Some Observations and Suggestions for Improving Agricultural and Rural Statistics in Developing Countries

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1. Introduction

In approaching this task of speaking about international standards and methodology for agricultural and rural statistics, the observations and suggestions I have chosen to include are based heavily on experience in the Asian and Pacific countries. Hopefully, some of the observations and suggestions are relevant also to the developing countries in the other regions. We hope also that some of views could in some small measure influence the thinking among some of the donors that are actively promoting the improvement of agricultural and rural statistics in the developing countries.

2. On Some Definitions and Their Implications on Data Analysis and Availability.

We dwell on two sets of terms in this note. The first is rural versus agricultural. Going through the literature, one gets the impression that these two words are often used interchangeably. Perhaps the statistical community has not invested enough time to analyze the difference between the two, besides the obvious that rural implies a condition, state or a geographical area (with shifting boundaries), while agricultural relates to activities, like growing crops and raising livestock. In some developing countries, agricultural statistics is meant generically or operationally to include fisheries and aquaculture statistics, partly because the same agency is responsible for the latter also.

It had been pointed out that China's 1996 agriculture census was really a rural census, because it included more subjects and areas that transcended the traditional coverage of an agriculture census; specifically, towns and townships that were classified as rural but had little agricultural activities were covered fully also.

The rural-urban divide is based on variables (e.g. population density, presence of theater, central market and other urban amenities) that are updated in the census of population and housing (CPH). The variables are seldom changed but their values do, giving rise to rapid urbanization and a shrinking rural area in developing countries. From a survey design standpoint, we are reminded that it is not advisable to stratify using an unstable variable (rural-urban), because this leads to loss in precision and complications during analysis such as resorting to post-stratification. Rural and urban areas could instead be treated as classes or domains that cut across strata, for which estimation procedures are routine. However, the loss of comparability in the rural-urban dichotomy from one CPH to the next implies loss in continuity of the time series statistics, so that their

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interpretation could be far from routine. An example is shown in Tables 1a-b, below. From Table 1b, it is seen that the poverty incidence from 1988 to 1991 increased in both the urban and rural areas of the Philippines – at the same time that the incidence for the country decreased. This is not possible arithmetically, *ceteris paribus.* What made it possible was that the urban domain - where the poverty incidence was comparatively much lower - expanded in both population size and area coverage. (Table 1a).

Table 1a. Population and Number of Villages in 1980 and 1990 CPH, Philippines.

	1980	1990
Population (million)	48.1	60.7
Of which: Urban (million)	18.0	29.4
Urban (%)	37.5	48.5
Villages (thousand)	40.2	41.3
Of which: Urban (thousand)	7.7	10.2
Urban (%)	19.2	24.8

Table 1b. Poverty Incidences, 1985 – 1997, Philippines.

	1985	1988	1991	1994	1997
Poverty Incidence (%)	49	50	45	41	37
Urban (%)	38	34	36	28	22
Rural (%)	56	52	55	53	51

Source: David and Maligalig (2001)

Confounding rural with agricultural could mask the impact of the short term (less than one year) duration of many agricultural activities. Take poverty. The reference period for household income and expenditure surveys is one year, with the data collected in weekly, monthly, quarterly or six-month intervals to capture seasonality in the variables. In the end, however, the data are averaged for the year, with the resulting annual poverty statistics broken down into rural-urban and other domains. These fail to capture the transitory or short-term poverty experienced by households in rainfed and upland areas (who often belong to minority ethnic groups) who have much reduced incomes during the dry than in the wet season; and of fisher folk who earn less during bad weather and live in coastal areas that are at risk to floods and typhoons. Even off-farm income is affected, as both public and private infrastructure works that are important sources of temporary employment show a downturn during the rainy season. These are critical gaps in the poverty information systems that are currently in place in the developing countries.

The second set of terms that may have yet to be defined or differentiated adequately are undernourishment or undernutrition on the one hand, and malnourishment or hunger on the other hand. The Millennium Development Goals (MDGs) include eradicating hunger, but the road map indicator chosen to assess progress on the goal seem to be associated more with undernourishment. This is discussed in more detail later in this note.

3. The Future of Agricultural Censuses

There have been indications that support for censuses of agriculture (CAs) in some developing countries have been diminishing since the last two to three rounds. This could not be ascribed solely to the declining support for the statistical systems and services in these countries; for one, support for the censuses of population and housing (CPHs) has remained strong during the same period. Several factors could be at work here.

