



# Poverty and Inequality in Bhutan

## Computation of a National Poverty Line, and Derived Poverty and Inequality Indicators

### Background

NSB to write a few paragraphs on Bhutan's commitment to alleviate poverty, on how the measurement of poverty is related to the goal of gross national happiness.

This paragraphs could refer to the Millennium Development Goals, and to the measurement of poverty based on internationally recommended income-based poverty measurement methods, not as a substitute but as a complement to other important dimensions of welfare (basic needs, etc).

The paragraphs should also mention that a pilot poverty line had been established based on HIES 2000, but that data was not fully satisfactory. With BLSS 2003, NSB obtained a better dataset. Although a similar method was used to compute the poverty line, the results of these two surveys should not be compared. The main reason for non-comparability is that consumption was aggregated using different rules, and that a different set of regional price deflators was used.

### Acknowledgment

Population for providing information.  
NSB staff for hard work  
ADB for funding and technical support.

### The Bhutan Living Standards Survey (BLSS) 2003

The source of data used to compute the poverty line and the related poverty and inequality indicators is the Bhutan Living Standard Survey (BLSS) 2003, conducted by NSB with the support

of the Asian Development Bank. Data was collected between [month] 2003 and [month] 2003 on a sample of 4007 households, out of an initial sample of 4200. The geographical coverage extended over the entire area of Bhutan with the exception of some rural gewogs in [Dzongkhas], not accessible at the time of the survey.

This sample represents a total extrapolated population of 546,099 people. This figure is an estimate based on the sample frame, which does not cover the whole population of the Kingdom.

The population coverage included all households in the country except the following:

- Households of expatriates;
- Residents of hotels, boarding and lodging houses, monasteries including nunneries, school hostels, orphanages, rescue homes, vagrant houses, and under-trail in jails and indoor patients of the hospitals, nursing homes etc.; and
- Barracks of military and paramilitary forces including the police.

The survey collected data on household expenditure, as well as on households' characteristics (demographics, education, health, assets ownership, sources of income, housing, employment, priorities, etc).

The survey had a double objective: (i) establish a comprehensive poverty profile of Bhutan; (ii) provide detailed data on household consumption and expenditure, for the purpose of updating the reference consumption basket used for computing the consumers' price index (CPI), and the rebasing the CPI and national accounts (using 2003 as new base year).

## Methodology of Poverty Measurement

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A method widely used in developing countries was used to compute a national poverty line.

A household is said to be poor if its income or consumption level is insufficient to acquire a given level of goods and services regarded as essential for a minimum standard of living.

Poverty is measured at the household level. Data does not allow intra-household analysis. If a household is considered poor, then all its members are considered poor. If a household is non-poor, then none of its member is poor.

The poverty line is established at a level of consumption that assures basic needs are met. Details on the computation of household consumption are provided in Technical Note 1. Consumption includes items purchased, produced, and received.

The national poverty line is made of two components: (i) a food poverty line, giving the cost of a bundle of goods attaining a pre-determined minimum food energy requirement, and (ii) an allowance for basic non-food goods. The approach to compute the national poverty line thus involves two steps:

1. Computation of a *food poverty line* by setting and valuation a basic needs food bundle. The basket of goods must be consistent with the observed consumption patterns among low-income households in the country, and represent a certain nutritional value.
2. Valuation of the non-food component of the basic needs bundle, to obtain an *overall poverty line*.

### Food Poverty Line

The food poverty line is constructed on the basis of calorie requirements of individuals. It is assumed that, with the typical Bhutanese diet, households that fulfill the calorie requirements automatically fulfill the protein requirements. The calorie norms vary from country to country. Since no specific food energy requirement is available for the Bhutanese population, the norm applied in Nepal was used, i.e. 2,124 Kcal. per day per person.

The composition of the food basket for the food poverty line must bear resemblance to actual typical eating habits of the poor. This involves a certain degree of arbitrariness. We chose to consider the poorest 40 percent of the population (based on nominal per capita consumption) as

the reference group. Further, although some differences exist in regional patterns of consumption, one single national food basket was used.

Not all food items were retained. We retained only those for which both data on quantity consumed (in standard measurement units), and data on calories intake, was available. We obtained a typical food bundle of  $x$  products. These products account for  $x\%$  of the consumption of the poorest 40%,  $x\%$  of the consumption of the total population.

The quantity of each item in the reference bundle is scaled in such a way that it provides a total of 2,124 Kcal per day. Based on these quantities, the cost of the bundle was estimated, using the national median of unit prices. The cost of purchasing such a bundle was estimated at 396 Nu. per month, which corresponds to the food poverty line (per capita). Technical Note 2 provides detailed information on the composition and the valuation of the food bundle.

