Well-being measurement and analysis

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Outline

Technical Notes

Guide to Web Resources

1 Introduction

This chapter offers a primer on poverty, inequality and vulnerability analysis and a guide to resources on this topic. It is written for decision-makers who want to define the type of information they need for monitoring poverty reduction and making appropriate policy decisions, and for the technical experts in charge of the analysis. The chapter takes a broad look at tools for analysis and provides a brief introduction to each topic. It also outlines why certain information is essential in policymaking and how this information can be generated

The measurement and analysis of poverty, inequality and vulnerability are crucial for cognitive purposes (to know what the situation is), for analytical purposes (to understand the factors determining this situation), for policy making purposes (to design interventions best adapted to the issues), and for monitoring and evaluation purposes (to assess whether current policies are effective, and whether the situation is changing).

There are many different definitions and concepts of well-being. This chapter focuses on three aspects of well-being. First, it focuses on what is typically referred to as **poverty**, namely on whether households or individuals have enough resources or abilities today to meet their needs. This aspect is based on the comparison of the individuals' income, consumption, education or other attributes with some defined threshold below which they are considered as being poor in that attribute. Second, the chapter focuses on **inequality** in the distribution of income, consumption or other attributes across the population. This is based on the premise that the relative position of individuals or households in society is an important aspect of their welfare. In addition, the overall level of inequality in a country, region or population group, in terms of monetary and non-monetary dimensions, is also in itself an important summary indicator of the level of welfare in that group (a detailed analysis of inequality is given in the chapter on **Inequality and Social Welfare**). Finally, the chapter considers the **vulnerability** dimension of well-being, defined here as the probability or risk today of being in poverty – or falling deeper into poverty -- in the future. Vulnerability is a key dimension of well-being since it affects individuals' behavior (in terms of investment, production patterns, coping strategies) and their perception of their own situation.

Although the concepts, measures and analytical tools can be applied to numerous dimensions of well-being – such as income, consumption, health, education and assets ownership - the chapter mainly focuses on the income and consumption dimension and only casually refers to the other dimensions (a brief discussion of the multidimensional concepts of extreme poverty and social exclusion is provided in **Technical Note 12**). Other chapters in the sourcebook focus on the dimensions of well-being not dealt with here. It should also be noted that the chapter outlines general principles which should be valid in many settings, but the methods used for analyzing well-being must always be adapted to country circumstances and data availability.

The chapter is arranged into several sections so that readers can easily find the information of greatest interest to them. The chapter begins with the nuts and bolds of poverty measurement and analysis (section 2), before turning to inequality (section 3) and vulnerability (section 4). In each of these sections, the chapter first defines some of the concepts, indicators and measures that can be used, before turning to the various analytical tools available. Section 5 presents an overview of different sources and types of data that can be used for the analysis. The section includes a reference table linking the analytical methods described in this chapter with the data

sources necessary for their application. Finally, A reference list provides resources and Web sites for further study and technical notes further explore specific issues.

2 Poverty Measurement and Analysis

The section provides an introduction to the concept and measurement of poverty as defined above, i.e. poverty being defined as not having enough today in some dimension of well-being. This section starts with a discussion of what needs to be done to measure poverty (Section 2.1) before turning to the types of analysis which can be carried out using the selected measures (Section 2.2).

2.1 Poverty concept and measurement

To compute a poverty measure, three ingredients are needed. First, one has to choose the relevant dimension and indicator of well-being. Second, one has to select a poverty line – that is a threshold below which a given household or individual will be classified as poor. Finally, one has to select a poverty measure – which is used for reporting for the population as a whole or for a population sub-group only.

2.1.1 Defining indicators of well-being

This section mainly focuses on the monetary dimensions of well-being, income and consumption. In particular, this section concentrates on quantitative, objective measures of poverty. Other measures exist, in particular covering non-monetary dimensions (health, education, assets, etc.), subjective measures and qualitative measures, which only receive cursory treatment in this chapter. The typical data source for the indicators and measures presented here is the household survey (see Section 5.2).

2.1.1.1 Monetary dimensions of poverty

When estimating monetary measures of poverty, one may have a choice between using income or consumption as the indicator of well-being. Most analysts argue that provided the information on consumption obtained from a household survey is detailed enough, consumption will be a better indicator for poverty measurement than income for the following reasons:

➢ **Consumption is a better outcome indicator than income:** Actual consumption is more closely related to a person's well-being in the sense defined above, i.e. that of having enough to meet current basic needs. On the other hand, income is only one of the elements which will allow consumption of goods (others include questions of access, availability, etc.).

➢ **Consumption may be better measured than income:** In poor agrarian economies, incomes for rural households may fluctuate during the year, in line with the harvest cycle. In urban economies with large informal sectors as well, income flows may be erratic. This implies that it may be difficult for households to correctly recall their income, in which case the information on income in the survey may be of low quality. For farmers, one added difficulty in estimating income consists in excluding the inputs purchased for agricultural production from the farmer's revenues. Finally, large shares of income are not monetized if households consume their own production or exchange it for some other goods, and it might

be difficult to price these. Estimating consumption has its own difficulties, but it may be more reliable if the consumption module in the household survey has been well designed.

> **Consumption may better reflect a household's ability to meet basic needs:** Consumption expenditures reflect not only the goods and services that a household can command based on its current income, but also whether that household can access credit markets or household savings at times when current income is low or even negative, due perhaps to seasonal variation or harvest failure. Consumption can therefore provide a better picture of actual standards of living than current income, especially when income fluctuates a lot.

One should not be dogmatic about the use of consumption data for poverty measurement, however. Using income may have its own advantages, for example, by allowing to distinguish by income sources when analyzing poverty. When this is available, income can also be compared more easily to data from other sources, such as wages, which provides a check for the quality of the data in the household survey. Finally, in some surveys, consumption or expenditure might simply not be collected.

When both income and consumption are available, the analyst might want to compute poverty measures with both indicators and compare the results. A simple way of testing the sensitivity of the results to the choice of consumption or income (or to any other choice) consists in computing a *transition matrix*. To construct this matrix, one divides the population into a number of groups -- for example, ten deciles, with each of them representing ten percent of the population, from the poorest ten percent to the richest ten percent. Each household belongs to only one decile for each indicator, but some households may belong to one decile for income, and another for consumption, in which case many households would not belong to the diagonal of the matrix. Since income and consumption capture different aspects of poverty, the matrix might show that household ranking is affected by the definitions, which can in turn inform on other aspects of well-being (such as the ability of households to smooth consumption, see Hentschel and Lanjouw 1996 for an illustration).

Whether one chooses income or consumption, it is typically necessary to aggregate information provided at the household or individual level for many sources of income or consumption in the survey. This aggregation is a complex process. Some adjustments might be necessary to ensure the aggregation process leads to the desired measures. However, most adjustments do require access to good information (in particular on prices), which might not be available. Complicated adjustments might also limit the understanding some users will have of the poverty analysis, and the use they will be able to make of it. Basic guidelines for aggregation are as follows (see **Technical Note 3** for related issues in the case of Uganda):

> **Adjust for differences in needs between households and intra-household inequalities:** Households of different size and composition have different needs, and it is not easy to reflect these differences in needs in poverty measures. Two crucial decisions need to be made. First, should adjustments be made to reflect the age of the household members—adults and children—and perhaps their gender? Second, should households of different sizes be treated differently, to reflect the fact that larger households may be able to purchase goods in bulk at cheaper rates and to economize on the purchase of some products, especially consumer durables? Box 1 discusses the issues related to equivalence scales (adjustments of basic needs for different age groups and by gender), and economies of scale (adjustments for household size). The analyst may want to test for the impact of equivalence scales and economies of scale on poverty measures, and for the comparison of these

measures between household groups. If feasible, the analyst may also want to investigate the magnitude of intra household inequalities, for example to the detriment of women.

Box 1. Differences in needs between households and intra-household inequalities

When computing poverty measures, analysts should test for two important assumptions inherent in these calculations: the assumptions about equivalence scales, and about economies of scale in consumption.

➢ **Equivalence scales:** The standard way of determining whether a household is poor is to compare its per capita spending or income to a per capita poverty line. The calculation of the poverty line is based on assumptions about the cost of basic needs of men and women of different ages. Most often, the poverty line is computed for a 'typical family' of two adults and three children with adjustments made for lower needs among children. Analysts can vary such equivalence assumptions in deriving the poverty line and see how many changes this implies. A 'pure' way to measure poverty would assign each household in the data set an individual poverty line that reflects the unique composition of the households. It can be tested to what degree poverty comparisons are influenced by making the shortcut of applying an 'average' poverty line to all households, independent of their structure.

➢ **Economies of scale:** When calculating a household's per capita spending or income by dividing total household resources by the number of people living in the household, the implicit assumption is made that no economies of scale in consumption exist--that is, a two-person household with a consumption of 200 would be as equally well off as a one-person household with a consumption of 100. However, larger households generally have an advantage over smaller households as they can benefit from sharing commodities (such as stoves, furniture, housing, and infrastructure) or from purchasing produce in bulk, which might be cheaper. If economies of scale exist in consumption, this will especially affect the relationship between household size and the risk of being poor--an important relationship. There is no single agreed-upon method to estimate economies of scale in consumption (see Lanjouw and Ravallion 1995, Deaton 1997). Simpler tests can also be made to test how sensitive a poverty profile is to the assumption about economies of scale (see, for example, World Bank 1999b, p. 69; see also the references on sequential stochastic dominance in **Technical Note 5**).

Another issue relates to intra-household inequalities. Measuring intra-household allocation and inequality is difficult when the analysis is confined to income and consumption. This is because the available data typically fail to capture individual spending and consumption directly. Intra-household inequality has not been systematically measured, but evidence points to its existence. A study by Haddad and Kanbur, (1990) suggests that relying only on household information could lead to an underestimate of inequality and poverty of more than 25 percent. Evidence on differences in health and education confirms that discrimination within households does exist in certain regions and countries. Capturing intra-household inequality and assessing its importance can be done partly through qualitative and participatory surveys (section 5.3). Another alternative is to analyze non-income measures of well-being, such as nutrition (anthropometric measures), education, or health, for which measures of individual wellbeing are possible.

➢ **Adjust for differences in prices across regions and at different points in time:** the cost of basic needs might vary between areas and over time. Expenditure and income data are proxies for the real level of welfare that households are reaching. Nominal expenditures or incomes need to be made comparable in spatial terms, by adjusting for different price levels in different parts of the country. The more diverse and vast a country, the more important spatial adjustments will be (factors of diversity include the degree of rural-urban integration, remoteness of areas, and so on). Adjustments are also sometimes needed over time, sometimes within a given survey. That is, if inflation is significant during data collection, whether a household is interviewed at the beginning or the end of the data collection period will matter. Then time adjustments will be needed. Once regional price indices are available, once can make the adjustments in two different ways: (1) one can apply spatial and time

deflators to the income or consumption of each household and compare it against a single poverty line or (2) one can compute one poverty line for each region and date. **Technical Note 2** presents an example from Bangladesh.

➢ **Exclude input and investment expenditure:** Care must be taken not to interpret spending that is made for inputs into household production—such as outlays for tools or other inputs such as fertilizer, water, or seed in agricultural production—as spending for consumption or as income. If we included spending on inputs in the consumption or income aggregate, we would overstate the actual welfare levels achieved by households.

➢ **Impute missing price and quantity information:** Not all households provide information on the various income or consumption sources available in a survey. In the case of consumption, when information is lacking regarding the amounts and prices of the goods that are known to be consumed by the household, these data may need to be estimated (imputed). One of the most common imputations is for owner-occupied housing, that is, a hypothetical rental value for those households not paying rent. In the case of income, when it is known that household members are working, an imputation may also be needed if no labor earnings are reported.

➢ **Adjust for rationing:** When using consumption, even if prices are available for each household in the survey, markets may be rationed. There may be restrictions on the quantities available for purchase although prices are kept at a set level—for example for public water or electricity services. In such cases, the price paid by the consumer is lower than his or her marginal utility from consumption, and yet the latter is the yardstick for measuring welfare levels. If it is possible to estimate the shadow price of the goods consumed, this should be done.

➢ **Check whether adjustments for under-reporting can be made:** In some regions, it is a common practice to adjust income or consumption for underreporting in the surveys. There is a presumption of underreporting when the mean income (or consumption) in the surveys is below what is suggested in the disposable income or private consumption information as available in the National Accounts aggregates. Underreporting tends to be more severe when poverty measures are based on income instead of consumption. Before adjusting household income or consumption estimates for underreporting, however, a careful examination of the reliability of the national accounts data is necessary. Further, underreporting adjustment generally make very strong assumptions about the structure of underreporting across households (e.g., that each household under-declares income or consumption to the same degree). Such assumptions have to be carefully reviewed.

2.1.1.2 Non monetary dimensions of poverty

Although poverty has been traditionally measured in monetary terms, it has many other dimensions. Poverty is associated not only to insufficient income or consumption, but also to insufficient outcomes with respect to health, nutrition and literacy, to deficient social relations, to insecurity, and to low self-confidence and powerlessness. In some cases, it is feasible to apply the tools which have been developed for monetary poverty measurement to non-monetary indicators of well-being. The requirement for being able to apply the tools of poverty measurement to non-monetary indicators is that it must be feasible to compare the value of the non-monetary indicator for a given individual or household to a threshold or "poverty line" under which it can be said that the individual or household is not able to meet its basic needs.

Various chapters in this Sourcebook, and in particular the Chapters on **Education** and **Health** provide examples of indicators which might be suitable for such analysis. **Technical Note 6** also provides examples. Without going into too much details on these, for which one can refer to the specific chapters, analysts could focus on important dimensions of capabilities, such as literacy and nutrition. A few examples of dimensions of well-being for which the techniques could be used include:

➢ **Health and nutrition poverty:** The health status of household members can be taken as an important indicator of well-being. One could focus on the nutritional status of children as a measure of outcome, as well as on the incidence of specific diseases (diarrhea, malaria, respiratory diseases) or life expectancy for different groups within the population. If data on such health outcomes are not available, input proxies could be used such as the number of visits an individual makes to hospitals and health centers, access to specific medical services (such as pre-and post-natal care), or on the extent to which children receive vaccinations in time as a input for their future health status.

➢ **Education poverty:** In the field of education, one could use the level of literacy as the defining characteristic, and some level judged as the threshold for illiteracy as the "poverty line". In countries where literacy is close to universal, one might opt for specific test scores in schools as the relevant outcome indicator to distinguish different population groups. Another alternative consists in comparing the number of years of education completed to the expected number of years of education that should be in principle completed .

➢ **Composite indices of wealth:** An alternative to using a single dimension of poverty could be to combine the information on different aspects of poverty. One might want to create a measure which takes income, health, assets and education into account. It might also be the case that information on income is not available but other dimensions are covered. The description of the various techniques available goes beyond the scope of this chapter but **Technical Note 14** presents the case of use of Demographic and Health Surveys. It is important to note that a major limitation of composite indices is that it is not possible to define a 'poverty line'. Analysis by quintile or other percentile remains possible, though, and can provide important insights in the profile of poverty.

Other measures can also be based on subjective assessments of one's poverty or on self-reported, as presented in Box 2.

Box 2: Subjective measures of poverty

Subjective perceptions can also be used to measure poverty. Such measures of poverty are based on questions to households about 1) their perceived situation, such as 'do you have enough?', 'do you consider your income to be very low, rather low, sufficient, rather high, or high?', 2) a judgment about minimum standards and needs, such as 'what is the minimum amount necessary for a family of two adults and three children to get by?' or 'what is the minimum necessary for your family?', or 3) poverty rankings in the community, such as 'which groups are most vulnerable in the village?'. On the basis of the answers, one can also derive poverty lines. Answer to the second types of questions could provide a line for different types of reference households. Alternatively, answers to the first questions can be compared to actual income to infer the income level for which households tend to say they have sufficient income. This income level could then be used as poverty line.