- Users outside the statistical system are generally not clear about the role of CAs in the national statistical database vis-à-vis the other sources of agricultural information; i.e. to update structural benchmark data for small geographic areas. They expect to find small area estimates of production and other temporal characteristics that are normally obtained through sample surveys. The result is disaffection with the CA; on some occasions questions have been raised about the wisdom of spending massive money and effort on an undertaking that users find do not serve their current needs. The situation is exacerbated when the sample surveys also had failed to provide reasonably reliable estimates for relatively larger domains like provinces, which is the case in many countries.

- The final CA reports had been released very late and, in the words of one major user (from the Philippines), these were like cadavers that went straight to bookshelves for burial. The hour of reckoning comes four to five years hence when the NSO requests a huge budget for yet essentially the same census.

- When CAs and inter-census sample surveys collected the same characteristics (e.g. areas planted to specific crops, counts of productive trees like coconuts and mangoes, and of livestock and poultry) the results often showed large differences that were indicative of divergences in concepts and methods used, in measurement errors, and in sampling errors influencing the two sources. In many cases the differences were so large that CA estimates of levels were not adopted as the official estimates during the census years. Thus, the inter-census surveys are conducted also during census years in order to have continuity in the official series. The use of CA estimates of levels tended to be confined to cross section analysis and to providing small area estimates for formulating projects and programs. Other uses tended to be based on ratios and proportions instead of levels (e.g. land use distributions) and as sources of frames for sample surveys. The latter, however, is done mainly by the official statisticians (that need no further convincing of the need for CAs), but not by other stakeholders, including those who hold the purse strings for statistical activities.

Some countries in Asia have managed without CAs. Cambodia has not done a CA for half a century. After its census in the early 1970s, India has relied on its Patwaris (village registrars) to update area and land use data, continuing to conduct every five years a livestock census only. In Sri Lanka, there was a 20 year pause between the 1991 and

2001 CAs. Indonesia's CAs are in reality large scale three stage agricultural sample surveys. Similarly, the Philippines last two CAs were actually large scale two stage sample surveys. Previously, sampling in CAs had been confined to the ultimate sampling units; e.g. sampling in the stratum of small farm households.

Given the funding, operational, timeliness and accuracy problems with past CAs, the future direction would likely be towards the use of more in-depth sampling.[2] This is not necessarily bad. Inter-census surveys designed as second-phase samples from a first-phase sample census forge a closer link between census and surveys, thereby narrowing the gap in the methodologies and statistics from the two sources (David, 1998). For this to happen, and happen successfully, the national statistical system will need competent technical assistance from survey statisticians, who tend to be in short supply, particularly in developing countries that have decentralized statistical systems in which the agriculture statistics agency is in the agriculture ministry.

Protracted civil wars, ethnic or religious conflicts, and terrorism prevent the successful conduct of CAs in parts of a growing number of countries – Sri Lanka, Nepal, Philippines, Indonesia, Myanmar, Solomon Islands in the Asia-Pacific. Other regions have their lists. To the extent that sample surveys are more doable than censuses in these situations, then the former could likewise take the place of censuses in these countries.

4. Some Outstanding Measurement, Survey Design and Estimation Problems

Agricultural statisticians are finding it increasingly difficult to answer questions that sound simple to users and lay persons, such as: How many farmers are there? How much income do they make? Among the reasons for the difficulty is that households that derive their income solely from farming are becoming rare. Hence, the definition of a farmer or farm household is no longer that clear, or the old definition based on combination of minimum area and number of livestock is no longer useful for policy use. At the same time, the household's income from agricultural activities should not be estimated and presented separately from its off-farm incomes. Instead of point estimates, the questions can be more appropriately answered through estimates of distributions, e.g. of the number of farm households along a farm income scale, or of total income through a two-way table with farm income and off-farm income as coordinates.

There may be a need to reorient activities and strengthen capacity in the agricultural statistics bureaus towards estimating distribution functions from survey data. The integration of rural household surveys, as proposed by Fred Vogel in a paper in this conference, is almost a necessary condition to make estimations of many useful distributions possible. We would go even further by suggesting that all major household surveys of the national statistical system be integrated. For instance, rural or agricultural household income and expenditure are more economically and rationally analyzed from a

[2] China, Vietnam and other countries that continue to have one party governments will be exceptions. In these countries, the old administrative reporting systems that are still wholly or partly in place are harnessed to do complete enumeration censuses.

household income and expenditure survey; agricultural labor force statistics can be derived from or improved by labor force surveys; etc.

The integration of household surveys can be pursued through a master sample. For example, the Philippines developed and began implementing in 2003 a master sample for all household surveys of the National Statistics Office (NSO), including Family Income and Expenditure Survey (FIES), Labor Force Survey (LFS), and Health and Demographic Survey. As mentioned in the next section, another agency used one-fourth of the master sample for its National Nutrition Survey (NNS); this opens up the possibility of using the returns from the 41,000 sample households of FIES as concomitant information to improve the analysis of the NNS. There should be no serious technical difficulties in revising the sampling rates of the quarterly LFS, e.g. increase/decrease the rates in the rural/urban areas, and do supplemental data collection in the rural areas order to come up with agricultural labor force statistics – without having to do independent agricultural labor force surveys.