### Non-food Allowance and Overall Poverty Line

Having set the food poverty line, a non-food allowance was added to obtain an overall poverty line that incorporates both food and non-food needs.

This was done by scaling up the food poverty line by some factor to allow for the purchase of essential non-food items. This factor was computed by measuring what is the typical value of non-food spending by a household that is just able to reach its food requirements. Details on this computation is available in Technical Note 3.

The overall poverty line was estimated at 719 Nu. per capita month.

## Regional Price Deflators

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Prices differ from region to region. What matters is the "real" consumption of households, not their nominal consumption. To obtain the real values, the nominal consumption must be deflated by regional price deflators.

No such deflators were available. Paasche regional price deflators were thus computed for food items using the BLSS data. The Paasche price deflators, which are specific to each household as they are based on every household consumption pattern, are the most appropriate for money-metric measurement of poverty.

The deflators were computed using the median national unit prices of each food item as reference. Details on these computations are provided in Technical Note 4. Table 1 below provides the median of the food regional price deflators by region.

**Table 1. Paasche regional price deflators, by dzongkha (median of household-level deflators)**

Urban	1.06	Rural	0.98
Chukha	.95	Chukha	.89
Ha	1.03	Ha	.95
Paro	1.02	Paro	1.01
Thimphu	1.09	Thimphu	1.08
Punakha	1.06	Punakha	1.03
Gasa	1.03	Gasa	.99
Wangdi	1.04	Wangdi	1.02
Bumthang	1.24	Bumthang	1.19
Trongsa	1.12	Trongsa	1.04
Zhemgang	1.08	Zhemgang	.97
Lhuntshi	1.10	Lhuntshi	.99
Mongar	1.06	Mongar	.96
Trashigang	1.13	Trashigang	.98
Yangtse	1.12	Yangtse	.97
Pemagatshel	1.03	Pemagatshel	.88
Samdrup	.92		
Jongkhar			
Samtse	.90	Samtse	.80
Sarpang	.92	Tsirang	.99
Tsirang	.99	Dagana	1.05
Dagana	1.07		

No price data was available for non-food items. We therefore used the food regional price deflators as overall regional price deflators. [Yeshey: is there data on prices for some non-food items in the community questionnaire, which we could use to compute non-regional price deflators?]

## Poverty Indicators

Having established the overall poverty line, we can identify poor households by identifying those that have real consumption below the poverty line. We can also determine the extent by which household consumption fall below the poverty line. This leads to the computation of the poverty incidence, poverty gap index, and poverty severity index.

### Poverty Incidence

A household is considered poor if its real consumption falls below 719 Nu per capita per month.

Since consumption data is only available at the household level (not on intra-household allocations), either all members of a household or none are considered poor.

Table 2 provides the incidence of poverty, both in terms of percentage of poor people and percentage of poor households. Since poor household tend to be larger than non-poor, the proportion of poor households is inferior to the proportion of poor people. The most relevant information for policy making is the percentage of poor people (not households). More information on the computation of the poverty incidence is available in Technical Note 5.

**Table 2. Poverty incidence by geographic location (% of population, national poverty line)**

	% of Population	% of Households
National	30.1	23.4
Urban	3.3	2.4
Rural	36.4	29.6

The incidence of poverty can be measured for different categories of population (e.g. by education level, gender, economic activity of the head of household, main source of income, etc). The next analytical briefs will provide such cross tabulations by theme (education, health, economic activities, etc), which will provide a comprehensive poverty profile of Bhutan.

National poverty lines are country-specific. They are based on different methods and different datasets. They are therefore not strictly comparable. For information, we however provide in the table below the poverty incidence in some other countries in the region, based on their own national poverty lines.

**Table 3. Poverty incidence in selected Asian developing countries (% of population, based on national poverty lines)**

Country /Year	Poverty Incidence (% population)		
	National	Urban	Rural
Bangladesh (2000)	44.3	52.5	42.3
<b>Bhutan (2003)</b>	<b>30.1</b>	<b>3.3</b>	<b>36.4</b>
Cambodia (1999)	35.9	18.2	40.1
India (2000)	28.6	24.7	30.2
Malaysia (1999)	7.5	3.4	12.4
Nepal (1999)	38.1	...	...
Philippines (2000)	33.7	20.4	47.4
Thailand (2001)	13.0	5.5	16.6
Viet Nam (1998)	37.4	9.0	44.9

### Poverty Gap Index

Poverty line doesn't say how poor are the poor. Not the same to be just below or well below poverty line. Poverty gap gives weight to distance to poverty line. P1. Formula:

The poverty gap index is the average depth of poverty for the population. For one individual, the depth of poverty is the proportion by which that individual is below the poverty line (it has a value of 0 for all individuals above the poverty line). The poverty gap index is thus the sum of the depth of poverty of each individual, divided by the total number of individuals in the population. This gives a good indication of the depth of poverty, in that it depends on the distances of the poor below the poverty line.