Subjective measures can be used not only to assess the situation of a particular household but also to set or inform the choice of poverty lines, equivalence scales, economies of scale, and regional cost-of-living differences. It can also be useful to compare subjective and self-reported measures of well-being to

objective measures based on observed income and consumption data and ensure the robustness of the results.

Self-reported measures have important limitations, however. Subjective measures might reproduce existing discrimination or exclusion patterns, if these patterns are perceived as 'normal' in the society. This might be the case of discrimination against girls or against particular groups in society. Subjective assessments could then fail to capture discrimination, which should be addressed by public policy. More generally, the observed perceptions of poverty need not provide a good basis to establish priority public actions. This may be the case if policy makers have a different time horizon and/or a different understanding of the determinants of social welfare than the population providing the subjective measures of poverty. It might also be the case that people perceive the elderly to be those most in need, but that public policy aimed at improving nutrition practices or at providing preventive health care would have a higher impact on poverty.

For more information, refer to Goedhart et al. 1977, Pradhan and Ravallion 1998. For an application to a developing country, see Pradhan and Ravallion 2000.

2.1.2 Choosing and estimating a poverty line

Once an aggregate income, consumption or non-monetary measure is defined at the household or individual level, the next step is to define one or more poverty lines. Poverty lines are cut-off points separating the poor from the non-poor. They can be monetary (e.g. a certain level of consumption) or non-monetary (e.g. a certain level of literacy). The use of multiple lines can help in distinguishing different levels of poverty. There are two main ways of setting poverty lines—in a relative or absolute way:

➢ **Relative poverty lines:** These are defined in relation to the overall distribution of income or consumption in a country; for example, the poverty line could be set at 50 percent of the country's mean income or consumption.

➢ **Absolute poverty lines:** These are anchored in some *absolute* standard of what households should be able to count on in order to meet their basic needs. For monetary measures, these absolute poverty lines are often based on estimates of the cost of basic food needs (i.e., the cost a nutritional basket considered minimal for the healthy survival of a typical family), to which a provision is added for non-food needs. For developing countries, considering the fact that large shares of the population survive with the bare minimum or less, it is often more relevant to rely on an absolute rather than a relative poverty line. **Technical Note 2** presents the process for setting a poverty line in Bangladesh. Box 3 briefly presents alternative methods of setting absolute poverty lines.

Alternative poverty lines are also sometimes used. They can be set on the basis of subjective or self reported measures of poverty (see Box 2). Alternatively, one can combine absolute and relative poverty lines. This technique allows to take inequality and the relative position of households into account while recognizing the importance of an absolute minimum below which livelihood is not possible. When deciding on the weight to give to the two lines when combining them, one can use information contained in the consumption or income data and information from qualitative data (if the qualitative data shows that people consider a specific good to be a basic need, the elasticity of ownership of that good to income can be used, see Madden 2000)

Ultimately, the choice of a poverty line is arbitrary. In order to ensure wide understanding and wide acceptance of a poverty line, it is therefore important to ensure that the poverty line chosen does resonate with social norms (with the common understanding of what represents a minimum). For

example, in some countries, it might make sense to use the minimum wage or the value of some existing benefit which is widely known and recognized as representing a minimum. Using qualitative data (see Section 5.3) could also be useful to decide what goods would go in the basket of basic needs (when constructing an absolute poverty line).

Box 3. Methods of Setting Absolute Poverty Lines

Different methods have been used in the literature to define absolute poverty lines [see Deaton 1997, Ravallion and Bidani 1994, Ravallion 1994, and Wodon 1997a]. The choice of method can greatly affect poverty measures and who is considered poor. It is important to derive poverty lines that provide consistency in welfare measurement in space and time: two people with the same real consumption should be considered either poor or non-poor. As discussed in Ravallion and Bidani (1994) and Wodon (1997a), the food-energy intake method defines the poverty line by finding the consumption expenditures or income level at which a person's typical food energy intake is just sufficient to meet a predetermined food energy requirement. If applied to different regions within the same country, the underlying food consumption pattern of the population group just consuming the necessary nutrient amounts will vary. This method can thus yield differentials in poverty lines in excess of the cost-of-living differential facing the poor. An alternative is the Cost of Basic Needs method, where an explicit bundle of foods typically consumed by the poor is valued at local prices first. To this, a specific allowance for nonfood goods, consistent with spending by the poor, is added. However defined, poverty lines will always have a high arbitrary element; for example, the calorie threshold underlying both methods might be assumed to vary with age. Ordinal ranking of welfare--crucially important for the poverty profile--is more important than cardinal ranking, with one household 'above the line' and another 'below the line.' For comparisons over time, however, the stability and consistency of the poverty line need to be ensured.

2.1.3 Choosing and estimating poverty measures

The poverty measure itself is a statistical function which translates the comparison of the indicator of well being and the poverty line which is made for each household into one aggregate number for the population as a whole or a population sub-group. Many alternative measures exist but the following three measures are most commonly used (see **Technical Note 1** for the formulae used to derive these poverty measures):

➢ **Incidence of poverty (headcount index):** This is the share of the population whose income or consumption is below the poverty line, that is, the share of the population that cannot afford to buy a basic basket of goods. An analyst using several poverty lines, say one for poverty and one for extreme poverty, can estimate the incidence of both poverty and extreme poverty. For non monetary indicators, similarly, the incidence of poverty measures the share of the population which does not reach the defined threshold (e.g. percentage of the population with less than 3 years of education).

➢ **Depth of poverty (poverty gap):** This provides information regarding how far off households are from the poverty line. This measure captures the mean aggregate income or consumption shortfall relative to the poverty line across the whole population. It is obtained by adding up all the shortfalls of the poor (considering the non-poor has having a shortfall of zero) and dividing the total by the population. Put differently, it gives the total resources needed to bring all the poor to the level of the poverty line (divided by the number of individuals in the population). This measure can also be used for non-monetary indicators, provided that the measure of the distance is meaningful. The poverty gap in education could be the 'number of years of education missing to reach the defined threshold' (see **Technical Note 6** for a discussion of this and other examples of application of poverty measurement tools to non-monetary

indicators). In some cases, though, the measure does not make sense or is not quantifiable (e.g. when indicators are binary, such as literacy, in which case only the concept of the headcount can be used). Note also that, as discussed in **Technical Note 1**, the poverty gap can be used as a measure of the 'minimum amount of resources necessary to eradicate poverty', that is, the amount that one would have to transfer to the poor under perfect targeting (i.e. each poor getting exactly the amount he/she needs to be lifted out of poverty) to bring them all out of poverty.

➤ **Poverty severity (squared poverty gap):** This takes into account not only the distance separating the poor from the poverty line (the poverty gap), but also the inequality among the poor. That is, a higher weight is placed on those households who are further away from the poverty line. As for the poverty gap measure, limitations apply to some non-monetary indicators.

All of these measures can be calculated on a household basis, i.e. by assessing the share of households who are below the poverty line in the case of the headcount index. However, it might be better to estimate the measures on a population basis – in terms of individuals – in order to take into account the number of individuals within each household.

The measures of depth and severity of poverty are important complements of the incidence of poverty. It might be the case that some groups have a high poverty incidence but low poverty gap (when numerous members are just below the poverty line), while other groups have a low poverty incidence but a high poverty gap for those who are poor (when relatively few members are below the poverty line, but with extremely low levels of consumption or income). Table 1 provides an example from Madagascar. According to the headcount, unskilled workers show the third highest poverty rate, while the group is in the fifth rank according to the poverty severity. Comparing them with the herders shows that they have a higher risk of being in poverty, but that their poverty tends to be less severe or deep. The types of interventions needed to help the two groups are therefore likely to be different.

Table 1. Poverty Groups by Socio-economic Groups, Madagascar 1994

Socio-economic Group	Headcount	Rank	Poverty Gap	Rank	Poverty Severity	Rank
Small farmers	81.6	(1)	41.0	(1)	24.6	(1)
Large farmers	77.0	(2)	34.6	(2)	19.0	(2)
Unskilled workers	62.7	(3)	25.5	(4)	14.0	(5)
Herders/fishermen	61.4	(4)	27.9	(3)	16.1	(3)
Retirees/handicapped	50.6	(5)	23.6	(5)	14.1	(4)

Source: World Bank 1996b, p.21.

Depth and severity might be particularly important for the evaluation of programs and policies. A program might be very effective at reducing the number of poor (the incidence of poverty) but might do so only by lifting those who were those closest to the poverty line out of poverty (low impact on the poverty gap). Other interventions might better address the situation of the very poor but have a low impact on the overall incidence (if it brings the very poor closer to the poverty line but not above it).

Box 4. Key Questions to Ask When Measuring Poverty

When analyzing monetary poverty, one is concerned with the population whose income or consumption is below a poverty line. This section has discussed how to define income and consumption, as well as the cut-off point of the poverty line, and how to use this information for poverty measurement. Some of the basic questions which must be asked by the poverty analysts in the process of producing a poverty profile and/or trend are outlined below.

Income or consumption aggregate
- Which module of the household survey is better developed, income or consumption?
- Does the household survey include the necessary price data for spatial and inter-temporal deflation of the welfare aggregate? If not, are there other price data available that can be used? Does this price information truly reflect price variations by, for instance, agro-climatic zone?
- Are certain markets rationed? Do certain consumption or income components have to be shadow-priced?
- Which consumption series is incomplete for households? What information must be imputed?

Poverty line
- Does a poverty line already exist in the country? If so, is it well-accepted?
- If a new poverty line is derived, should international standards of setting the poverty line be followed?
- Can a basic nutritional basket underlying poverty line computations be derived from the survey?

Poverty measure:
- Are poverty comparisons by region stable across different measures, such as headcount, gap, and severity?
- How do estimated poverty measures change with small alterations in the poverty line (sensitivity test)?
- Which poverty measure, and at which aggregation level, is most used in-country?
- Is it important for the national debate on poverty to focus more on distribution-sensitive forms of income-poverty measurement?

2.2 Poverty analysis

Once the indicator, line and measures have been chosen, the various characteristics of the different poverty groups (poor and non-poor) can be compared to shed light on correlates of poverty (section 2.2.1). One can also compare poverty measures for groups of households with different characteristics or over time (section 2.2.2). Tools to analyze the determinants of poverty and poverty changes are presented in section 2.2.3.

When comparing, it is important to test whether the observed differences in characteristics between different poverty groups, or the differences in poverty incidence between specific groups or over time are statistically significant. All measures from household surveys are only estimates of 'true' poverty because they are derived from a population sample and not a population census. All estimates therefore carry margins of error that must be computed in order to provide an indication of the precision of the estimates. Moreover, since poverty measures are sensitive to the assumptions made by analysts in the estimation (Box 1), it is important to test whether the poverty rankings obtained between household groups or periods of time are robust to these assumptions (section 2.2.4).

2.2.1 Characteristics of households/individuals in different poverty groups

A first way to draw a poverty profile is to analyze the characteristics of the different income or consumption groups. This allows to get a better understanding of who the poor are, and what are the differences between the poor and the non-poor. The profile may include information on who the poor are, where they live, what they do, how they earn a living, how they access and use government services, and what their living standards are in terms of health, education, nutrition, and housing, among other topics. It is important that the data gathered in the profile to describe the living conditions of the poor be placed in the political, cultural, and social context of each country. In other words, qualitative and historical information as well as institutional analysis is necessary to give meaning to, and complement, the profile.

When doing such analysis, it might be useful to separate the tabulations for those groups which are expected to be very different. In Table 2, we present information on households' education, employment and access to services in Ecuador by urban and rural areas. The Table shows that the poor have on average lower education levels, and lower access to services. However, on average, the same proportion of households is engaged in the informal sector among the poor and the non-poor (although patterns differ in urban and rural areas). When looking at urban and rural areas separately, it appears that access to services such as electricity is very similar for the poor and non-poor in urban areas This dimension is not a correlate of urban poverty. When carrying out such type of analysis, one should remember that we are only looking at averages, which can hide very large variations, e.g. some of the poor might be very educated while some of the non poor have low education attainments.

Table 2. Some Characteristics of the Poor in Ecuador, 1994

	Urban		Rural		Total	
	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor
Education						
Education of head (years)	5.2	9.1	3.2	4.7	4.0	7.5
Employment						
Informal sector	54.6	44.1	27.9	35.8	39.2	41.7
Regulated sector	15.5	35.3	3.4	9.9	8.6	26.7
Access to basic services						
Sewerage connection (%)	57.3	83.4	12.4	28.2	29.6	63.8
Electricity supply (%)	97.8	99.5	62.0	75.8	75.8	91.1
Water from public net (%)	61.2	78.8	18.3	23.0	34.8	59.3
Waste collection (%)	59.7	76.7	1.1	5.6	23.5	51.5

Source: World Bank 1996a.

The analysis can also be carried out by quintiles or deciles of the selected indicator. This is particularly relevant in the case of those indicators for which a poverty line cannot be drawn Table 3 presents some results from Senegal for a composite welfare indicator derived from a Demographic and Health Survey (see **Technical Note 14**). The table distinguishes five wealth quintiles of the population and reveals that those in the lower quintiles have higher mortality, higher fertility, and are less likely to receive attendance from trained persons when giving birth. The Table also reports the ratio of the poorest to the richest, a measure which allows to appreciate the size of the gap between the two groups (this measure of inequality is similar to the decile dispersion ratio presented later in section 3.1).

Table 3. Socio-economic differences in health, Senegal 1997

Indicator	Quintiles					Population Average	Poorest/Richest Ratio
	Poorest	Second	Middle	Fourth	Richest		
Infant mortality rate	84.5	81.6	69.6	58.8	44.9	69.4	1.9
Total Fertility Rate	7.4	6.8	6.2	5.2	3.6	5.7	2.1
Deliveries attended by medically trained person (%)	20.3	25.4	45.3	69.3	86.2	46.5	0.2

Source: Gwatkin et al. 2000, on the basis of the Demographic and Health Survey of 1997.

2.2.2 Poverty comparisons between groups and over time

2.2.2.1 Poverty comparisons between groups

The poverty profile focuses on presenting the poverty characteristics of various household groups. The choice of the types of groups will be driven by some ex-ante knowledge of important dimensions (where qualitative data can help) or by dimensions which are relevant for policies. For instance, geographic location, age or gender might be dimensions along which policies can be developed. Another dimension which can provide useful insights for policy elaboration is the link between employment and poverty. This could indicate which sectoral pattern of growth would have the highest impact on poverty. (see later, in section 3.3, for techniques to simulate changes in poverty which would result from growth in various sectors).

There are three main ways to present a poverty profile.

➢ **Poverty measures according to household groups***:* The first and most common way to present poverty data is to give poverty measures for various household groups. For example, Table 4 shows that households without education have higher poverty incidence than those with higher levels of education in Malawi. Another example is provided in Table 5, which shows that households living in Barisal in Bangladesh had a poverty incidence of 60 percent in 1996, as compared to 53 percent for the country as a whole.

Table 4: Poverty incidence among various household groups in Malawi, 1997/98

Characteristics of household or household head	Poverty incidence	Poverty depth	Poverty severity
Southern region	68.1	0.254	0.134
Central Region	62.8	0.212	0.105
Northern Region	62.5	0.231	0.111
Rural	66.5	0.239	0.122
Urban	54.9	0.191	0.097
male	57.9	0.22	0.11
female	65.6	0.28	0.15
under 20	40.7	0.17	0.09
20 to 29	49.6	0.18	0.08
30 to 44	61.2	0.25	0.13
45 to 64	61.5	0.25	0.13
65 and older	66.9	0.25	0.12
no education	70.6	0.31	0.17
less than standard IV	63.2	0.25	0.13
standard IV	58.1	0.22	0.11
Primary school	47.2	0.15	0.06
Secondary school	29.8	0.08	0.03
University	15.5	0.07	0.04

Source: National Economic Council (2000).

