disorders, these are functions of seasonal, periodic or chronic food insecurity and therefore enable its dynamics to be investigated.

Under the current circumstances of transition to a market economy, rural and urban households appear to be undergoing different kinds of stress. In urban areas, inflationary pressures of the order of 100-150% p.a. have conspired with an absolute shortage of flour, sugar and milk foodstuffs to raise the prospect of serious shortfalls in nutrition. For example, health education literature on management of childhood diarrhoea in one provincial children's hospital explains how to prepare oral rehydration therapy from water and salt but can make no mention of sugar, the main source of energy in such solutions, which is presently unobtainable. In the absence of household survey data, it is not possible to quantify the true nature, extent and periodicity of food insecurity. However, it appears that this problem may be worse in provincial centres than in the three major cities; and it is reported that families have found it necessary to revert to rural dependence on livestock in some cases.

Dependence on livestock for subsistence carries its own risks. The privatization of collectives has enhanced inequalities in wealth which were formerly supposed to be absent. For some, the privatization has been a success. A fairly well-to-do couple with three pre-school children could now own and manage 300 sheep and goats, 80 horses, 30 camels, and 80 cattle jointly with a close relative's family of the same size and composition. Formerly, the maximum allowable individual private holding was 75-100 head of livestock, depending on the area.

Seasonal stress becomes particularly harsh during the first two or three months of the calendar year, at the time of late winter and early spring. It is probably useful to distinguish between families which do and do not have access to non-livestock produce during this period. Towards the end of autumn, in late September/early October, preparations for winter involve building up stores of a range of milk products (fermented milk, cheeses, yoghurts) and the fat and dried meat of slaughtered stock. Fat can be stored inside sheep's stomach and frozen to form a sort of cake. The well-to-do herding group would expect to consume 10 sheep, 1 cow and 1 horse over the winter period, killing a sheep perhaps every 10 days. This group would also have some access to flour at present, and would have little doubt that its supplies would last through to the spring. A poorer family would lack the access to flour and need to subsist wholly on its livestock produce through this period, and perhaps for longer.

As yet, there are no seasonal nutritional survey data which could indicate the severity of periodic energy or nutrient stress. However, it is clear that identifying households or individuals vulnerable to food insecurity depends on understanding present social-economic mechanisms for risk management; on being able to identify the demographic and social groups likely to face particularly high risks of food shortage; and on quantifying the nutritional consequences of failure to manage such risks successfully in the currently changing economic climate.

CONCLUSION: LINES OF FUTURE RESEARCH

The above considerations suggest that there are three inter-connected lines of nutritional research which now need to be undertaken. These should attempt to cover both urban and rural circumstances, to encompass the implications of the marked climatic seasonality of the Mongolian year, and to include both field- and hospital-based nutritional studies. The research should focus on: (1) the changing household perception and management of seasonal and inter-annual nutritional risk; (2) the clinical nutritional status of women of reproductive age and its relationship to birth outcomes; and (3) the demographic determinants and consequences of female fertility and maternal and infant mortality.

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