More information on the computation of the poverty incidence is available in the Technical Note 5.

**Table 4. Poverty Gap Index (national poverty line)**

National	0.0865
Urban	0.0068
Rural	0.1054

### Poverty Severity Index

The poverty severity index is similar to the poverty gap index, except that more weight is given to very poor than to less poor households in its computation. It is calculated as the average value of the square of depth of poverty for each individual (see more in Technical Note 5).

**Table 5. Poverty Severity Index (national poverty line)**

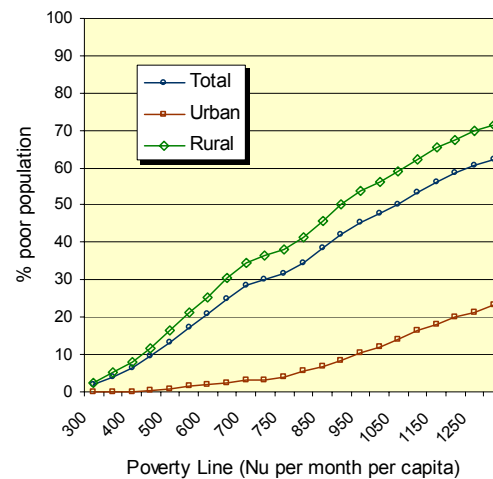
National	0.0348
Urban	0.0018
Rural	0.0426

### Sensitivity to Poverty Line

The computation of a national poverty line is based on some arbitrary methodological choices.

The extent to which the poverty incidence is sensitive to the choice of the poverty line can be seen by computing the poverty incidence corresponding to different poverty lines (fig.1 and table 6).

**Fig. 1. Poverty incidence by level of the poverty line**



**Table 6. Poverty incidence for various poverty lines**

Poverty Line	Poverty Incidence (% population)		
	National	Urban	Rural
300	2.1	0.0	2.6
350	4.1	0.0	5.1
400	6.4	0.1	8.0
450	9.6	0.3	11.8
500	13.3	0.7	16.4
550	17.3	1.5	21.1
600	20.8	2.2	25.2
650	25.1	2.6	30.5
700	28.5	3.1	34.5
<b>719</b>	<b>30.1</b>	<b>3.3</b>	<b>36.4</b>
750	31.6	4.2	38.1
800	34.6	5.5	41.5
850	38.5	7.0	45.9
900	42.3	8.4	50.3
950	45.4	10.5	53.7
1000	47.6	12.0	56.1
1050	50.4	14.2	59.0
1100	53.3	16.3	62.1
1150	56.4	17.9	65.5
1200	58.5	19.9	67.6
1250	60.5	21.2	69.8
1300	62.4	23.4	71.6

Poverty line in Nu per capita per month.

## Inequality Indicators

### Quintile distribution

Each quintile contains 20 percent of population, ranked by ascending order of per capita consumption.

**Table 7. Mean monthly per capita consumption (Nu), and share of national consumption, by population quintile, National**

Population Quintile	Mean Consumption (Nu per capita per month)	Share in National Consumption (%)
Poorest	441.6	5.3
Second poorest	726.4	8.7
Middle	1040.1	12.7
Second richest	1580.8	19.7
Richest	4289.5	53.7
<b>Total</b>	<b>1615.9</b>	<b>100%</b>

Ratio of fifth to first quintile: 10.13

**Table 8. Mean monthly per capita consumption (Nu), and share of national consumption, by population quintile, Urban**

Population Quintile	Mean Consumption (Nu per capita per month)	Share in Urban Consumption (%)
Poorest	910.4	6.2
Second poorest	1454.6	9.8
Middle	2002.3	13.5
Second richest	2843.9	19.4
Richest	7624.6	51.1
<b>Total</b>	<b>2964.4</b>	<b>100%</b>

Ratio of fifth to first quintile: 8.24

**Table 9. Mean monthly per capita consumption (Nu), and share of national consumption, by population quintile, Rural**

Population Quintile	Mean Consumption (Nu per capita per month)	Share in Rural Consumption (%)
Poorest	413.1	6.2
Second poorest	651.2	9.8
Middle	908.9	13.9
Second richest	1291.3	20.1
Richest	3216.1	50.0
<b>Total</b>	<b>1295.7</b>	<b>100%</b>