➢ **Contribution of various household groups to poverty measures:** An alternative way to present a poverty profile consists in assessing how various household groups contribute to the overall poverty in the country. The contribution of a household group to overall poverty is a function of that group's population share and the incidence of poverty in the group. Table 5 shows that the population living in the Barisal division represents 7 percent of the population, and the headcount index is 60%, against a national average of 53%. Therefore, the share of all the poor living there is 8 percent (8=7*60/53). In the case of Madagascar, the Table shows that 14 of the country's poor live in urban areas (14 = 21 * 47/70).

Table 5. Geographic Poverty Profile, Bangladesh (1995-96) and Madagascar (1994)

Bangladesh, 1996	Barisal	Chittagong	Dhaka	Khulna	Rajshahi	National
Population share	7	26	31	12	24	100
Headcount index	60	45	52	52	62	53
Share of all poor	8	22	30	12	28	100
Relative risk	+14%	-20%	-3%	-3%	+24%	
Madagascar, 1994	Total urban	Capital city	Major urban	Other urban	Rural	National
Population share	21	10	5	7	79	100
Headcount index	47	41	43	59	77	70
Share of all poor	14	6	3	6	86	100
Relative risk	-39%	-44%	-41%	-17%	+63%	

Source:

➢ **Relative risk:** Poverty measures can be translated into relative risks of being poor for different household groups. These risks provide the probability that the members of a given group will be poor in relation to the corresponding probability for all other households of society (all those not belonging to the group). In Madagascar, the Table indicates that urban households are 39 percent less likely to be poor than non-urban (i.e. rural) households (0.39 = 1 – 47/77), while rural households are 63 percent more likely to be poor than non-rural (i.e. urban) households (0.63 = 1 – 77/47). Similar calculations could be carried out relative to the entire population or to a specifically selected group.

The extent to which a detailed poverty profile can be constructed depends on the type of data available. Multi-topic surveys are ideal for developing detailed poverty profiles, but many other types of surveys can be used as well. For example, demographic and health surveys can be used to relate household characteristics with household wealth (see **Technical Note 14)**. Monitoring surveys can also be used to establish links between income or wealth and variables such as school enrollment rates, access to basic services, and satisfaction with service delivery.

While certain variables like education, health, and access to service will almost always be part of a poverty profile, the relevance of many variables will depend on country circumstances and on the data source available. The profile should, if possible, identify the major production and consumption characteristics of the poor: whether the rural poor farm their land, are agricultural wage laborers, or work in various non-farm activities; whether the urban poor work as wage employees or as micro-entrepreneurs in the informal sector. Data on asset holdings by the poor are also relevant, as are their production technologies, use of inputs, and access to social and infrastructure services. Information on the composition of poor people's consumption, including their access to public goods, is also valuable. Cross-links to other forms of poverty, such as lack of education, health care, and security, can also be established.

If the survey is designed to be representative at the level of relatively small geographic areas (e.g. the district level), the various measures could also be presented graphically on a poverty map. One could present more than one poverty measure on the map (one could present child malnutrition incidence and income poverty incidence simultaneously). A particularly useful combination would be to include indicators of outcomes and indicators of access to services to study the correlation and to guide the allocation of resources among local administrative units.

If the survey is not designed to be representative at a sufficiently small level (when the level at which the survey is representative is larger than the level at which administrations operate. Some surveys are only representative at the regional level while ministries work on the basis of districts), one can combine census and survey data to predict poverty measures at the municipal level, using a model for the determinants of poverty estimated with the household survey and comprising of variables available in the census itself (see **Technical Note 4**).

Poverty comparisons across countries are difficult for several reasons. The best option would be to use a fixed poverty line, since households would then uniformly be labeled as 'poor' if they consume less than a fixed bundle of goods. However, both absolute and relative prices of different goods and services differ across countries. In order to allow comparison, one can develop conversion factors, which reflect how many goods the local currency buys within each country. On the basis of information on prices, GDP structure, population figures, and exchange rates, a set of Purchasing Power Parity (PPP) conversion factors have been developed, which allow such comparisons. However, even once PPP factors are used (and assuming they reflect reality), cross-country comparisons still rely on the assumption that consumption or income are measured homogeneously across countries. Significant distortions can be introduced if survey instruments differ from each other or purchasing power parities do not reflect the actual price differentials between a basket of goods important to the poor. Comparing national poverty rates based on nationally derived poverty lines--those anchored in nationally specific consumption patterns and food requirements--is a feasible alternative only to the extent that the poverty lines estimated in the various countries represent similar welfare levels. (see http://www.worldbank.org/data/ppp/ and **http://pwt.econ.upenn.edu/**)

Box 5. Key Questions to Ask When Preparing a Poverty Profile

Poverty profile
- How robust is a ranking of poverty by area or group to variations in the poverty line?
- How is income poverty correlated with gender, age, urban and rural, racial, or ethnic characteristics?
- What are the main sources of income for the poor?
- On what sectors do the poor depend for their livelihood?
- What products or services—tradables and non-tradables—do the poor sell?
- To what extent are the rural poor engaged in agriculture? In off-farm employment?
- How large a factor is unemployment? Underemployment?
- Which are the important goods in the consumption basket of the poor? How high is the share of tradables and non-tradables?
- How is income poverty linked with malnutrition or educational outcomes?
- What are fertility characteristics of the poor?
- To what public services do the poor have access? What is the quality of the service?
- How important are private costs of education and health for the poor?
- Can the poor access formal or informal credit markets?
- What assets—land, housing, and financial—do the poor own? Do property rights over such assets exist?
- How secure is their access to, and tenure over, natural resources?
- Is environmental degradation linked to poverty?
- How variable are the incomes of the poor? What risks do they face?

Poverty risk
- Are certain population groups in society at a higher risk of being poor than others are?
- If so, can those groups be defined along age, gender, ethnicity, place of residence, occupation, and educational lines?

Geographic profile
- Does poverty vary widely between different areas in the country?
- Are the most populated areas also the areas where most of the poor live?

Source: Based in part on Poverty Reduction Handbook (World Bank 1992)

2.2.2.2 Poverty comparisons over time

If consecutive rounds of a household survey, several separate surveys, or a survey with a panel component are available, changes in income poverty over time can be assessed (see Section 5.2 for definitions. A survey with a panel component is a survey with consecutive rounds during which the same households or individuals are interviewed at different points in time). This requires poverty measures which are comparable and which reflect differences over time in the cost-of-living across regions. The standard method for preparing comparisons over time consists of converting nominal income or consumption data from different surveys and regions into real income and consumption by deflating the indicators in space and time. A constant poverty line can then be applied to these real values to infer poverty measures. Ideally, to obtain robust poverty comparisons over time, one would want to use surveys with similar sampling frame and methods, with corrections for prices differences, and with similar definitions of consumption or income. In practice, however, differences exist in some of these dimensions. This does not imply that no comparison can be made. It simply means that the analyst will need to:

- correct for major differences in the sampling frame and sampling method for the different surveys or the different rounds of a panel survey;
- use regional and temporal price indices to ensure an similar definition of the poverty line over time and across regions;
- adjust the definition of consumption or income aggregates over time to ensure a similar definition is used. Changes in definitions, and in particular in the degree to which home production is included in the definition, can lead to important distortions of poverty measurement. **Technical Note 3** presents an example of the types of adjustments that can be made.

When several rounds of survey are available, the analyst can investigate changes in the regional distribution of poverty or in the major characteristics of the poor, such as ethnicity, gender, age, urban and rural location, employment, access to social programs and basic services, etc. Although the various population groups identified in the first period of time should clearly form the basis of the analysis over time, it is also important to investigate whether or not 'new' groups of poor people have appeared. This is particularly relevant for countries that undergo rapid changes linked to such factors as economic reforms, conflicts, natural disasters, and epidemics such as HIV/AIDS. For example, Figure 1 compares the headcount indices of poverty by sector of employment in Burkina Faso in 1994 and 1998. The incidence of poverty declined for those employed in export agriculture and for households without working members, and increased for all other categories. This type of results can provide insights about the stability of poverty characteristics and about the relevance of various policies, including the use of targeting devices.

Figure 1. Poverty Incidence Across Sectors of Employment, Burkina-Faso 1994-1998.
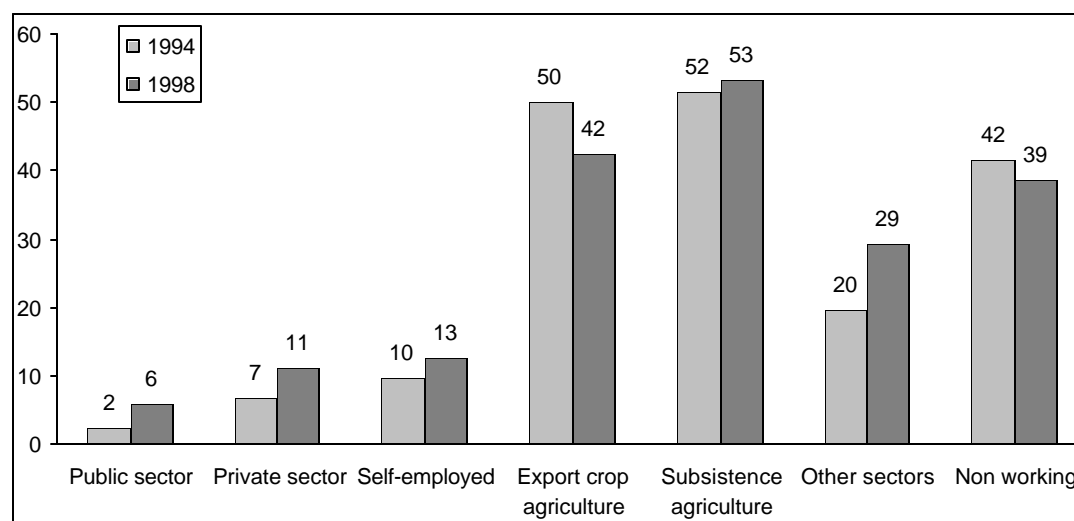
Source: Institut National de la Statistique et de la Démographie, Enquête Prioritaire 1999.

One can also look at changes in the characteristics of different poverty groups (along the lines of Tables 2 and 3). For example, the distribution of access to services in the base year can be compared with the distribution of services in the second year. The patterns can then be compared to uncover whether changes made in the supply of the services have been pro-poor. In Ghana, as shown in Figure 2, while the non-poor saw their access to services increase over time (those with access to electricity increased from 73 to 85 percent), the situation of the very poor and poor did not improve over the period. In some cases, it even decreased. This information, and further disaggregation by locality, can help improve the provision of services.

Figure 2. Percentage of Households, by poverty group with a refrigerator, access to electricity and access to water, Ghana 1991/92 – 1998/99
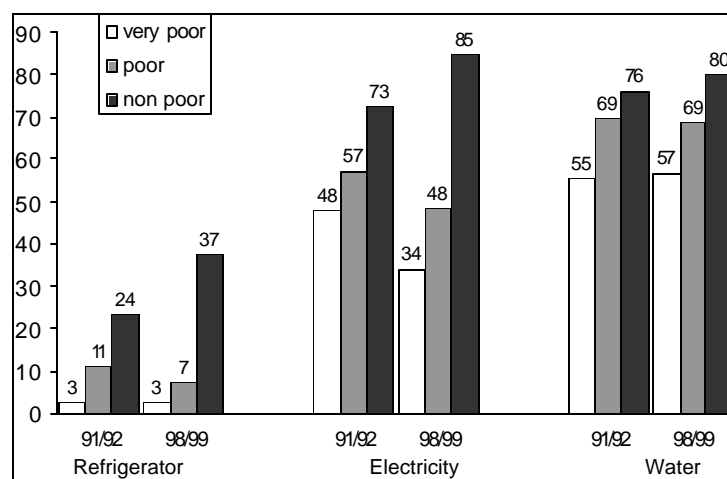
Note: access to water refers to access to water from pipe, neighbor/private or public pipe.
Source: Ghana Statistical Service (2000).

The concept of relative poverty risk introduced in the previous section can also be applied to the analysis of changes in poverty over time using repeated cross-section surveys. The objective is to examine whether, over time, the relative poverty risk of specific population groups decreases or increases. Table 6 compares the relative poverty risk of various groups in Peru in 1994 and 1997. It shows, for example, that the poverty risks of households of seven persons or more increased over time (from 71 percent to 106 percent), while that of households where the spouse of the head is working diminished (from –11 percent to –21 percent).

Table 6. Poverty Risks for Selected Groups of Households, Peru 1994 and 1997 (percent)

Household characteristic	1994	1997
Households using house for business purposes	-28	-29
Rural households with at least one member in off-farm empl.	-24	-23
Households with head's spouse working (1)	-11	-21
Households without water or sanitation	+54	+50
Households without electricity	+63	+69
Households with head less than secondary education	+73	+72
Households of 7 persons or more	+71	+106

(1) in remunerated work in the last seven days before the survey was conducted
Source: World Bank 1999b, p.25.

It is also possible to decompose a national change in poverty into the effects of changes in poverty within groups or between groups/sectors. This allows the analyst to assess whether poverty has changed because poverty within certain groups has changed or because people have moved to more affluent or poorer groups. More specifically, the national change in poverty is decomposed into intra-sectoral effects (changes in poverty within sectors), inter-sectoral effects (changes in population shares across sectors), and interaction effects (correlation between sectoral gains and population shifts--depending on whether people tend to move to sectors where poverty is falling or not). This poverty decomposition for Uganda shows that 54 percent of the total change in poverty is due to poverty reduction in the cash crop sector alone

(Table 7). Interaction effects are small but positive, showing that those who moved tended to enter sectors where poverty was falling faster. Population shifts between sectors explain only 2 percent of total change in poverty--suggesting the relative immobility of the workforce in terms of employment sectors. This might reveal barriers to entry into some sectors. Either such barriers would need to be removed if the poor are to benefit from growth in the more promising sectors, or interventions would have to focus more on generating growth in the sectors where the poor work. (see **Technical Note 1** for technical details).

Table 7. Sectoral Decomposition of Changes in Poverty, Uganda 1992/1993-1995/96

Sector	**Poverty incidence** (headcount)			**Population share**			**Contribution to change in total Poverty incidence** (percentage)
	1992/93	1995/96	change (percentage point)	1992/93	1995/96	change (percentage point)	
Food crop	64	62	-2	47	44	-3	10
Cash crop	60	44	-16	23	27	3	54
Non-crop agriculture	53	40	-13	3	2	-1	5
Mining	32	74	43	0	0	0	-1
Manufacturing	45	27	-17	4	3	0	9
Public utilities	34	11	-23	0	0	0	0
Construction	38	35	-4	1	1	0	1
Trade	26	19	-7	7	7	0	6
Hotels	30	20	-11	1	1	1	1
Transport/communication	32	15	-17	2	2	0	4
Government services	26	29	3	2	2	1	-1
Other services	35	28	-7	7	6	-1	7
Not working	60	63	3	4	5	1	-2
National total	56	49	-7	100	100	0	
Total intra-sectoral							94
Total inter-sectoral							2
Total interaction							4

Source: Appleton 1999.

Box 6: Key Questions to Ask When Comparing Poverty Measures Over Time

When comparing poverty over time, the indicators of well-being should be identical to avoid distortions. The distortions can result from changes in the questionnaire.

♦   Are the number of items covered in the surveys the same?. For example, the indicator in the second survey might include expenditures and auto-consumption of a specific food item that was not included in the first survey round. In this case, households with the same true consumption in the two periods will appear to have higher measured consumption in the second period. If the poverty line is fixed, the computations will report a reduction in poverty while there may have been no real improvement;

♦   Is the level of detail for specific items the same? This is especially important when prices for different types of the same item are likely to be different--for example, when only one type of flour is subsidized or when some goods are available only in urban areas;

♦   Are questions phrased in an identical way? Different phrasing can influence the level and structure of responses;

♦   Is the recall period the same? It has been shown that the accuracy of reporting varies with the length of the recall period;

♦   Is the method used for estimating specific items identical across surveys? Differences might arise, e.g., when consumption from self-production is given either in money terms or by quantities.