Since the master sample uses the most recent census of population and housing (CPH) as sampling frame, it would be preferable if future CPH questionnaires include a minimum set of agricultural information that can be used in developing master samples that are more agriculture sector-friendly.

After the major crops such as rice, maize and wheat and inventory of livestock during the survey date, the remaining statistics on other crops and production of livestock and livestock products are derived using subjective methods. This sentence is true in the majority of Asian developing countries, and possibly in the other regions. It is important to know the reasons for this lack of advance in design and measurement methodologies, especially since the household-based statistics in the non-agriculture sector are based by and large on objectively designed sample surveys. Have the measurement problems proved insurmountable and costly given the resources made available to the agricultural statistics agency? Is it because the agricultural statistics subsystem is accorded lower priority in the agriculture ministry (in the case of decentralized statistical systems), or compared to the other subsystems like population, demography and industry? Has donor assistance been skewed in favor of non-agriculture statistics? Placing the agriculture statistics at par with the non-agricultural statistics is an important step towards integration of survey systems. Many crops, livestock and fishery production statistics can be improved by pulling in relevant information from household consumption surveys, for example. While this can be done at aggregate levels, higher efficiencies are possible if the linking is done at household or small area levels.

Some objective methods of data capture are losing their effectiveness. Missing observations from crop-cutting have been rising because farmers who own or rent harvesting machines, or who hire labor for harvesting, have increasingly been unwilling to skip the designated crop-cut areas. Experiments are needed to test alternative methods; for example, two-phase sampling where the crop-cuts are limited to a much smaller sub-sample, regress these on yields obtained by interview, and use the results to adjust the interview responses from the first-phase sample.

5. Improving Statistics on the Food Poor, Undernourished and Hungry

5.1 Poverty and hunger indicators for the Millennium Development Goals

Poverty is predominantly a rural phenomenon. In cases where rural poverty incidence has been disaggregated further, subsistence farming and fishing households and those living in agriculturally marginal areas like arid and high lands have been found to harbor most of the poor.

The first of the millennium development goals - eradicate extreme poverty and hunger – aims to halve, between 1990 and 2015, both the proportion of people whose income is less than $1 a day and the proportion who suffer from hunger. Of the five indicators chosen to monitor progress toward the goal, the first three - (1) proportion of people living below the $1 a day poverty line, (2) poverty gap ratio, and (3) share of poorest 20% in national income or consumption – are for extreme poverty, while the remaining two – (4) proportion of underweight children, and (5) proportion of undernourished persons – are for hunger (see UN MDG website). All are short-term input or intermediate indicators since they are compiled/updated from annual data, except indicator (4) which is a manifestation of long-term chronic undernourishment of children. All are based on data from household surveys (and in the case of (4) on observations from individual children in the sample households), except (5) in which the method of compilation "takes into account the amount of food available per person nationally and the extent of inequality in access to food" (FAO – SOFI 2003).

Of the five indicators, (1) and (5) are the most used for monitoring extreme poverty and hunger respectively at regional and global, and sometimes at national, levels. We discuss three topics in this section. First is the possibility that, on the one hand, the two indicators conceptually might be trying to measure the same phenomenon; on the other hand, since the methodologies for the two indicators use data from different sources, the results could in some actual cases point in different directions. Second, to the extent that being undernourished does not necessarily mean going hungry or malnourished, (5) may be improved to make it a more appropriate indicator for monitoring the other half of the first goal – that of halving the proportion of hungry persons. Third, we explore the possibility of estimating the proportion of hungry, malnourished or undernourished persons – or food deprivation in general - directly from household level food consumption data.

5.2 Empirical Comparison of the Indicators.

Most developing countries use a 2100 kcalories per capita energy threshold as basis for computing the food poverty line (fpl). This is inflated into a total poverty line (tpl) by adding an amount for a bundle of basic non-food goods and services that are considered essential and hence availed of by the poor. This is done in two ways: sum up the costs of a prescribed list of items comprising the bundle, nfpl say, so that tpl = fpl + nfpl; or

calculate the food expenditure (fe) and total expenditure (te) of a small reference population, such as those whose per capita income or expenditure falls within a narrow band, say ± 10% around fpl, and compute tpl = fpl/(fe/te). This tpl is the basic input for the World Bank methodology, hence the resulting $1 a day estimate includes both food and essential non-food components. However, since the original choice of $1 a day line was guided by countries near the bottom of the group of low income countries (see WB-WDR 1990), the World Bank estimates are considered severe or very conservative.[3] The primary data sources for food consumed, prices, income and expenditure are household surveys.

