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Nutritional status and poverty assessment of vulnerable population groups in Armenia

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Abstract

Objectives: To produce estimates of main nutrition deficiencies to identify public health intervention priorities; to investigate the importance of urban-rural and resident-refugee differences; to validate the vulnerability indicators used for targeting humanitarian aid.

Design: Cross-sectional study with cluster design on a nationally representative sample of 2627 households (3390 children under five and 2649 mothers).

Results: Underweight was observed in 4% of the mothers, while more than one third of them showed different levels of overweight. Prevalence of anaemia in mothers was 15% with significant highest prevalence in rural areas. Stunting was detected in 12% of children with highest prevalence in rural zones. The overall prevalence of wasting was 4%. The prevalence of anaemia in children under five was 16% with highest prevalence in rural areas (22%). A vulnerability questionnaire was tested: it was only partially able to identify best potential beneficiaries of humanitarian aid.

Conclusions: Armenian children and women were not affected by major energy problems, but followed inadequate diets that led them to a low micronutrient status. Drought in 2000s compromised the possibility of improving the general nutritional status.

Keywords: Nutritional status – Vulnerability profile – Children – Mothers – Armenia.

The Republic of Armenia is a small, mountainous country located in south-western Asia, between the Caucasus and Near Asia, and bordered by Georgia, Azerbaijan, Iran and Turkey. Armenia shows the typical contradictions of a transition country with a low population density, a high literacy rate, a high employment rate but a low average monthly income (Cairella et al. 1999). In addition to that the breakdown of the central planning sanitary system following the independence form the Soviet Union and the catastrophic recent events (the 1988 earthquake and the armed conflict with Azerbaijan) exacerbate the general situation causing a marginal health and nutritional status affecting in particular high risk population groups such as young children and women. Since its independence, Armenia has reorganised its political/demographic units from administrative "districts" into 11 Marzes. The capital, Yerevan is the smallest yet most populated Marz. The Marzes represent great variations in size, population, and climate ranging from rugged mountains (90% of Armenia lies above 1000 m) to high plains. The north-western portion of the country is especially prone to earthquakes.

Lack of population data characterises the Eastern European countries after the former Soviet Union collapse. The end of Soviet Union influence brought a number of social, economic, and political changes to Armenia; the transition to a new status is in progress and represents a formidable challenging. Baseline data are an important prerequisite of public health approaches; data may be translated into policy and programmatic activities to improve population nutritional status. In order to fulfil the necessity of baseline data regarding nutritional status of vulnerable groups of population, a national nutritional survey promoted by United Nations Children's Fund (UNICEF) and shared by the Ministry of Health of Armenia, by the United Nations High Commissioner for Refugees (UNHCR) and World Food Programme (WFP) was carried out.

The Armenia nutritional survey was a nationally representative assessment designed to provide information on

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children and mothers nutritional status. The information gathered was intended to produce realistic estimates of the main nutrition deficiencies as a first step towards the establishment of a monitoring system and for identifying the public health intervention priorities in Armenia. Specific goals of the work were the quantification of the importance of urban-rural differences, assessment of nutritional status of refugees, evaluation of relationship between nutritional indicators and vulnerability indexes and evaluation of efficacy of the vulnerability indicators presently used for targeting humanitarian aid.

Subjects and methods

Study area and study population

The study was carried out in May–June 1998. Armenia, like many of the newly independent states of the former Soviet Union, suffered tremendous disruption to its economy since declaring the independence. These social and economic problems were exacerbated by conflict with Azerbaijan over the territory of Nagorno-Karabagh. Throughout the 1990s occurred major changes in the Armenia demographic profile caused by labour migration, refugee flow and internally-displaced persons. A 1997 assessment conducted by the United Nations High Commissioner for Refugees found that, in the survey period, there were about 286000 refugees still living in Armenia (UNHCR 1998).

The study was cross-sectional and the most recent population censuses (1991 for residents and 1997 for refugees) were used as base to calculate the sample size for a cluster sampling design (Henderson & Sundaresan 1982). The survey was designed to provide national level estimates of the selected indicators, but also to provide separate estimates for residents and refugees and for rural and urban areas. Thus a four strata design was decided. The sample size calculation in each stratum was based on the expected prevalence of the main nutritional indicators. The national estimated prevalence of 21% of stunting and 19% of anaemia in children and 10% of anaemia in women were used in this calculation. This was expected to provide a prevalence estimate within the 95% confidence interval (CI) and an error margin of 0.05 for each age and sex categories mentioned. The final sample was incremented of 10% in order to compensate refusals or drop outs. The total number of subjects to be covered in the survey was then calculated to be 437 children and 282 women per strata. A total number of 98 clusters, 25 per stratum of residents and 24 per stratum of refugees, permitted to achieve the needed number of individuals per age group. In the absence of a clear definition of rural, all centres below 5000 inhabitants, in which agriculture was the main occupation, and houses the main dwelling type, were considered as rural. UNCHR registration status was used for defining refugees.

