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STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES (EUROSTAT)

FOOD AND AGRICULTURAL ORGANISATION (FAO)

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

MEASUREMENT OF FOOD CONSUMPTION AND FOOD DEPRIVATION

Invited paper submitted by FAO**

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* Due to the late submission of this paper, it could neither be translated nor reproduced.

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1. INTRODUCTION

1. FAO's measure of food deprivation, which is referred to as the prevalence of undernourishment, is based on the comparison of usual food consumption expressed in terms of dietary energy (kcal) with a minimum energy requirement. The part of the population with food consumption below the minimum energy requirement is considered underfed.

2. For the purpose of monitoring progress towards the target of halving the number of undernourished, the need had arisen to regularly up-date such estimates at the global as well as country level. FAO has been undertaking this task in its annual report on "The State of Food Insecurity in the World" (SOFI), which was first issued in 1999. SOFI 2002, which is the latest report, was issued in October 2002. The estimates cover 45 developing countries in Africa, 30 in Asia, 19 in Latin America and 5 in the Caribbean; the 12 Eastern European countries, the 12 CIS countries and the 3 Baltic States

3. In the following sections the basic methodological framework, the data sources and the procedures used by FAO for deriving the country estimates are described. The meaning and significance of the resulting estimates of prevalence of undernourishment are discussed. Then, the issues requiring improvement or further research are also discussed.

2. METHODOLOGICAL FRAMEWORK

4. The estimate of the proportion of the population below minimum level of dietary energy consumption has been defined within a probability distribution framework:

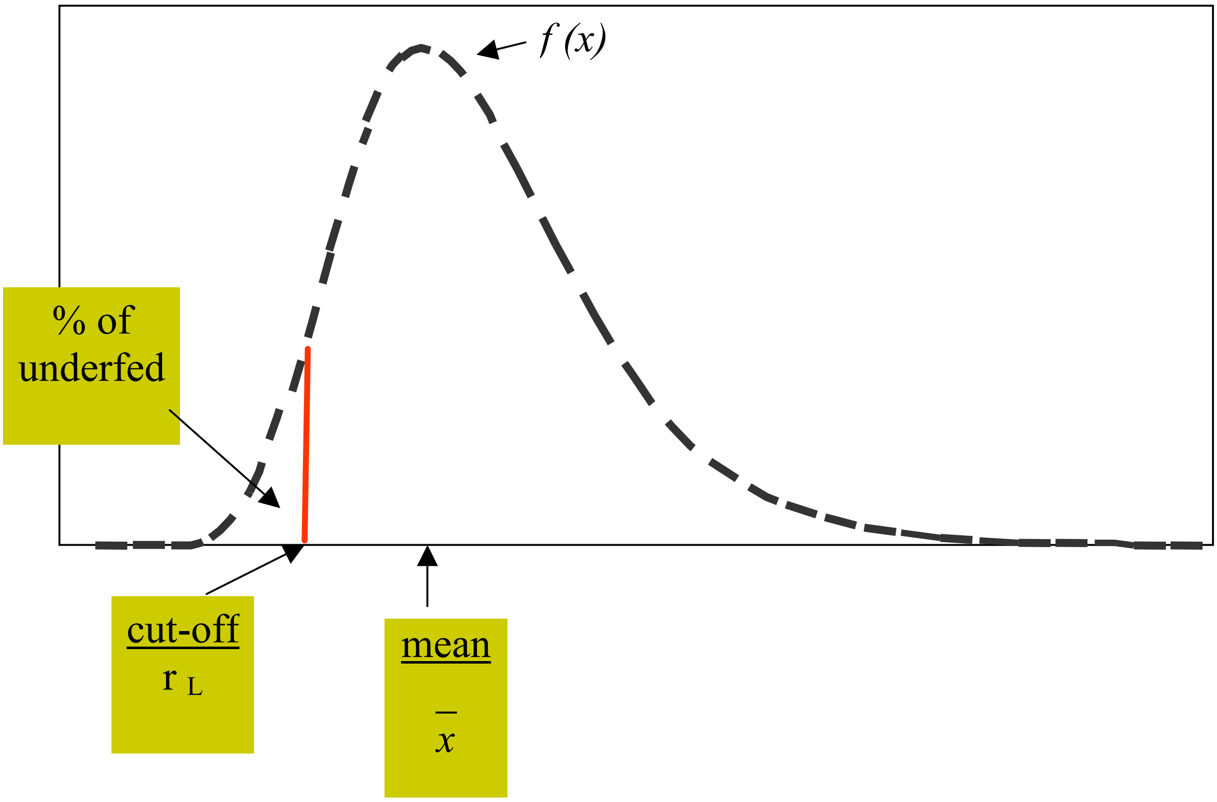
$$P(U) = P(x < r_L) = \int_{x<r_L} f(x)\,dx = F_x(r_L) \qquad (1)$$