Since the distortions can be substantial, the questionnaires and definitions should be carefully examined. When indicators cannot be made comparable, specific approaches can still allow poverty comparisons. These approaches may involve assumptions that the consumption measures are monotonically increasing in total expenditure, that relative prices do not change dramatically over time, and that the data contain no measurement errors. Then, robust poverty comparisons can be made by using the headcount measure and a poverty line based on the Cost of Basic Needs method (Lanjouw and Lanjouw, 1997).

2.2.3 The correlates of poverty

Poverty and poverty changes are affected by both macro- and microeconomic variables. Within a microeconomic context, the simplest way to analyze the correlates of poverty consists in using regression analysis in order to see the impact on poverty of a specific household/individual characteristic, while holding constant all other characteristics. This is discussed in this section. Obviously, the overall economic and social development of a country will also be an important determinant of poverty – whether jobs are created through economic growth, in which sectors such growth occurs and whether the fruits of growth are spread equally or benefit certain groups in society more than others. Section 3.3. will explore simple models how the impact of growth and inequality on poverty can be assessed.

Analysis of correlates of poverty can be carried if a multi-topic household survey is available, using multivariate income and consumption regressions (**Technical Note 8**). In these regressions, the logarithm of consumption or income (possibly divided by the poverty line) is typically used as the left-hand variable. Right-hand explanatory variables span a large array of possible poverty correlates, such as education of different household members, number of income earners, employment characteristics, household composition and size, and geographic location. Special care must be taken when including variables that themselves are likely a function of income or consumption availability, for example access to basic services. The regressions will only return results for the degree of association or correlation and not for causal relationships.

Before proceeding, it is important to note at this stage that numerous correlates or determinants of poverty are not quantifiable. For some other variables, one might only be able to use a proxy,

which might not fully reflect the underlying dimensions. The method used here is only able to take into account those dimensions which are quantifiable or for which a proxy is available. It is also important to note that the various coefficients obtained from a regression will have different degrees of significance.

These multivariate regressions will estimate the partial correlation coefficient between income or consumption per capita and the included 'explanatory' variables while holding all other impacts constant. For example, the results could tell us how strongly an additional year of education for the household head or his spouse is associated with a change in income or consumption per capita while holding gender, employment, age, location, and all other possible influences constant. They can tell us, then, much more than the simple relative poverty risks discussed in the previous section since a high relative poverty risk of a specific population group could in fact be attributable to individual characteristics such as education rather than to a group characteristic.

Table 8 shows an example of such a regression in Cote d'Ivoire. It indicates that education plays a different role in urban and rural areas (where it does not seem to significantly influence consumption), as do different types of assets. In rural areas, infrastructure has substantial predictive power—households located in villages that are nearer to both paved roads and public markets are better off, as are households living in areas with higher wage levels. The results present further questions about the quality of education in rural areas and to the importance of rural infrastructure in helping families grow out of poverty, that could be addressed in putting together a poverty reduction strategy.

Table 8. Determinants of Household Spending Levels in Côte d'Ivoire

	URBAN	RURAL
Education Level of Most Educated Male		
Elementary	.38 (5.3)	0.04 (0.6)
Junior secondary	.62 (8.6)	0.08 (0.9)
Senior secondary	.80 (9.6)	0.05 (0.4)
University	.93 (9.4)	---
Education Level of Most Educated Female		
Elementary	.11 (1.7)	0.07 (1.0)
Junior secondary	.24 (3.1)	0.27 (2.2)
Senior secondary	.34 (3.4)	---
University	.52 (4.1)	---
Value of Selected Household Assets		
Home	.06 (5.3)	---
Business assets	.04 (3.3)	0.16 (4.9)
Savings	.08 (4.7)	---
Hectares Agricultural Land		
Cocoa trees	---	0.17 (4.3)
Coffee trees	---	0.04 (1.3)
Distance to Nearest		
Paved road	---	-0.04 (-2.9)
Market	---	-0.09 (-3.3)
Unskilled wage (males)	---	0.37 (6.4)

Source: Adapted from Grosh and Munoz 1996, p.169, based on Glewwe 1990. T-statistics are in brackets.

The information obtained from multivariate regression can be used to construct easy-to-use software that permits simulations of the impact of changes in household characteristics on the expected per capita income of a household and its probability of being poor or extremely poor. **Technical note 8** presents details on an example of such software.

Several variations of these multivariate income regressions can be used to examine the correlates of the income of the poor. Poverty analysis focuses on correlates of income and expenditure at the lower end of the distribution rather than the correlates at the top end. One can then perform different regressions for each quintile, or quartile, of the population. Whether these regressions can be conducted will in part depend on the sample size of the survey. Alternatively, the regression can examine structural differences in parameter estimates for different income or expenditure groups. Box 7 describes types of regression analysis.

Box 7. Income Regressions versus Probit/Logit/Tobit Analysis

An alternative to exploring the correlates of poverty by using the logarithm of income per capita as the endogenous variable is to run a probit, logit, or tobit regression. In a probit or logit, the endogenous variable is a dummy variable, with '1' standing for the individual being poor, and '0' for non-poor. Probits and logits have been used in many poverty assessments. However, the underlying variable with which the 'poverty dummy' is constructed is income or consumption per capita. The probit/logit uses an artificial construct as the endogenous variable. Much of the information about the actual relationship between income and determining factors is lost. In addition, probit/logit regressions are much more sensitive to specification errors than linear regressions. Since there is no difficulty in predicting poverty from a linear regression, this type of regression should be used instead of probits/logits. The same argument holds for tobit models in which the poverty gap (difference between the poverty line and a household's per capita income) is the endogenous variable. Again, the use of a tobit implies that the income distribution is artificially truncated.

There are, however, some instances when the use of probit or logit regressions is appropriate. First, for targeting analysis, probit and logit regressions can be used to assess the predictive power of various variables used for means-testing (see **Technical Note 9**). Second, when panel data is available, probit or logit regressions can be used to analyze the determinants of transient versus chronic poverty. The use of panel data for poverty analysis is discussed in section 4.2.2

When multiple cross-sectional surveys are available, the same regression can be repeated for different years to see how the association of certain correlates with income or consumption varies over time. Variations over time will be reflected in changes in coefficients or parameters. The results of repeated cross-section regressions can also be used to decompose changes in poverty between changes in household characteristics, and changes in the returns to (or impact of) these characteristics (e.g., Wodon 2000). Another possibility is to use parameters from the regression model obtained for year one in order to predict household income or consumption in year two, and to compare this prediction with the prediction obtained using the regression estimates for year two applied to the data for year two. The differences in the predictions with the two models can then be analyzed, and one can test whether changes in income between years is due to changes in structural conditions or changes in the behavior of households between the two years.

Apart from income and consumption regressions, several other types of multivariate regressions can provide additional insights into the determinants of poverty. These can in particular be applied to other dimensions of poverty, such as child nutrition, mortality, morbidity, literacy or other

measures of capabilities. The techniques are also sometimes applied to understand the determinants of employment and labor income and to estimate the returns to education (**Technical Note 10**). They can also be used to better understand agricultural production patterns by estimating agricultural production functions (which relate production with information on type of crops grown per area, harvest, inputs into agricultural production, and input and output prices).

Box 8: Key Questions in Addressing Multiple Correlates of Poverty

- Building on the poverty profile, which are important variables that are correlated with income and expenditure levels and can be included in regression analyses?
- Are such factors directly linked to income and expenditures, or are other, non-measurable factors responsible?
- Which factors cannot be captured directly or indirectly through surveys but are likely to determine income and expenditure levels of households?

2.2.4 Testing for the robustness of poverty comparisons

Poverty comparisons inform policy design and the evaluation of poverty reduction strategies. For example, if poverty decreases from one year to the next, this may suggest a good performance of the authorities in charge of poverty reduction. However, due to the many assumptions involved in poverty measurement, it is important to test for the robustness of poverty comparisons between groups or over time to these assumptions. There are three main ways of testing for robustness:

➢ **Standard errors***: The fact that poverty calculations are based on a sample of households, or a subset of the population, rather than the population as a whole, has implications. Samples are designed to reproduce the whole population, but they can never be exact since the information does not cover all households in a country. Samples carry a margin of error, and so do the poverty measures calculated from household surveys. The standard errors, which most statistical packages will easily calculate, depend on the sample design— stratification and clustering, essentially--and the sample size in relationship to the size of the total population (see Deaton 1997 and Ravallion 1992 for a description of the standard errors of various poverty measures). When the standard errors of poverty measures are large, it may well be that small changes in poverty, although observed, are not statistically significant, and thereby cannot be interpreted for policy purposes.

➢ **T-statistics:** When carrying out multivariate regressions (as in Section 2.2.3), it is also important to compute the T-statistics or standard errors, which inform on the degree of significance of the various coefficients. It might be the case that the coefficient on a specific variable is large, but that it is not significantly different from zero. Attention should be paid to these significance levels when interpreting the results.

➢ **Sensitivity analysis:** Apart from taking standard errors into account when comparing poverty measures between groups or over time, it is important to establish the robustness of the poverty comparisons to the assumptions made by the analyst. This may call for repeating the analysis for alternative definitions of the income aggregate and alternative ways of setting the poverty line. The sensitivity analysis may for example focus on the impact of changes in the construction of the income or consumption aggregate when imputations for missing values or corrections for under-reporting of income in the surveys are implemented. Alternatively, one can test results with various lines, say the base poverty line plus and minus 5 percent in monetary value. Tests can also be conducted for checking

the sensitivity of poverty comparisons to the assumptions regarding economies of scale and equivalence scales within households.

➢ **Stochastic dominance:** Profiles allow a ranking of various household groups (or various time periods) in terms of their level of poverty. However, it is important to test whether the ranking is robust to the choice of the poverty line. This leads to a special type of robustness test, referred to as stochastic dominance, which deals with the sensitivity of the ranking of poverty levels between groups or between periods of time to the use of different poverty lines. The simplest way to do this (for the robustness of poverty comparisons based on the headcount index of poverty) is to plot the cumulative distribution of income for two household groups or two periods of time, as shown on Figure 3 and Box 9. One can then see whether the curves intersect. If they do not intersect, then the group with the highest curve is poorer than the other group. If they do intersect, then for all poverty line below intersection, one group is poorer and for all poverty lines above the intersection, the other group is poorer. For further details on stochastic dominance tests, see **Technical Note 5**.

Box 9. Cumulative distribution functions

Cumulative distribution functions indicate the change in poverty incidence that result from changes in the poverty line. In Figure 3, the horizontal axis shows monetary values while the vertical axis shows cumulative percent of the population. If the poverty line intersects a steep part of the distribution function, small variations in the poverty line will cause large variations in the calculated poverty rates. Distribution functions are also powerful tools to compare well-being in different areas of the country, for example, between rural and urban areas, as shown in Figure 3. Another way of testing the sensitivity of calculated poverty measures is simply to calculate the various poverty indices for various lines, for example, the base poverty line plus and minus 5 percent in monetary value. One can then compare the results across different groups or periods of time.

Figure 3. Cumulative Distribution Functions
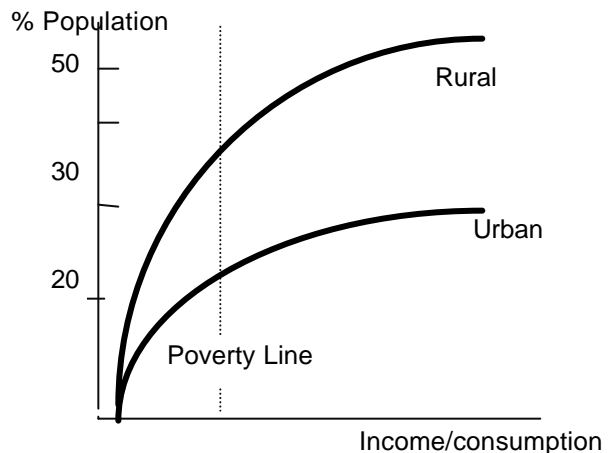
3 Inequality Measurement and Analysis

A second definition of welfare which is often considered in analysis is that of 'relative' poverty, defined as having little in a specific dimension compared to other members of society. This concept is based on the idea that the way individuals or households perceive their position in society is an important aspect of their welfare. To a certain extent, the use of a relative poverty line in the previous sections (see section 2.1.2) does capture this dimension of welfare by classifying as 'poor' those who have less than some societal norm.

The overall level of inequality in a country, region or population group – and more generally the distribution of consumption, income or other attributes – is also in itself an important dimension of welfare in that group. This section briefly reviews the concept and the most commonly used inequality measures (section 3.1) and turns to some analysis which can be carried out on the basis of these indicators (section 3.2). Finally, section 3.3 brings together our discussions about inequality in this section with the definitions and measurement of poverty in the previous chapter.   It explores how inequality, growth and poverty are linked and presents simple

simulations that can help to assess the likely impact of future growth and its distribution on poverty.

3.1 Inequality concept and measurement

Poverty measures depend on the average level of income or consumption in a country, and the distribution of income or consumption. Based on these two elements, poverty measures then focus on the situation of those individuals or households at the bottom of the distribution. Inequality is a broader concept than poverty in that it is defined over the entire population, not only that below a certain poverty line. Most inequality measures do not depend of the mean of the distribution (or at least this is considered to be a desirable property of an inequality measure). Instead, inequality is concerned with distribution.

Inequality indicators can be harder to develop than income poverty indicators because they essentially summarize one dimension a two-dimensional variable. Note that inequality measures can be calculated for any distribution—not just for consumption, income or other monetary variables, but also for land and other continuous and cardinal variables.

Some commonly used measures are (the formulae for the computation of these indicators are presented in **Technical Note 7**: A more detailed analysis of inequality and its impact on well-being with many policy applications is provided in the chapter on **Inequality and Social Welfare**.

➢ **Gini-coefficient of inequality:** This is the most commonly used measure of inequality. The coefficient varies between 0, which reflects complete equality and 1, which indicates complete inequality (one person has all the income or consumption, all others have none). Graphically, the Gini coefficient can be easily represented by the area between the *Lorenz curve* and the line of equality. On Figure 4, the Lorenz curve maps the cumulative income share on the vertical axis against the distribution of the population on the horizontal axis. In this example, 40 percent of the population obtains around 20 percent of total income. If each individual had the same income, or total equality, the income distribution curve would be the straight line in the graph – the line of total equality. 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 Lorenz curve and the line of total equality are merged and the Gini coefficient is zero. If one individual receives all the income, the Lorenz curve would pass through the points (0,0), (100,0) and (100,100), and the surfaces A and B would be similar, leading to a value of one for the Gini-coefficient. It is sometimes argued that one of the disadvantages of the Gini coefficient is that it is not additive across groups, i.e. the total Gini of a society is not equal to the sum of the Ginis for its sub-groups.