FAO also uses 2100 kcalories threshold for its indicator (5); however, similarities with the World Bank methodology stop there. Per capita kcal consumption is derived from estimates of total national food supply (viz. national food balance sheets) and distribution of the supply to the population. Since the methodology does not take into account non-food requirements, the indicator – conceptually - could or should yield lower incidence estimates than the World Bank's $1 a day indicator. This is not at all clear or certain to happen in practice, however, since the basic data sources are different and, as mentioned, the original $1 threshold was strongly influenced by a subset of low income countries.

In 2000, two out of three people in the developing world lived in the eight most populous developing countries (Table 2). Almost one out of two lived in China or India. Thus the combined trend in extreme poverty and under-nutrition in these eight countries should pretty much reflect what transpires in the developing world. The sizes of China and India likewise exert heavy influence on regional and global trends.

The values of indicators (1) and (5) for the milestone years 1990, 1995 and 2000 are shown in Table 2. The combined estimates for the eight countries show that indeed (1)> (5). However, the differences are perhaps more than what one would expect: In 1990, the proportion of persons below the $1 a day poverty line was 34.7%, while the prevalence of undernourishment was 19.4%. By 2000, the proportions had declined to 23.7% and 14.6% respectively; the decline was faster in (1) than in (5), which can be seen more clearly in Figure 1a. Thus, the prospects are higher in halving extreme poverty incidence by 2015 than in halving the prevalence of hunger. This gets plainer when the proportions are turned into persons (Figure 1b). There were an estimated 945 million extremely poor in 1990, 802 million in 1995, and 752 million in 2000. On the other hand, while the number of undernourished declined from 524 million in 1990 to 453 in 1995, there appeared to be a setback to a higher 463 million in 2000.[4] Thus, the two indicators show

[3] The World Bank also compiles estimates based on a more generous $2 a day poverty line.

[4] While the MDGs which sprung from the UN Millennium Summit talk about halving the *proportion* of people who suffer from hunger, the 1996 World Food Summit's goal is to reduce by half the *number* of undernourished people, also by the year 2015 (see. e.g. FAO-FIVIMS website). The fact that indicator (5) from FAO is used to monitor both goals raises the possibility that undernourishment and hunger are used interchangeably or synonymously, as well as the likelihood - small as it might be – that success is achieved in terms of proportions but not in numbers of people lifted out of food deprivation.

Table 2. $1 a day poverty and undernutrition estimates in eight most populous developing countries

Country	$1 a Day			Undernutrition			Population in 2000
	1990	1995	2000	1990	1995	2000	
China							1275
Incidence (%)	33	17.4	16.6	17	12	11	
Persons (Mns)	381	212	212	193	145	135	
India							1017
Incidence	42.1	42.2	34.7	25	21	21	
Persons	356	393	353	215	195	214	
Indonesia							212
Incidence	17.4	13.9	7.2	9	6	6	
Persons	32	27	15	17	11	13	
Brazil							172
Incidence	14	10.5	8.2	12	10	9	
Persons	21	15	14	19	17	16	
Pakistan							143
Incidence	47.8	33.9	13.4	26	19	19	
Persons	53	42	19	29	24	27	
Bangladesh							138
Incidence	35.9	28.6	36	35	38	32	
Persons	39	35	49	39	48	44	
Nigeria							115
Incidence	59.2	70.2*	…*	13	8	8	
Persons	51	70*	80*	11	8	9	
Mexico							99
Incidence	15.8	8.4	9.8	5	5	5	
Persons	13	8	10	4	5	5	
Totals							
Incidence (weighted)	34.7	27.1	23.7	19.4	15.4	14.6	
Persons (Mns)	945	802	752	524	453	463	

Notes: Some values under 1995 and 2000 are for 1996 and 2001 respectively. FAO undernutrition values are 3-year averages, e.g. 2000 are for 1999-2001.

* Nigeria's 1995 values are actually in 1997. For purposes of estimating weighted incidence and total of eight countries, the same 70.2% incidence was applied to the 1995 and 2000 populations.