where *f(x)* is the distribution function of dietary energy consumption and r_L is a cut-off point reflecting the *minimum energy requirement.* The next two sections discuss the estimation of *f(x)* and r_L.

3. ESTIMATION PROCEDURES

5. The graph below illustrates the framework for the estimation procedures.

Food consumption distribution and proportion of population undernourished



6. In the graph the curve *f(x)* depicts the proportion of the population corresponding to different per caput dietary energy consumption levels *(x)* represented by the horizontal line. The area under the curve up to the cut-off point, r_L, represents the proportion of the population undernourished.

7. The distribution, *f(x)*, is assumed to be lognormal so that the parameters of the distribution of the logarithm of x (i.e., μ and σ^2) can be derived on the basis of the mean, $\bar{x}$, and the coefficient of variation, *CV(x)*. A summarised description of the procedure for calculating the prevalence of undernourishment on the basis of $\bar{x}$, *CV(x)* and r_L applied to an hypothetical country is given below.

3.1 Estimation of the mean and CV of f(x)

3.1.1 Estimation of the mean, $\bar{x}$

8. There are two options for estimating the mean: using Food Balance Sheet (FBS) data or Household Budget Survey (HBS) data. The first can be used to prepare annual estimates for monitoring progress in food security for the country as a whole. The second one allows the derivation of sub-national estimates. The latter estimates can not be prepared on a yearly basis, as they depend on the survey frequency, in general ranging from 5 to 10 years. The illustrative results are presented for the FBS option only.

a) Dietary energy consumption from the Food Balance Sheet

9. The mean is represented by the *per caput* Dietary Energy Supply (**DES**) which refers to the food available for human consumption during the course of the reference period, expressed in terms of energy (kcal/person/day). The estimate is derived from the Food Balance Sheets compiled on the basis of data on the production (**PROD**) and trade (**IMP**orts and **EXP**orts) of food commodities. Using these data and the available information on stock changes (**STCH**), losses between the level at which production is recorded and the household (**WASTE)** and types of utilization (**SEED**, **FEED**, **FOOD**, inputs for **PROC**essing derived products and **OTHER** uses) a supply/utilization account is prepared for each commodity in weight terms. The food component, which is usually derived as a balancing item, refers to the total amount of the commodity available for human consumption during the year. The total DES is obtained by aggregating the food component of all commodities after conversion into energy values. The table below presents the standard Food Balance Sheet for the hypothetical country in 1999-2001.

Table 1. The Standard FBS for hypothetical country, 1999-2001

	PROD	+ IMP	+ STCH	- EXP	- FEED	- SEED	- PROC	WASTE	- OTHER	= FOOD	DES CALORIES PER PERSON / DAY (*)
	....................................1000 MT / YEAR....................................										
Grand Total											**2414**
Cereals (excl. Beer)	19973.7	1116.5	-355.7	6673.9	5211.8	434.7	407.5	969.4	9.7	7027.8	1114.2
Starchy Roots	16956.2	133.8	-1053.9	13525.9	0.4	0.9	143.7	1350.1	3.7	1011.4	45.2
Sugar crops	53406.6		-1333.3	0.3			43698.3	2753.7		5621.0	73.0
Sugar & Sweeteners	5267.7	11.3	-136.6	3360.6					13.0	1776.6	283.2
Pulses	269.5	5.7		37.9		21.9		8.2		207.3	31.5
Treenuts	54.0	2.2		15.8						40.5	6.5
Oil crops	2337.2	873.5	-198.7	38.5	1.0	14.3	1735.2	135.9		1087.5	100.1
Vegetable Oils	819.9	66.3	-149.9	116.5					272.8	348.7	137.9
Vegetables	2753.0	25.3		372.1			0.0	245.7		2163.9	26.8
Fruits (excl. Wine)	7270.5	55.9	0.2	1173.2			14.5	566.7		5574.7	114.4
Stimulants	78.1	21.4	-6.7	64.6						28.5	0.9
Spices	67.1	7.2		20.9				1.9		51.6	6.9
Alcoholic Beverages	2114.9	28.4		78.9					24.0	2040.4	163.4
Honey	3.0	0.2		1.6						1.6	0.2
Meat	1902.5	3.3		271.6				20.7		1614.8	150.9
Offals	75.7	2.8		0.4						77.7	3.8
Animal Fats	31.8	19.1		0.7					5.6	44.6	15.6
Milk (excl. Butter)	409.4	1095.4		81.1				12.3	12.0	1400.1	32.1
Eggs	812.0	1.3		6.8		137.4		40.6		628.4	42.6
Fish, Seafood	3458.0	532.1	1.7	809.3	1185.9					1996.5	62.2
Aquatic Products	30.1	0.5		14.5						16.1	0.2
Miscellaneous											2.1

