

***MEASURING POVERTY IN ARMENIA:***  
**METHODOLOGICAL EXPLANATIONS**

## 1. Welfare Measure: Consumption Aggregate Calculation

A consumption aggregate is used to approximate well-being in Armenia. It is assumed that consumption is better declared and is less sensitive to short-term fluctuations than income, especially in transition countries. The consumption aggregate is estimated based on the Armenia Integrated Living Conditions Survey (ILCS). It comprises the following components: (i) the value of food and non-food consumption including consumption from home production, as well as aid received from humanitarian organizations and other sources; and (ii) the rental value of durable goods.

### (i) Food consumption

Food consumption includes food consumed at home and outside the home (i.e. in restaurants etc.) and in-kind food consumption such as own food home production, food gifts and in-kind transfers, as well as humanitarian food aid.

The 2008 Armenian ILCS provides information on household purchases of 240 food items and information on household food consumption over the 30 days of the Survey. In order to express food consumption in monetary values, the estimated prices of purchased items are used. The collected information on household food purchases includes the value, quantity, unit of measure and the location of purchase. Using the value and (standardized) quantities, unit values for all items at the household level were estimated. Based on the household-level unit values, median unit values were estimated at different levels of aggregation. Three basic categories were used for desegregation: a region (Yerevan and *marzes*), location (urban/rural), and a quarter of the interview. The median prices were estimated excluding household-level prices that were identified as outliers. An outlier is detected if the difference between the household-level price and the “local” price is larger than two standard deviations. The local price is defined as the median price at the corresponding *marz*-urban/rural-quarter strata.

If the household purchased the item, the reported price was used. If the household consumed an item, but did not purchase it, the *marz*-urban/rural-quarter price was imputed. Note that those prices are not affected by outliers. In 2008 eight items were reported in the Food Consumption Module but not reported in the Food Expenditures Module. For those items the price for the corresponding month/quarter from the NSS price department was imputed.

### (ii) Non-food consumption

Non-food consumption comprises the following categories: alcoholic beverages and tobacco, clothing and footwear, household goods, transportation, utilities, recreation, education, health, and the rental value of durable goods. It also includes in-kind non-food consumption such as non-food goods and services received free of charge (i.e., in-kind non-food humanitarian aid, gifts, non-food goods and services provided by the members of the household). The value of in-kind non-food consumption is estimated by households. Using monthly expenditure data, monetary values for expenditures on non-food items were estimated. Price adjustments for those groups were based on the official CPI for the corresponding quarter

The rental value of dwelling—benefits for owner-occupied housing—is not estimated as a component of consumption due to the lack of data on housing transactions in Armenia.

The estimates of the rental value of durables—the value of flow of services from durables owned by a household—faced some difficulties, although since 2004 the ILCSs contained detailed information on durables. The diary (survey tool) indicates whether a durable good is bought during the last 12 months and the price paid for it. It includes additional information on durables such as the age of durables owned by the household and the estimated current value of

durables if sold. However, the respondents over-estimated the current value of durables if sold, giving in some cases even higher value than the value of new durables<sup>1</sup>.

Given the above problems with the data, a simple technique is used to estimate the durables rental value. Using an annual depreciation rate, the rental value of the items bought during the last 12 months is estimated<sup>2</sup>. The rental value of second-hand items bought during the last 12 months is estimated as one third of the rental value for the new items. For those items that were bought more than one year ago (and apparently were much older), the rental value is assumed as one fifth of the median rental value for each item. This technique is compatible with alternative approaches where the rental value is estimated as the ratio between the value of the good (when reported) and the expected remaining life of the good (World Bank, 2000)<sup>3</sup>. In this case, the underlying assumption is that items not reported by households as bought during the last 12 months prior to the Survey, have an average life of 20 years.

### (iii) Adjustments for regional and seasonal differences in prices

As the survey data were collected throughout the year, there is a need to adjust consumption from different quarters for inflation. Furthermore, regional price differences can distort the measure of well-being, as consumption is a good measure of well-being only if higher expenditures mean higher consumption or consumption of better quality goods. This is not the case when higher levels of consumption are caused by higher prices. Therefore, those regional price differences ought to be adjusted for.

Food consumption is adjusted for price differences over time and across regions using the survey data, since the NSS RA does not provide urban and rural food prices (according to price statistics methodology). The non-food consumption is adjusted only for price changes over time as only the official Consumer Price Index (CPI) can be used for this purpose given the fact that unit values for non-food items are normally not collected by household surveys.