… Not available

Sources: UN Statistics Division, MDG Web site

UN Population Division Website

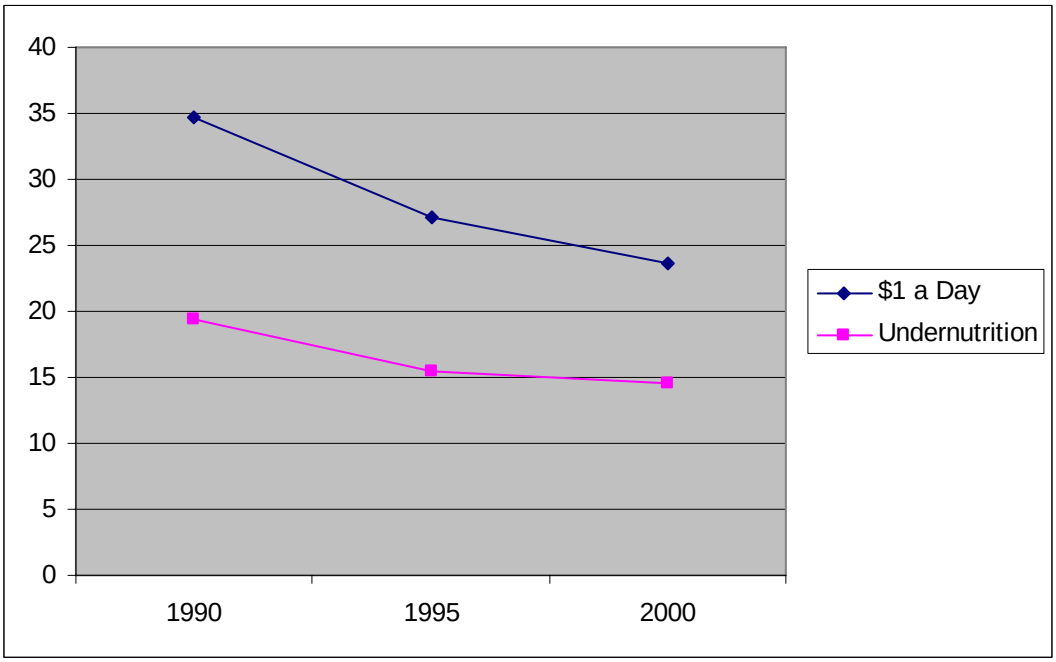

Fig. 1a. $1 a Day Poverty and Undernutrition in Eight Biggest Dev. Countries (%)

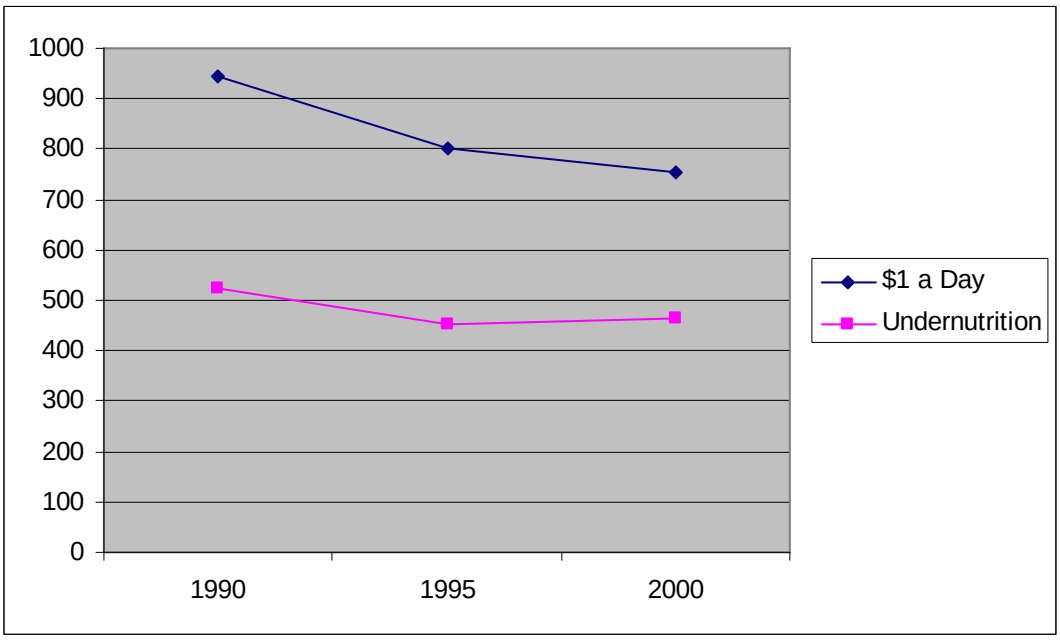

Fig. 1b. $ a Day Poverty and Undernutrition in Eight Biggest Dev. Countries (Million Persons)

discordance in two ways: (1) show much higher estimates than (5) and the two point to opposing trends. It would be paradoxical if the number of extremely poor declines significantly at the same time that number of undernourished increases appreciably.