Figure 4: Lorenz Curve of Income Distribution
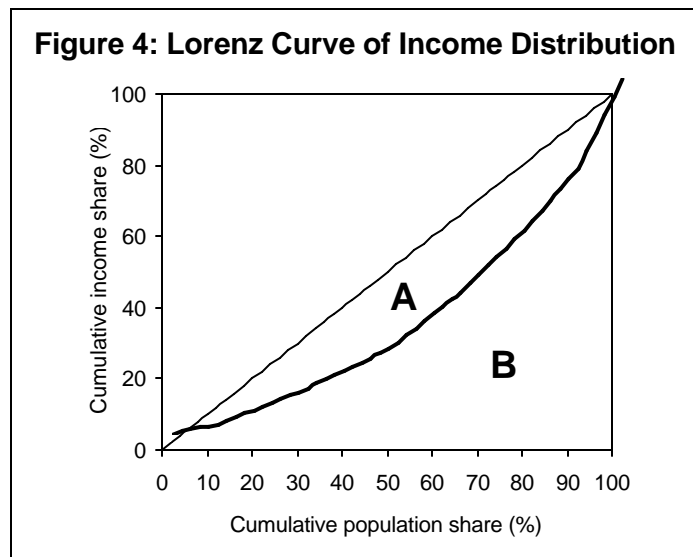
➤ **Theil-index:** While less commonly used than the Gini coefficient, the Theil-index of inequality has the advantage of being additive across different subgroups or regions in the country. The Theil index, however, does not have a straightforward representation and lacks the appealing interpretation of the Gini coefficient. The Theil index is part of a larger family of measures referred to as the General Entropy class.

➤ **Decile dispersion ratio:** Also sometimes used is the decile dispersion ratio, which presents the ratio of the average consumption or income of the richest 10 percent of the population divided by the average income of the bottom 10 percent. This ratio can also be calculated for other percentiles (for instance, dividing the average consumption of the richest 5 percent – the 95th percentile – by that of the poorest 5 percent – the 5th percentile). This ratio is readily interpretable, by expressing the income of the rich as multiples of that of the poor.

➤ **Share of income/consumption of the poorest x%:** A disadvantage of both the Gini coefficients and the Theil indices is that they vary when the distribution varies, no matter if the change occurs at the top or at the bottom or in the middle (any transfer of income between two individuals has an impact on the indices, irrespective of whether it takes place among the rich, among the poor or between the rich and the poor). If a society is most concerned about the share of income of the people at the bottom, a better indicator may be a direct measure, such as the share of income that goes to the poorest 10 or 20 percent. Such a measure would not vary, for example, with changes in tax rates resulting in less disposable income for the top 20 percent at the advantage of the middle class rather than the poor.

3.2 Inequality analysis

3.2.1 Inequality comparisons

Many of the tools used in the analysis of poverty can be similarly used for the analysis of inequality. One could draw a profile of inequality, which would look at the extent of inequality among certain groups of households. This informs on the 'homogeneity' of the various groups, an important element to take into account when designing interventions.

Analysis of changes in inequality over time can also be carried out. One could focus on changes for different groups of the population to show whether inequality changes have been similar for all or have taken place, say, in a particular sector of the economy. In rural Tanzania, while rural incomes have increased substantially between 1983 and 1991, inequality increased (with a Gini coefficient increasing from 0.52 to 0.72), especially among the poor. This can be linked to important reforms which took place in the agricultural price policy, which has intensified inequalities, with the poor and less-efficient farmers unable to participate in the growth experienced by wealthier, more efficient farmers (Ferreira 1996).

Another aspect of inequality analysis would be to compare the level of inequality in different dimensions. In a country where public health provision is well developed and reaches all strata of the population, one could expect to see lower levels of inequality in health outcomes than in income levels. This can be done using tabulations along the lines of Table 4, presenting measures of inequality (in Table 4, the ratio of the average for the higher quintile to that of the lower quintile) for different dimensions, and comparing the value of the measures.

Analysis could also focus on the inequality of different consumption categories or income sources. In Egypt, it was found that agricultural income represented the most important inequality-increasing source of income, while non-farm income has the greatest inequality-reducing potential. Table 9 presents the decomposition and shows that while agricultural income only represents 25% of total income in rural areas, it contributes to 40% of the inequality

Table 9: Decomposition of income inequality in rural Egypt, 1997

Income Source	Percentage of households receiving the income source	Share in total income (%)	Gini coefficient for the income source	Percentage contribution to overall income inequality
non farm	61	42	0.63	30
agricultural	67	25	1.16	40
transfer	51	15	0.85	12
livestock	70	9	0.94	6
Rental	32	8	0.92	12
Total	100	100		100

Note: the Gini coefficient for agricultural income is high because of the numerous negative incomes in that category. Source: Adams 1999.

3.2.2 Decompositions of income inequality

The common inequality indicators mentioned above can be used to assess the major contributors to inequality, by different subgroups of the population and regions as well as by income source. In static decompositions, household and personal characteristics, such as education, gender, occupation, urban and rural, and regional location, are determinants of household income. If that is the case, then at least part of the value of any given inequality measure must reflect inequality between people with different educational levels, occupations, genders, and so on. This inequality is referred to as the 'between-group' component.

But for any such partition of the population, whether by region, occupation, sector or any other attribute, some inequality will also exist among people within the same subgroups; this is the 'within-group' component. The Theil index and those of the Generalized Entropy class can be decomposed across these partitions in a additive way (see **Technical Note 7**). Using the Theil coefficient, the within-area (within rural areas and within urban) contribution to inequality in Zimbabwe in 1995/1996 was 72 percent, while the between-area (between urban and rural areas) component was 28 percent. In other words, differences among residents living within rural or within urban areas were relatively much larger than differences between rural and urban areas. In many Latin American countries, the between-area component of inequality has a much higher share in explaining total inequality.

In Ghana, both poverty and inequality decreased between 1988 and 1992. Table 10 shows an increase in mean expenditure and a decrease in inequality, mainly at the lower end of the distribution (GE(0) decreased by 5.6%). However, when focusing on income levels and inequality levels in different localities, analysis shows that improvements in terms of income only took place in cities other than Accra and in rural areas. In Accra, poverty actually increased, from 9 to 23 percent, even if it still has the lower poverty incidence of the country. In terms of inequality, the situation worsened in Accra for both measures. On the contrary, improvement took place in other cities through out the distribution (for both measures), while in rural areas improvements were noted at the lower end of the distribution (decrease in GE(0) by 7.7%), with a very small overall deterioration. Going further into details, the analysis showed that all socio-economic groups within each region had similar patterns. In Accra, the decline was linked to the important downsizing in

the public sector (which employed 50% of the population), but in other cities, where a similar downsizing occurred, the development of the informal sector seems to have allowed the retrenched civil servants to find alternative sources of income.

Table 10. Within-group inequality and contribution to overall inequality by locality, Ghana

	Accra			Other cities		
	1988	1992	Change (%)	1988	1992	Change (%)
Mean expenditure	314	260	-17.1	206	225	9.0
Poverty incidence	9	23		33	28	
GE(0)	18.5	21.4	15.7	20.2	18.9	-6.4
Contribution (%)	7.9	9.5	20.3	26.8	25.6	-4.5
GE(1)	20.9	23.6	12.9	21.6	20.2	-6.5
Contribution (%)	13.4	11.5	-14.2	28.4	25.8	-9.2
	Rural			All Ghana		
	1988	1992	Change (%)	1988	1992	Change (%)
Mean expenditure	181	206	13.9	198	215	
Poverty incidence	42	34				
GE(0)	19.4	17.9	-7.7	19.5	18.4	-5.6
Contribution (%)	65.3	64.9	-0.6			
GE(1)	19.9	20.0	0.5	20.5	20.4	-0.5
Contribution (%)	58.2	62.7	7.7			

Source: Canagarajah, Mazumdar and Ye 1999.
Note: Expenditure in 000 1992 Accra Cedis. GE(0) and GE(1) are inequality measures of the General Entropy family (see **Technical Note 3**). E(0), the mean log deviation, is sensitive to changes at the lower end of the distribution. E(1) , the Theil index, is equally sensitive to changes across the distribution.

Of equal interest is which of the different income sources, or components of a measure of well-being, are primarily responsible for the observed level of inequality. For example, if total income can be divided into self-employment income, wages, transfers, and property income, one can examine the distribution of each income source. Raising one of the income sources by 1 percent, what would happen to overall inequality? Table 11 shows the results for the Gini coefficient for both income and wealth sources in Peru (1997). As the table shows, self-employment income is the most equalizing income source, while agricultural property is the most equalizing wealth asset. Increase in some income sources would actually lead to **increased** inequality (when these sources are less equally distributed than overall income). The results depend on two factors: (1) the importance of the income source in total income (for larger ones, one percent increase is larger in absolute terms) and (2) the distribution of that income source (if it is more unequal than overall income, it will lead to a reduction; if it is less unequal, it will result in an increase in overall inequality). The size of impact will be greater, the greater the distance from the overall level of inequality. A more detailed discussion of this type of simulations and their relevance for the analysis of well-being can be found in the chapter on **Inequality and Social Welfare**.

Table 11. Peru: Expected Change in Income Inequality Resulting From 1 Percent Change in Income Source, 1997 (Percent of Gini Change)

Income Source	Expected Change	Wealth Sources	Expected changes
Self-employment income	-4.9	housing	1.9
Wages	0.6	durable goods	-1.5
Transfers	2.2	urban property	1.3
Property income	2.1	agricultural property	-1.6

	enterprises	0

Source: World Bank 1999b, p.16.

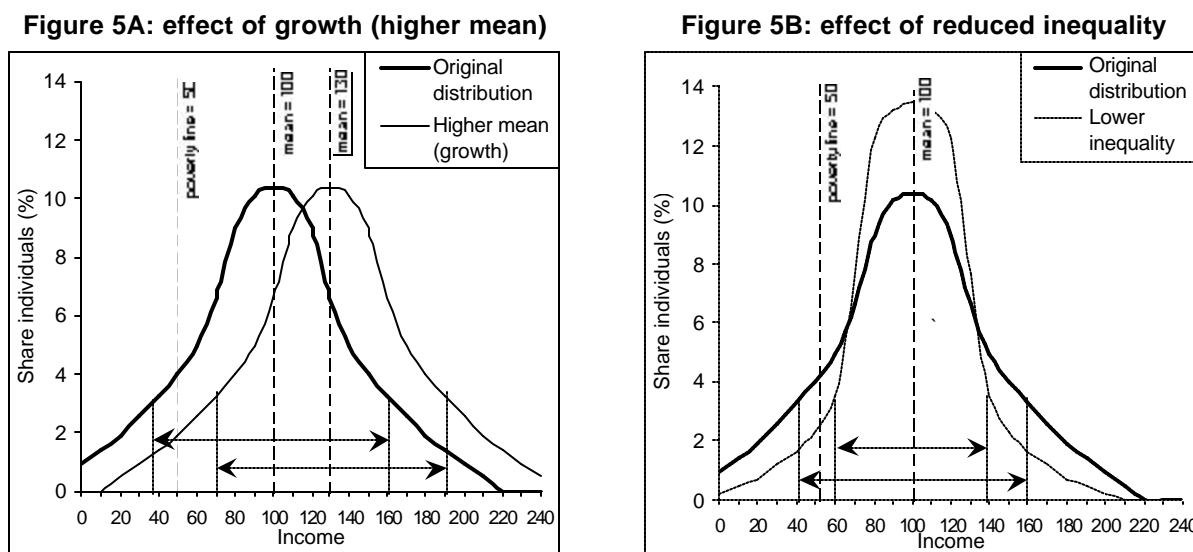## 3.3 Inequality, growth and poverty

Given that poverty is fully determined by the mean income or consumption and the inequality in income or consumption, it is feasible to simulate the impact of growth (an increase in mean income or consumption) and changes in inequality (an shift in the distribution across the population) on poverty. This type of analysis can be used for setting of targets for poverty reduction and to simulate the impact of various policy changes (which affect growth and/or distribution) on poverty levels. (Alternative methods for simulating the impact on poverty of economic growth and changes in inequality are presented in the chapter on **PRSP Targets and Costing**.)

It is important to note that these techniques have important limitations, linked to the underlying strong assumptions. For example, if per capita GDP growth is used as a proxy for the growth in disposable income or private consumption, it is implicitly assumed that GDP growth translates directly into household income or consumption. Also, when sectoral decompositions are used to analyze the poverty reduction impact of growth in various parts of the economy, the simulations typically assume that sectoral growth rates translate directly into household consumption and income growth rates in the same sectors; that is, that sectoral growth raises the wages of workers affiliated with the sector. Labor movements are also typically assumed to be absent, as well as secondary effects. Growth in exports, for example, could have a positive technology spillover in other sectors of the economy. Thus, the tools presented in this section should be used with much caution.

Figure 5 illustrates graphically the difference between 'growth' effects and 'inequality' effects. The Figure presents the distribution function of income or consumption (i.e. the vertical axis shows us the percentage of households with incomes of different levels, represented on the horizontal axis). The vertical lines represent the means of the distribution and the poverty lines (set in this example at 50). The dotted lines which link the distributions to the horizontal axis represent the 5th and the 95th percentiles of the population, i.e. there are 5 percent of households with incomes below the left line and 5 percent of households with incomes above the right line. The arrows between these lines give a measure of inequality (see Section 3.1). The higher the dispersion between the 5th and the 95th percentile, the higher the inequality.

Figure 5.A shows the impact of a uniform growth (where all individuals get an increase in income by 30), without any change in inequality. The entire distribution is simply shifted to the right. Figure 5.B shows the impact of a decrease in inequality with constant mean (no growth). The two distributions have equal mean, but the "lower inequality" distribution has lower dispersion (distance between 5th and 95th percentile). The impact on poverty is measured by the share of households below the poverty line (i.e. the part of the distribution to the left of the line). In both cases, poverty is reduced. The purpose of this section is to distinguish between these two effects, in order to better understand past changes or to design various simulations of future poverty levels.

Figure 5. Effect of income/consumption growth and inequality changes on poverty levels.

Figure 5A: effect of growth (higher mean)

Figure 5B: effect of reduced inequality

3.3.1 Simulations of future poverty with a single household survey

A single household survey with income and/or expenditure modules can be used to simulate the effect of growth and inequality on poverty. Such simulations can make different assumptions about inequality (it may remain constant, increase, or decrease), the sectoral distribution of growth (agriculture may be the engine of growth, in which case the population linked to agricultural activities would have a higher growth rate in personal incomes and expenditures than other groups), or the geographic distribution of growth.

Using 1993 as a baseline for Tanzania, Table 12 shows how per capita growth rates and changes in inequality would translate into changes in poverty over a 20-year period. With a zero real per capita growth rate and no change of inequality, the poverty rate would remain unchanged. A 1.5 percent sustained per capita growth rate with no change in the distribution of income (all household get a 1.5 percent income gain per year) would yield a substantial reduction in poverty. If inequality were to improve at the same time, the poverty reduction would be greatly accelerated, even with a similar growth level (see Section 3.1 for concept and measures of inequality).

Table 12. Poverty, Inequality, and Growth in Tanzania

	1993	2005	2015
Poverty rate with			
- 0 percent growth, no change in Gini	50	50	50
- 1.5 percent growth, no change in Gini	50	35	18
- 1.5 percent growth, Gini reduction by 0.5 percent/year	50	30	3
- 3.0 percent growth, no change in Gini	50	25	5

Source: World Bank 1996, p. 76.

The technique can be further refined to assess the impact of growth in different parts of the country—urban versus rural areas or by different sectors of the economy. Table 13 shows simulations for Peru. The simulations calculate how severe poverty would change from 1997 to

the year 2002 under different scenarios in terms of the growth of different sectors: first, it is assumed that the 'high poverty sectors' grow by 6 percent, then the 'medium poverty sectors' are assumed to grow at 6 percent, and finally the 'low-poverty sectors' are assumed to grow at 6 percent (for each of these scenarios, the rest of the economy is assumed to grow at a much lower rate so that the overall growth rate is always 3 percent). Table 13 shows that 'pro-poor' growth in Peru would especially mean that the economic upturn materializes in the agriculture and construction sectors. Similarly, a 6 percent growth is assumed to take place first in Lima, then in other urban areas, and finally in rural areas (while the growth in other regions is much lower, such that overall growth is 3 percent). Geographically, rural growth would result in larger poverty reduction.

