Chapter 3. Poverty Lines

Summary

The poor are those whose expenditure (or income) falls below a poverty line. This chapter explains how poverty lines are constructed and discusses the strengths and weaknesses of defining poverty lines based on three methods: the cost of basic needs, food energy intake, and subjective evaluations. The construction of a poverty line is the most difficult step in the practical measurement of poverty.

Most commonly used is the ***cost of basic needs approach***. It first estimates the cost of acquiring enough food for adequate nutrition – usually 2,100 Calories per person per day – and then adds on the cost of other essentials such as clothing and shelter. When price information is lacking, one may use the ***food energy intake method***, which graphs expenditure (or income) per capita against food consumption (in Calories per person per day); from this one may determine the expenditure (or income) level at which a household acquires enough food. ***Subjective poverty lines*** are based on asking people what minimum income level is needed in order to just make ends meet.

An absolute poverty line remains fixed over time – adjusted only for inflation – as in the United States. It allows one to track the evolution of poverty over time, and is also useful when evaluating the effects of policies and programs on the incidence of poverty. However, in most countries poverty lines are revised from time to time; these allow one to measure relative but not absolute poverty, but typically reflect the evolution of social consensus about what constitutes poverty.

The choice of poverty line depends on the use to which it will be put: thus for international comparisons the $1/day standard is helpful, while for targeting the poor a relative poverty line suffices. The appropriate choice of poverty line is a matter of judgment, and will therefore vary from country to country.

Learning Objectives

After completing the module on poverty lines, you should be able to:

15. Explain what a poverty line is, why it is needed, and how countries adjust their poverty lines over time.
16. Distinguish between absolute and relative poverty lines, and identify the conditions under which one might be preferred to the other.
17. Identify the steps required to construct a poverty line using the Cost of Basic Needs method, and justify the choices made at each step.
18. Show how to construct a poverty line using the Food Energy Intake method, and explain the serious weaknesses of this method.
19. Explain how subjective poverty lines are constructed and critically appraise their usefulness.
20. Construct a poverty line using real survey data, using
    a. The Cost of Basic Needs method.
    b. The Food Energy Intake method.

Note: This chapter includes embedded questions, which you are encouraged to tackle as you read the text.

3.1 How to define a poverty line

Let us assume that we have chosen a measure of household well-being - say consumption expenditure. The next step is to choose a poverty line. Households whose consumption expenditure falls below this line are considered to be poor.

Following common practice, the poor are defined as those who lack command over basic consumption needs, including food and non-food components. Thus, the poverty line, thus, is obtained by specifying a consumption bundle considered adequate for basic consumption needs and then by estimating the cost of these basic needs. In other words, the poverty line may be thought of as the minimum expenditure required by an individual to fulfill his or her basic food and non-food needs.

Once we have computed a household's consumption, we need to determine whether that amount places the household "in poverty", or defines the household as "poor". The threshold that we use for this is the poverty line. The poverty line defines the level of consumption (or income) needed for a household to escape poverty.

It is sometimes argued that the notion of a poverty line implies a distinct "turning point" in the welfare function. That is, by rising from just below to just above the poverty line, households (and individuals therein) move from considerable misery to an adequate minimum amount of well-being. However, given that well-being follows a continuum, and given how arbitrary the choice of poverty line is, the notion of such a "turning point" is not very compelling.

A corollary is that it may make sense to define more than one poverty line. For example, one common approach is to define one poverty line that marks households that are "poor," and another lower level that indicates those that are "extremely poor." Another approach is to construct a "food poverty line," which is based on some notion of minimum amount of money a household needs to purchase some basic-needs food bundle and nothing more. If the cost of basic non-food needs is estimated, then the food poverty line added to the non-food needs will equal the overall poverty line.

1.	A poverty line is:	
	A	The minimum expenditure required to fulfill basic needs.
	B	The threshold consumption needed for a household to escape poverty.
	C	Somewhat arbitrary because the line between poor and non poor can be hard to define.
	D	All of the above

More formally, the poverty line for a household, z_i, may be defined as the minimum spending/consumption (or income, or other measure) needed to achieve at least the minimum utility level u_z, given the level of prices (p) and the demographic characteristics of the household (x), so:

(3.1) $$z_i = e(p, x, u_Z)$$

In practice we cannot measure u_z, or even $e(.)$, and so a more pragmatic approach is needed.

There are two approaches. One is to compute a poverty line for each household, adjusting it from household to household to take into account differences in the prices they face and their demographic composition. For example, a small household in a rural area may face low housing costs and relatively modest food prices. Thus, their z_i may be low compared to a large household living in a city where housing is more expensive and food prices are perhaps higher. This gives different poverty lines for each household.

A second, and more widely used, approach is to construct one *per capita* poverty line for all individuals, but to adjust *per capita* y_i for differences in prices and household composition. The adjusted *per capita* y_i is then compared with the one poverty line to determine if the individual is living below the poverty line. With this approach, it is easier to talk of "the poverty line" and present it as a single number.

The approach taken for Cambodia in 1999 is somewhere between these two extremes. Separate poverty lines were constructed for each of three major "regions", based on the prices prevailing in those areas; whether a household in any given region is poor is then determined by comparing its expenditure per capita with the appropriate regional poverty line. These poverty lines are shown in table 3.1, based on Gibson's (1999) poverty profile of Cambodia using the CSES 1999 data, and Prescott and Pradhan's (1997) profile using the SESC 1993/94 data. We discuss the construction of these poverty lines in more detail below.

Table 3.1: Summary of Cambodia poverty lines				
	1993/94 SESC		1999 CSES	
	Food Poverty Line	Poverty Line	Food Poverty Line	Poverty Line
	(riels per person per day)			
Phnom Penh	1185	1578	1737	2470
Other Urban	995	1264	1583	2093
Rural	881	1117	1379	1777
Source: Prescott and Pradhan (1997); Gibson (1999). Average exchange rate was 2,617 riels/USD in 1993-94 and 3,808 riels/USD in 1999.				

As shown in table 3.1, poverty lines Phnom Penh, the capital of Cambodia, are higher than other areas. This is consistent with experience in other countries. For example, in Vietnam, Duong and Trinh (1999) note that the World Bank concluded that households would need to spend at least 1,071,000 dong (about US$81) per person in 1998 to be out of poverty. However, for urban areas, the amount was estimated to be 1,342,000 dong ($101); in rural areas it was just 1,054,000 dong ($79). This reflects that fact that costs are higher in cities.

Over time, we expect nominal poverty lines to change for a population. This is due to two factors. First, poverty lines reflect the costs of purchasing food and non-food items. As prices rise – inflation is typical – nominal poverty lines increase. This is what underlies the rising nominal poverty lines in Cambodia, shown in Table 3.1. It is also reflected in the poverty line for Thailand, shown in Table 3.2.

Table 3.2: Average poverty line of Thailand	
Year	Poverty Line, baht/month
1988	473
1990	522
1992	600
1994	636
1996	737
1998	878
1999	886
Note: All values are in Baht per person per month. *Source*: Kakwani, based on Thailand Socio-Economic Survey conducted by the National Statistical Office	

Second, the poverty line could change if the real poverty threshold were revised over time. This raises the question of whether we should look at relative, or absolute, poverty lines. We now consider each in turn.