The discordance is more marked at the country levels. For example, Mexico's proportion of extremely poor persons declined by five percentage points from 1990 to 2000, which when converted to population implied 3 million fewer extremely poor. On the other hand, the proportion of undernourished remained flat at five per cent; this implied more undernourished persons on account of a positive population growth. The discordance is most acute in Nigeria, where in 1990 the estimates for indicators (1) and (5) were 59% and 13% respectively. By 1997 the estimate for (1) pointed to a sharp increase in the proportion of extremely poor people, to 70%. On the other hand indicator (5) showed an improvement from 13 % to 8 % during the same period. These examples emphasize that these indicators are intended mainly for regional and global monitoring and should be used for national assessments – if at all- with great caution.

5.3 Undernourished versus Malnourished or Hungry?

National food poverty lines and FAO's indicator (5) are based on thresholds that are guided by WHO energy requirement or recommended daily allowance (RDA) defined as 'the amount needed to maintain health, growth, and an "appropriate" level of physical activity' (WHO, 1985, p. 34). Thus, while persons who consume less than the RDA may be undernourished, not all of them go hungry – or stay hungry for a long period. Indeed, FAO refers to its indicator as the proportion of the population below the minimum level of dietary energy consumption, or proportion of undernourished persons, or prevalence of undernourishment (FAO, Naiken, op.cit.). It may not, therefore, be an apt indicator for the second target under the first MDG -- halving the proportion of persons who suffer from hunger.[5]

A hunger prevalence indicator can be derived by lowering the energy threshold. Some countries have been doing that. For instance, Bangladesh computes two poverty lines: an absolute poverty line based on a 2,122 kcal threshold and a "hard core poverty line" based on 1,805 kcalories (Ahmed, 2000). A 1971 FAO/WHO Expert Committee on Energy and Protein Requirements accepted a 15% coefficient of variation of energy requirement between individuals in a population or group with similar demographics; (WHO, 1985, p.6). Assuming a normal or bell-shaped distribution of energy requirement in the group, this CV and RDA = 2100 kcal implies RDA - SD = 1785 (which nicely rounds off to 1800 kcal). This could be put forward as justification for Bangladesh's hard core poverty threshold, for instance. Furthermore, WHO (op.cit) and earlier writers (e.g. Sukhatme, 1978) suggest a lower threshold of RDA – 2SD. A 15% CV implies 2SD = 30%, or a lower threshold of 1470 kcal (which rounds off nicely to 1500).

[5] It may be difficult to get a consensus on a conceptual definition of the state of being hungry. This has not stopped survey practitioners from using pragmatic operational definitions; e.g. going hungry means missing a meal during the reference period because there was no food available.

Thus, with a 2100 kcal food poverty threshold that most countries use, a hunger threshold rounded to 1500 may be recommended. In fact, it may be a good idea to have three thresholds, by adding an in-between 1800 kcal.

5.4 Direct Estimation of Food Poverty and Hunger Prevalence

No international agency has resources and reach like the World Bank's to launch an expensive global undertaking such as the International Comparison Program, the results of which are required for updating indicator (1). Hence, the use by FAO of indicator (5) which is in kilocalories and not in different national currencies, and therefore has the potential for direct universal comparability, is commendable. What is needed is to revise the methodology to accept household food consumption surveys as inputs instead of national food supply estimates.[6] Such a move will align the FAO indicator with the others.

Computationally, there are several ways of implementing the new threshold – or any other threshold for that matter. One that is simple is to compare the per capita energy consumption of each household (adjusted into adult equivalent or economies of scale) against 1500. An alternative that is more appealing analytically is to compute the lowered threshold for each household, by reducing the individual age by sex RDAs by the same proportion (e.g. 30%), and compare this against the estimated actual per capita consumption of the same household. More generally, estimating the per capita energy consumption cumulative distribution function (CDF) opens up the flexibility of determining the proportion below any choice of threshold(s). An example is provided sub-section 5.6.

5.5 Multiple Sources of Food Consumption and Nutrition Data

In many developing countries there are specialized agencies that conduct time series surveys on nutrition and food consumption. These are, typically, health and nutrition institutes in either health or science ministries. Their surveys generally employ comparatively more objective methods of data capture than those used by NSOs, e.g. food weighing, clinical observations, and anthropometric and biochemical measurements. They also use specialists such as nutritionists, chemists, and health personnel like nurses data collectors, as opposed to NSO statisticians and enumerators hired (sometimes temporarily) for specific surveys. However, these specialized agencies are often outside their country's national statistical system; hence, their surveys' results get into research reports but seldom in official statistical series.