Table 13. **Poverty, Inequality, and Growth in Peru**

	1997	2002
Extreme poverty rate at per capita growth rate of 3 percent with growth in:		
- high-poverty sectors (agriculture, construction)	14.8	7.5
- medium-poverty sectors (mining, petroleum, manufacturing, trade, transport, communication)	14.8	10.7
- low-poverty sectors (services)	14.8	11.1
- Lima	14.8	11.5
- other urban areas	14.8	10.9
- rural areas	14.8	7.8

Source: World Bank 1999b, p. 35.

3.3.2 Decomposition of changes in poverty with two or more surveys

When successive surveys are available, it is feasible to find how much of observed changes in poverty over time can be attributed to changes in distribution and to changes in mean income or consumption (see Section 2.2.2.2 and **Technical Note 3** for limitations and difficulties in comparability). For example, lower poverty could result either from a general increase in the income of all households (without change in the income distribution) or from a decrease in inequality (redistribution from the rich to the poor without change in mean income or consumption). A change in poverty can always be decomposed into a growth component, a redistribution component, and a 'residual' component (see **Technical Note 1** for details of the methodology).

An example can be taken from rural Tanzania, which experienced a decrease in poverty but an increase in inequality (see also section 3.2.2). Decomposing changes in poverty incidence (headcount) and depth (poverty gap) reveals that while the poor benefited from growth over the period, the rich captured a much greater share of economic improvement. In fact, if the distribution of income hadn't changed, the reduction in poverty incidence would have been much larger and the poverty gap would have also decreased. Table 14 presents the results of the analysis and show that, using a high poverty line, the head count would have decreased by 38% and the poverty gap by 24%. The changes in distribution (and interaction factors) resulted in a decrease in the head count of only 14% and in the poverty gap of only 2%.

Table 14. Decomposition of changes in poverty in rural Tanzania, 1983-1991

Poverty line	Growth component	Redistribution component	Residual	Total change in poverty
Head count index				
High	-38.5	11.8	12.6	-14.1
Low	-34.4	16.7	5.7	-12.0
Poverty gap index				
High	-23.7	20.5	1.6	-1.6
Low	-19.0	22.9	-1.9	2.0

Source: Ferreira 1996.

Figure 6 provides another illustration, which further distinguished between various locations. It shows that the greatest part of the overall reduction in poverty in Ghana in the 1990s was due to growth in mean consumption (responsible for a drop of 7 percentage points in poverty). A small reduction in inequality contributed to an additional poverty reduction of 2 percentage points. A similar pattern was observed in the regions with the largest reduction in poverty (Accra and Rural forest). In other regions, however, the pattern was different, because an increase in inequality reduced to a certain extent the gains in poverty reduction due to growth (in Rural coastal, poverty reduction would have reached 6 percentage points with growth only, but an increase in inequality reduced that to only 4 percentage points). The policies to pursue in the different regions will have to take these differences into account.

Figure 6. Decomposition of Changes in Poverty by Location, Ghana 1991/1992–1998/99
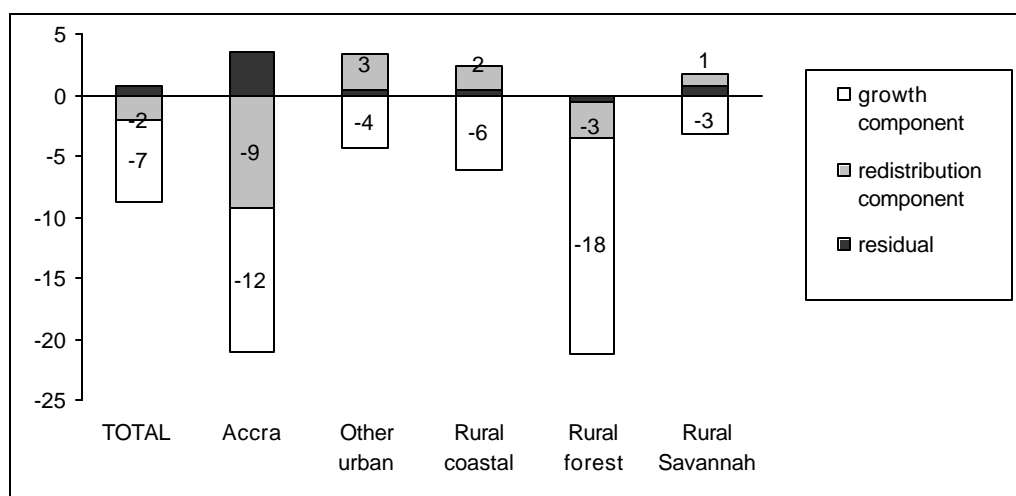
Source: Ghana Statistical Service 1999.

4 Vulnerability Measurement and Analysis

Insecurity is an important component of welfare and can be understood as vulnerability to a decline in well-being. The shock triggering the decline can occur at the micro (household) level, (e.g. illness, death); at the meso or community level (pollution, riots); and/or at the national or international level (national calamities, macroeconomic shocks). In poor rural areas, the most common risks are those affecting the harvest (see **rural poverty** chapter). Vulnerability is not necessarily unexpected, but could be seasonal. Everywhere, the risk of illness is a prime concern of the poor (see the **health** chapter). The macroeconomic and private sector

development chapters discuss the origins of macroeconomic shocks that lower the living standards of the poor. Structural reforms could be associated with increased short-term vulnerability for certain groups. Declines in income are more devastating for the poor than for the better-off because the poor are less likely to have the assets they need, or have access to insurance or credit—to hedge against income shocks. In addition, even a small change is likely to have substantial impact on their ability to meet their basic needs.

4.1 Vulnerability concept and measurement

Vulnerability is defined here as the probability or risk **today** of being in poverty or to fall into deeper poverty in the future. It is a key dimension of welfare since a risk of large changes in income may constrain households to lower investments in productive assets--when households need to hold some reserves in liquid assets--and in human capital. High risk can also force households to diversify their income sources, perhaps at the cost of lower returns. Vulnerability may influence household behavior and coping strategies and is thus an important consideration for poverty reduction policies. The fear of bad weather conditions or the fear of being expelled from the land they cultivate can deter households from investing in more risky but higher productivity crops and affect their capacity to generate income. Section 4.1 presents some of the measures that can be used to capture or proxy vulnerability. Section 4.2 then turns to the analysis of determinants of vulnerability.

Vulnerability is difficult to measure: anticipated income or consumption changes are important to individuals and households before they occur—and even regardless of whether they occur at all—as well as after they have occurred. The probability of falling into poverty tomorrow is impossible to measure, but one can analyze income and consumption dynamics and variability as proxies for vulnerability. Such analysis could be replicated for specific non-monetary variables likely to fluctuate, e.g. health status, weight, asset ownership, etc.

Measuring income and consumption dynamics and variability requires specific types of data.
- In countries where only **one cross-sectional survey** is available, quasi-panel data can sometimes be derived if income and consumption are recorded at different points in time. Surveys sometimes record information on demographics, activities, and income in a first visit, and repeat the income module quarterly thereafter, for a year. Also, some surveys ask households to recollect their income or consumption for previous time periods. Even when no quasi-panel components are available, it may be possible to build measures of household vulnerability that rely on the variation within communities or other subgroups; or on external information on the seasonality of prices and production.

- When **two or more cross-section surveys** are available, changes and trends in levels and patterns of poverty over time can be analyzed. Comparison over time requires careful techniques and analysis but allows insights into the dynamics of poverty and its determinants. Repeated cross-sections reveal trends for population groups but do not allow tracking of individuals or households within groups over time. They reveal only net aggregate changes; they would not capture large movements into or out of poverty.

- **Panel data** follow the same households over time and relate their patterns of consumption and income to changes in other characteristics, such as demographics, migration, labor market situation, durable goods ownership, access to services, and health and education status. The welfare and income variability of households can be followed only when panel

data are available. Panel data allow the analyst to determine factors that underlie mobility; estimate changes at the individual level (see Section 5.2 for discussion of panel data).

♦ Alternatively, **qualitative information** can complement the picture by allowing the analysis of important aspects of vulnerability, such as (see **Technical Notes 12 and 13**):
  • Households' participation in informal networks.
  • Variation patterns in household income and consumption (e.g. seasonal variations).
  • People's perceptions of their vulnerability and its determinants.
  • Various strategies households put in place to reduce their vulnerability: households can engage in depletive strategies—when they sell their productive assets, can diversify their income sources to reduce the probability of income changes; can reduce their consumption in case of income change; or manage to find new means to increase their income—for instance by changing their labor supply.

Some measures that can be used as proxies for vulnerability are discussed below: movements in and out of poverty, length of poverty spells, and income variability and mobility.

Movements in and out of poverty, entry and exit probability

When two observations in time are available (in a panel or in a cross-section which contains a quasi-panel component), transition matrices can be used to map changes-- improvement or decline--in household welfare.

Table 15 presents an example of a transition matrix depicting the movements in and out of poverty for households in rural Ethiopia between 1989 and 1995. The headcount index of poverty declined from 61 percent to 46 percent. This type of information would be revealed by an analysis based on two cross sections of data. The use of panel data provides a more revealing picture. Despite poverty reduction between the two years, half of those that were poor in 1989 remained poor in 1995 (31 out of 61). The other half of the population which was poor in 1989 had emerged from poverty by 1995, but more than a third of the non-poor in 1989 had fallen in poverty by 1995 (15 out of 39). The data still suggests significant flows in and out of poverty, a sign of vulnerability.

Table 15. Movements In and Out of Poverty in Rural Ethiopia

cell percentage	Status in 1995		
Status in 1989	Poor	Non poor	Total
Poor	⇔ 31	⇑ 30	61
Non-poor	⇓ 15	⇔ 24	39
Total	46	54	100

Source: Dercon 1999.

When data are available for several periods within the same year, the analysis can also distinguish between seasonal and non-seasonal poverty. Table 16 presents results of quarterly panel data from rural Rwanda in 1983, which shows that while some households appear to be poor all year round, others fall into poverty only at the end of the dry season, when food stocks are almost exhausted, and then recover later. These households can be said to be vulnerable to seasonal risk. Such data identify periods of hardship and the groups most at risk and can suggest specific interventions (see the **Social Protection** chapter on these issues).

Table 16. Transition matrices in rural Rwanda 1983 (row percentages).

First quarter	Second quarter				
	1	2	3	4	5
1	50	14	24	4	7
2	30	31	27	10	3
3	30	35	16	12	7
4	13	23	21	27	16
5	10	8	23	15	43

Second quarter	Third quarter				
	1	2	3	4	5
1	52	21	12	7	8
2	19	18	28	13	21
3	28	13	20	17	22
4	5	24	12	27	32
5	2	11	12	19	56

Third quarter	Fourth quarter				
	1	2	3	4	5
1	66	21	8	4	1
2	40	30	17	7	6
3	29	26	27	12	7
4	15	15	22	19	29
5	9	15	24	16	32

Source: Muller 1997.

Another way to look at flows into and out of poverty is to compute poverty entry and exit rates—the probability that a household enters in, or emerges from, poverty. Table 17 shows that in rural Pakistan, the probability of entering poverty increased over the years of the panel, while the probability of escaping fluctuated. Altogether, the ratio of the entry to exit probabilities increased, leading to an increase in the poverty headcount. This probability can then be computed for different groups in order to assess their vulnerability.

Table 17. Entry and Exit Probabilities, Rural Pakistan, 1986-91

	Probability of **entering** poverty, for **non-poor** households (percentage)	Probability of **escaping** poverty, for **poor** households (percentage)
From year to year:		
1986/87 – 1987/88	15	51
1987/88 – 1988/89	17	43
1988/89 – 1989/90	20	51
1989/90 – 1990/91	20	46
Over entire period:		
1986/87 – 1990/91	24	49

Source: Baulch and McCulloch 1998.

Length and frequency of poverty spells

When several years of panel data are available, it becomes possible to distinguish households according to the time they spend in poverty and the frequency of their poverty spells. There are many different ways of naming these groups, and we only present one of them. Some households will have a very low probability of falling below the poverty line (some time referred to as the transiently poor) – they are not very vulnerable, even if they do experience poverty every now and then. Others will have a higher probability of falling into poverty (some time referred to as the chronic poor) – they are vulnerable. Some households will typically spend most of their time in poverty and have a very high probability of falling into poverty (can be called the persistently poor) – they are very vulnerable.

Definitions and names can vary from one example to the other. In the example from Rural China presented below (Table 18), households have been classified as "very vulnerable" or "persistently poor" when their income is always below the poverty line; as "vulnerable" or "chronically poor" when their income is on average below the poverty line but sometimes above it; and as "not very vulnerable" or "transiently poor" when their income is on average above the

poverty line but sometimes below the line. Table 18 shows that, over the period 1985-1990, 33 percent of households were not very vulnerable, 14 percent vulnerable, and 6 percent very vulnerable. Analysis of the characteristics of these groups would inform on the determinants and correlates of vulnerability and on the policy options.

Table 18. Classification of Households in Rural China over 1985-1990 (Percentage):

	Persistently poor	Chronically poor	Transiently poor	Never Poor
Guangdong	0.4	1.0	18.3	80.3
Guangxi	7.1	16.1	37.4	39.4
Guizhou	11.9	21.2	40.2	26.7
Yunnan	4.9	18.0	35.6	41.5
Full Sample	6.2	14.4	33.4	46.0

Source: Jalan and Ravallion 1999.

In practice, surveys often suggest that the group of "not very vulnerable" or "transiently poor" households is larger than the group of the "very vulnerable" or "chronically poor". For instance, 60 percent of households were found to be transiently poor and 11 percent chronically poor in Zimbabwe over 1992-1996. In South Africa, 32 percent of households were found to be transiently poor and 23 percent chronically poor over 1993-1998.

Income variability and mobility

A last measure that can be sometimes used to proxy vulnerability is that of income variability. Some households may be on average slightly below the poverty line and experience low income variability—an unskilled wage worker in urban areas, for example. Other households may be on average slightly above the poverty line but experience higher income variability—a rural agricultural household, for example. Standard static poverty analysis might classify the first type of household as poor, and the second as non-poor. However, both types experience some form of poverty, and if the second type of household does not have access to instruments to smooth its consumption, it may need some form of temporary support from the state. By contrast, the first type of household may need a very different type of support on a more regular basis. The first group could be called "non-vulnerable" while the second group is "vulnerable". The analysis of income variability thus reveals alternative policy options for alternative groups of households (see **Technical Note 11** on the use and limitations of variability measurement)**.**

Information on the movements in and out of poverty can be combined with measures of income variability. In Table 19, results for rural Pakistan shows that the chronically poor have on average lower income levels than the transiently poor, but that the transiently poor have a higher coefficient of variation (a variability measure) and are therefore more exposed to shocks. The coefficients of variation of the chronically and the transiently poor are higher than that of those who are never poor. This means that the better off not only have higher incomes levels, but also more stable incomes, so that they not vulnerable to shocks.

Table 19. Poverty Type and Income Variation in Rural Pakistan, 1986-1991

	Chronically poor	Transiently poor	Never poor
Mean income	1,594	3,148	5,998
Standard deviation	716	1,715	2,482
Coefficient of variation	0.449	0.545	0.414

Source: McCulloch and Baulch 1999.

4.2 Vulnerability analysis

In addition to some of the analysis presented earlier (sections 2.2.2 and 2.2.3 on changes over time and their determinants) which looks at aggregate changes for groups of the population, one can carry analysis on changes of households or individuals. As was the case for poverty and inequality analysis, different types of analysis can be done: vulnerability profile (section 4.2.1) and regression analysis of changes in consumption over time, and of movements in and out of poverty (section 4.2.2).