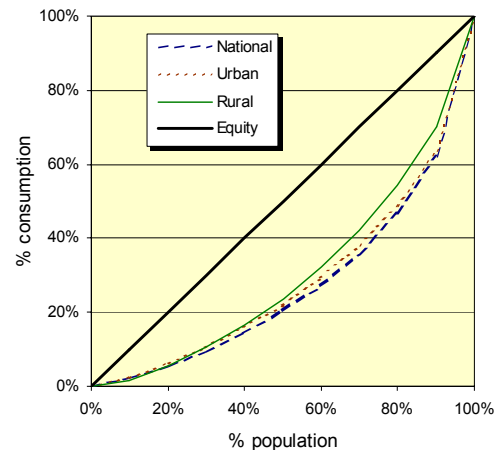
Ratio of fifth to first quintile: 8.06

### Lorenz Curve

The Lorenz curve maps the cumulative consumption share on the vertical axis against

the distribution of the population on the horizontal axis. If each individual had the same income, or total equality, the income distribution curve would be the straight line in the graph.

**Fig. 2. Lorenz Curve, National, Urban, and Rural**



### Gini coefficient

The Gini coefficient is a measure of concentration of expenditure (or income). The ratio ranges from zero (complete equality) to one (complete inequality, when one person spends/owns everything).

If income is distributed completely equally, then, the Gini coefficient is zero; if only one individual owns all income, it is one. The Gini coefficient of inequality varies between 0, (or complete equality) of income to 1, (or complete inequality, one person has all the income, all others have none).

**Table 10. Gini coefficient**

National	0.47
Urban	0.44
Rural	0.42

### Atkinson Index

The Atkinson class of measures ranges from 0 to 1, with zero representing no inequality. It is computed for various values of a parameter  $\epsilon$  indicating the society's aversion for inequality (the higher the value of  $\epsilon$  the more the society is concerned about inequality). See Technical Note 6 for more information.

**Table 11. Atkinson index for various parameters of aversion for inequality**

$\epsilon = 2$	$\epsilon = 2$	$\epsilon = 2$	$\epsilon = 2$
...	...	...	...

## Next briefs

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Subsequent BLSS Analytical Briefs will report on the demographics profile of the poor, poverty and education, health, housing, assets ownership, consumption patterns, priorities of the poor, etc. These notes will provide a comprehensive poverty profile of Bhutan.

Other Briefs, more technical, will be produced on the identification of poverty predictors (proxies) for future monitoring, computation of Paasche and Laspeyres regional price deflators specific to some categories of the population, updating of the CPI reference basket of goods, etc.

### Contact Us

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The analytical briefs will be disseminated by e-mail, free of charge, to all interested readers. To subscribe, please send us an e-mail mentioning your name, title, and organization.

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# Technical Notes

## Technical note 1

### Measuring household consumption

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Computations were made following the recommendations by A. Deaton and S. Zaidi.

#### Income versus consumption

In most industrialized countries living standards and poverty are assessed with reference to income, not consumption. The empirical literature on the relationship between income and consumption has established, for both rich and poor countries, that consumption that consumption is smoother and less-variable than income. Observing consumption over a relatively short period, even a week or two, will tell us a great deal more about annual—or even longer period—living standards than will a similar observation on income. Although consumption has seasonal components they are of smaller amplitude than seasonal fluctuations in income in agricultural societies.

There are several other reasons why it is more practical to gather consumption than income data. Where self-employment, including small business and agriculture, is common, it is notoriously difficult to gather accurate income data, or indeed to separate business transactions from consumption transactions.

#### Food consumption

Households consume food obtained from a variety of different sources, and so in computing a measure of total food consumption to include as part of the aggregate welfare measure, it is important to include food consumed by the household from all possible sources. In particular, this measure should include not just (i) food purchased in the market place, including meals purchased away from home for consumption at or away from home, but also (ii) food that is home-produced, (iii) food items received as gifts or remittances from other households, as well as (iv) food received from employers as payment in-kind for services rendered.

The food consumption module questionnaire contains separate sets of questions on (a) purchased and (b) non-purchased food items.

The food purchases module contains questions on purchases of a fairly comprehensive list of

food items (a) during a relatively short reference period, i.e. the last two weeks, and during a typical month in which such purchases were made. Data are collected on the total amount spent on purchasing each food item, and also on the quantities purchased, during the specified reference period.

Calculating the food purchases sub-aggregate involves converting all reported expenditures on food items to a uniform reference period—one year—and then aggregating these expenditures across all food items purchased by the household.