2.	In measuring poverty in Cambodia, researchers used	
	A	One poverty line for the country, and adjusted household spending for price differences.
	B	Separate poverty lines for each individual.
	C	Separate poverty lines for each household.
	D	Separate poverty lines for each major region.

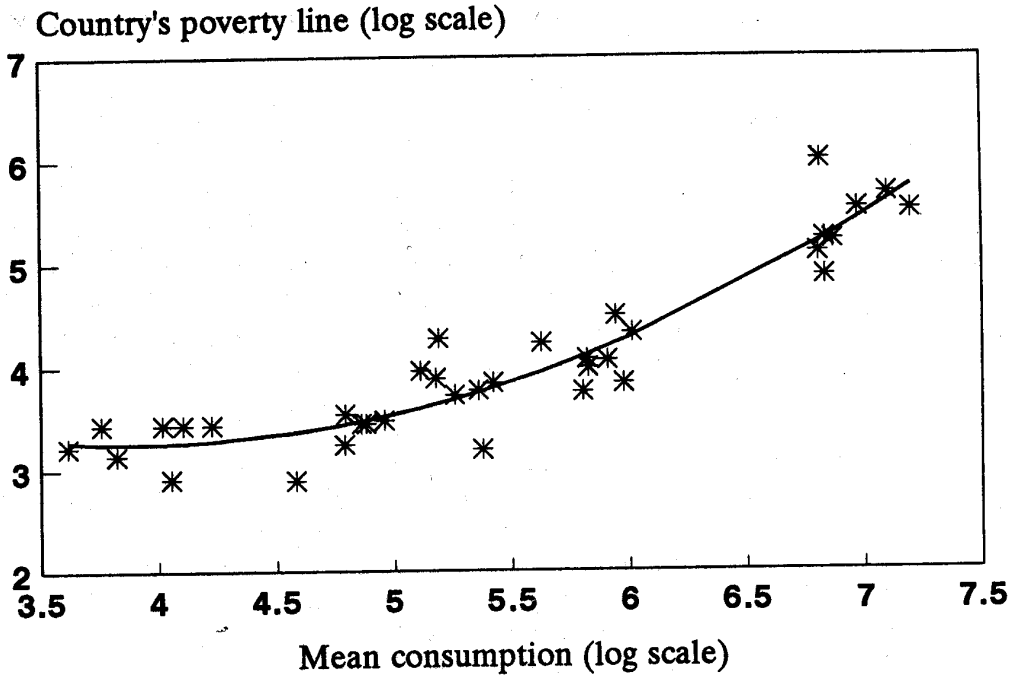
3.1.1 Relative poverty

Sometimes we are interested in focusing on the poorest segment (e.g. a fifth, or two-fifths) of the population; these are the relatively poor. When defined in this way, it is a truism that "the poor are always with us." It is often helpful to have a measure such as this in order to target programs that are geared to helping the poor.

In practice, rich countries have higher poverty lines than do poor countries, as shown clearly in figure 3.1 (from Ravallion 1998, p.26, based on an earlier paper by Ravallion, Datt and van de Walle). This explains why, for instance, the official poverty rate in the early 1990s was close to 15% in the United States and also close to 15% in (much poorer) Indonesia. Many of those counted as poor in the U.S. would be considered to be comfortably well off by Indonesian standards.

As countries become better off, they have a tendency to revise the poverty line upwards – with the notable exception of the United States, where the line has (in principle) remained unchanged for four decades. For instance, the European Union typically defines the poor as those whose per capita incomes fall below 50% of the median. As the median income rises, so does the poverty line.

Figure 5: Poverty lines across countries



Note: Each point is one country. Both poverty line and mean consumption are measured at purchasing power parity.
Source: Ravallion, Datt and van de Walle (1991)

Figure 3.1. Poverty lines across countries.

Based on a sample of 36 countries, Ravallion, Datt and van de Walle (1991) estimated the following relationship:

(3.2) $$\ln z_i = 6.704 - 1.773 \ln(C/cap) + 0.228[\ln(C/cap)]^2 + v_i$$
t=5.1 t=-3.6 t=5.1

where R^2=0.89; all three coefficients are statistically significant at the 1% level or better. They found that at the mean value of per capita consumption (which they measured in purchasing power parity terms), the elasticity of the official poverty line (z_i) with respect to consumption per capita (C/cap) was 0.71. This means that if per capita consumption were to rise 10%, then the official poverty line would rise 7.1% on average. But the non-linear relationship implies that the elasticity of the poverty line with respect to consumption per capita was close to 0 in low-income countries, and was almost 1 in high-income countries.

To the extent that one's goal is to identify and target today's poor, then a relative poverty line is appropriate, and needs to be tailored to the overall level of development of the country. For instance, a $1 per day poverty line might be useful in Vietnam, where 27% of the population would be considered poor by this standard in 1998 (Haughton 2000), but would be of little relevance in the United States where almost nobody would be poor by this standard.

3.	According to Ravallion et al., as countries become richer, they adjust their real poverty lines upwards	
	A	A little, if they are poor, and a lot if they are rich.
	B	A little, if they are rich, and a lot if they are poor.
	C	To maintain poverty at 27%.
	D	To adjust for inflation.

3.1.2 Absolute poverty

An absolute poverty line is "fixed in terms of the standard of living it commands over the domain of poverty comparisons." In plain English, the poverty line is set so that it represents the same purchasing power year after year. For example, the United States poverty line does not change over time (except to adjust for inflation), so that the poverty rate today may be compared with the poverty rate of a decade ago, knowing that the definition of what constitutes poverty has not changed.

An absolute poverty line is essential if one is trying to judge the effect of anti-poverty policies over time, or to estimate the impact of a project (e.g. microcredit) on poverty. Legitimate comparisons of poverty rates between one country and another can only be made if the same absolute poverty line is used in both countries. Thus, the World Bank needs absolute poverty lines in order to be able to compare poverty rates across countries, which in turn is useful in determining where to channel resources, and also in assessing progress in the war on poverty. It commonly uses two measures: a) an estimated 1.1 billion people worldwide lived on less than one dollar a day in 2001 (see box for details), and b) 2.7 billion people worldwide lived on less than two dollars a day in the same year. These are absolute poverty lines. There is a vigorous controversy about whether world poverty is indeed falling – this issue is addressed more completely in chapter 10. In this context, the focus is also on absolute poverty.

Box: The "dollar a day" standard

Cross-country comparisons of poverty rates are notoriously difficult (see chapter 10), but the World Bank has tried to get around this problem by computing the proportion of the population in different countries living on less than "one dollar" per capita per day; the original line referred to $1/capita in 1985 US dollars, but was revised by Chen and Ravallion (2000) to $1.08 in 1993 US dollars (worth $1.31 in 2004 US prices). The numbers shown below suggest that the poverty rate in Vietnam (computed by Haughton 2000) compares favorably with that of India, but lags behind (more affluent) China and Indonesia. One possible lesson that may be drawn from these numbers is that the easy gains in poverty reduction in Vietnam are probably over, and the country will have difficulty reducing its poverty rate substantially in the decade ahead, even if economic growth continues at its current relatively robust rate of between 6% and 8% annually.