(*) Food quantities converted into energy values and divided by total population and by 365 days.

10. The *per caput* DES of 2414 kcal/person/day shown in the first row and last column of the above table is the figure used as the estimate of the mean of the food consumption distribution of the hypothetical country, i.e.:

$$\bar{x} = \mathbf{2414}$$

b) Dietary energy consumption from Household Budget Survey

11. This option requires to convert quantities of the different food items consumed by the household into energy values. These data are usually collected through budget surveys using large scale samples which may allow mean estimates not only at the national level but also at sub-national levels such as geographic areas and socio-economic population groups.

3.1.2 Estimation of the coefficient of variation, CV(*x*)

12. The **CV** of the household *per caput* dietary energy consumption distribution is formulated as follows:

$$CV(x) \;=\; \sqrt{CV^2(x\,|\,v) + CV^2\,(x\,|\,r)}\,,$$

where **CV(*x*)** is the total CV of the household *per caput* dietary energy consumption, **CV(*x*|*v*)** is the component due to household *per caput* income **(*v*)** and **CV(*x*|*r*)** is the component due to energy requirement **(*r*)**. **CV(*x*|*r*)** is considered to be a fixed component and is estimated to correspond to about 0.20. **CV(x|v)** is however estimated on the basis of household survey data.

13. For the purpose of estimation, **CV(x|v)** is formulated as follows:

$$\mathrm{CV(x|v)} \;=\; \sigma\,\mathrm{(x|v)} / \mu\mathrm{(x)}\,.$$

The numerator of the ratio is derived as

$$\sigma(x\,|\,v) = \sqrt{\left[\sum_{j=1}^{k} f_j\,(x\,|\,v)_j^2 - (\sum_{j=1}^{k} f_j\,(x\,|\,v)_j)^2 / n\right] / (n-1)}$$

and the denominator, which is the overall average household *per caput* dietary energy consumption, is derived as

$$\mu(x) = \sum(x)/n$$

where ***k*** is the number of income classes and $\boldsymbol{f_j}$ is the number of sampled households and $\mathbf{(x|v)_j}$ is the average household *per caput* dietary energy consumption of the ***jth*** income or expenditure class.

14. Thus, the data required for estimating **CV(x|v)** are the averages of household *per caput* dietary energy consumption by household *per caput* income or expenditure classes from **n** households and the number of households in each class. The table below presents the average *per caput* energy consumption by deciles of household *per caput* total expenditure from a recent National Household Budget Survey conducted in the hypothetical country (sample of 2370 households).

Table 2. Average dietary energy consumption by household per caput expenditure deciles

Decile of household *per caput* expenditure	Average dietary energy consumption (kcal per person/day)
1	1554
2	1874
3	2066
4	2263
5	2413
6	2461
7	2530
8	2474
9	3093
10	3373

Using the data from the above table, **CV(x|v)** is estimated as follows

CV(x|v) = σ (x|v) / μ(x) = 508 / 2410 = 0.211

Hence, given that **CV(*x*|*r*)** corresponds to 0.20, we obtain

$$CV(x) = \sqrt{0.211^2 + 0.20^2} = 0.29$$

15. According to the sample size and design, the CV estimates can be broken-down by geographic areas and socio-economic groups.