The literature reviewed in Deaton and Grosh leads to a recommendation in favor of the use of “usual month” data measure over the “last two weeks”. The latter tends to be biased by progressive forgetting, as well as the occasional intrusion of purchases from outside the period. The former has the advantage of being closer to the concept that we want—usual consumption is a better welfare measure than what actually happened in the last two weeks, which could have been unusual for any number of reasons—and reduces problems with seasonality, but suffers from measurement error if respondents find it difficult to calculate a reasonable answer.

The survey also asked explicitly about the total value of meals taken outside the home by all household members; this amount was also included in the food consumption aggregate.

The questionnaire contains a separate set of questions on consumption of home-produced food items. Data were collected on both the value and quantity of consumption of each home-produced food item. The home-production food sub-aggregate can thus be calculated by adding the reported value of consumption of each of the home-produced food items in a manner analogous to that followed in the case of food purchases.

Consumption of food derived from payment in-kind, as well as in the form of gifts, remittances, etc., was added to the overall food aggregate.

Some quantities were not reported in standard units. We used data from the standardization survey to convert, using region specific conversion rates.

Due to interviewer error—or a variety of other reasons—we found households consuming non-zero quantities of a particular item, but where data on the total value of consumption may be missing. Others had quantities, but no value. Others had inconsistent data on quantity and value (outliers of unit price). In such instances, median regional unit prices were used to make imputations. Median prices were preferred to mean prices, as they are less sensitive to outliers. Median was computed and used separately for purchased items and produced items.

When median price was not available at the lowest geographic level, we used prices reported by other households in the same town, dzongkha, or stratum, depending on whichever is the next higher level of aggregation for which price information is available.

### **Non-food consumption**

Unlike many homogeneous food items, most non-food goods are too heterogeneous to permit the collection of information on quantities consumed, so that BLSS collected data only on the value of non-foods purchased over the reference period. Data on purchases of non-food items were collected for different recall periods, i.e. over the past month, or the past 12 months, depending on how frequently the items concerned are typically purchased. Constructing the non-food aggregate thus entails converting all these reported amounts to a uniform reference period—one year—and then aggregating across the various items.

Not all non-food expenditures should be included in the consumption aggregates. Some other "expenditures" require imputations.

### **Housing**

What is required is a measure in monetary terms of the flow of services that the household receives from occupying its dwelling. Because house purchase is such a large and relatively rare expenditure, under no circumstances should expenditures for purchase be included in the consumption aggregate.

In the hypothetical case where rental markets function perfectly and all households rent their dwellings, the rent paid is the obvious choice to include in the consumption aggregate. Whenever such rental data are available, they were used for constructing the housing sub-aggregate and the consumption total.

In most cases, however, households own the dwelling in which they reside and do not pay rent

as such. Others are provided with housing free of charge (or at subsidized rates) by their employer, a friend, a relative, government, or other such entities. Non-renter households were asked how much it would cost them if they had to rent the dwelling in which they reside, and this "implicit rental value" was used in place of actual rent.

Expenditure on house repairs and improvements were excluded.

### **Taxes**

Expenditures on taxes and levies are not part of consumption, and were not included in the consumption total.

### **Repayment of debt and interest payments.**

All purchases of financial assets, as well as repayments of debt, and interest payments were excluded from the consumption aggregate.

### **Education**

Education expenditure paid by the households were included. We also estimated the "cost" of the education provided by the government by level of education, and imputed this cost to the household consumption.

- Grade 0 to 6: 5,751 Nu per year
- Grade 7 to 8: 5,975 Nu per year
- Grade 9 to 12: 8,701 Nu per year
- Grade 13 to 15: 71,150 Nu per year

We computed two sets of consumption data. One includes this cost. For the purpose of poverty assessment, the cost of education provided by the government was not considered.

### **Health**

Expenditure on health is an often lumpy expenditure. One argument for exclusion is that such expenditure reflects a regrettable necessity that does nothing to increase welfare. By including health expenditures for someone who has fallen sick, we register an increase in welfare when, in fact, the opposite has occurred. The fundamental problem here is our inability to measure the loss of welfare associated with being sick, and which is (presumably) ameliorated to some extent by health expenditures.

Including the latter without allowing for the former is clearly incorrect, though excluding health expenditures altogether means that we miss the difference between two people, both of whom are sick, but only one of which pays for treatment. It is also true that some health expenditures—for



example cosmetic expenditures—are discretionary and welfare enhancing, and that it is difficult to separate “necessary” from “unnecessary” expenditures, even if we could agree on which is which. It is also difficult without special health questionnaires to get at the whole picture of health financing. Some people have insurance, so that expenditures are only “out of pocket” expenditures which may be only a small fraction of the total, while others have none, and may bear the whole cost. Simply adding up expenditures will not give the right answer.