Factors for price adjustments of food consumption accounting for price differences between quarters and between urban and rural areas were estimated using three different types of price indices: Laspeyres, Paasche and Fischer index. Table 1 shows price differences by quarters and by urban and rural regions using these price indices. The Fischer index is used for price adjustments as its value lies between the Laspeyres (upper value) and the Paasche values (lower value). This is expected given the way of its calculation (Laspeyres index multiplied by Paasche index). Food consumption for 2008 is expressed in 2008 autumn-urban price levels.

**Table 1. Factors for price adjustment of food consumption, median prices (multiplied by 100)**

Quarter	Urban			Rural		
	Laspeyres	Paasche	Fischer	Paasche	Laspeyres	Fischer
January-March, 2008	99.4	92.1	95.7	105.4	101.1	103.2
April-June, 2008	96.4	95.9	96.1	97.4	96.8	97.1
July-September, 2008	104.6	102.6	103.6	106.7	103	104.8
October-December, 2008	100	100	100	100.8	101.5	101.1
Implicit inflation I 2008/IV 2008.	-0.6	-7.9	-4.3	4.6	-0.4	2.1

Source: ILCS 2008

Note: Factors convert food expenditures into amounts comparable with urban areas during the last quarter in 2008. Food consumption values from different households are multiplied by those factors for the corresponding poverty analysis. The Fischer index is used (median prices).

<sup>1</sup> Based on these observations, the 2006 ILCS questionnaire (diary) was modified so as to include additional information on purchased value of durables owned by household, however, that information was not sufficient enough for calculation and thus was not used.

<sup>2</sup> A depreciation rate of 8 percent implies that in ten years the good will have lost 57 percent of its value. In the United States, the depreciation rate is 6.66 percent (Office of Management and Budget, 1999). The Armenia Poverty Update uses the rate of 8 percent, as a way to account for a higher inflation rate.

<sup>3</sup> See: *Panama Poverty Assessment, Priorities and Strategies for Poverty Reduction*, The World Bank. Washington, D.C., 2000.

Food prices in rural areas decreased more than in urban areas. The Fischer index shows that food prices in urban areas decreased by 4.3% in the last quarter of 2008 compared to the first quarter, while in rural areas prices increased by 2.1%. According to official CPI estimates based on Laspeyres index, which includes only prices in big cities in Armenia, food prices increased by 6.8 percent over the period IV 2008/ I 2008. Significant variations in food prices over the 12-month survey period appeared in 2008. Food prices were significantly lower during the third quarter of 2008 regardless of index used. The Fischer index shows that food prices in urban areas in July-September, 2008 were lower than in the fall, and therefore they should be multiplied by 1.036 so as to be expressed in fall urban price levels.

Non-food consumption is adjusted for inflation using the official CPI for relevant non-food expenditure sub-groups provided by the National Statistical Service. The total consumption aggregate is then expressed in 2008 IV quarter price levels.

**Table 2: Composition of the consumption aggregate, 2004-2008**

Consumption aggregate			Components
C0	=		Food
C1	= C0	+	Alcohol and tobacco; clothing and shoes
C2	= C1	+	Household goods
C3	= C2	+	Utilities, transportation
C4	= C3	+	Education, culture, recreation
C5	= C4	+	Health
C6	= C5	+	Rental value of durables

Finally, household consumption is calculated as the sum of the above sub-aggregates (Table 2), with food consumption adjusted for regional and quarterly variations in prices and non-food components adjusted for quarterly variations in prices. Different consumption aggregate definitions were used in the estimates of different equivalence scales and size economies parameters, in order to examine the sensitivity of those estimates.

## 2. Equivalence scales and household size economies

Equivalence scale takes into account differences in consumption between adults and children. It is believed that consumption needs of young children are less than those of working-age adults. Furthermore, household size economies take into account that some of household expenditures are shared between household members (i.e., expenditures on housing, utilities, car, newspapers, etc.). For example, a five member household with US \$100 per month is better off than a single person who lives on US\$20 per month because of economies of scale in consumption.

Since 2004 the NSS RA is using equivalence scale coefficient of 0.87 and coefficient of households size economies of 0.65 estimated at that year.

### (i) Equivalence scales

The Engel method is used to estimate equivalence scales of children as compared to adults. This method estimates the cost of children as the compensation necessary to bring the household well being—measured by the *share of food consumption*—back to its original level (without children).