	% of population living on less than $1/day			% of population living on less than $1/day	
Vietnam	45	1993	Indonesia	8	1996
	27	1998	Nigeria	31	1992-93
China	22	1995	Philippines	27	1994
India	47	1994			

Sources: World Bank. 1999c. *Entering the 21st Century: World Development Report 1999/2000*. Washington DC. Haughton 2000.

4.	An absolute poverty line is needed for all of the following *except:*	
	A	To make international comparisons of poverty rates.
	B	To evaluate the effects of projects, such as irrigation investments, on poverty.
	C	To target anti-poverty measures to the poorest quintile of the population.
	D	To measure the success of government policies in combating poverty.

3.2 Issues in choosing an absolute poverty line

3.2.1 Decide the standard of living

An important conceptual problem arises when working with absolute poverty lines, which is the issue of what is meant by "the standard of living" (Ravallion, 1998, on which much of this discussion is based).

In practice, almost all absolute poverty lines are set in terms of the cost of buying a basket of goods (the "commodity-based poverty line," which we denote by z). If we assume that

(3.3) $$u = f(y),$$

which says that utility or "standard of living" (u) depends on income or expenditure (y), then

(3.4) $$y = f^{-1}(u).$$

This says that for any given level of utility, there is some income (or expenditure) level that is needed to achieve it. If u_z is the utility that just suffices to avoid being poor, then

(3.5) $$z = f^{-1}(u_z).$$

In other words, given a poverty line that is absolute in the space of welfare (i.e. gives u_z) there is a corresponding absolute commodity-based poverty line.

But suppose we make a different, but equally plausible assumption, which is that utilities are interdependent. My well-being may depend not just on what I consume, but also on how my consumption stacks up against that of the rest of society. Thus, a household of four with an income of $12,000 per year would not be considered poor in Indonesia, but when this household compares its position with average incomes in the U.S., it may feel very poor. We may capture this idea by assuming

(3.6) $$u = g(y, \frac{y}{\bar{y}}),$$

where $\bar{y}$ is the mean income in the society. In this case

(3.7) $$u_z = g(z, \frac{z}{\bar{y}})$$

and so, making the standard assumption of invertibility,

(3.8) $$z = g^{-1}(\bar{y}, u_z).$$

This means that for a poverty line to be absolute in the space of welfare (i.e. to yield u_z), the commodity-based poverty line (i.e. z) may have to rise as $\bar{y}$ rises. The commodity-based poverty line would then look more like a relative poverty line! However, in what follows, we simplify the analysis by assuming that utilities are not interdependent, and so the commodity based poverty line is given in absolute terms.

5.	Is the following statement true or false? If my wellbeing depends on where I stand relative to others, then the dollar absolute poverty line needs to change as a country becomes richer.	
	True	False

3.2.2 Decide u_z *and g(.)*

Even if we assume that the commodity-based poverty line remains constant, we are still left with two problems.

a) *The Referencing problem*. What is the appropriate value of u_z – i.e. the utility of the poverty line? The choice is of course arbitrary, but "a degree of consensus about the choice of the reference utility level in a specific society may well be crucial to mobilizing resources for fighting poverty" (Ravallion, 1998, p.6).

b) *The Identification problem*. Given u_z, what is the correct value of z – i.e. of the commodity value of the poverty line. This problem arises both because the size and demographic composition of households vary – an issue we raised in the discussion of equivalence scales in chapter 2 – but also because "the view that we can measure welfare by looking solely at demand behavior is untenable" (Ravallion, 1998, p.7).

The implication is that external information and judgments will be required to answer the referencing and identification problems, and hence to determine the absolute poverty line in practice. But how is this to be done in practice?

Table 3.3 presents absolute and relative poverty headcount rates for different regions in the world. How regions compare with each other depends on which poverty measure is used. For example, by the absolute measure of less than US $1 a day, Sub-Saharan Africa has the highest portion of the population

living in poverty. On the other hand, countries in Latin America and the Caribbean have the highest portion of their population living below one-third the average national consumption; in effect, these are the most unequal societies, an issue that is addressed directly in chapter 6.

In passing we might note that an absolute poverty line is best thought of as one that is fixed in terms of living standards, and *fixed over the entire domain of the poverty comparison* (Ravallion); the domain could be a region or country, or the whole world. Thus absolute poverty comparisons will deem two persons at the same standard of living to both be either "poor" or "not poor" irrespective of the time or place being considered, or with or without some policy change, *within the relevant domain*. However, depending on the purpose of the comparison, the relevant domain may vary. For example, a global comparison of absolute consumption poverty may entail using a poverty line (e.g. $1 consumption per capita per day) that is low by the standards of rich countries. If, however, one is trying to form a poverty profile for one country only, the choice of an absolute poverty line should be appropriate to that country (e.g. a poverty line of $1 per day might be appropriate in Vietnam, and $20 per day might be suitable in the United States). Judgments of what constitutes a reasonable absolute poverty line must first specify the domain of comparisons, and recognize that the answer may change if the domain changes.

Table 3.3: Absolute and Relative Poverty rates

	Share of population living on less than $1 per day (in 1998)	Share of the population living on less than one-third of average national consumption for 1993 (in 1998)
East Asia and Pacific	15.3	19.6
East Asia and Pacific excluding China	11.3	24.6
Europe and Central Asia	5.1	25.6
Latin America and the Caribbean	15.6	51.4
Middle East and North Africa	1.9	10.8
South Asia	40.0	40.2
Sub-Saharan Africa	46.3	50.5
Total	**24.0**	**32.1**
Total excluding China	26.2	37.0
Source: World Bank (2000)		

6.	The poverty line will vary depending on the domain of comparison because of	
	A	The referencing problem.
	B	The identification problem.
	C	The purpose of the comparison.
	D	The $1/day standard is too low.

3.3 Solution A: objective poverty lines.

How then are we to determine poverty lines? One possibility is to pick an "objective" poverty line. The key idea here is that the poverty line should be set at a level that enables individuals to achieve certain capabilities, including a healthy and active life and full participation in society. In practice this almost certainly would imply that the commodity-based poverty line would rise as a country becomes more affluent, because the minimum resources needed to participate fully in society probably rise over time. In Sen's rather dense prose (Sen 1983, p.168), "an absolute approach in the space of capabilities translates into a relative approach in the space of commodities."

A common, and fairly satisfactory, way of approaching capabilities is to begin with nutritional requirements. The commonest way of making this operational is the Cost-Of-Basic Needs (CBN) approach, while the Food Energy Intake (FEI) method has been suggested as an alternative when the data available are more limited.

3.3.1 The Cost-of-Basic-Needs method:

The most satisfactory approach to building up a poverty line, while remaining in the spirit of trying to ensure that the line covers basic needs, proceeds as follows:

- Stipulate a consumption bundle that is deemed to be adequate, with both food and non-food components; and
- Estimate the cost of the bundle for each subgroup (urban/rural, each region, etc.).