4.2.1 Vulnerability comparisons across groups

With panel data, poverty profiles can also prove a powerful tool to reveal differences in poverty dynamics between various household groups. For example, one may analyze the movements in and out of poverty of population groups defined according to various characteristics such as demographics and place of residence. This approach answers such questions as 'are female-headed households more likely to remain poor?'. Are households in specific regions more likely to escape poverty? In the case of China, the answer to that question is provided in Table 18 above. The Table shows that most of those who experienced poverty in Guangdong were transiently poor while a larger share were persistently poor in Guizhou. Such differences suggest different underlying characteristics of poverty, and thereby different policy responses.

In the same way that a static poverty profile can be presented in two different ways (see sections 2.2.1 and 2.2.2), when long observation periods are available, one may compare the characteristics of the "vulnerable", "very vulnerable", and "non vulnerable", and how these change over time.

4.2.2 Determinants of vulnerability

In the same way that regressions can be used to assess the determinants of poverty at any given point in time, regressions can also be used to assess the determinants of changes in income or poverty over time. Again, the advantage of panel data are that they go beyond finding the static correlates of poverty to identify the determinants of income or spending changes over time. Some of the problems of mutual causality with cross-sectional data do not arise in this case, since the initial conditions of households cannot be caused by the changes in household welfare. There are different ways to address the issue. First, when data is observed for two periods, one can run regression of income or consumption in the second period on household and individual characteristics in the first period. Doing so allows to estimate households' ex-ante distribution of future consumption or income, and therefore to estimate the probability of each household to fall in poverty in the future. An alternative would be to relate change in household welfare over time to exogenous variables and to 'initial starting conditions' of the household. Regressions could also be run to explain entry and exit rates and the duration of poverty.

Finally, the analyst can carry out regressions of low-vulnerability (in the sense of transient poverty) and high vulnerability (in the sense of chronic poverty).

Ex-ante distribution of consumption

Vulnerability has been defined as the risk today to fall below the poverty line tomorrow. One way to analyze the determinants of poverty is therefore to see which factors influence the probability of low income in the future. When two observations are available, one can therefore carry out a regression of income in the second period on household characteristics observable in the first period. This will allow to see which characteristics influence ex-ante distributions of future foot consumption. The methodology has been developed and applied to consumption in Northern Mali (Christiansen and Boisvert, 2000). The methodology could easily be adapted to study vulnerability regarding other dimensions of well being, such as nutrition or income. Table 20 presents the results and shows that female-headed households have on average a substantially larger expected consumption and a substantially smaller variance, suggesting they are less vulnerable to drought shocks. This might be explained partly by the existence of community solidarity actions to help those in greatest need. Results also show that ownership of agricultural assets increases expected consumption and decreases variability, because fishing and transport equipment provide a relatively secure source of income when agricultural production is low.

Table 20. Estimates of Conditional Mean and Conditional Variance of consumption during the Hunger Season, Northern Mali 1997/98

Dependent variable: Log calorie intake per capita at t+1	**Conditional Mean**		**Conditional variance**	
Explanatory variables	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
Intercept	7.4839	29.05	-0.4132	-0.26
Human capital:				
# adult male at t	-0.0165	-0.94	-0.0812	-0.65
# adult female at t	0.0082	0.36	-0.2106	-1.35
#children at t	-0.0837	-6.40	0.2205	2.54
# children * potential to send children away (interaction)	0.0289	1.87	-0.0380	-0.40
# elderly at t	0.0126	0.25	0.1122	0.34
age household head	0.0081	0.81	-0.0987	-1.60
age household head squared	-0.0001	-0.67	0.0008	1.39
female headed household	0.0823	1.17	-0.8055	-1.55
Productive capital:				
# draft animals at t	0.0648	1.53	0.0856	0.31
value agric., fishing and transport equipment at t	0.0005	1.60	-0.0061	-2.34
Access to perimeter	0.0577	0.91	-0.7403	-1.69
Income diversification:				
% income from migrant remittances at t-1	-0.0713	-0.77	-106820	-2.22
Savings/Credit:				
Value food stock carried over at t	0.0028	2.89	0.0112	1.63
Value food stock * % agric. Income at t-1 (interaction)	-0.0031	-2.45	-0.0077	-0.82
# goat/sheep at t	0.0029	1.15	0.0072	0.49
# cattle at t	-0.0002	-0.04	-0.0193	-0.65
Value of consumer durables at t	0.0008	3.58	0.0005	0.38
Insurance:				
Official food aid received between t and t+1	0.0248	0.44	-0.8956	-1.86
Official food aid * migration of household head or main adults between t and t+1 (interaction)	-	-	1.5425	2.05

Note: Value in 1,000 CFA francs. Survey carried out in Zone Lacustre, Northern Mali. The model estimates values for the Hunger period of August 1998 (t) on the basis of information from the preceding post harvest season (t).
Source: Christiansen and Boisvert 2000.

Changes in consumption or income over time

One can also carry out a regression analysis of the determinants of changes in consumption or income over time. This approach does not capture vulnerability in the sense used above (that of probability of falling into poverty) but focuses on explaining absolute changes in consumption (In order to focus on vulnerability, one could carry out the regression only with those households who fell into poverty in the second period of observation). Table 21 presents results of a regression on changes in consumption in Peru from 1994 to 1997 (same technique as in 2.2.3, but with change in income as a dependent variable). It reveals that the household head's education is not only an important determinant of consumption levels, but also results in a higher probability of welfare growth in the future. Female-headed and migrant households also have higher probability of increase, i.e. lower vulnerability, and access to financial savings has the expected positive influence. Interestingly, households that used at least one room in their house for business purposes, most of them in the informal sector, also have lower vulnerability (significantly higher growth rates). The results also suggest that access to public services, such as water, electricity, sanitation, and telephone, may be are important factors in reducing vulnerability and promoting consumption growth, especially when there is access to several services.

Table 21. Consumption Change Regression, Peru, 1994-1997

(Dependent variable: change in household consumption per capita)

Variable	Parameter	t-statistic
Constant term	5.11	(18.4)
Initial consumption per capita in 1994	-.68	(-21.6)
Years of education of the household head in 1994	.03	(7.1)
Quechua speaking households in 1994	-.10	(-2.4)
age of the household head in 1994	.01	(4.6)
female headed households in 1994	.11	(2.4)
households size in 1994	-.10	(-3.7)
household size (squared) in 1994	.01	(2.3)
households that used at least one room in their house for business purposes in 1994	.15	(3.7)
households with financial savings in 1994 and 1997	.20	(2.2)
migrant households in 1994	.05	(1.4)
dependency ratio in 1994	-.01	(-0.9)
households with 1 basic service in 1994	.04	(0.8)
households with two basic services in 1994	.05	(0.9)
households with three basic services in 1994	.16	(3.2)
households with four basic services in 1994	.28	(3.9)

Source: World Bank 1999b, p.52.

The analysis can also be based on initial conditions and changes in conditions, allowing the analyst to identify the changes that influence increases and decreases in welfare. In the analysis in Côte d'Ivoire, a regression explained the change in per capita spending. The regression included base-year conditions as in the case of Peru, such as income, human capital, physical capital, region, socioeconomic status and income composition, and change in these variables over the period of analysis. Not only was human capital found to be a key factor explaining welfare, it was also found to be the most important endowment that explains welfare changes over time in urban areas. In rural areas, physical capital, especially the amount of land

and farm equipment, had a significant impact. The results also show that households with more diversified income sources managed better.

Determinants of movements in and out of poverty

The analysis of entry and exit rates, and more particularly, the analysis of poverty duration, usually requires long panels which are not as common in low-income countries. Therefore, only a brief description of these techniques is given here. Regression models can explain the probabilities of entering, exiting, staying in, or staying out of poverty. One way to analyze these issues consists in using logit and probit regressions of the probability of each event (see Box 7). These regressions can help explain the triggers that cause households to fall into poverty, such as death of a family member, illness, or unemployment, and the triggers that pull them out of poverty. They also allow the analyst to test the impact of potential alternative policies, for example, social protection interventions, on the probability of exit from, and entry into, poverty. Other models rely on duration analysis. These techniques, which are frequently used in the study of unemployment, aim to find the characteristics of households and their environment, which explains the length of time they spend in poverty. They can be useful in identifying the policy actions that could act on the characteristics that determine whether a household is likely to be able to exit poverty quickly or is likely to be trapped in poverty for a long period of time. Duration analysis, however, requires long and large panels that are not often available.

Determinants of vulnerability as measured in terms of 'transient' and 'chronic' poverty

Using data for rural China and probit regressions for the determinants of transient and chronic poverty, Jalan and Ravallion (1998, 1999) suggests that both ''acute vulnerability" or "chronic poverty" and "vulnerability" or "transient poverty" are reduced by greater command over physical capital, such as wealth and land, and certain demographic characteristics. These are, however, the only similarities. Smaller and better-educated households, and those who live in areas with better attainments in health and education, have lower chronic poverty, but these factors have little influence on transient poverty. Thus, interventions aimed at reducing chronic poverty may have little impact on transient poverty. Similar regressions for Pakistan (McCulloch and Baulch, 1999) also revealed interesting results since some of the variables that influence the probability of entry or exit were different from those that explained poverty and income levels in a standard (static) regression analysis.

5 Data

Before applying the above described analysis tools, the analyst will first have to assess all available data sources — and then plan accordingly for the analytical work to be done. Each data source tends to have particular strengths. After broadly reviewing the different aggregation levels and collecting agencies, different types of sources are examined (section 5.1). Special attention is devoted to the various types of household surveys (section 5.2) and to the use of qualitative tools (section 5.3).

5.1 Types of data

As indicated in Table 22, many sources of data can be useful for poverty analysis and the evaluation of policy interventions. Some data, such as central public finance data and national accounts, exist only at the national level. Often, these data are collected centrally by the statistical institute or the central bank. Local-level data--for example, by region, province, or

district--often include availability and use of services, such as education, health, water, and electricity, and may include economic and price information, such as regional inflation, are often collected through local offices of the statistical institute or the Ministry of Finance. Few countries produce national accounts at the sub-national level. Household or individual-level data on welfare components, such as income, consumption, illness patterns, and household priorities and perceptions, present the most disaggregated data. These data are typically gathered through household surveys, and they can be summarized at higher levels (at the local or national level) to produce aggregate statistics. For example, household-level data are needed to determine whether the members of a particular household are income poor. Aggregation across households will provide regional or national estimates of poverty. Along with providing national averages, local-level data can be important because local realities vary, and so do the key dimensions of poverty and the indicators that are useful to analyze and monitor. Moreover, some decisions—increasingly more as decentralization advances—are made at the local level and require local information. In many instances, however, the collection and monitoring of local level data will be set up differently, since local capacities vary and there is greater potential for community involvement.

Table 22. Data Types and Agencies

Data	*Agency*	*Source*	*Frequency*
National-level data:			
National accounts: GDP, Consumption, Investment, Exports, Imports, and so on	Central statistical agency	System of National Accounts, trade statistics	Monthly or quarterly where possible--trade statistics, for example; at least yearly
Public finance data: revenues, spending by category	Ministry of Finance, central statistical agency, sectoral ministries	Budgets and actuals	Monthly or quarterly where possible--trade statistics for example; at least yearly
Consumer and producer prices	Central statistical agency, central bank	Price surveys	Monthly; CPI basket updated at least every five years
Social Indicators	Management information systems (MIS) of sectoral ministries	Administrative systems	Yearly where possible
Local-level data:			
Consumer and producer prices, climatic data, national accounts at regional level	Central statistical agency, central bank	Price surveys, systems of national accounts	Monthly; CPI basket updated at least every five years
Availability of services	Local administration, sectoral ministries	Multi-topic household surveys; employment surveys, qualitative studies	Yearly
Use of services	Local service providers	Rapid Monitoring and Satisfaction Surveys	Yearly
Individual and household-level data:			
Household consumption and income; living conditions, social indicators	Central statistical agency, Ministry of Labor/Employment	Household budget, expenditure, income surveys, multi-topic household surveys, demographic and health surveys	Every three to five years
Population statistics, access to	Central statistical agency	Population census	Every five or ten years

Data	Agency	Source	Frequency
services—no consumption or income; literacy			
Household living standards — no detailed consumption or income; illness patterns, malnutrition, education profile	Central statistical agency, Ministry of Labor/Employment, others	Rapid Monitoring Surveys, demographic and health surveys	Yearly
Household priorities, perceptions of well-being, user satisfaction	Central statistical agency, sectoral ministries, others	Qualitative studies; Rapid Monitoring Surveys	Every one to three years

Source: Own elaboration

The role of administrative data and the population census are worth commenting upon:

➢ **Administrative Data:** In many countries, administrative data are the most accessible data source. Usually provided by line ministries and specialized agencies, these data describe specific activities and programs such as school enrollment, disease prevalence, malnutrition information, hospital expenses, road network information, and income and expenditure for decentralized units. This information is important in assessing levels of public and private inputs, outputs, and outcomes, as well as their distribution within the country. For example, it is possible to compare how the distribution of enrollment rates matches spending on primary schools; how the structure of health spending--primary versus tertiary care-- reflects disease patterns; or how agricultural productivity of main crops varies with land tenure patterns. Administrative data can often provide an important entry into poverty analysis, especially if it they are used to compare need and demand for services. Administrative data, however, do not allow for cross-tabulating or analyzing poverty across different dimensions. For example, it is generally not possible to look at enrollment rates of children by the income group of their parents (multi-topic household surveys, which are discussed below, differ from administrative systems in that they allow the analyst to relate indicators with each other.)

➢ **Population census:** A population census contains basic information on all citizens of a country. The census is carried out for all households to obtain basic information on the population, its demographic structure, and its location. The census is typically carried out by the national statistics institute, which then provides data to lower levels of government tailored to local information needs. Since the census covers the whole population, it is costly, and most countries conduct a census only once a decade. The census can provide policymakers with important data for planning in the years directly following its implementation, but its usefulness diminishes after that. Since the census is carried out across millions of households, the information gathered is, by necessity, limited. Information on household income, consumption, disease patterns, and poverty perceptions are generally not included. However, the census usually contains descriptive statistics of the housing stock, access to basic services such as water, electricity, and sanitation; information on education and employment patterns, and population statistics. The census has the advantage of being able to provide information at low levels of aggregation, such as the municipality level. Census data are also an important tool to check how representative other surveys are. The usefulness of sample surveys can be increased substantially if they are combined with census information, for example for providing poverty maps.

5.2 Household surveys

Household surveys are essential for the analysis of welfare distribution and poverty characteristics. At the same time, aggregate household-level analysis can provide only limited understanding of the intra-household distribution of resources, especially of income and consumption. Moreover, while the census covers the whole population in the country, surveys interview only a subset, generally a small fraction, of all households. This sample of households must be carefully chosen so that the results of the survey nevertheless describe living conditions in the country, and different parts of the country, accurately. Sampling should be based on mapping of actual settlements, including newly formed informal urban ones. Sampling is most often informed by a recent population census. The sample size—the number of households interviewed—will vary with several factors, including the indicator that is to be measured (a survey that aims to measure countrywide averages of income may require a larger sample than a survey designed to measure the percentage of the population with water connection, in part because the later is easier to measure); the level at which the policymaker needs the information (a national electricity connection rate will require fewer households to be interviewed than regional or district rates). Different types of household surveys exist (Table 23):

➢ **Living Standard Measurement Study (LSMS) surveys and other multi-topic surveys:** Multi-topic welfare surveys, like the LSMS, are geared towards measuring and analyzing poverty and are important instruments for poverty diagnostics. LSMS surveys collect information on household expenditures and income, health, education, employment, agriculture, the ownership of assets such as housing or land, access to services, and social programs. Dozens of countries have implemented multi-topic surveys and many now have several rounds of surveys that allow rich comparisons across time. Multi-topic surveys can also be used to measure the impact of public policies and programs on poverty.

➢ **Expenditure and income surveys:** Contrary to multi-topic surveys, expenditure and income surveys are narrower in scope. They are useful instruments to measure different dimensions of poverty—such as income- or education-poverty—but are limited in their ability to relate household well-being to underlying causes such as asset distribution or productive activities.