3.2 Estimation of the minimum energy requirement (cut-off point), r_L

16. The procedure for estimating the minimum energy requirement by sex and age group begins with the specification of the reference body weight. After specifying the reference body weight the procedure for arriving at the corresponding energy requirement differs between children below age 10 on the one hand and adolescents and adults on the other. Therefore the procedure for deriving the reference body weight is handled first, followed by two separate subsections dealing with the derivation of minimum energy requirements for children and adolescents and adults and lastly a fourth subsection dealing with the derivation of the overall minimum *per caput* energy requirement. Minimum energy requirements can be estimated for geographic and socioeconomic groups, using survey data on heights and demographic structure.

3.2.1 Reference body- weight

17. The reference body weights by sex and age groups are based on the available weight-for-height reference tables. Thus given an estimate of the actual height the acceptable weight corresponding to this height is derived from these tables.

18. For **children below age 10 the** reference body weight is fixed at the median of the range of weight-for-height given by the WHO reference tables (WHO, 1983).

19. For **adolescents and adults** of age 10 and above, the reference body weight is estimated on the basis of the fifth percentile of the distribution of the Body Mass Index [1] (WHO, 1995).

20. The actual heights by sex and age used are those estimated by national anthropometric studies. The height figures for the hypothetical country are given below.

Table 3: Average heights by age and sex

	Actual height in cm				
Age (years)	Male	Female	Age (years)	Male	Female
0	68.0	65.0	10	135.0	137.9
1	81.0	80.0	11	137.3	139.3
2	92.0	92.0	12	142.9	145.9
3	98.0	98.0	13	148.9	150.5
4	107.0	106.0	14	155.4	155.6
5	113.0	110.0	15	161.7	156.5
6	116.0	116.0	16	166.4	157.2
7	120.0	120.0	17	168.4	158.2
8	125.0	125.0	18 +	170.6	158.7
9	130.0	129.0			

3.2.2 Minimum energy requirements for children below 10

21. The minimum energy requirement per person for children is obtained by multiplying the reference body weight by the recommended energy requirement per kilogram of body weight for each sex/age group. The energy requirements per kilogram of body weight are based on the recommendations of the report of the FAO/WHO/UNU Expert Consultation on Energy and Protein Requirements (FAO/WHO/UNU, 1985).

3.2.3 Minimum energy requirements for adults and adolescents aged 10 and above

22. The minimum energy requirements per person for adults and adolescents are derived by first estimating the Basic Metabolic Rate (**BMR)** on the basis of the reference body weight and using the sex and age specific regression parameters of the Schofield equations (James and Schofield, 1990).

[1] The BMI refers to weight (kg) divided by height² (m).

23. Then, the minimum energy requirements are derived by multiplying BMR by sex specific Physical Activity Level factors.

3.2.4 The overall minimum *per caput* energy requirement

24. The overall minimum *per caput* dietary energy requirement, which is used as the cut-off point, $\mathbf{r}_L$, for estimating the prevalence of undernourishment, is derived by aggregating the sex-age requirements weighted by the proportion of each sex and age group in the total population.

25. Finally a pregnancy allowance (**PA**) in *per caput* terms for the whole population is added to the overall requirement. The PA is estimated by multiplying the birth rate by 75 kcal (assuming an estimated daily requirement of 100 kcal during pregnancy over 75 per cent of the year).

26. The estimated country birth rate for 1999-2001 is 26 per thousand. Thus, the overall minimum *per caput* energy requirement is derived as

$$\mathbf{r_L = \Sigma_{ij} (MER_{ij} * P_{ij}) + PA = 1883 + 2 = 1885\ kcal/day}$$

where

MER = minimum energy requirement per person

$\mathbf{P_{ij}}$ = proportion of each sex and age group in the total population

PA = pregnancy allowance

i = age group

j = sex

3.3. Estimation of the proportion and number of undernourished

27. The frequency distribution of intake, **f(x),** is assumed to be lognormal with parameters μ and σ^2. These are estimated on the basis of $\bar{x}$ and $CV(x)$ as follows:

$$\sigma = [\log_e (CV^2(x) + 1)]^{0.5} = [\log_e (0.29^2 + 1)]^{0.5} = 0.2842$$

and

$$\mu = \log_e \bar{x} - \sigma^2 / 2 = \log_e 2414 - 0.2842^2 / 2 = 7.7487.$$

The proportion of population below $\mathbf{r_L}$ is then evaluated as follows:

$$\Phi [(\log_e r_L - \mu) / \sigma)] = \Phi [(\log_e 1885 - 7.7487) / 0.2842)] = \Phi [- 0.7284] = 0.2332$$

Where

$\mathbf{\Phi}$ = standard normal cumulative distribution.