The location of the clusters across the country (Fig. 1) was decided with a two-stage procedure with a probability proportional to size methodology. According to this methodology, communities with large populations had a proportional greater chance of containing a selected cluster than small communities. For this reason Yerevan Marz (the most populated including the country capital) resulted to contain 24 urban clusters (14 resident and 10 refugee) out of 98 in the whole country. Individual households in each cluster were selected by randomly choosing an address on a detailed map of the administrative district. This address served as a starting point of a random walk. Households with at least one child under five (6–59 months) or a woman in fertile age (15–45 years) were included. A household was defined as a group of people (adults and children) who live and eat together. Cluster sampling, that is the selection of groups of households whose are geographically close to one another, has many advantages. It reduces time and travel costs, simplifies filed work and permits a good supervision of teams, leading to better quality of the data. Households are the basic smallest sampling unit. The choosing of the clusters from the sampling frame with probability proportional to size methodology guarantees that each household in the sample will have an equal chance of being selected (UNICEF 1995). 15 teams, of three people each, performed the field data collection. A team was composed of one person with a specific training in interview techniques, one paediatrician and one

Figure 1 Geographic cluster distribution in the Marzes (● = urban resident; * = urban refugee; ■ = rural resident; ◆ = rural refugee)

laboratory technician. Three teams were part of a unit, that was also staffed with a data entry specialist, who daily keyed in the data using a specifically designed software. A senior person (national/international) supervised the units. Supervisors were responsible for selecting the clusters, controlling the interview technique, standardising the measurement procedures, controlling data entry, controlling biological sample collection, storage and transport to the central laboratory.

The purpose, benefits, and limitations of the survey were explained to respondents and informed consent was obtained orally before proceeding with the interview, the measurements and the biological samples collection. Identifying information was not recorded to maintain respondents' anonymity. A letter of presentation of the survey provided by the Ministry of Health facilitated the interactions of the field workers with the people. No information was collected on households that either refused or were unavailable to be interviewed.

The survey protocol was reviewed and approved by the Ministry of Health of Armenia and by the UNICEF office of Yerevan.

Nutritional status assessment

Anthropometry provides one of the most important indicators of population nutritional status. Anthropometric measurements were performed in order to evaluate growth performance in children and women's body size.

Children's birth date reported by mothers was collected and accepted as correct; children's age was calculated on its basis. Birth card check for age confirmation was not considered necessary in a high literacy rate country like Armenia. Children able to stand up and women were weighted on digital electronic scales (Seca, Inc, Columbia, MD). The subjects were dressed in a standard way, with skirt, blouse and underwear and without shoes hence a fixed value of 1 kg for adults and 0.3 kg for children was subtracted from the recorded weight during data analysis. Children unable to stand up were weighed with an adult. The scale allowed for subtraction of adult weight so that net values of the child weight were directly displayed. Locally made wooden measuring boards were used for length and height measurement. Length boards were used to measure children under two or children unable to stand up; height rods were used to measure older children and mothers. All measurements were recorded to the nearest 0.1 unit. Anthropometrists were trained to take all measurements using standard techniques to minimize inter-observer variation and quality control exercises were performed before starting data collection (Lohman et al. 1988). For all children, *z* scores were calculated for height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ) by using the National Center for Health Statistics reference (Hamill et al. 1979). For women body mass index (BMI) was calculated as weight (in kg) divided by height (in m) squared (kg/m^2). To avoid bias in the measurement of women's nutritional status, pregnant women and women who had birth in the two months preceding the survey were excluded from the calculation of weight and body mass measures. The presentation of BMI data will not include young women (15–25 years) because in populations with a high percentage of stunting, growth may continue until 20–25 years and body composition can change accordingly. This means that the application of cut-off points for adults in connection to malnutrition and obesity may be incorrect; in fact according to international consensus standards (WHO 1995), it is difficult to establish appropriate limits of BMI in young adults aged 15–25 years and the application of common cut-off points could lead to misclassification of a large proportion of people in this age group as mildly or moderately thin.

Anaemia evaluation

Anaemia in children and mothers was assessed by haemoglobin measurement, which is one of the most convenient field method. Capillary blood obtained by finger pricks was collected and haemoglobin concentration was measured by a field analyser (HemoCue AB, Ängelhom, Sweden). This system consists of disposable microcuvettes with sodium azide reagent in dry form. Undiluted blood samples applied to this reagent react to form azide methaemoglobin and are then measured directly at 565 nm. The photometer is calibrated with cyanmethaemoglobin method, which is the international reference method used to determine the total haemoglobin concentration in the blood. Haemoglobin concentration lower than 11 g/L for children and lower than 12 g/L for mothers define anaemia status; in both age groups values lower than 7 g/L correspond to severe forms (WHO 1998). In considering the public health significance of this indicator, WHO/UNICEF/UNU (1996) propose to classify "high" a prevalence of anaemia of at least 40%, "medium" a prevalence of 15–40% and "low" a prevalence of less than 15%.