This is essentially the approach taken by Seebohm Rowntree in his seminal study of poverty in York, undertaken in 1936. Note that although we begin with a consumption bundle – so much food, so much housing space, so much electricity, etc. – the poverty line is measured in money. We are therefore not insisting that each basic need be met by each person, only that it *could* be met. Operationally, the steps to follow are these:

- Pick a nutritional requirement for good health, such as 2,100 Calories per person per day. This standard is widely used, and has been proposed by the Food and Agricultural Organization of the United Nations.
- Estimate the cost of meeting this food energy requirement, using a diet that reflects the habits of households near the poverty line (e.g. those in the lowest, or second-lowest, quintile of the

income distribution; or those consuming between 2,000 and 2,200 Calories). This may not be easy if diets vary widely across the country. Call this food component z^F.

- Add a non-food component (z^{NF}). There is a lot of disagreement about how to do this; we offer some more thoughts on this issue below.
- Then the basic needs poverty line is given by

(3.12) $$z^{BN} = z^F + z^{NF}$$

7.	Is the following statement true, false or uncertain? The Cost of Basic Needs approach requires that households meet their basic needs of food and essential non-food spending.		
	True	False	Uncertain

Box. The US poverty line

In 1963 and 1964, Mollie Orshansky of the U.S. Social Security Administration computed the cost of an 'adequate' amount of food intake, to get z^F. She then multiplied this number by 3 to get z^{BN}. Why? Because at the time, the average food share for all consumers in the United States was 1/3. This line is still used, updated regularly for price changes.
Source: Dalaker and Naifeh (1998).

To illustrate how this might work, suppose, following common practice, that we use a food energy threshold of 2,100 Calories per day.[3] Suppose that there are only three foodstuffs: rice, corn and eggs. For this hypothetical example, imagine that table 3.4 shows the expenditure on each item, and the amount consumed by a household in the second (from bottom) quintile; since such a household consumes, we suppose, just 2,000 Calories per day, the figures here have to be grossed up to give the cost of purchasing 2,100 Calories. In this example the cost comes to 105 pesos per day.

Table 3.4: Illustration of Construction of Cost of Food Component of Poverty Line

	Expenditure per day (pesos)	Calories	Calories, Adjusted to give 2,100 Calories	Expenditure, adjusted to cover 2,100 Calories
Rice	60	1,400	1,470	63
Corn	20	400	420	21
Eggs	20	200	210	21
Total	**100**	**2,000**	**2,100**	**105**

[3] We use the convention that 1 Calorie is equivalent to 1,000 calories.

The choice of which diet to use when estimating the cost of obtaining 2,100 Calories is not a trivial one, a point emphasized in the context of Indonesia by Pradhan et al. (2000)[4]. To illustrate, consider the information in Table 3.5, drawn from the Vietnam Living Standards Survey of 1992-93. Households in the poorest quintile paid 0.68 dong per Calorie; those in the richest expenditure quintile paid almost twice as much (1.38 dong/Calorie). Depending on which cost/Calorie one uses, the poverty line could vary widely.

Table 3.5: Food consumption by expenditure quintile, Vietnam, 1992-93.

Quintile	Expenditure per capita, '000 dong/year	% of expenditure devoted to food	Calories per capita per day	Dong per Calorie
Lowest	562	70	1,591	0.68
Low-mid	821	65	1,855	0.79
Middle	1,075	60	2,020	0.87
Mid-upper	1,467	54	2,160	1.00
Upper	2,939	47	2,751	1.38

Source: Vietnam Living Standards Survey 1992-93

8.	In constructing a Cost of Basic Needs poverty line in Vietnam, the poverty line will be
A	Lower if the food price of the lowest quintile is used.
B	Higher if one uses the Calorie per capita level of the lowest quintile.
C	Lower if one uses the percentage of spending on non-food from the top expenditure quintile.
D	Higher if one uses a threshold of 2,020 Calories per capita per day.

An Application. In practice, researchers in this case used the price of food for households in the middle quintile, on the grounds that those households were close to the poverty line because they were consuming almost 2,100 Calories per year. The food expenditure of the middle quintile, grossed up to pay for 2,100 Calories, came to 750,228 dong per capita in 1993; the non-food expenditure of this same group of households was taken to be adequate for those at the poverty line (after a similar grossing up). This gave an overall poverty line of 1,160,842. Individual households lived in regions with different prices, so their expenditure per capita was first deflated, and then compared to this poverty line. The result was an estimated headcount poverty rate in Vietnam of 58% (World Bank 1999).

To compare poverty over time, this poverty line was updated to 1998. The cost of each item in the poverty-line diet of 1993 was recomputed using the prices of 1998 (as taken from the

[4] Pradhan et al. (2000) favor an interactive procedure: pick a reference population that is relatively poor and compute their cost of Calories; now recompute the poverty line; take as the new reference population those households close to this poverty line and re-calculate the cost of Calories; compute the poverty line again; and so on, until the poverty line stabilizes.

price questionnaire component of the VLSS, mainly); non-food expenditure was inflated using data from the General Statistical Office's price index. This yielded a poverty line of 1,793,903, and an associated poverty rate of 37%. The details are summarized in Table 3.6.

Table 3.6: Poverty Lines and Headcount Measures of Poverty, Vietnam

	Poverty line (m dong/capita/yr)	Headcount poverty rate
Poverty overall		
1993	1,160 ($109)	58
1998	1,790 ($135)	37
Food poverty		
1993	750 ($70)	25
1998	1,287 ($97)	15

Note: The food poverty rate excludes any provision for non-food items; it sets the poverty line at z^F.
Sources: Vietnam Living Standards Surveys of 1992-93 and 1997-98.

There is no wholly satisfactory way to measure the non-food component of the poverty line, and the procedures followed tend to be somewhat ad hoc. We saw above that for Vietnam, researchers essentially used the (slightly adjusted) level of non-food spending by households that were in the middle expenditure quintile in 1993. The poverty lines developed for South Korea (KIHASA 2000) measure the cost of food plus the cost of housing that meets the official minimum apartment size plus the cost of non-food items as measured by average spending by households in the poorest two-fifths of the income distribution.

Is there a better way to proceed? Probably not. Even the theory calls for compromise. Consider the food expenditure function shown in figure 3.6. Generally, $b = f(y)$, where b is food purchases and y is total expenditure. Following Ravallion (1998), let b^F be the cost of buying 2,100 Calories. Then an upper poverty line might be given by

(3.13) $$f^{-1}(b^F) = z^F$$

which measures the income level at which the household would buy 2,100 Calories of food; this is essentially the poverty line used in Vietnam. The non-food component is given by A (in figure 3.6).