➢ **Employment surveys:** Labor ministries use employment surveys to gather information on employment and wages. These surveys include questions about household income, demographics, and housing features. They can be good sources for employment statistics, income-based poverty indicators—if the income module is good—and input indicators such as access to basic services. Employment surveys tend to be more important information sources for heavily urbanized countries.

➢ **Demographic and Health Surveys:** These are special household surveys geared to exploring the incidence of diseases and use of health facilities. They collect anthropometric data—height, weight, and age of children, that can be used to calculate malnutrition rates-- and many other health and health behavior-related variables that enable such factors as survival rates, birth histories, and disease incidences to be computed. The surveys also contain basic data about housing conditions, educational attainments, and employment patterns. Although they do not include income or expenditure data, they can be used to calculate household wealth and carry out important poverty diagnostics (see **Technical Note 14**).

> **Rapid Monitoring and Satisfaction Surveys:** These surveys are generally large, contain relatively short questionnaires, and include predetermined data entry packages. They are easy to implement and have a rapid turnaround time. The Core Welfare Indicator Questionnaire (CWIQ)—widely applied in Africa—is one example. Unlike other surveys, the CWIQ is not designed to serve as a tool for measuring whether poverty levels are increasing or decreasing. It is intended only to measure whether or not public services and development programs are reaching the poor and benefiting them, and to monitor selected indicators—those that contain advance warnings of the future impact of policies and events—and assess household living conditions, access to basic social and infrastructure services, and the satisfaction of the population with these services. Satisfaction surveys are best viewed as complements to multi-topic household surveys and have been used in many countries to monitor access to and quality of basic services.

> **Specialized Surveys:** Many other, specialized surveys exist that can be used for poverty diagnostics. These can range from violence surveys--for example, in Lima, Peru--to opinion surveys--for example, those conducted by the Social Weather Station in the Philippines. Several countries also have surveys of health centers, schools, or other public institutions. Firm surveys can be essential to understanding the impact of crisis on employment and specific groups at risks and were used extensively in understanding the impact of the East Asian crisis. Food security assessments identify high-risk groups and are often used by relief organizations. Typically, the Web sites of national statistical institutes and international organizations will provide information about the availability of such data.

Table 23. Household Survey Types

Household Survey	Advantage	Limitations
Multi-topic surveys	measurement and analysis of different poverty dimensions, their inter-relationships, and correlates	time-intensive (collection and evaluation)
Demographic and health surveys	health-poverty measurement, health behavior analyses, basic poverty diagnostics	measurement of other dimensions of poverty limited, diagnostics limited
Employment surveys	analysis of employment patterns, wage income analysis (link to education)	limited use for poverty measurement and diagnostics
Single-topic surveys	income-poverty measurement (or one other dimension)	limited diagnostics possible
Rapid monitoring surveys and service satisfaction surveys	quick and cost-effective monitoring of key welfare indicators	income-poverty measurement not possible, limited diagnostics

Source: Own elaboration

It is clear from the list above that a number of different surveys and other data sources can be used for analyzing income poverty and its correlates. Table 24 distinguishes cases of severe data limitation (#1) to a good data situation (#9). The data sources discussed and ranked include the population census, rapid monitoring surveys, income and expenditure surveys, demographic and health surveys, and multi-topic surveys. Based on data availability, Table 24 identifies which tools among those reviewed in the previous sections can be used for poverty analysis. Income poverty measurement is possible only if at least one multi-topic or income and expenditure survey exists. Other data sources–-such as a population census, demographic and

health surveys, and rapid monitoring surveys–-do not lend themselves to poverty measurement. Even in cases where income and consumption poverty measurement is not possible, as Table 24 illustrates, several analysis tools can be applied that are important for policy making. For example, spatial poverty maps can in most cases be developed using proxies for income or consumption. Rapid monitoring surveys and demographic and health surveys also lend themselves to developing a basic profile of the poor. Still, although many different surveys can be and are used for poverty and welfare analysis, it should be emphasized that a multi-topic survey is a key tool for measuring and understanding a wide range of issues related to poverty. In the short run, demographic and health surveys or more specialized surveys can supply important information but in the long run, the availability of a multi-topic survey is essential.

Apart from the type of survey available, it matters whether analysts have access to only one single cross-section of data, several cross-sections, or panel data. In principle, insights into the dynamics of poverty require the availability of several multi-topic household data sets collected at different times. Such information allows for measuring changes in poverty as well as the underlying characteristics causing these changes (case #8 and #9). In countries where only one cross-sectional survey is available (#5 and #7 in Table 24), quasi-panel data can sometimes be derived if income and consumption are recorded at different points in time. Surveys sometimes record information on demographics, activities, and income in a first visit, and repeat the income module quarterly thereafter, for a year. Also, some surveys ask households to recollect their income or consumption for previous time periods. Even when no quasi-panel components are available, it may be possible to build measures of household vulnerability that rely on the variation within communities or other subgroups, or on external information on the seasonality of prices and production. More can be done when two or more cross-section surveys are available (#6 and #8 in Table 24), because changes in the levels and patterns of poverty over time can be analyzed. As mentioned earlier, poverty comparisons over time require careful analysis, but they give insights into the dynamics of poverty and its determinants, and they can be used for evaluation. While repeated cross-sections reveal trends for population groups, they but do not allow the tracking of individuals or households over time. They reveal aggregate changes, but they do not capture individual movements into or out of poverty.

Panel data (#9 in Table 24) follow the same individuals or households over time, so that one can relate their patterns of consumption and income to changes in other characteristics, such as demographics, migration, labor market situation, durable goods ownership, access to services, and health and education status. Panel data have advantages over repeated cross-sectional surveys. They permit the analysis of the factors that underlie mobility. They also record information on past events more precisely than the retrospective questions sometimes included in cross-sectional surveys, and they help in assessing the impact of public programs and services on poverty outcomes. Only panel data allow analysis of the determinants of poverty, while cross-sectional data are limited to revealing correlates of poverty. Correlates are characteristics that are found to be closely linked to poverty-- for example, family size might be linked to poverty--but no causality pattern can be inferred from their analysis. For example, it is impossible to say whether a family is poor because it is large or whether a family is large because it is poor. On the contrary, determinants of poverty provide information on the causes of poverty and can be analyzed by looking at households over time and analyzing their welfare changes in light of their characteristics.

Some limitations of panel data are that households can change over time, disappear entirely from the sample (because of death or migration), or split or regroup because children grow up or household members are married or divorced. If the disappearance from the panel (attrition) is linked to certain characteristics—for example households with good education move away from

poor neighborhoods—then the estimation results of panel regressions have to be treated with care. Also, as time passes by, panel surveys can become less representative if they fail to include new members of the population--new births or immigrants. As other surveys, panel data can also suffer from measurement errors, especially those related to household income and consumption, which can affect the quality of mobility statistics.

Table 24. Income Poverty: Data Availability and Analyses Tools

Case	Data Availability	Income-Poverty Measurement (IPM)	Analytical Tools
#1	No surveys (multi- or single topic) exist. Only census data or administrative data available	IPM not possible	- geographic maps: access to services; housing deficit; literacy, GDP per capita but not income poverty - geographic incidence: of spending or enrollment in relation to access maps
#2	One round of rapid monitoring surveys exists (CWIQ), priority survey	IPM not possible. Wealth index can be calculated as proxy for income (but no absolute line applied).	By wealth quintile: - geographic maps (depends on size of survey) using poorest 20 or 40 percent of wealth indicator - risk of being in bottom 20 percent wealth quintile (by group, characteristic) - profile of wealth relationship with education, enrolment, access and satisfaction with services, basic service access, basic labor market statistics - incidence analysis (distribution of health, education, specific program spending by area and wealth quintile)
#3	One cross-section demographic and health survey	IPM not possible. Wealth index can be calculated as proxy for income (but no absolute line applied)	By wealth quintile: - geographic maps (depends on size of survey) using wealth indicator (20 or 40 percent poorest) - risk of being in bottom 20 percent wealth quintile (by group, characteristic) - profile of wealth relationship by quintile with education, enrollment, health outcome indicators, basic service access, basic labor market statistics - incidence analysis (distribution of health, education, specific program spending by area and wealth quintile)
#4	Repeated cross-section demographic and health surveys	IPM not possible. Wealth index can be calculated as proxy for income (but no absolute line applied).	As above plus - changes in risks, profile, incidence (by wealth quintile)
#5	One cross-section single-topic survey (with income/consumption variable)	IPM possible—one time period	By Poor/Non-poor groups or by using income variable: - geographic maps (depends on size of survey) - profile (limited) of poverty group and quintile to labor market, education - risk analysis (limited) - incidence (limited) - static decomposition (inequality) - correlates (limited)
#6	Repeated cross-section single-topic surveys (with income/consumption variable)	IPM possible—several time periods	As above plus: - dynamic decomposition analysis (inequality and growth) - risk, profile, correlates, incidence, welfare changes over time (limited)
#7	One cross-section of multi-topic survey	IPM possible—one time period	By Poor/Non-poor groups or by using income variable: - geographic maps (depends on size of survey) - profile - risk analysis - correlates - static decomposition (inequality) - incidence
#8	Repeated cross-section of multi-topic survey	IPM possible—several time periods	As above plus: - dynamic decomposition of poverty changes - repeated cross-section regression - map, profile, risk, incidence, welfare changes in time
#9	Repeated multi-topic survey with panel component	IPM possible—several time periods	As case #7 plus case #8 plus: - panel growth regressions (determinants) - mobility/ vulnerability analyses, entry/exit modeling, duration analysis

Box 10. Questions for Assessing Quantitative Data Availability for Poverty Analysis

- Is a recent multi-topic household survey available? Is the survey representative in the most important areas in the country? Can the survey be used to learn about gender, urban and rural, racial, or ethnic dimensions of poverty?
- Are single-topic surveys available that could be used in measuring and analyzing income and consumption poverty? Has one demographic and health survey been conducted, or have repeated surveys been conducted?
- How old is the census? Can it still be used to derive a map of service access?
- Are poverty monitoring surveys executed or planned?

5.3 Qualitative data

Qualitative data and research (**Technical Note 12 and 13**) can be very useful to complement a quantitative poverty analysis. Qualitative techniques have been used to analyze household participation in informal networks; patterns in household income and consumption, and in particular, seasonal variations; people's perceptions of poverty and vulnerability; the strategies put in place by households to reduce their vulnerability to income changes, etc… In the latter case, it is important to see whether households engage in depletive strategies—when they sell their productive assets, diversify their income sources to reduce the probability of income changes; reduce their consumption in case of income change; or manage to find new means to increase their income—for instance by changing their labor supply.

Qualitative techniques help in understanding household behavior, and the interpretation of quantitative results can be complemented, triangulated, and enriched with qualitative work. Institutional, political, and sociological analysis is needed to understand many issues, such as

➢ why the informal sector might play a minor or major role in absorbing the labor supply of the poor. The determinants of the role of the informal sector can be legal (regulations), economic (entry costs), sociological (stigma effects, gender bias), etc.
➢ why certain factors are correlates of poverty. For example, certain groups in society, as classified by gender or by ethnicity, may be poorer than others because they are discriminated against. Qualitative work can help uncover such discrimination.
➢ what factors influence poverty outcomes that are not easily quantifiable. For example, to what degree does trust in institutions or corruption undermine the working of education and health programs?
➢ how the intra-household distribution of resources is structured along gender or age lines-- that is, whether intra-household poverty is hidden in households that theoretically have sufficient resources (see **Gender** chapter).

Qualitative research tools range from participatory assessments (see **Technical Note 13**) to ethnographic and sociological case studies, and institutional to political investigations. Some of these tools are described in Table 25. These tools help in gathering information that household surveys are not able to capture, or can capture only partially (e.g., subjective dimensions of poverty and variations in perceptions along gender, urban/rural, or ethnicity lines; barriers that poor people themselves believe are stopping them from advancing; intra-household inequalities; poor people's priorities for action; cultural factors determining poverty, such as gender roles and some traditional beliefs; political factors determining poverty, such as trust, corruption, and conflict; certain social factors determining poverty, such as the role of community networks; etc.). The tools may also help in the design appropriate household survey questionnaires--for example, in the section on reasons for use or non-use of health and education facilities. Finally,

the tools may help for assessing the validity of survey results at the local level and to evaluate how much general policy design should consider the heterogeneity of local conditions.

Table 25. Data Collection Methods for Qualitative and Participatory Assessments

Data Collection in	*Methods*
Beneficiary Assessments	Participant observation and more systematic data collection methods like structured interviews over a limited time span.
Ethnographic Investigations	Anthropological research techniques, especially direct observation, to analyze the influence of ethnicity, gender, and village stratification on the household and group well-being and behavior.
Longitudinal Village Studies	Wide variety of methods ranging from direct observation and recording (tabulation), periodic semi-structured interviews with key informants (for example, health center staff) and village population, to survey interviews in several different observation periods.
Participatory Assessments	Ranking, mapping, diagramming, and scoring methods are prominent besides open interviews and participant observation. The time horizon of participatory assessments is often short. They build on local populations describing and analyzing their own reality surrounding poverty and well-being.

Participatory assessments can help policy makers determine the type of indicators important for the poor—is it housing, employment, or income?. They can also capture information that other sources cannot capture, for example, the incidence and effect of domestic violence (see **Participation** chapter and **Technical Note 13**). Beneficiary and participatory assessments also involve the population more than household surveys. They can take different forms. In town-hall or village meetings, citizen groups or their representatives can discuss poverty problems and policies, rank what they consider the causes of poverty, and map out new infrastructures in actual planning exercises. Individual interviews can investigate the problems of women or children in households. Participatory methods do not necessarily guarantee, though, that all groups in the community are given an equal voice. There is a danger that women may be under-represented. This danger may be even more present for the very poor.

Whenever possible, it is important to link participatory and qualitative investigations with household surveys and population censuses in a formal way. This can be done by collecting variables in participatory studies that allow for easy comparison with regional or national averages obtained from quantitative sources; designing qualitative case studies so that they are done on sub-samples of larger surveys; and following formal sampling and data recording procedures that allow for systematic analysis and replicability of qualitative results. **Technical Note 13** suggests ways to assess whether sufficient qualitative and participatory information is available to inform poverty analyses and anti-poverty policy formulation.

Box 11. Questions for Assessing Qualitative Data Availability for Poverty Analysis

- Are community case studies, ethnographic studies, and participatory assessments available to complement the household survey results? Are they recent?
- Have the qualitative studies been properly integrated in survey findings and design?
- Do qualitative studies uncover additional factors linked to income and consumption poverty? How can these be addressed on the political level?

6 Concluding Remarks

This chapter focused for the most part on analytical technique to measure and understand the income or consumption dimension of poverty, inequality and vulnerability. The techniques described ranged from developing a simply poverty profile to conducting panel regressions to examine vulnerability and from using transition matrixes to examine the stability of welfare rankings to a decomposition of inequality measures. However, the range of tools that can be applied to better understand poverty will depend crucially on data availability. The richest understanding of income poverty can be gained if several rounds of multi-topic household surveys are present; especially if they contain a panel component of identical households being visited at different points in time. The analysis of income poverty presented here should ideally be complemented with an examination of other dimensions of poverty and how the dimensions are related to each other. Determinants of different dimensions of poverty can then be compared and common factors singled out for policy interventions. For example, health poverty analysis of the determinants of malnutrition often reveals that a mother's education is a key determinant of the nutritional status of their children. Income poverty can also be closely associated with the same variable so that policies that aim to improve female education can have important synergy effects on both malnutrition and income-poverty. However, analyzing the determinants of various aspects of poverty can also reveal important differences in the determinants, which would then imply that policymakers would have to make important choices as to which dimension of poverty they would want to tackle first.

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