Vulnerability indicators

Interviews with a pre-tested questionnaire were performed in order to provide relevant indicators of health and nutritional status of the target groups. The survey instruments (questionnaire and training materials) were designed in Yerevan during the period preceding the survey after consultation with local physicians and international workers;

this material was translated into Armenian, then back translated into English to ensure high accuracy and correspondence between the two versions. The questionnaire covered areas concerning to households characteristics, vulnerability and food security information. The current vulnerability system is based on the Paros score that integrates several socioeconomic risk factors in a single index. Paros (Armenian for "beacon") is a government-operated poverty assessment system, which was put in place through support from the United States Agency for International Development in 1995. It is an open system for continuous registration of vulnerable households. Under Paros, household or family vulnerability assessment is based on: 1) family composition, including the presence of household members belonging to socially vulnerable groups; 2) income level of the household in money and/or assets; and 3) place and conditions of residence. Numerical values are assigned to each variable and a vulnerability index is calculated for each household; the higher the index, the more vulnerable the family. The predominant groups identified by the Paros system are pensioners (the majority of whom are women, as their life expectancy is higher), and households headed by women. Two additional potential vulnerability indicators were tested. The dependency index was based on the demographic composition of the household and was computed as the ratio of dependants (children, adolescents and elderly) to income producers (adults aged 18–65 years) in the family. The dependency index is a gross measure of the household capacity to generate income, compared to its needs, but also to its care potentials, compared to its care needs. In the first tertile of the distribution of the indicator (<0.5), the income and care needs were in excess; in the second tertile (0.5–1) potential and needs were somehow balanced; in the highest tertile (>1) potential exceeded the needs. The second potential vulnerability indicator was the income category. Households were classified according to their main source of income, without any quantitative evaluation of salaries.

Statistical analysis

Data analysis was done by using EpiInfo (Centers for Disease Control and Prevention, Atlanta, USA) and STATISTICA for Windows 4.5 (StatSoft, Tulsa, OK, 1995) software packages. The results are presented either as the means and standard deviation (SD) or as proportions (%). In order to examine the results for each population strata cross tabulations were produced and chi-square test was used. The same technique was followed for examining results by regions (Marz), by urban and rural areas, and by sex. Statistical significance was defined as a P value of 0.05 or less. Continuous variables were transformed into categorical using the internationally accepted cut-off points and cross tabulations were produced and analysed. In order to calculate national prevalence figures, a different weighting factor was applied for each of the four strata. This population weight was obtained by dividing the total population in each stratum by the number of subjects in the studied sample.

Results

Characteristics of the study population

Complete interview data were gathered on 2627 households and included 3390 children under five (6–59 months) and 2649 women in fertile age (15–45 years). Refusals were uncommon and the sample loss rate was lower than the estimated 10%. Descriptive data showed a mean household size of 5.5 with, on average, more than one child under five per family (1.3 ± 0.5). In rural areas, both among residents and refugees, households were significantly larger and with more children under five than in urban zones. The ratio of dependent (boys and girls under 18 and adults above 65) to independent (adults 18–65 years) was less than one in the whole population, with a significantly higher ratio among refugees (1.05 ± 0.75) than residents (0.86 ± 0.60). Almost the totality of the households was headed by a man having, in the majority of the cases, attended secondary schools or higher education. No significant gender differences were found regarding literacy rate. In rural areas, both among residents and refugees, farming was the main source of cash income. In urban areas, residents were mainly living on an official salary (39%), on private business (24%) while refugees were more dependent on pensions (26%), but were also salaried (27%), or running their own business (21%). Measures to alleviate poverty, such as distribution of electricity coupons or food aid, had also reached one fifth (22%) of the residents, and one third (33%) of the refugees. The staple food in Armenia diet is bread that was consumed almost in each meal. Milk, dairy products and vegetables were consumed approximately every second day. Meat was consumed once/twice a week.

Assessment of nutritional status

Table 1 shows the prevalence of the most common indicators of nutritional status in mothers and children under five by population strata.

Mothers

Low BMI (<18.5 kg/m^2) was observed only in about 4% of the mothers surveyed, while more than one third of them showed different levels of overweight (39%). High degrees

Table 1 Prevalence of the most common indicator of nutritional status in the target groups by population strata

		Urban residents	Rural residents	Urban refugees	Rural refugees	Total
Mothers (15–45 years)						
Underweight (BMI < 18.5 kg/m²)[a]	n	18	16	20	22	76
	%[b]	4.1	4.1	5.0	5.3	4.2
	95 % C.I.[b]	2.4–5.9	2.0–6.2	2.9–7.2	2.9–7.6	2.9–5.4
Overweight (25 < BMI > 30 kg/m²)[a]	n	103	106	92	109	410
	%[b]	23.6	27.1	23.2	26.2	24.7
	95 % C.I.[b]	19.1–28.0	22.3–31.9	17.9–28.4	22.0–30.4	21.6–27.8
Obesity (BMI > 30 kg/m²)[a]	n	62	61	70	49	242
	%[b]	14.2	15.6	17.6	11.8	14.6
	95 % C.I.[b]	10.7–17.6	11.7–19.5	14.5–20.7	8.7–14.8	12.2–17.1
Children (6–59 months)						
Low height-for-age	n	79	147	70	106	399
	%[b]	10.0	15.6	11.2	13.2	12.2
	95 % C.I.[b]	6.0–14.0	10.6–20.5	7.6–14.8	10.7–15.8	9.3–15.0
Low weight-for-height	n	37	30	24	32	123
	%[b]	4.7	3.1	3.9	3.9	4.0
	95 % C.I.[b]	3.1–6.3	1.9–4.3	2.0–6.0	2.2–5.7	3.1–5.1
High weight-for-height	n	61	63	26	32	179
	%[b]	7.7	6.6	4.3	3.9	7.0
	95 % C.I.[b]	4.4–11.0	3.5–9.6	2.5–5.9	2.5–5.1	4.8–9.2
Low weight-for-age	n	26	45	28	40	139
	%[b]	3.3	4.7	4.5	4.9	3.9
	95 % C.I.[b]	1.7–4.9	3.0–6.3	2.2–6.9	3.2–6.5	2.8–5.0