A lower poverty line might be given by

(3.14) $$z_L^F = b^F$$

which measures the expenditure level at which the household could just buy enough food, but would not have any money left over to buy anything else; in Vietnam this is referred to as the food poverty line. But even in this case, households will typically buy non-food items, as shown by C in Figure 3.2. Ravallion

suggests that one might want to compromise, and measure non-food at the mid-point between these two extremes, giving *B*. In each case, the poverty line would be given by

(3.15) $z = b^F + 0$ *(or A or B')*

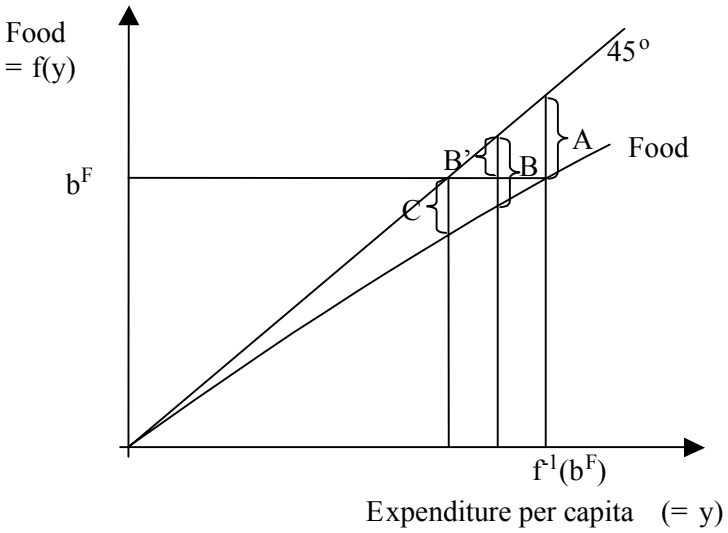


Figure 3.2 **Food Expenditure Function**.

9.		The non-food component of the poverty line, under the Cost of Basic Needs approach, may be obtained as
	A	The cost of basic housing and services.
	B	Non-food consumption of a household with just enough income to buy 2,100 Calories of food per capita per day along with other necessary goods and services.
	C	Non-food consumption of a household with just enough income to buy 2,100 Calories of food per capita per day.
	D	All of the above.

As one might expect when there is potential disagreement about the best approach to take, practice varies widely from one analyst to the next. Table 3.7 summarizes the approaches used to measure poverty in Africa, based on World Bank *Poverty Assessments* undertaken up to 1998. Based on a list of forty cases of poverty measurement compiled by Hanmer et al. (1999), 23 measured relative poverty; most of these set the poverty line as a share of mean income or expenditure (11 cases) or identified the poor using some percentage (e.g. 20%, 25%) of the income or expenditure distribution. The remaining 17 cases used an absolute measure of poverty, with most of them beginning with a calorie requirement (12 cases), sometimes adding a non-food component (5 cases). In a further five cases the analysts specified a basked of goods (including food) that was intended to measure the cost of basic needs but did not begin by identifying a calorie requirement. The heterogeneity of these measures makes it

difficult to compare poverty across countries, although in most country poverty assessments this is of secondary importance.

Table 3.7: Typology of poverty lines in World Bank Poverty Assessments for Africa		
Absolute (17 cases)	Calorie requirement (12)	Calories only Calorie cost/food share (1) Calories + basket of goods (5)
	Basket of goods (including food) (5)	
Relative (23 cases)	Relative to income base	Multiple of wage
		Share of mean income or expenditure (11)
	Specified percentage of income distribution (11)	
Source: Hanmer et al. (1999).		

3.3.2 Food Energy Intake method

The basic needs approach outlined above requires information on the prices of the goods that the poor consume. When price data are not available, a number of researchers have used an alternative method to construct the poverty line – the *food energy intake method*. As before, the goal here is to find the level of consumption expenditure (or income) that allows the household to obtain enough food to meet its energy requirements. Note that consumption will include non-food as well as food items; even underfed households typically consume some clothing and shelter, which means that at the margin these "basic needs" must be as valuable as additional food.

The basic idea is captured in figure 3.3, which shows a *calorie income function*; as income (or expenditure) rises, food energy intake also rises, although typically more slowly. Given some level of just-adequate food energy intake k, one may use this curve to determine the poverty-line level of expenditure, z. Formally, the function shows

(3.9) $$k = f(y)$$

So, given monotonicity,

(3.10) $$y = f^{-1}(k),$$

or, given a minimum adequate level of calorie k_{min}, we have

(3.11) $$z = f^{-1}(k_{\min})$$

where z is the poverty line. This approach is parsimonious in that it does not require any information about the prices of goods consumed.

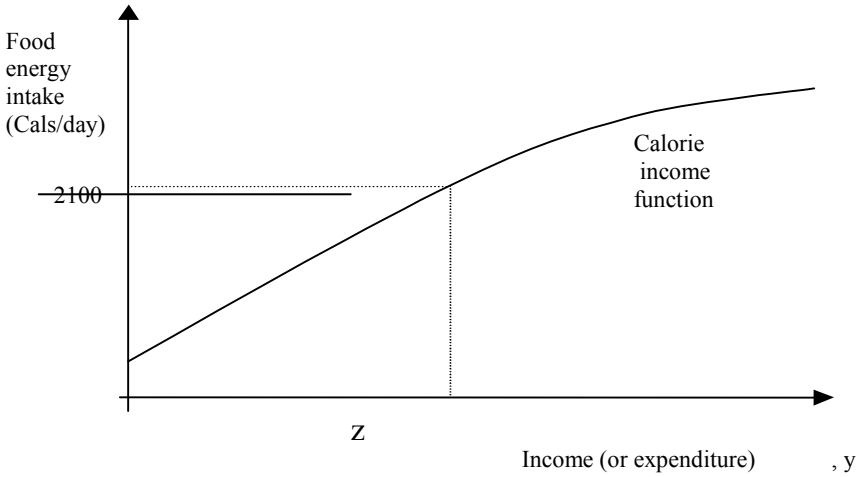


Figure 3.3: Calorie income function

First one needs to determine the amount of food that is adequate. Vietnam pegs this level at 2,100 Calories per person per day, in line with FAO recommendations, but it is recognized that individuals may need more or less food than this – clearly the needs of young children, growing teenagers, manual workers, pregnant women, or sedentary office workers may differ quite markedly; physical stature also plays a role. Not all countries have set the same cut-off point, as table 3.8 shows:

Table 3.8: Per Capita Daily Calorie Intake Used in Poverty Line Construction	
Vietnam	2,100
Indonesia	2,100
Philippines	2,000
Thailand	1,978
China	2,150

A variant of this approach was used to measure poverty in Vietnam, using data from the Vietnam Living Standards Survey of 1993. Separate food expenditure lines were estimated for urban and rural areas in each of seven provinces; the cost of obtaining 2,100 Calories of food per person per day was then computed, and the associated poverty lines – one for each rural and urban area in each province. This gave a headcount index of 55% (Dollar et al. 1995).

10.	Is the following statement true, false or uncertain? The Food Energy Intake approach sets the poverty line at the level of expenditure at which the household buys just enough Calories (e.g. 2,100 Calories per capita per day).		
	True	False	Uncertain

Unfortunately, the Food Energy Intake method is seriously flawed, and should not be used unless the alternatives are infeasible. Ravallion and Bidani (1994) computed headcount poverty measures for Indonesia using the SUSENAS data for 1990, both for the Cost of Basic Needs and the Food Energy Intake methods. Their results are shown in table 3.9. The most striking finding is that the poverty rates measured by the two approaches differ sharply! Ravallion and Bidani also computed poverty rates using these two measures, for each of the main regions of Indonesia, and found almost no correlation between the two measures.