For example, Vietnam's official poverty statistics are produced by the General Statistics Office (GSO) from its Multipurpose Household Survey up to the 1980s and later from the Vietnamese Living Standard Surveys (VLSS). The National Institute of Nutrition of the Ministry of Health conducts General Nutrition Surveys, the last one in 2000 which had 7,658 sample households. The data capture method was described as a "24-hour recall

[6] It appears that FAO is seriously studying this possibility, as mentioned in FAO-SOFI (State of Food Insecurity) and FIVIMS (Food Insecurity and Vulnerability Information and Mapping System) websites.

combined with controlled weighing …standardized by food weighing as a checking method" (General Nutrition Survey 2000 Report). Adjustments were made for food taken outside the home and for guests.. The quantities so obtained were converted into energy (and other nutrients) units using food composition tables developed by the Institute. Instead of estimating poverty lines in (Vietnamese Dong) as GSO does, the Institute derived empirical CDFs of per capita consumption of nutrients, including kilocalories of energy. The Philippines provides another example which is presented separately in the next subsection for illustrative purposes and to point out problems and potential areas of improvement of food poverty statistics.

5.6 An Illustrative Example

The main source of basic data for poverty measurement in the Philippines is the Family Income and Expenditure Survey (FIES) that the National Statistics Office conducts every three years. Two face-to-face interviews are done, the first in July for data pertaining to the first half of the year, and the second in January for the July-December period. For food, quantities, prices and values are elicited using as recall or reference period either the actual or usual consumption for a week or a month depending on the item. Data from the two visits are combined to derive annualized estimates. The last FIES was conducted in 2003, with a sample of about 41,000 households. As of this writing, preliminary results (of income and expenditure distributions) have been published, but poverty statistics have yet to be released. Clean family level data files (containing food consumption details) also have yet to be made available.

The official poverty rates for Metropolitan Manila or National Capital Region (NCR) for 1997 and 2000 are shown in Table 3. (Why NCR only will become clear shortly). The Philippines methodology in compiling these statistics is unique in Asia in that the food poverty line (fpl) is the cost of the ingredients that go into a prescribed one-day menu that provides 2000 kcal and constructed based on the consumption behavior of poor families. This is inflated into a total poverty line (tpl) using Engel's coefficient for families whose per capita expenditures fall within ± 10 percentage points of fpl. To estimate the poverty incidences (of families), these poverty lines are then compared with household per capita income distribution. The poverty incidences (of persons) is obtained from the sizes of the poor families and inflated to reflect the entire population. Because poor families tend to be bigger, it is seen from Table 3 that family poverty incidence rates are appreciably lower than the population rates. The much higher rates for total poverty compared to food poverty is another noticeable feature of the entries in Table 3. Granted that the costs of other non-food basic needs, particularly housing and transport, are much higher in NCR than in other regions and rural areas especially; nevertheless, it would be important to ask or ascertain whether non-food basic needs should really cause a 3- to 5-fold increase in total poverty from food poverty incidences. (Or, is food poverty incidence underestimated? This question is suggested by alternative data and ways of estimating food poverty incidence, as discussed below.)

Table 3. Official Poverty Rates (%), National Capital Region, Philippines

Type / Year	1997	2000
	Total Poverty	
Families	4.8	5.7
Persons	6.5	7.6
	Food Poverty	
Families	0.6	0.7
Persons	0.8	1.0

Source: National Statistical Coordination Board (NSCB); NSO for basic data.
Note: NSCB also calls food poverty as subsistence poverty or core poverty, and is the estimate of the proportion of families or persons whose per capita income < cost of 2000 kilocalorie menu prescribed for the National Capital Region.

The Food and Nutrition Research Institute (FNRI) in the Department of Science and Technology conducts a National Nutrition Survey (NNS) every five years. The 2003 NNS is a one-fourth sub-sample of the 2003 FIES sample.[7] NNS has four modules: Food Consumption Survey (FCS), Anthropometric Survey, Clinical Survey, and Biochemical Survey. The data capture method used in FCS has been one-day actual weighing of all food items cooked by the sample family in the course of the day, with the sample families spread over the seven days of the week. Left over portions, amounts fed to pets, etc. were weighed also. Family members who ate outside were asked to recall their meals particulars, at the same time that consumption of guests who ate with the family during the day were netted out as well.

The 2003 NNS data are currently being processed; only the questionnaires from the 931 sample families in the National Capital Region (NCR) or Metropolitan Manila have been cleaned and the energy values derived from the NCR-FCS questionnaires. (This is the reason why Table 3 entries are confined to NCR also). Empirical cumulative distribution functions (CDF) of per capita energy consumption were calculated from this sub-sample (Table 4). Owing to the smallish sub-sample and lack of time to compute sampling errors, the results should be regarded as preliminary and mainly for illustration of the method.