Thus,

The percentage of the population undernourished = 23.

28. As the total population of the hypothetical country is 11 million, the number of undernourished is estimated as follows:

Number of undernourished = 11 * 0.2332 = 2.6 million.

4. MEANING, SIGNIFICANCE AND ADVANTAGES OF THE RESULTING ESTIMATES OF THE PREVALENCE OF UNDERNOURISHMENT

29. The data and approximations used to derive the distribution of dietary energy consumption and the cut-off point have implications on the precise meaning and significance of the resulting estimate of the prevalence of food deprivation. These are discussed below.

4.1 Concept of food consumption

30. It was noted that the *per caput* DES is used as the mean of the frequency distribution, *f(x)*. This means that the distribution refers to food acquired by (or available to) the households rather than the actual food intake of the individual household members.

4.2 Time reference

31. When Food Balance Sheet data are used, the *per caput* DES taken as the mean of *f(x)* corresponds to a three-year rather than annual average in order to even out the effect of errors in the annual food stocks data used in preparing the food balance sheets. On the other hand, the per caput food consumption from household budget surveys refer to a one year average period. Furthermore, for the purpose of deriving the $CV(x|v)$, only household survey data grouped according to income/expenditure classes are used thus removing the effect of seasonal and other short-term variation that the household level data are subject to. As a consequence of these, the estimate refers to the average condition during the given one or three-year period and the effect of seasonal and other short-term variations in food availability are not considered.

4.3 Use of concept of minimum energy requirement as cut-off point

32. The cut-off point is derived by aggregating the sex-age specific minimum energy requirements using the proportion of the population in the different sex-age groups as weights. The sex-age specific minimum energy requirements for at least the adults and adolescents are based on the energy expenditure corresponding to the lower limit of the range of acceptable body-weight for given height and the light activity norm. This approach of arriving at the cut-off point might give the impression that food deprivation is operationally defined as the state of having a food consumption level that is below that needed by an average individual for maintaining minimum acceptable body-weight and performing light activity. This is however, strictly speaking, not so. The minimal approach in establishing the

cut-off point is a consequence of the consideration that, due to the effect of correlation between energy intake and requirement, the individuals with consumption falling within the range of variation of requirement are likely to be close to, if not exactly, matching their requirements. In other words their risk of food shortfall or excess is low if not exactly zero.

4.4 Advantages of the use of food consumption estimates from Food Balance Sheets

33. The procedure of using the *per caput* DES derived from the food balance has some advantages as indicated below.

- The FAO *per caput* DES database, which covers practically all countries of the world, is regularly revised and up-dated in connection with FAO's continuous work programme on supply/utilization accounts and food balance sheets. As a result the database represents a readily available source of information for the assessment and monitoring of the prevalence of food deprivation at the global, regional and country levels.

- The linkage of the *per caput* DES with a measure of inequality within a theoretical distribution framework provides a mechanism for assessing the effect of short-term changes in aggregate food availability as well as its components (production, import, etc.) on the distribution of dietary energy consumption and hence the prevalence of food deprivation. In addition, the use of a distribution model – such as the log-normal function – facilitates the assessment of expected changes in the prevalence of food deprivation as a result of the combined effect of food supply increase and inequality reduction, as illustrated in the table below.

Mean Food Consumption (kcal/caput/day)	**Percentage of food deprived at different levels of food consumption and inequality (CV = coefficient of variation)**			
	CV=0.20	***CV=0.24***	***CV=0.29***	***CV=0.35***
1700	65	64	63	63
2040	30	34	38	42
2450	7	12	17	23
2940	1	2	6	10

5. CONCEPTUAL, METHODOLOGICAL AND DATA ISSUES REQUIRING IMPROVEMENT OR FURTHER RESEARCH

34. The sections below discuss certain issues relating to the major limitations and problems affecting the accuracy of the measurement of food deprivation. The discussions are a follow-up of the inputs and recommendations from the International Scientific Symposium (FAO, Rome 26-28 June 2002). In particular the aim is to consider the actions needed to improve the procedure for estimating the prevalence of food deprivation.

5.1 Need for clarification on the concepts used for the variable under measurement

35. Critics have been expressed on the use of the terms "undernourishment" "undernutrition" or "hunger" in referring to the FAO measure of food deprivation. The term "Dietary Energy Deficiency (DED)" could be a more appropriate as the measure refers to those with dietary energy consumption below requirement.