The standard Engel equation is a regression that explains the share of food expenditures,  $w_f$ , presented in the following form:

$$w_f = \alpha + \beta \ln\left(\frac{x}{n}\right) + \sum_{j=1}^J \gamma_j n_j + \varepsilon \quad (1)$$

where  $n_j$  is the number of individuals in the  $j^{\text{th}}$  demographic category ( $j=1, \dots, J$ ),  $n$  is the number of people in the household,  $x$  is the total expenditure,  $\varepsilon$  is a random error, and  $\alpha$ ,  $\beta$ , and  $\gamma$  are parameters. Sometimes a quadratic term on  $\ln(x/n)$  is included. Based on the regression (1) and under different specifications of the consumption aggregate, the equivalence scales were estimated. For a household composed of an adult couple, the equivalence scale parameter represents the ratio between the budget with an additional child and the original budget in order to keep the food share constant. These estimates are presented in the next table.

**Table 3: Equivalence scales for children aged 0-14, 2004**

Consumption aggregate	Equivalence scale E	Test E=1; F-test
1	1.737	1206.4
2	1.704	1501.4
3	1.631	1524.9
4	1.643	1930.3
5	1.645	2462.8
6	1.549	1345.2

Note: The equivalence scale  $E$  denotes the ratio of the household expenditures after the inclusion of an additional child,  $x_1$ , to the household expenditures before the change,  $x_0$ . That is,  $E = x_1/x_0$ . This is interpreted as required percentage increase in expenditures to keep the household welfare unchanged.

The results indicate that an additional child would represent between 74 and 55 percent of the cost of an adult depending on the consumption aggregate used. Once utilities were included (consumption aggregate 3), the cost of a child declined from 71 percent of an adult to 63 percent. It slightly increased to 64 percent when education is included (consumption aggregate 4) and remained stable when health expenditures were included. It was assumed that **an additional child will have a cost of 64.5 percent of an adult** (consumption aggregate 5), which is very close to estimates obtained using consumption aggregates 3 and 4.

### (ii) Household size economies

Following Lanjouw and Ravallion (1995) the size economies were estimated using a food share equation where, controlling for differences in household composition and other variables, an estimate of size economies can be made. The parameter  $\theta$  represents the degree of scale economies in household consumption. If  $\theta=1$ , no economies of scale are present and the use of *per capita* consumption is appropriate. The food share can be written as a function of per-equivalent consumption,  $x/n^\theta$ , household demographic composition variables ( $\eta_j = n_j/n$ ), prices, and other variables such as location. The estimating equation can be written as

$$w_f = \alpha + \beta \ln\left(\frac{x}{n^\theta}\right) + \sum_{j=1}^{J-1} \gamma_j \eta_j + \varepsilon = \alpha + \beta \ln x - \beta\theta \ln n + \sum_{j=1}^{J-1} \gamma_j \eta_j + \varepsilon \quad (2)$$

and an estimate of  $\theta$  can be obtained from the ratio of the coefficients of consumption and a household size.

Equation (2) was estimated using OLS regression. Table 4 shows the estimates of  $\theta$  for different definitions of the consumption aggregate.

**Table 4: Household size economies**

Consumption aggregate	OLS
	Mean (1)
1	0.710
2	0.756
3	0.790
4	0.743
5	0.710
6	0.874

The finding that relatively big size economies are in food and clothing consumption must be taken with the following caveat. The parameter estimates for  $\theta$  using the consumption aggregates 1 through 3 may be biased since a fraction of households have food shares equal to 1. Size economies in food consumption, however, are not new to the literature (Deaton and Paxson, 1998). The full consumption aggregate shows that size economies are observed and are close to 0.87. It is assumed that a household size economy around 0.87 may be appropriate for Armenian households, and is used in this Report.

### (iii) Estimating consumption per adult-equivalent

Consumption per adult-equivalent is obtained dividing household total consumption by the number of *adult equivalent members* ( $EA_i$ ). Adult equivalent members are calculated using the above estimates of equivalence scales and size economies according to the following formula for household  $i$ :

$$EA_i = (A_i + a C_i)^\theta$$

where  $A_i$  is the number of adults in the household,  $C_i$  is the number of children,  $\theta$  is the scale parameter ( $\theta=0.87$ ) and  $a$  is the cost of a child relative to an adult ( $a=0.65$ ). Children are individuals of age 14 and below.

Since 2004 these estimated parameters are used to express household consumption in per adult equivalent measure, hence avoiding changes in poverty indicators due to changes in those parameters.