[a] BMI was calculated for 25–45 years old mothers
[b] Calculated applying a weighting factor for each population strata (urban residents = 12.37; rural residents = 6.68; urban refugees = 0.94; rural refugees = 0.95)

of obesity (BMI > 30 kg/m²) were found in 15% of the cases. In southern regions more thin and less obese women than in other areas were present. A reverse pattern of underweight and obesity was observed in central and northern Marzes (Fig. 2).

The overall prevalence of anaemia in mothers was 15% (Fig. 3, left side) with significant higher prevalence in rural areas in both resident (15%) and refugee (18%) strata. No cases of severe anaemia were detected. Considering the geographical distribution of this indicator, the most affected regions were the Southern Marzes while the least affected were the central areas of the country. In urban regions, Yerevan had the lowest rate of anaemia (Fig. 4, left panel).

Children

Approximately 12% of children under five had height-for-age below –2 z score. Higher prevalence of low height-for-age was observed in rural areas, both among residents (16%) and refugees (13%), respect to urban zones (10% in residents and 11% refugees). The prevalence of low height-for-age was not different in boys and girls. There were instead large regional differences: low height-for-age spanned between 6% in Yerevan and 44% in Shirak in the north western. The overall prevalence of low weight-for-height was 4% without appreciable differences between population strata and among gender. High weight-for-height was more common in residents (7%), particularly in urban areas, than in refugees (4%). The largest proportion of wasted children was observed in Syunik (12%), in the south. According to the distribution of underweight (low weight-for-age), most Armenian children were classified as normal, with only 4% below –2 z score. Southern regions had a significantly larger proportion (11%) of underweight respect to other Marzes.

The overall prevalence of anaemia in children under five was 16% (Fig. 3, right side). Children living in rural areas, both residents (23%) and refugees (20%) showed significantly higher prevalence of anaemia than children living in urban zones (12% residents and 13% refugees). Figure 4 (right panel) showed the geographical distribution of children anaemia. Northern-east and centre regions were the most affected with Tavush (31%), Armavir (21%) and Ararat (25%) showing the highest prevalence. Yerevan Marz showed the lowest percentage of children anaemia (10%), under the general population average.

There is no significant relationship between mothers' anaemia and their children iron nutritional status (data not shown).

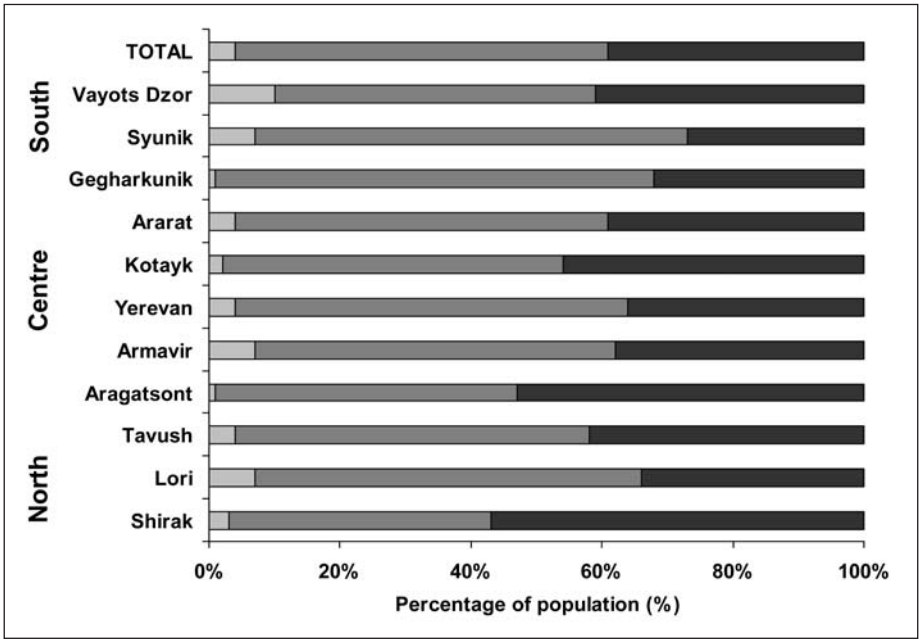

Figure 2 Prevalence of underweight and overweight (■ underweight; ■ normal, ■ overweight) in women 25–45 years by regions (n = 1641, missing values = 144, prevalence between regions significantly different with $p<0.05$ and Pearson Chi-square = 45.82)