Expenditure on hospitalizations, consultations, and analyses were excluded from the household consumption. Purchase of medicine was however included.

### Remittances

Another group of expenditures are charitable contributions, and remittances to other households. Their inclusion in the consumption aggregate would involve double-counting if, as one would expect, the transfers show up in the consumption of other households. We therefore excluded them from household consumption.

### Lumpy expenditures

While almost all households incur relatively large expenditures on relatively infrequent expenditures such as marriages and dowries, births, and funerals at some stage, only a relatively small proportion of households are likely to make such expenditures during the reference period typically covered by the survey. Ideally, we would want to “smooth” these lumpy expenditures, spreading them over several years, but lacking the information to do so—which might come, for example, by incorporating multi-year reference periods for such items—we left them out of the consumption aggregate.

### Durable Goods

Another important group of items to consider are items such as consumer durables whose useful life typically spans a time-period greater than the interval for which the consumption aggregate is being constructed.

From the point of view of household welfare, rather than using expenditure on purchase of durable

goods during the recall period, the appropriate measure of consumption of durable goods is the *value of services* that the household receives from all the durable goods in its possession over the relevant time period.

To assess the value of services, one would need data on the cost of purchase and year of purchase. Such information is not available in BLSS. Consumption of durable goods was thus not included in the overall consumption aggregate.

## Technical note 2

### Computing the food poverty line

BLSS 2003 collected data on xx different food items. 34 items for which data was available in standard quantity unites, and for which calories intake data was also available, were retained to create a reference food bundle (see table below). These 34 goods account for XX% of the total national consumption.

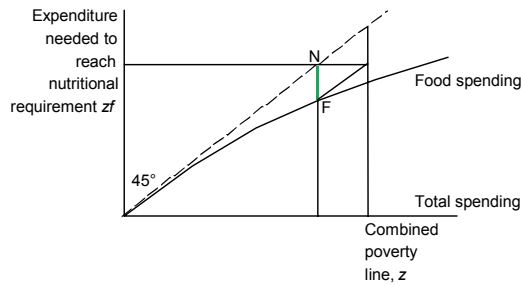
	Edible share	Calories per unit	Quantity	Calories intake	Median unit cost	Cost
Rice Bhutanese	1	3.46	71.8	248.43	0.023	1.666
Rice Bhog	1	3.46	1.17	4.05	0.019	0.022
Rice fine	1	3.49	46.06	160.75	0.012	0.553
Rice FCB	1	3.46	126.97	439.32	0.011	1.397
Other Rice	1	3.46	46.39	160.51	0.012	0.557
Maize	1	3.42	152.01	519.87	0.010	1.520
Ata,Maida,Kapchi	1	3.41	14.49	49.41	0.012	0.174
Pulses	1	3.45	5.85	20.18	0.030	0.176
Fresh Milk	1	0.67	27.42	18.37	0.015	0.411
Milk powder	1	4.96	1.99	9.87	0.135	0.269
Local butter	1	7.29	7.54	54.97	0.150	1.131
Eggs	1	75	0.09	6.75	2.500	0.225
Fresh fish	0.78	0.97	1.34	1.01	0.060	0.080
Dried fish	1	2.55	6.82	17.39	0.060	0.409
Fresh Beef	1	1.14	5.7	6.50	0.040	0.228
Fresh pork	1	1.14	5.77	6.58	0.080	0.462
Fresh chicken	1	1.09	3.15	3.43	0.075	0.236
Fresh yak	1	1.14	0.43	0.49	0.070	0.030
Fresh mutton	1	1.94	1.29	2.50	0.100	0.129
Dried Beef	1	2	2.08	4.16	0.140	0.291
Apple	0.9	0.59	0.81	0.43	0.040	0.032
Orange	0.67	0.48	29.65	9.54	0.007	0.199
Mango	0.74	0.74	1.11	0.61	0.030	0.033
Banana	0.71	1.16	102.99	84.82	0.001	0.103
Beans	1	1.58	14.2	22.44	0.018	0.256
Tomatoes	0.98	0.23	6.19	1.40	0.015	0.093
Potato	0.85	0.97	65.27	53.82	0.008	0.522
Onions	0.95	0.5	10.73	5.10	0.015	0.158
Cauliflower	0.7	0.3	1.93	0.41	0.012	0.023
Mustard Oil	1	9	15.09	135.81	0.060	0.905
Refined vegetable	1	9	1.34	12.06	0.056	0.075
Soya refined oil	1	9	0.62	5.58	0.060	0.037
Green chillies	1	0.29	16.14	4.68	0.020	0.323
Sugar/gur	1	3.98	13.28	52.85	0.022	0.292
Quantities in grams or ml, except eggs in pieces.						
Cost in Nu.				2124 Kcal	13.017 per day	
					395.92 per month	

### Technical note 3

#### Computing the non-food component of the poverty line

Having set the food poverty line, a non-food component must be added to obtain an overall poverty line that incorporates both food and non-food needs. The non-food needs must be consistent with the consumption behavior of those who can just afford their basic food needs.