## 3. Poverty lines

### (i) Food poverty line

The food poverty line is used to determine the extremely poor population, or as it is often expressed, people who live in extreme poverty. This line is defined as an amount of consumption necessary to satisfy basic food needs. Hence, **people whose consumption falls short of satisfying basic food needs are considered to be extremely poor**. To express this amount in monetary terms, a national average caloric requirement needs to be determined and the cost of one calorie estimated.

**Average caloric requirement:** The average caloric requirement for Armenia is calculated using information on caloric requirements of different demographic groups according to the World Health Organization (1985) standards and information on population shares of these demographic groups (Table 5). In that way, the average caloric requirement for Armenia is estimated at 2,232 calories per day per capita.

**Table 5: Daily per capita caloric requirements for Armenia, used since 2004**

	By demographic compositions					Average caloric requirement
	Men 16-60	Female 16-60	Elderly	Children 0-6	Children 7-15	
<b>Daily caloric requirements</b>	2,655	2,099	2,006	1,614	2,362	
Yerevan	0.279	0.360	0.151	0.078	0.131	2,237
Aragatsotn	0.257	0.305	0.151	0.115	0.172	2,217
Ararat	0.260	0.317	0.150	0.083	0.190	2,239
Armavir	0.264	0.322	0.135	0.098	0.181	2,234
Gegharkounik	0.257	0.321	0.157	0.091	0.174	2,229
Lori	0.236	0.316	0.175	0.092	0.181	2,216
Kotayk	0.283	0.352	0.122	0.077	0.166	2,251
Shirak	0.251	0.323	0.149	0.100	0.177	2,223
Syunik	0.259	0.321	0.166	0.084	0.169	2,231
Vayots Dzor	0.258	0.308	0.163	0.091	0.181	2,231
Tavoush	0.249	0.309	0.205	0.082	0.155	2,220
All Armenia	0.264	0.334	0.153	0.087	0.162	<b>2,232</b>

*Source: ILCS 2004 and WHO (1985).*

**Cost of one calorie:** The cost of one calorie for Armenia is calculated by dividing total country expenditures on food with total country caloric consumption. Total country expenditures on food are obtained by summing household expenditures on food for all households in the sample. Using the information on the value of every food item purchased for each household (including imputed consumption in kind, i.e. food consumption that is not purchased, received as gifts, and humanitarian aid), household expenditures on all food items are calculated. Total country caloric consumption is computed by summing household caloric content for all food items and for all households. Caloric content of each food item is obtained from the Food and Agriculture Organization (FAO). Total caloric content of each food item purchased and/or consumed is calculated using the information on quantity purchased and/or consumed and caloric content of the food item per kilo.

The **food poverty line** is obtained by multiplying country-average caloric requirement with the cost of one calorie. The cost of one calorie is estimated at AMD 173.7 per person per month using mean prices and AMD 167.2 per person per month using median prices (both estimated based on the 2004 ILSC). Thus, the cost of a 2,232 calorie basket per month is set at AMD 11,631<sup>1</sup> per capita using mean prices and AMD 11,195.7<sup>2</sup> per capita using median prices in 2004. The value of the food poverty line is expressed in urban prices from the fourth quarter of 2004, as the consumption aggregate is expressed in these prices (2004 autumn urban price levels). The food poverty line estimated in this way reflects the actual consumption patterns of the average Armenian households and the prices they face in reality when shopping for food.

The food poverty line per capita is then adjusted for equivalence scales, as welfare measure—consumption—is expressed per adult equivalent. The estimated ratio of the weighted average of equivalent scale coefficients for different demographic groups (adults and children) and household size of 0.898 is used to express the food poverty line per capita in food poverty line per adult equivalent. Accordingly, the average food poverty line per adult equivalent in 2004 is

<sup>1</sup> It is obtained as:  $173.7 \times 30 \text{ days} \times 2.232 \text{ kilo calories}$ .

<sup>2</sup> It is obtained as:  $167.2 \times 30 \text{ days} \times 2.232 \text{ kilo calories}$ .

estimated at AMD 12,952 using mean prices and AMD 12,467 using median prices. Over 2005-2008 the nominal value of the poverty lines was adjusted using CPI of food derived from the survey. The food poverty line in 2008 amounted to 17232 AMD, in 2007- 15753 AMD, in 2006 - 14,300 AMD, in 2005-13266 AMD per adult equivalent per month.