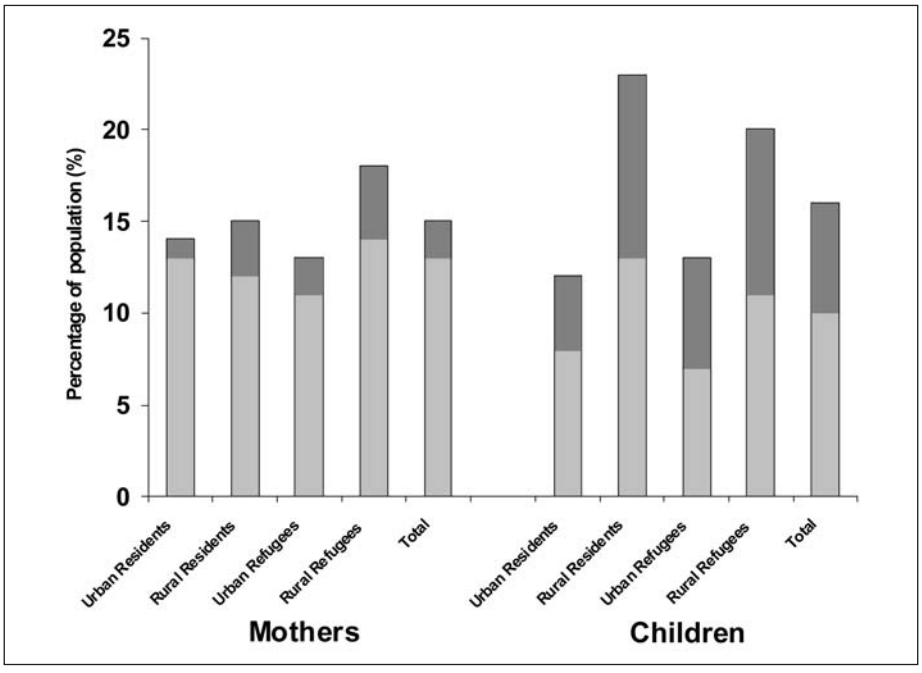

Figure 3 Prevalence of anaemia (■ mild, ■ moderate) in mothers 15–45 years by population strata (n = 2543, missing values = 106, prevalence between population strata significantly different with $p < 0.05$ and Pearson's chi-square = 12.81) and in children 6–59 months by population strata (n = 3 122, missing values = 268, prevalence between population strata significantly different with $p < 0.05$ and Pearson's chi-square = 52.30).

Vulnerability indicators

Table 2 summarises the relationship between vulnerability indicators and prevalence of main nutritional deficiencies in children. In Paros registered households, children's nutritional status was not different from those not registered, with prevalence of stunting and anaemia similar in the two groups. The occurrence of stunting and anaemia is also the same in families that received food aid in the year preceding the survey, compared to families that did not receive any food aid. Electricity coupon distribution discriminated households with stunted children while the prevalence of anaemia was not statistically significant in the households with this support respect to the others. Classifying the households according to the dependency index no differences in the prevalence of stunting in the three tertiles were found, while anaemia was significantly lowest in the highest tertile.

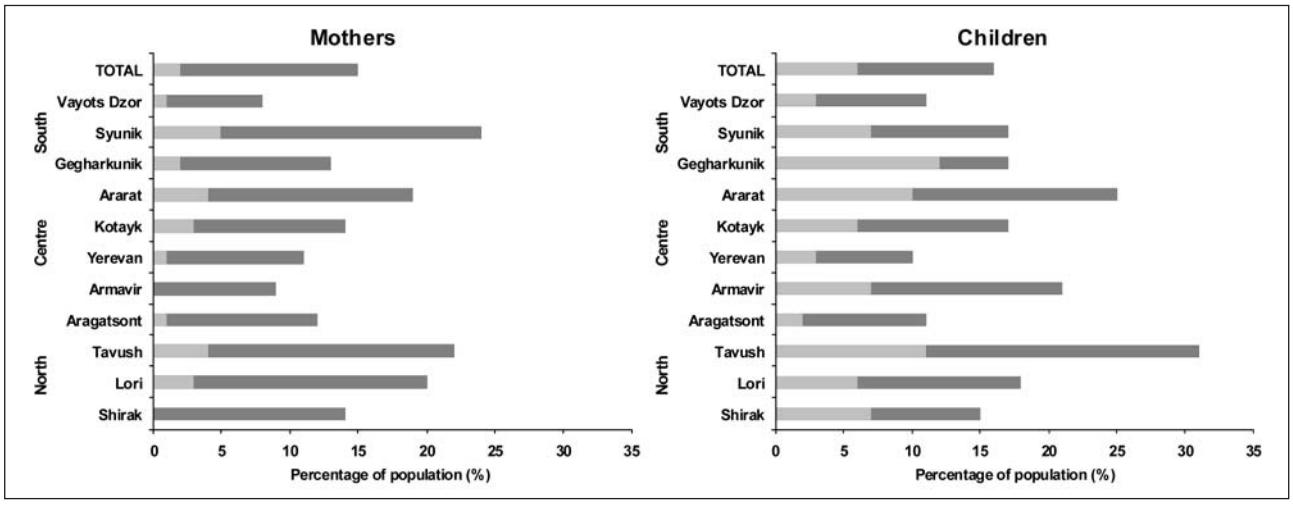

Figure 4 Prevalence of anaemia (■ mild, ■ moderate) in mothers 15–45 years by regions (n = 2543, missing values = 106, prevalence between regions significantly different with $p < 0.05$ and Pearson's chi-square = 55.36) and in children 6–59 months by regions (n = 3122, missing values = 268, prevalence between regions significantly different with $p < 0.05$ and Pearson's chi-square = 667.89).