Table 3.9: Headcount Measures of Poverty in Indonesia, 1990

	Cost of Basic Needs Method		Food Energy Intake Method
	Food	Food + non-food	
Indonesia overall	7.9	19.6	15.1
Urban	2.8	10.7	16.8
Rural	10.2	23.6	14.3
Source: Ravallion and Bidani 1994.			

Why is the Food Energy Intake method potentially unreliable? The weaknesses of the method were pointed out in an important article by Ravallion and Bidani (1994); in the next few paragraphs we summarize their approach and findings. The method also failed in a recent analysis of data from Vietnam, for slightly different reasons, also summarized below.

3.3.2.1 The urban-rural problem

The problem begins when one recognizes that food energy – typically shown on the Calorie income function – depends on other factors as well as income. The other influences include the tastes of the household (e.g. urban tastes in food may differ from rural tastes); the level of activity of household members; the relative prices of different foods, and of food to non-food items; and the presence of publicly-provided goods.

Figure 3.4 shows hypothetical (but plausible) calorie income functions for urban and rural households. Rural households can obtain food more cheaply, both because food is typically less

expensive in rural areas and also because they are more willing to consume foodstuffs that are cheaper per calorie (such as cassava rather than rice); urban consumers are more likely to buy higher quality foodstuffs, which raises the cost per calorie. It follows that the calorie income function for rural households will typically be higher than that of urban households. The implication is that for a given level of food energy intake, the poverty line in the rural area will be lower than in the urban area, as figure 3 makes clear. To the extent that this reflects differences in the cost of living, it is not a problem to have two poverty lines of this kind.

The key finding of Ravallion and Bidani (1994), based on 1990 data from the SUSENAS household survey in Indonesia, was that the urban poverty line (20,614 rupiah per person per month) was *much* higher than the rural one (13,295 Rp./person/month). This gap far exceeded the difference in the cost of living between urban and rural areas. Using these poverty lines, Ravallion and Bidani (1994) found that that poverty in Indonesia appeared to be higher in the urban than in the rural areas (Table 3.10), a completely implausible result. The point is also illustrated in figure 3.5, which shows the cumulative distribution of consumption per capita, for rural and urban areas, and marks the poverty lines and headcount poverty rates.

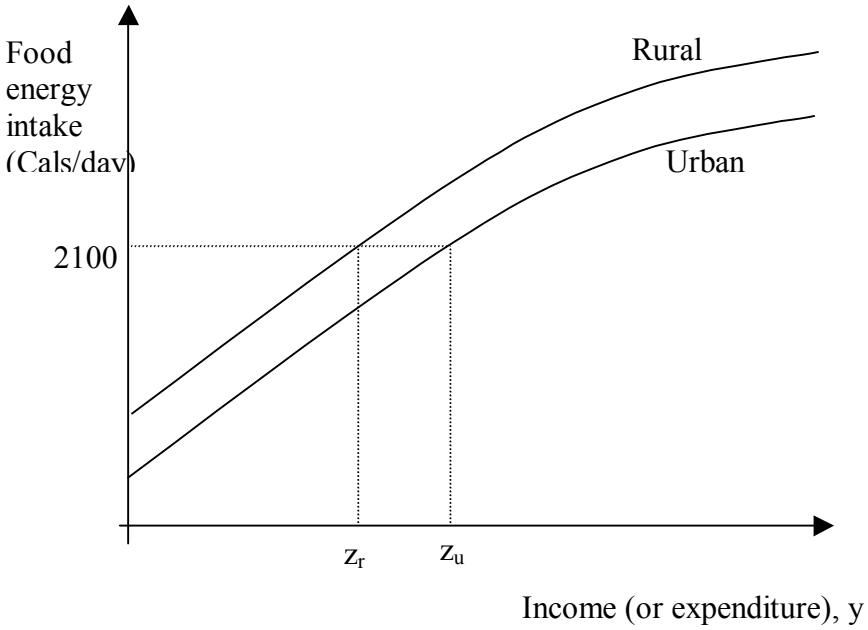


Figure 3.4. Calorie income functions for urban and rural Indonesia

Table 3.10: Poverty Lines in Indonesia using Food Energy Intake Method, 1990			
	Indonesia overall	Urban areas	Rural areas
P_0 (%)	15.1	16.8	14.3
P_1 (%)	2.42	3.23	1.06
P_2 (× 100)	0.66	0.94	0.53
Source: Ravallion and Bidani 1994			

.

11.	Ravallion and Bidani found, using the Food Energy Intake method, that the urban poverty line in Indonesia exceeded the rural poverty line by more than a simple comparison of living costs would lead one to expect, because	
	A	Urban households eat more.
	B	Urban households eat better quality food.
	C	Urban food prices are much higher than rural food prices.
	D	Urban housing costs more than rural housing.

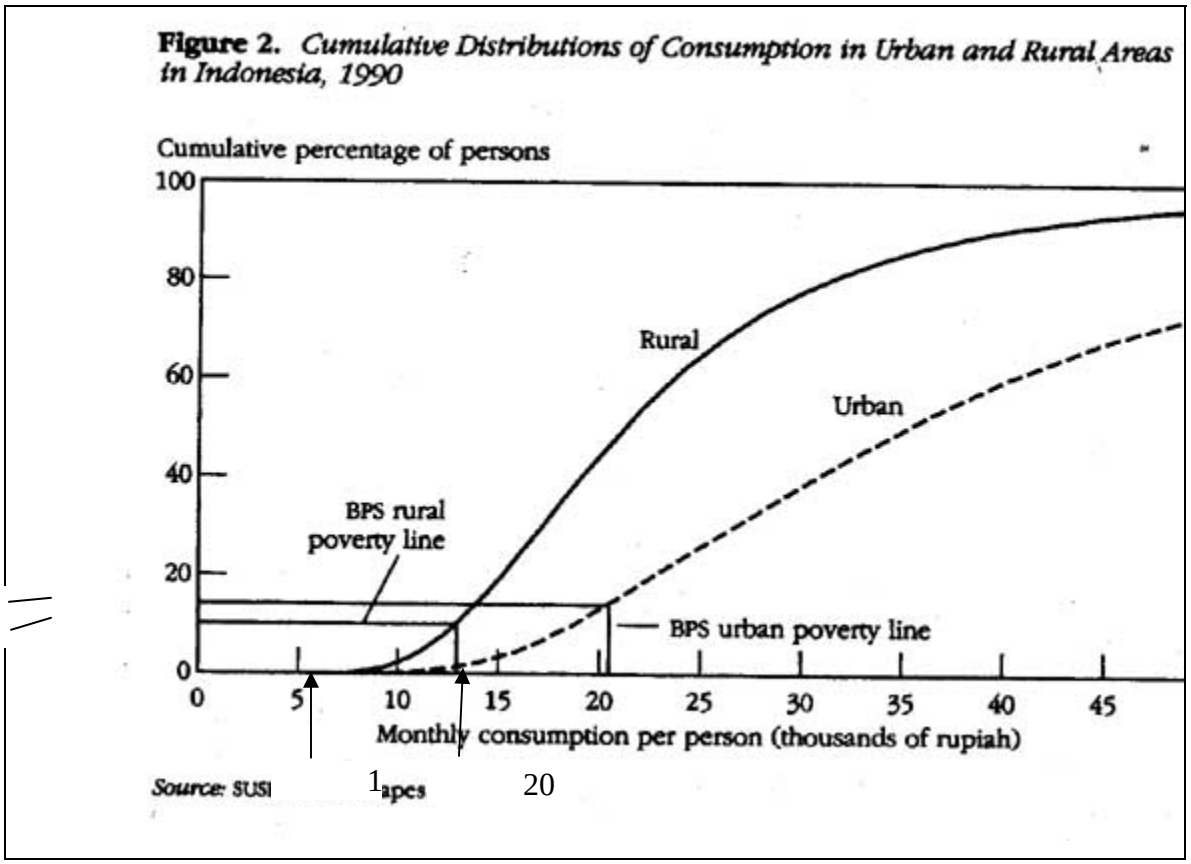


Figure 3.5 Cumulative distribution functions for consumption, Indonesia, 1990
(*Source*: Ravallion and Bidani 1994.)