**(ii) Complete poverty line**

The complete poverty line comprises the food poverty line and a **non-food** allowance, as individuals should be able to cover not only basic food needs, but also essential or minimum non-food needs.

The non-food allowance for the complete poverty line is estimated using the Food Expenditure Method (FEM) and Consumption Basket Method (CBM), (see World Bank, 2002). According to the first method, the non-food share is estimated as a non-food share of those households whose food consumption per adult equivalent is around the food line. According to the second approach (CBM), the non-food share is estimated as the non-food share of those households whose total consumption per adult equivalent is around the food line. The results are presented in Table 6 using different relative distance to the food line and the mean and median prices.

The estimates of the non-food share are slightly higher using the first than using the second approach, as expected. Using the Food Expenditure Method, the share of non-food consumption is estimated at 43.4 percent of the total minimum consumption (+/- 2% distance to food line), while using the Consumption Basket Method it is estimated at 35.6 percent.

The complete poverty line is calculated using the estimated non-food share based on the two methods described above and applying the relative distance to the food line of 2 percent. According to the above estimates, the complete poverty line for Armenia is set between AMD 18,984 and AMD 24,429 per adult equivalent per month using mean prices, and between AMD 19,373 and AMD 20,033 per adult equivalent per month using median prices.

The nominal value of the non-food allowance estimated on the basis of 2004 survey was adjusted for inflation of non-food items between 2004 and 2005, between 2005 and 2006, between 2006 and 2007, between 2007 and 2008 using the CPI for non-food items from the price statistics (102.2% for 2005, 103.3 for 2006, 102.2% for 2007 and 107.3% for 2008).

**Table 6: Armenia: Poverty lines per adult equivalent, 2004**

Relative distance to food line	Food poverty line, in drams	Non-food shares (in %)		Complete poverty line, in drams	
		Lower	Upper	Lower	Upper
<i>Average prices per calorie</i>					
2%	12,952	31.77	46.98	18,984	24,429
5%	12,952	29.76	46.00	18,439	23,987
10%	12,952	30.74	44.22	18,701	23,219
<i>Median prices per calorie</i>					
2%	12,467	35.64	43.42	19,373	22,033
5%	12,467	31.77	43.42	18,274	22,033
10%	12,467	30.74	45.08	18,001	22,701

Source: *ILCS 2004*.

Notes: Food poverty line and non-food shares are estimated in prices for the fourth quarter of 2004 in urban areas.

**The complete poverty line for 2008 equaled 25188 AMD compared to 23168 AMD in 2007, 21555 AMD in 2006 and 20,289 AMD in 2005.** Thus, using the fixed methodology for calculating the poverty line in real terms over the period of several years, evolution of poverty over time relative to the same benchmark can be tracked. In addition, fixing the food and non-food allowance allows monitoring poverty changes over time which are not caused by different consumption patterns.

#### 4. Main poverty indicators

In this report, poverty is measured by the poverty incidence, gap and severity indicators. The headcount index or poverty incidence is the simplest and most frequently used measure of poverty. It represents the fraction of individuals with consumption per adult equivalent below the poverty line (Forster et al 1984). The poverty gap index indicates how poor the poor people are, i.e. how far their consumption is below the poverty line. The severity of poverty indicator is used to measure the inequality of consumption among the poor (some poor people may have consumption close to the poverty line, while some may be far from it).

The poverty measurement indicators are described by the following formula:

$$P(\alpha) = \frac{1}{n} \sum_{i=1}^n \left[ \max\left(\frac{z - c_i}{z}, 0\right) \right]^\alpha$$

where  $\alpha$  is parameter (explained below),  $z$  is the poverty line,  $c_i$  is consumption of individual  $i$ , and  $n$  is the total number of individuals. For  $\alpha$  equal to 0,  $P(0)$ , or the *poverty headcount index* is obtained; it measures the fraction of individuals below the poverty line. If  $\alpha$  is equal to 1,  $P(1)$ , or the *poverty deficit index* is obtained; it indicates how far the poor, on average, are below the poverty line.

$P(1)$  can be defined in the following way:

$$P(1) = P(0) * (\text{Average Deficit})$$

where the average deficit is measured as a percentage of the poverty line by which the consumption of the poor on average falls short of the poverty line. Finally, if  $\alpha$  is equal to 2,  $P(2)$ , or the *severity of poverty index* is obtained; it indicates inequality of consumption among the poor.

In this report, overall poverty trends are described using all three measures of poverty, while the analysis of the poverty profile mainly relies on the poverty headcount.