Table 2 Relationship between vulnerability indicators and prevalence of main nutritional deficiencies in children

		Stunting				Anaemia			
		yes	no	χ^2	p	yes	no	χ^2	p
Paros registration status	yes	12 %	88 %			16 %	84 %		
	no	13 %	87 %	0.13	0.72	17 %	83 %	0.30	0.60
Food aid	yes	13 %	87 %			14 %	86 %		
	no	12 %	88 %	0.23	0.63	17 %	83 %	0.58	0.44
Electricity coupons	yes	16 %	84 %			15 %	85 %		
	no	11 %	89 %	8.25	< 0.05	17 %	83 %	3.25	0.07
Dependency index	<33rd centile	8 %	92 %			22 %	78 %		
	33rd–66th centile	13 %	87 %			15 %	85 %		
	>66th centile	15 %	85 %	11.33	0.06	16 %	84 %	82.6	< 0.05
Source income									
	private	9	91			9	91		
	official	10	90			10	90		
	pension	17	83			17	83		
	farming	13	87			13	87		
	no cash	15	85	16.56	< 0.05	15	85	182.7	< 0.05

Anaemia and stunting were higher in farmers and in households with no cash income respect to households having private, official salary or pension as source of cash income. Combinations of possible predictive indicators were also tested with logistic regression, using the main nutritional outcomes in children and women as dependent variables. None of the indicators, on its own or in combination, was able to explain a sufficient proportion of the variance of the outcome variables (data not shown).

Discussion

Nutritional status of vulnerable groups

The present survey has confirmed that the nutritional status of Armenian mothers and children was not ideal.

Proportion of low BMI in women was acceptable while the high prevalence of different degrees of overweight should be monitored for its close relationship with an increased incidence of several chronic diseases such as diabetes, hypertension and cardiovascular diseases. Anaemia was observed in 15 % of the women in fertile age. According to international references (WHO 1996), this prevalence was considered at a low level of public health attention and similar to that

observed in a well nourished population. Southern regions showed a higher level of vulnerability than northern Marzes. The prevalence of underweight and anaemia of women living in southern area could be the effect of a monotone diet, quantitatively and qualitatively limiting and with low micronutrient intake.

Prevalence of stunting (12%) and wasting (4%) are not a problem of public health concern in Armenian children (WHO 1995). The overall prevalence of anaemia in children under five corresponds to a low level of public health significance. Regarding to this indicator, it should be pointed out that there were groups in the population, such as children living in rural areas or in southern regions, in which the prevalence of anaemia (higher than 20%) is considered to be of medium public health significance.

Residents and refugees did not show differences in their nutritional status. The complete integration of displaced people in Armenian social structure and the long term occurred from the war with Azerbaijan were probably responsible for this situation.

In general the nutritional status of children living in southern regions, particularly in rural areas, resulted more affected by anaemia and stunting. Taking the results related to vulnerability assessment into account it should be pointed out that a more detailed evaluation is difficult with currently available indicators. The current system used in Armenia to target beneficiaries (from government or from international support) was only partially able to identify nutritionally vulnerable children. Alternative systems, based on the demographic composition of the household or on income categories, however, did not perform better. Another interpretation of these findings could be that the aids have had a positive effect by reducing the inequalities; however the demonstration of this point will require additional socioeconomic information and different analysis of data.

A synthetic interpretation of survey results is that Armenian children and women are not affected by major energy problems, but the chronic exposure to poor diet led to a low micronutrient status with remarkable presence of anaemia in these population groups. Insufficient amount of some micronutrients in family diet is one of the most important determinant of haemoglobin status in individuals and populations. Nutritional evaluation of the minimal food basket showed, on average, an appropriate energy and macronutrient intake. Armenian diet is characterised by sufficient protein consumption, carbohydrate and lipid content in line with recommendations but low iron, vitamin A and carotenoids intake (Cairella et al. 1999). Furthermore, consumption of vegetables and fruit, containing enhancers of iron absorption, is highly seasonal and could be particularly limiting in highly vulnerable population groups such as children. Public health implications of present survey findings could be addressed to the general population and to specific vulnerable groups. Interventions to the general population should mainly aim to correct dietary habits and lifestyle factors that are detrimental to health, namely infant and child feeding and rearing practices. Taking the prevalence of anaemia into account, nutritional education campaigns aimed to encourage the introduction of good sources of iron like meat or pulses, promote foods that improve non-haem iron absorption such as fermented milk products and fresh fruit and vegetables and discourage iron absorption inhibitors, particularly black tea. Other kind of iron intake increasing, such as fortification of staples, are not justified by the rates of anaemia, that are well below the cut-off point (40%) considered appropriate to recommend blanket fortification (WHO 1998). Interventions on vulnerable groups should be addressed mainly to refugees and rural areas, especially in most disadvantaged regions, such as Gegharkunik, Syunik, or Shirak. Actions aimed to improve refugees' diet quality and diversification could be justified and may entail distributions of fresh fruit and vegetables or subsidies for the purchase of such food items. In most vulnerable areas, interventions may be envisaged to improve production, storage, marketing and distribution of fruit and vegetables as well as interventions to improve the water and sanitation systems.