The total poverty line is obtained by scaling up the food poverty line, to allow for the purchase of some essential nonfood items to reach a final poverty line.



The most commonly used method is to determine the average level of total consumption of those people whose food consumption is just equal to the food poverty line. This level of total consumption is then used as the final poverty line.

The best solution is to measure what is the typical value of non-food spending by a household that is just able to reach its food requirements. This will equal the lowest level of non-food spending for households that are able to acquire the basic food bundle. It can thus be considered a minimal allowance for nonfood goods.

A good first approximation of the poverty line  $z_t$  can be obtained using the following formula:

$$z_u = z_f / \tilde{w}, \quad \tilde{w} = (\alpha + \beta) / (1 + \beta)$$

where  $\alpha$  and  $\beta$  are the parameters of the food-share demand system:

$$w = \alpha + \beta \log(x/z_f) + \varepsilon$$

where  $w$  denotes the budget shares for food,  $x$  is the total household per capita expenditure,  $z_f$  is the food poverty line,  $\alpha$  and  $\beta$  are real parameters, and  $\varepsilon$  is the error term with standard properties. It follows that  $\alpha$  represents the food budget share when  $x = z_f$ .

$\alpha$	0.613
$\beta$	-0.139
Adjusted $R^2$	0.424
<b><math>z_f</math> (food poverty line)</b>	<b>395.77 Nu</b>
$(\alpha + \beta) / (1 + \beta)$	0.5505
<b><math>z_u</math> (total poverty line)</b>	<b>718.90 Nu</b>

Note: poverty lines are expressed in national median prices.

### Technical note 4

#### Computing regional price deflators

Before our measure of consumption could be used to compare standards of living of individuals residing in different parts of the country, it is necessary to take into account differences in cost of living.

To convert total expenditure into money metric utility, the price index must be tailored to the household's own demand pattern, a demand pattern that varies with the household's income, demographic composition, location, and other characteristics. The calculation of money metric utility requires that the nominal aggregate be deflated by a Paasche price index, in which the weights vary from household to household.

Data collected by the BLSS were used to construct these regional price deflators. The Paasche price index for household  $h$  is given by:

$$P_P^h = \left( \sum w_k^h (p_k^0 / p_k^h) \right)^{-1}$$

where  $p_k^0$  is the reference unit price for good  $k$ ,  $p_k^h$  is the unit price paid for good  $k$  by household  $h$ , and  $w_k^h$  is the share of household  $h$ 's budget devoted to good  $k$ . The weights used for the price index are the quantities consumed by the household itself and therefore differ from one household to another. In other words, these indexes involve, not only the prices faced by household  $h$  in relation to the reference prices, but also household  $h$ 's expenditure pattern, something that is not true of a Laspeyres index.

The reference price vector  $p^0$  is inevitably selected as a matter of convenience, but should not be very different from prices actually observed. A good choice is to take the median of the prices observed from individual households.

The use of a national median price vector ensures that the money metric measures conform as closely as possible to national income accounting practice, as well as eliminating results

that might depend on a price relative that occurs only rarely or in some particular area.

Quantities and unit values were available at the household level only for foods items. For nonfoods, data is not available at the household level.

## Technical note 5

### Computing poverty indicators

#### Incidence of poverty (P0)

The incidence of poverty is the proportion of the population that is poor (percentage of the total population below the poverty line). The percentage of households below the poverty line may also be computed (since poor households usually have a smaller size, the proportion of poor households is usually lower than the proportion of poor population).

$$P_0 = q/n$$

where P0 is the proportion of population deemed to be poor (poverty headcount), q is the number of poor people (below the poverty line), and n is the total population.

The fact that poverty calculations are based on a sample of households, or a subset of the population, carries implications. Samples are designed to reproduce the whole population, but they can never be as exact as information that covers everybody in the country. They carry a margin of error, as do poverty rates calculated from these sample surveys.