3.3.2.2 The relative price problem

When researchers tried to apply the Food Energy Intake approach to data from the Vietnam Living Standards Survey of 1998, the method failed. As with the 1993 data, the idea was to compute food expenditure functions, find the cost of 2,100 Calories of food, and then find the related level of expenditure per capita, which would then serve as a poverty line. After undertaking this exercise, researchers found a higher level of poverty in 1998 than in 1993, an implausible result in an economy whose real GDP grew by 9% annually between 1993 and 1998, and where there was a widespread sense that the benefits of this growth had spread widely.

What went wrong? Figure 3.6 shows the situation. The food expenditure function shifted down between 1993 and 1998; in other words, for a given (real) income, households in 1998 would buy less food than in 1993. The main reason was that the price of food rose by 70% between 1993 and 1998, while the price of non-food items rose by just 25%; in other words, food became *relatively* much more expensive. As a result consumers shifted away from food to non-food consumption. This meant that the poverty line rose from z_{93} to z_{98} (see figure 5), a jump that turned out to be implausibly large.

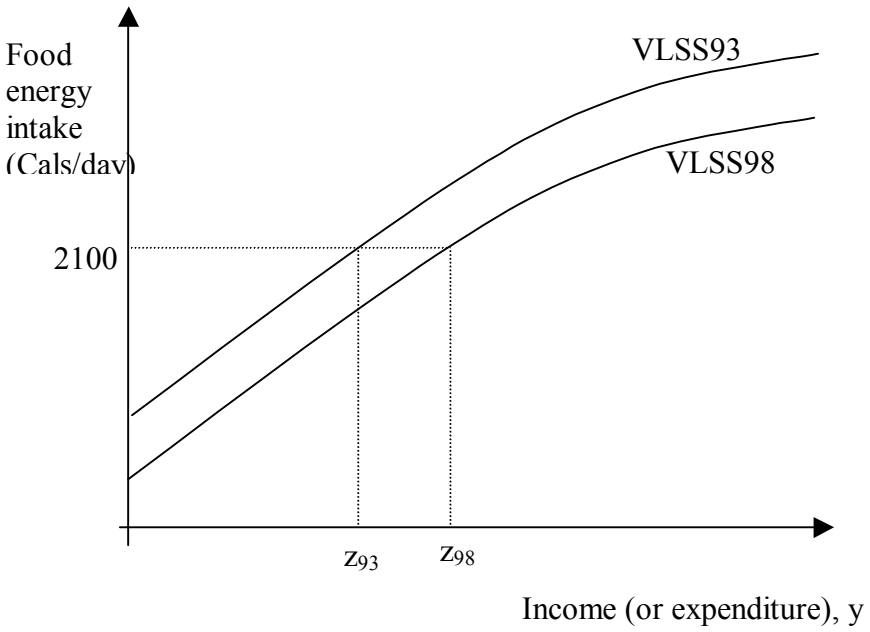


Figure 3.6 The determination of poverty lines for Vietnam, 1993 and 1998

This is a serious indictment of the Food Energy Intake method. But it should also be clear that every measure of poverty can be faulted, because it rests in part on arbitrary assumptions. In measuring poverty, there is no single truth.

12.	Is the following statement true or false? The Food Energy Intake method showed that the real poverty line in Vietnam rose rapidly between 1993 and 1998, because of inflation.	
	True	False

Solution B: Subjective poverty lines

We could measure poverty by asking people to define a poverty line, and using this to measure the extent of poverty. For instance, in a survey one might ask

"What income level do you personally consider to be absolutely minimal? That is to say that with less you could not make ends meet."

The answers will vary from person to person (and by size of household), but they could be plotted, and a line fitted through them, to get a subjective poverty line such as z^* in figure 3.7. It may also be possible to get adequate results by asking "do you consider your current consumption to be adequate to make ends meet?"

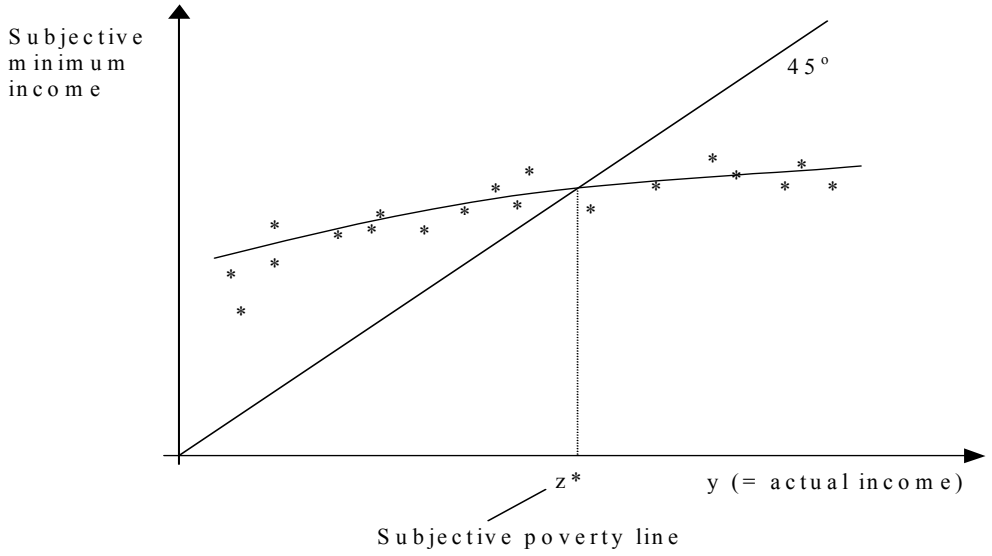
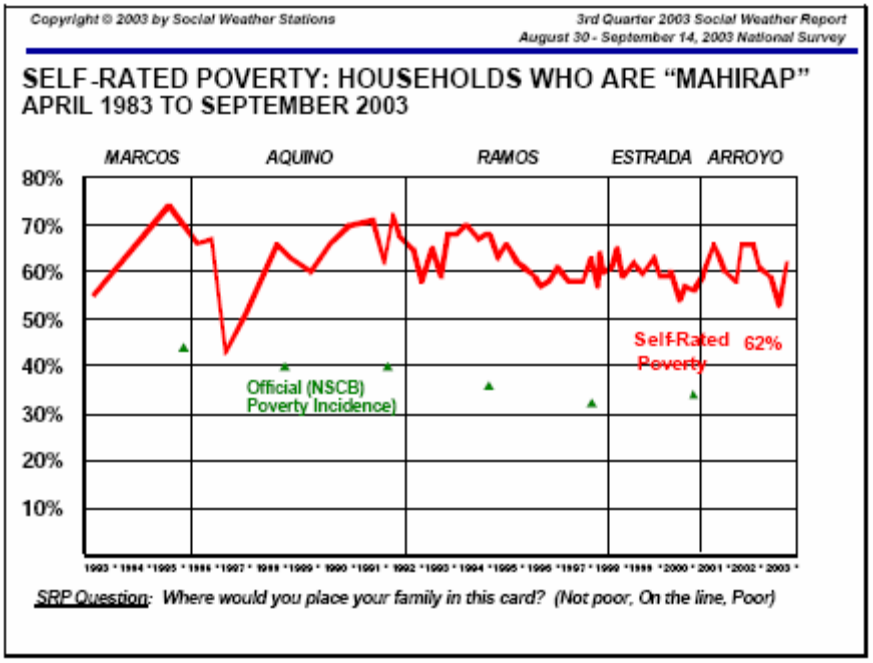