The application of these recommendations formulated in 1998 has had an important constraint due to Armenian recent story of exacerbation of environmental conditions. A severe drought spreading across Central and South Asia, the Middle East and Caucasus has also had a dramatic impact on living conditions in Armenia. The drought has taken a high toll on food production and feed for livestock, with high impact on production system. Nutritional status of vulnerable groups of population reflected this situation. A comparison between present survey data to those collected in the framework of a Demographic and Health Survey (DHS) in 2000 was performed. The DHS was carried out on a national representative sample of 5976 households including 6430 women in fertile age and 1461 children under five. These data sets are in the public domain and available from the DHS website (DHS 2001). The two surveys showed comparable figures with virtually the same level of underweight (4%) and overweight (39% vs. 41%) and a slight reduction of anaemia (15% vs. 12%) in women. The worsening of environmental conditions affected children micronutrient status with an increase of anaemia from 16% to 24%. Child anthropometric indicators resulted less affected (stunting: 12% vs. 13%; wasting: 4% vs. 2%). Combination of poor nutrition and gastro-intestinal infections impairing iron

absorption could explain the increasing of anaemia prevalence in children under five. The general drought emergency in the areas led donors to support the affected countries. A further assessment of vulnerable group of populations nutritional status in Armenia could permit an evaluation of efficacy of the external supports and to cover a ten years period of monitoring data collection after Soviet system collapse.

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Zusammenfassung

Erfassung von Ernährungsstatus und Armut gefährdeter Bevölkerungsgruppen in Armenien

Zielsetzungen: Einschätzung der wichtigsten Ernährungsdefizite zur Feststellung der am dringendst benötigten Public-Health Interventionen; untersuchen welche Bedeutung den Unterschieden zwischen Stadt und Land sowie Ortsansässigkeit und Flüchtlingsstatus beizumessen ist; Validierung der Gefährdungsindikatoren, auf deren Grundlage zielgerichtete humanitäre Hilfseinsätzen geplant werden.

Methoden: Querschnittstudie mit Clusterdesign für eine nationale repräsentative Stichprobe von 2627 Haushaltungen (3390 Kinder unter fünf Jahren und 2649 Mütter).

Ergebnisse: 4% der Mütter waren untergewichtig, während mehr als ein Drittel der Mütter unterschiedliche Ausprägungen von Übergewicht zeigten. Die Prävalenz von Anämie betrug bei den Müttern 15%, mit der signifikant höchsten Prävalenz in ländlichen Gebieten. Für 12% der Kinder wurde eine zurückgebliebene körperliche Entwicklung festgestellt, am häufigsten in ländlichen Regionen. Insgesamt 4% der waren von Auszehrung betroffen. Bei Kindern unter fünf Jahren betrug die Prävalenz von Anämie 16%, mit der höchsten Prävalenz in ländlichen Gebieten (22%).

Ein Fragebogen zur Gefährdungsanalyse wurde getestet. Er war nur bedingt geeignet Personen zu identifizieren, die am meisten von humanitärer Hilfe profitieren würden.

Schlussfolgerungen: Armenische Kinder und Frauen waren nicht von grösseren Problemen der Nahrungsenergieversorgung betroffen, aber ihre in der Zusammensetzung inadäquate Ernährung ging mit einer zu niedrigen Mikronährstoffversorgung einher. Die Dürre zu Beginn des 21. Jahrhunderst verunmöglichten den allgemeinen Ernährungszustand zu verbessern.

Résumé

Statuts nutritionnel et économique de groupes de population vulnérables en Arménie

Objectifs: Evaluer les principales carences nutritionnelles et identifier les priorités d'interventions de santé publique. Etudier l'ampleur des différences entre populations urbaines et rurales, et entre populations de résidants et de réfugiés. Valider des indicateurs de vulnérabilité utilisés pour cibler l'aide humanitaire.

Méthode: Étude transversale d'un échantillon en grappe représentatif de 2627 ménages comprenant 3390 enfants audessous de cinq ans et 2649 mères.

Résultats: 4% des mères présentaient un poids insuffisant, tandis que plus d'un tiers d'entre elles étaient en surpoids (39%). La prévalence de l'anémie chez les mères était de 15% en moyenne. Un retard de développement a été observé chez 12% des enfants de moins de cinq ans des zones rurales. Un amaigrissement a été observé chez 4% de tous les enfants de moins de cinq ans. La prévalence de l'anémie chez les enfants de moins de cinq ans était de 16%, mais plus élevée dans les secteurs ruraux.

Un questionnaire local de dépistage de la vulnérabilité des ménages n'a été que partiellement à même d'identifier les bénéficiaires potentiels d'une aide humanitaire.

Conclusion: Les enfants et les mères arméniens ne souffrent pas de troubles alimentaires majeurs ; ils ont cependant des habitudes alimentaires inadéquates qui compromettent leur équilibre nutritionnel. La sécheresse du début du XXI^{e} siècle a cependant compromis la possibilité d'améliorer le statut nutritionnel général.

References

Cairella G, Napoletano A, Coclite D, et al. (1999). A methodological approach for a nutritional surveillance system in a transition country: the case of Armenia. Ann Ig *11*: 199–208.

DHS (2001). Demographic and Health Surveys: Armenia 2000. Calverton, MD: Macro International. www.measuredhs.com.