There are three choices of denominator for the estimated total family energy consumption, to arrive at family per capita energy consumption. One is the family size, N. Since there is no adjustment at all (for family size, composition, elasticity of need in

[7] The National Statistics Office introduced a new master sample for its household surveys starting in 2003. The sampling design employed replicated sampling with four replicates. All NSO household surveys, e.g. Labor Force Survey, National Demographic and Health Survey, share the same sampling design, with variations only in sampling rates and sample sizes. Other publicly-funded household surveys are encouraged to use the same master sample.

general), the results lead predictably to very high food poverty incidence rates (first row, Table 4). Forty-eight percent of the population consumed less than 1500 kcal per day. The food poverty incidence at the official 2000 kcal threshold is an unrealistically high 83%.

FNRI uses what it calls a total consumption unit (TCU) in place of N. TCU adjusts N downwards taking into account the family's meal pattern and number of meals taken by each member; however, it does not adjust for family size and composition. The results (second row, Table 4), while lower, are still much too high compared to the official estimates (Table 3). Estimates of similar magnitudes have been observed before. These point to the inadequacy of N and TCU for per capita nutrient consumption estimation, as they lead to inordinately high estimates of food deprivation incidence.

A third conceptually and analytically more appealing denominator for total family consumption is N adjusted for elasticities of (food) need. Bantilan et. al. (1992) estimated such elasticity , ϵ , to be 0.7 using a double log function of food expenditure, income, and family size N using data from 1985 FIES.[8] Pending more recent data on food expenditure and income (e.g. from 2003 FIES), $N^* = N^{0.7}$ is tried on the 2003 NCR- FCS data. The results (third row, Table 4) look more reasonable, though still higher than the official estimates. They show a (tentative) 7.9% hunger prevalence and a 22.5% food poverty or dietary energy inadequacy incidence.[9]

Table 4. **Energy Consumption Distributions (% of Population) Using Three Different Divisors for Total Consumption, NCR- Philippines, 2003**

Divisor/Cut-Off (kcal)	<1500	<1800	<2000	<2100
Family Size, N	48.0	74.0	83.0	88.0
Consumption Units, TCU	29.0	53.0	69.0	74.0
Adjusted for Scale Economies, N*	7.9	16.0	22.5	26.3

Source: David, et. al. (2004)

[8] The double-log function relating family food expenditure (F), income (Y) and size (N) is $\log F = \alpha + \beta \log Y + \tau \log N$. F/Y connotes levels of welfare (It is Engel's ratio when Y is replaced by expenditure). For F/Y constant, the family elasticity of income is $\epsilon = (\partial \log Y) / (\partial \log N) = \tau / (1 - \beta)$.

[9] Coincidentally, a private polling company did a survey in the third quarter of 2004. Based on the company's definition that anyone who missed a meal for lack of food during the reference period is considered hungry, hunger prevalence in the NCR was estimated at 15.6% (a figure that was quoted in all the major Philippine dailies). This is very close to the 16.0 incidence in Table 4 under N* and 1800kcal threshold.

5.7. Comparison with Food Poverty Line Method

Estimating a food poverty line (fpl) requires constructing a food bundle or basket that provides the prescribed per capita energy threshold, converting these into energy units, choosing a reference poor population, and collecting the unit prices of the food items in the bundle; then fpl = Σ pq , where p is price, q is quantity, and the summation is over the items in the bundle. To estimate food poverty incidence, fpl is compared against either the household per capita income or expenditure distribution that is estimated from an income and expenditure survey.

On the other hand, all that the direct food poverty estimation method described in sub-section 5.6 needs are household food consumption data in quantities for each food item. These are converted into energy units and into per capita energy consumption using an appropriate divisor. The per capita energy consumption distribution is estimated (e.g. an empirical CDF), from which the proportion of the population below any chosen energy threshold is readily determined. Prices, choosing a reference population, collecting income or expenditure data do not enter the picture. Thus, work on improving basic data quality can be concentrated on accurately measuring food consumed. To the extent that a person is a person and a calorie is a calorie (disregarding quality difference between sources of calories for the moment), then the estimates are, or can be easily made comparable across space and time. An empirical CDF allows an assessment of the sensitivity of the food poverty estimates to different choices of energy threshold. For instance, a shift by the Philippines of its current 2000 kcal threshold to 2100 that is used by most countries, would mean a 3.8 percentage points increase in the food poverty incidence estimate (last row, Table 4). Last but not least, the method is uniformly applicable to protein, vitamin A and any other nutrient of choice. It can be generalized to more than one nutrient, e.g. by estimating the joint per capita consumption of energy and protein.

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