Figure 3.7 **Estimating a subjective poverty line.**

Mahar Mangahas has amassed extensive information on subjective poverty in the Philippines as part of the social weather stations project. Collected biannually since 1985, and quarterly since 1992, the surveys poll about 1,200 households. Each household is shown a card with a line running across it; below the line is marked *poor* ("mahirap") and above the line *non-poor*, and each household is asked to mark on the card where it fits. Separately, households are also asked to define a poverty line. Figure 3.8 reproduces a graph that tracks the evolution of this poverty rate from 1983 to 2003. Here are the comments of Mahar Mangahas that accompany the graph (Mangahas 2003, p.2):

> "The proportion of household heads rating their families as mahirap or poor was 62% in September, compared to a very low 53% in June, implying a return, roughly speaking, to conditions in November 2003 when Self-Rated Poverty was 61% [see Figure 3.8]. … Among poor households, the national median poverty threshold, or home expense budget needed in order not to feel poor, as of September 2003, is a modest P8,000 per month (P14,000 in Metro Manila, P8,000 elsewhere in Luzon, P5,000 in the Visayas, and P5,000 in Mindanao). This means that these home budgets are sufficient to satisfy one-half of the poor."[5]



Gaurav Datt of the World Bank has analyzed the Filipino data in some detail. Here are some of his more interesting findings:

- *Self-rated poverty lines are high.* In 1997 the median poverty line was about 10,000 pesos per month for a "typical" household; this compares with the government's "basic needs" poverty line, which at

[5] The exchange rate in mid-September 2003 was P54.75/USD.

that time stood at 4,495 pesos/month. The implication is that self-rated poverty rates are high – 60% of all households in 1997, compared to 25% using the basic needs line.

- *The self-rated poverty line has risen rapidly over time,* by about 60-70% between 1985 and 1997. One consequence is that there is no trend in self-rated poverty over time. Another implication is that even when there is an economic slowdown, as occurred in 1997-98, the self-rated poverty rate hardly changes: it rose from 59% in 1996-97 to 61% in 1998.
- Perhaps surprisingly, the *self-rated poverty line given by poor households is only slightly lower* than that for non-poor households, and in fact the difference is not statistically significant. One might have expected poor households to have a less generous measure of the poverty line.
- There is a *clear urban/rural difference in perceptions* of the poverty line, with urban households setting a (money) poverty line at about twice the level of rural households, giving:

(3.16) $$z^{u}_{self-rated} \approx 2\, z^{r}_{self-rated}$$

The cost of living is certainly higher in urban areas, but by a factor of 1.2-1.5 rather than by a factor of 2. Thus the urban self-rated poverty line is, in real terms, higher than its rural counterpart. Why?

- One possibility is that there is more inequality in the urban areas, and that this raises expectations.
- Another plausible explanation is that households in urban areas may have more exposure to the media, and may have been affected more thoroughly by consumerism.
- A third explanation is that urban households may be more attuned to political processes, and their estimates of the poverty line may include an element of strategic behavior – trying to influence policy makers.

Self-rated measures of poverty are rarely collected. If the Filipino experience is at all representative, it is clear that they cannot usefully supplant the more traditional "objective" measures of poverty.

13.		Based on experience in the Philippines, which of the following statements is *not* true?
	A	Subjective poverty lines are not absolute over time.
	B	Self-rated poverty lines show high poverty rates.
	C	The rich report markedly higher poverty lines than the poor.
	D	Urban households set poverty lines higher than rural households, by more than the price differential between urban and rural areas would imply.

References

Joseph Dalaker and Mary Naifeh. 1998. *Poverty in the United States: 1997*, U.S. Department of Commerce, Washington DC.

Datt, Gaurav. [on social weather station project]

Dollar et al. 1995 [Vietham]

Gibson. 1999.

Haughton. 2000.

Kakwani. 2000?

KIHASA. 2000.

Mangahas. 2003.

Pradhan et al. 2000. [Indonesia]

Prescott and Pradhan. 1997.

Martin Ravallion. 1998. *Poverty Lines in Theory and Practice*, Living Standards Measurement Study Working Paper No. 133, World Bank.

Martin Ravallion and Benu Bidani. 1994. "How Robust Is a Poverty Profile?", *The World Bank Economic Review,* 8(1): 75-102.

Ravallion, Datt and van de Walle. 1991.

Sen. 1983.

World Bank. 1999. *Entering the 21st Century: World Development Report 1999/2000.* Washington DC.

World Bank. 2000. [Absolute and relative poverty rates.]

Vietnam: General Statiistical Office. 2000. *Viet Nam Living Standards Survey 1997-1998*, Statistical Publishing House, Hanoi.

World Bank. 2000. *World Development Report 2000-2001.* Washington DC.

Lars Osberg and Kuan Xu. 1999. *Poverty Intensity: How Well Do Canadian Provinces Compare?" Canadian Public Policy* (XXV:2).

Arsenio Balisacan. 1992. "xxx", *Journal of Philippine Development*, 19(1). [On estimating equivalence scales.]

Martin Ravallion. 1996. "How well can method substitute for data? Five experiments in poverty analysis," *The World Bank Research Observer*, 11(2), 199-221, August.

Vu Tuan Anh. 1997. "Criteria for Rural Poverty Monitoring," *Vietnam's Socio-Economic Development*, Spring.

Christina Paxson. 1993. "Consumption and Income Seasonality in Thailand," *Journal of Political Economy*, 101(1): 39-72.

Harold Alderman and Christina Paxson. 1994. "Do the Poor Insure? A Synthesis of the Literature on Risk and Consumption in Developing Countries," in Edmar Bacha (ed.), *Economics in a changing world: Proceedings off the Tenth World Congress of the International Economic Association*, Moscow, 48-78.