Hamill PV, Drizd TA, Johnson CL, Reed RB, Roche AF, Moore WM (1979). Physical growth: National Center for Health Statistics percentiles. Am J Clin Nutr *32*: 607–29.

Henderson RH, Sundaresan T (1982). Cluster sampling to assess immunization coverage: a review of experience with a simplified sampling method. Bull World Health Organ *60*: 253–60.

Lohman T, Roche A, Martorell R (1988). Anthropometric standardization reference manual. Chicago: Human Kinetics.

UNHCR (1998). Number of refugees/IDPs in Armenia by Region. Yerevan Armenia: UNHCR.

UNICEF (1995). Monitoring progress toward the goals of the World Summit for Children: a practical handbook for multiple-indicator surveys. New York: United Nations Children's Fund.

WHO (1995). Physical status: the use and interpretation of anthropometry. Geneva: World Health Organization.

WHO (1996). Indicators for assessing iron deficiency and strategies for its prevention. Geneva: World Health Organisation, United Nations Children's Fund, United Nations University.

WHO (1998). Iron deficiency anaemia: assessment, prevention and control. Geneva: World Health Organisation, United Nations Children's Fund, United Nations University.

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Appendix

Table A1 Distribution of nutritional status indicators in mothers (25–45 years)

Age (years)	n	Percentile (P)					
		P10	P25	P50	P75	P90	Mean (SD)
		BMI (kg/m²)					
25–29	737	19.5	21.0	23.1	26.3	30.4	24.1 (4.7)
30–34	494	19.4	22.1	23.7	27.3	31.0	24.7 (4.9)
35–39	300	21.1	22.0	24.8	28.8	32.9	25.9 (5.3)
40–45	75	19.9	23.1	26.8	30.8	35.9	27.7 (6.2)

Table A2 Distribution of nutritional status indicators in girls (6–59 months)

Age (months)	n	Percentile (P)					
		P10	P25	P50	P75	P90	Mean (SD)
Height-for-age (m/months)							
6–12	137	−1.50	−0.75	0.14	1.13	2.07	0.27 (1.45)
13–24	273	−1.80	−0.87	0.21	1.51	2.75	0.36 (1.74)
25–36	265	−2.60	−1.59	−0.59	0.21	1.24	−0.62 (1.51)
37–48	257	−2.63	−1.61	−0.85	0.00	0.72	−0.86 (1.37)
49–59	258	−2.31	−1.64	−0.76	0.07	0.83	−0.75 (1.30)
Weight-for-height (kg/m)							
6–12	142	−1.52	−0.81	−0.14	0.48	1.24	−0.13 (1.18)
13–24	273	−1.80	−1.16	−0.27	0.45	1.62	−0.23 (1.34)
25–36	297	−0.77	−0.13	0.44	1.01	1.70	0.47 (1.04)
37–48	261	−1.01	−0.37	0.29	0.86	1.42	0.28 (1.04)
49–59	258	−1.10	−0.37	0.19	0.90	1.68	0.29 (1.05)
Weight-for-age (kg/months)							
6–12	143	−1.25	−0.74	−0.04	1.10	2.21	0.28 (1.42)
13–24	276	−1.80	−0.94	−0.12	0.71	1.49	−0.11 (1.31)
25–36	301	−1.36	−0.81	−0.17	0.50	1.03	−0.12 (1.09)
37–48	265	−1.70	−1.05	−0.41	0.20	0.78	−0.44 (1.03)
49–59	261	−1.63	−1.02	−0.18	0.31	0.93	−0.26 (1.12)

Table A3 Distribution of nutritional status indicators in boys (6–59 months)

Age (months)	n	Percentile (P)					
		P10	P25	P50	P75	P90	Mean (SD)
Height-for-age (m/months)							
6–12	195	–1.79	–0.95	–0.18	0.73	1.60	0.07 (1.46)
13–24	354	–1.73	–0.70	0.38	1.63	2.83	0.44 (1.74)
25–36	293	–2.98	–1.60	–0.70	0.10	1.02	–0.80 (1.53)
37–48	329	–2.12	–1.39	–0.65	0.12	0.84	–0.66 (1.30)
49–59	296	–2.41	–1.64	–0.71	–0.01	0.72	–0.83 (1.25)
Weight-for-height (kg/m)							
6–12	201	–1.75	–0.74	–0.14	0.58	1.15	–0.10 (1.28)
13–24	355	–2.09	–1.32	–0.37	0.45	1.18	–0.40 (1.31)
25–36	298	–0.93	–0.36	0.31	0.97	1.62	0.38 (1.12)
37–48	333	–1.21	–0.35	0.27	0.84	1.57	0.26 (1.13)
49–59	304	–0.90	–0.42	0.20	0.94	1.55	0.31 (1.08)
Weight-for-age (kg/months)							
6–12	201	–1.53	–0.85	–0.03	0.83	1.78	0.09 (1.39)
13–24	363	–1.65	–0.99	–0.07	0.90	1.71	–0.01 (1.37)
25–36	298	–1.69	–0.95	–0.26	0.42	1.09	–0.24 (1.15)
37–48	335	–1.50	–0.95	–0.33	0.36	0.97	–0.27 (0.98)
49–59	307	–1.73	–1.10	–0.42	0.27	0.83	–0.43 (1.09)