5.2 The bivariate distribution versus cut-off point approach issue

36. The validity of the FAO basic methodological framework for estimating the prevalence of dietary energy deficiency, which is based on the specification of the frequency distribution of intake and a cut-off point reflecting the lower limit of the requirement distribution, has been questioned. The critics are based on an application of the bivariate probability distribution model under the assumption that the joint distribution is lognormal and intake is correlated with requirement. However, it can be demonstrated that if the effect of correlation is appropriately taken into account in the same model the result should be the same as the FAO cut-off point approach.

37. The bivariate distribution is the appropriate framework for mathematically expressing the proportion of the population with intake below their respective requirements , although under the assumption of correlation, the bivariate formula reduces to the cut-off point formula. However, the problem is that the actual shape of the bivariate distribution of intake and requirement is unknown and the empirical specifications that have been used in evaluating the formula are too simplistic to yield realistic results. Further research is needed in order to arrive at better specifications of the bivariate distribution. Meanwhile FAO should continue to use the cut-off point formula which can be justified as reflecting an attempt to minimise the risk of overestimation. However it has to be recognized that the approach is subject to a risk of under-estimation, the extent of which cannot still be assessed.

5.3 Sampling design issue in relation to frequency distribution data from household surveys

38. This issue arose out of the consideration that the objective of most sample surveys is to estimate the mean and not the other parameters that determine the frequency distribution. Consequently the sample designs usually adopted in these surveys lead to biased estimates of the variance and the higher moments of the distribution.. In view of this, there is a need to discuss the reliability of the distribution parameters derived from the currently available

household survey data, in the context of estimating the proportion of households below certain fixed cut-off point (such as minimum income or food requirement level).

39. To avoid the above referred problem it has been proposed to estimate the proportion directly from the household level data in the sample. Consequently the resulting estimate should be treated just as a mean or a proportion. However, the proportion estimated directly from the sample households' data reflects an inference on the cumulated frequency distribution or percentile distribution. Although this distribution is non-parametric it cannot be claimed that it is free from the effect of the sample design bias referred to above.

40. It is well known that sample estimates of the frequency distribution of a variable or its parameters are unbiased if the sample selection procedure is through Simple Random Sampling (SRS) of the enumeration units. It is also well known that in socio-economic surveys the SRS procedure is rarely adopted. Instead more complex designs are applied for a number of reasons e.g. administrative and practical convenience, costs etc. However, in applying these more complex designs the aim has been to estimate the mean rather than the frequency distribution and in assessing the accuracy (confidence interval) of the mean it is generally assumed that the distribution of the sample mean is approximately normal.

41. In the context of estimating the proportion of the population with income, food or holding size below certain minimum level or measuring the inequality in distribution, interest is of course on the frequency distribution estimated from the sample. In this connection it is necessary to consider the accuracy of not only the mean but also the variance and other measures determining the shape of the distribution (i.e. the third and fourth moments). Furthermore, even in the context of estimating the mean, consideration has to be given to the fact that the distribution of such variables is generally believed to be highly skewed and it is not certain whether the skewness disappears from the distribution of the sample mean. Thus, it is important to investigate into the *extent* of the possible bias in the distribution data resulting from the non-SRS designs.

42. As basis for the discussion two case studies investigating into the issue has been commissioned by the FAO Statistics Division. The two papers (Arbia, 2002 and Srivastava et al, 2002) were presented at the International Scientific Symposium on Measurement of Food Deprivation and Undernutrition (26-28 June, 2002).

43. The measurement of bias involved the calculation of the mean and the variance of the relevant parameters describing the frequency distribution from a large number of replicated samples taken from a simulated population distribution. The size of the bias is measured by the difference between the mean of estimated values from the replicated samples and the simulated population value. The relative bias is then given by the ratio of the size of the bias to the standard deviation of the replicated sample values (Cochran, 1977).

44. One of the studies while confirming the expectation of no significant bias in the mean and the variance estimated through SRS, has shown that the bias is significant in both cases in the stratified two-stage sampling design. The fact that even the estimate of the mean is biased in the context of the latter design is a striking implication of this work. The other study indicated that the Gini measure of inequality, which is based on the cumulative frequency

distribution, is also biased is nearly all the designs considered, including SRS. It therefore follows that this problem should be taken into account in using the distribution data from the available surveys for the purpose of estimating the prevalence of undernourishment.