#### Poverty Gap Index (P1) and Income Gap Ratio

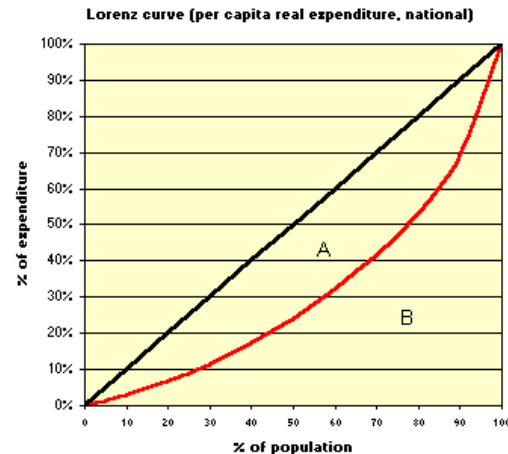
For one individual, the depth of poverty is the proportion by which that individual is below the poverty line (it has a value of 0 for all individuals above the poverty line).

The poverty gap index is the average depth of poverty for the population. This is the sum of the depth of poverty of each individual, divided by the total number of individuals in the population. This gives a good indication of the depth of poverty, in that it depends on the distances of the poor below the poverty line.

This can also be written as  $P_1 = H * (z - y^p / z)$  where  $(z - y^p / z)$  is referred to as the "income gap ratio" (= mean depth of poverty as a proportion of the poverty line).

$$P_1 = \frac{1}{n} \sum_{i=1}^q \frac{(z - y_i)}{z}$$

The income gap ratio is not a good poverty measure. To see why, suppose that someone just below the poverty line is made sufficiently better off to escape poverty. The mean of the remaining poor will fall, and so the income gap ratio will increase. And yet one of the poor has become better off, and none are worse off; one would be loathe to say that there is not less poverty, and yet that is what the income gap ratio would suggest. This problem doesn't arise if the income gap ratio is multiplied by the head count index to yield P1.



The poverty gap index doesn't tell us how the poverty is distributed among individuals; it may not convincingly capture differences in the severity of poverty. The poverty gap will be unaffected by a transfer from a poor person to someone who is less poor.

**The poverty severity index** gives a weight to the poverty gap (more weight to very poor than to less poor).

It is the average value of the square of depth of poverty for each individual. Poorest people contribute relatively more to the index.

$$P_2 = \frac{1}{n} \sum_{i=1}^q \left( \frac{(z - y_i)}{z} \right)^2$$

While this measure has clear advantages for some purposes, such as comparing policies which are aiming to reach the poorest, it is not easy to interpret. For poverty comparisons, however, the key point is that a ranking of dates, places or policies in terms of P2 should reflect well their ranking in terms of the severity of poverty. It is the ability of the measure to order distributions in a better way than the alternatives that makes it useful, not the precise numbers obtained.

## Technical note 6

### Computing inequality indicators

#### Gini Coefficient

Graphically, the Gini coefficient can be easily represented by different areas of the *Lorenz curve*. The Gini coefficient is calculated as the area A divided by the sum of areas A and B.

If income is distributed completely equally, then, the Gini coefficient is zero; if only one individual owns all income, it is one. The Gini coefficient of inequality varies between 0, or complete equality of incomes/ expenditures, to 1, or complete inequality (one person has all the income, all others have none).

The Gini coefficient calculated for individual-level per capita consumption is given by

$$\gamma = \frac{N+1}{N-1} - \frac{2}{N(N-1)x_w} \sum_{h=1}^H w_h n_h x_h [\rho_h + 0.5(n_h - 1)]$$

where  $N$  is the total population (extrapolated),  $x_w$  is the mean per capita consumption,  $w_h$  is the household sample weight,  $n_h$  is the size of household  $h$ ,  $x_h$  is the per capita consumption of household  $h$ , and  $\rho_h$  is the rank of the first person in household  $h$  (prior to computing the Gini coefficient, households must be ranked by descending order of their per capita consumption. The first person in the best-off household is then given rank 1. For the next households, the rank is given by  $\rho_{h+1} = \rho_h + n_h w_h$ ). (Deaton, 1997)

#### Atkinson index

The Atkinson class of measures has the general formula:

$$A_\varepsilon = 1 - \left[ \frac{1}{n} \sum_{i=1}^n \left[ \frac{y_i}{y} \right]^{1-\varepsilon} \right]^{\frac{1}{(1-\varepsilon)}}$$

where  $\varepsilon$  is an inequality aversion parameter,  $0 < \varepsilon < \infty$ : the higher the value of  $\varepsilon$  the more society is concerned about inequality. The Atkinson class of measures ranges from 0 to 1, with zero representing no inequality. (Litchfield, 1999)

The higher  $\varepsilon$ , the more sensitive the Atkinson index is to expenditure differences at the bottom of the distribution.