45. The two case studies have only illustrated the problem. The following are the general recommendations for future action.

- As the two case studies undertaken are of a preliminary nature it would be useful if both could be extended so that they cover a common set of parameters as well as sampling designs. In this way the two reports can be more comparable. This would help to reinforce or throw more light on the necessarily tentative views or conclusions reached.

- It would be useful to replicate the experiment on an actual rather than simulated distribution. This may be possible if one can obtain access to a population census where data referring to one or more of the variables of interest have been collected from each household in the population. In this context the assessment should not be limited to the mean and the variance but also the other parameters determining the shape of the distribution (i.e. the third and fourth moments). The use of an actual population would also enable investigating into whether the population distribution is unimodal and skewed as generally believed.

- If the conclusions made on the basis of the simulated populations are confirmed by the experiments on an actual population, it would be important to investigate into the feasibility of correcting the parameters of the sample distribution for the expected bias.

- As it may be practically impossible to adopt the SRS design in national level surveys it would be useful to investigate in the possibility of arriving at sample designs that, while being cost effective and practicable on a national scale, do lead to more reliable estimates of not only the mean but also the key parameters of the distribution. In other words the need for reliable distribution data should be explicitly taken into account in planning the surveys.

- The issue need to be brought to the attention of statisticians working in the field of sampling.

5.4 Improvement of the definition of the cut-off point (minimum energy requirement)

46. The definition of the cut-off point should be improved taking into account the recommendations of the Joint FAO/WHO/UNU Expert Consultation on Energy in Human Nutrition that was held in October 2001, which updates the 1985 report. In the new report the energy requirement of children have been scaled down to some extent, while those for the adults have risen. In addition, the physical activity level (PAL) index applied to the BMR in

order to arrive at energy required for light activity is likely to be specified as ranging from 1.40 to 1.69 as opposed to the past approach of giving a fixed value.

47. The new approach regarding PAL for light activity poses a practical problem in defining the cut-off point. From the point of view of FAO's aim of minimizing the risk of overestimation, the lower limit corresponding to 1.4 BMR should be adopted as the cut-off point. However, all other things being equal, this would imply a significant reduction in the proportion as well as the number of undernourished with obvious negative consequences in so far as comprehension of the changes by the public is concerned. On the other hand, the latter problem could be avoided by opting for the average of the range which would actually boil down to the currently used level (1.55 BMR). This would however imply an inconsistency with the basic principle justifying the use of the cut-off point formula. In this connection, it can be argued that after all the choice of the cut-off point is generally viewed as being rather arbitrary so that not much harm will result from sticking to the currently used one. The pros and cons of the two alternatives should be taken into account in deciding on the PAL value to be used.

5.5 Revision/up-date of the CV as data become available

48. To improve the estimates of food deprivation, the CVs should be revised and up-dated regularly as new survey data become available. This implies that not only the presently used CV be revised as necessary but also that any change in the CV over time be taken into account. For these purposes the FAO Statistics Division is reinforcing its programme on analysis of data from income-expenditure surveys. In the case of the countries where the CV was estimated by regression models this would imply re-estimation on the basis of the revised models.

49. While recognizing the need to take into account changes in the CV over time, it should be noted that its feasibility would depend on: a) the availability of time series data referring to the whole time-span covered by the FAO estimates (i.e. for 1969-71 to current period) and b) the time and effort that would needed to properly undertake this work.

5.6 Reconciling FBS estimates of mean with household survey estimated mean

50. As part of the efforts to improve the Food Balance Sheets estimates of the mean food consumption level , the available household survey data pertaining to per caput quantities of food items purchased/acquired by households should be confronted with the corresponding information derived through the supply/utilization accounts (SUA). This would provide a means of calibrating the SUA estimates. FAO Statistics Division is planning to update the publication entitled "A Comparative Study of Food Consumption Data from Food Balance Sheets and Household Surveys" (FAO, Rome,1983).

5.7 Up-dating the height data

51. The height data used for the estimation of the energy requirements should be revised and updated. FAO Nutrition Division is planning to undertake this work and publish the results in a FAO report dealing with the practical application of the principles and norms

recommended by the recent FAO/WHO/UNU Expert Consultation on Energy in Human Nutrition.

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