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# Statistical Poverty-Analysis in Sub-Saharan Africa

## Participant's Manual

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# 1. Introduction and Preparation

## 1.1 Initial Words / Abstract

Poverty is multifaceted, manifested by conditions that include malnutrition, inadequate shelter, unsanitary living conditions, unsatisfactory and insufficient supplies of clean water, poor solid waste disposal, low educational achievement and the absence of quality schooling, chronic ill health, and widespread common crime. Through the signing of the Millennium Development Declaration in 2000, 191 UN member states unanimously committed to reducing poverty. However, because it is not easy to define or measure, monitoring poverty in its broad manifestations is a complex task conceptually and empirically.

To get informed about the central issues of poverty and answers to the pertinent questions

- How much poverty is there?
- Who are the poor?
- What are the characteristics of their living conditions?
- How does poverty evolve over time?

Please read the "HANDBOOK ON POVERTY STATISTICS: CONCEPTS, METHODS AND POLICY USE" as of Dec 2005 by the UNITED NATIONS STATISTICS DIVISION.
..or study the most important contents of this document, the UN Handbook[1].

Many of the aspects of this document will be dealt with in this course; some of the contents are actually accepted as course material because there is not really a more encompassing document on the issue of Poverty Statistics.

When it comes to the purpose of this course: At the outcome the course should answer some questions and enable the participant to understand the concepts of poverty, the methods of poverty monitoring and understand and conceive the conception and implication of a poverty monitoring system and its impact on political decisions.

Some questions:
What is poverty? The earliest definitions of poverty centred on the inability to obtain adequate food and other basic necessities. Today, the main focus continues to be on material deprivations, i.e., the failure to command private resources. Development experts, including [33], though, have argued that this notion of economic welfare remains too narrow to reflect individual well-being, spurring active efforts over the past several decades to expand the concept of poverty.[2]

Some basic findings:
Not surprisingly, a single, all-encompassing measure of poverty remains beyond reach. Recognizing the trade-offs between different methods of measuring poverty, researchers are now seeking compromises by integrating **qualitative** and **quantitative** indicators into their analyses.

Some basic deductions:
Despite all this, social scientists still find it useful to focus largely on poverty as a lack of money measured either as **low income** or as **inadequate expenditures**. One reason for focusing on money is practical: inadequate income is clear, measurable, and of immediate concern for individuals. Another reason is that low incomes tend to correlate strongly with other concerns that are important but harder to measure.

[1] The target audience of the handbook are statisticians at government offices who possess an intermediate to strong background in statistics, with significant familiarity with common statistical modelling techniques such as regression or principal components analysis. Some chapters of the handbook require an advanced level of statistical theory whereas others are targeted to policy makers with minimal statistical literacy.
[2] [1] Page 27

The case of Mozambique and in particular the province of Sofala will play a prominent part in this course for several reasons:

- The author has spent almost 4 recent years in the Statistical service on Mozambique and there in particular as a consultant for provincial services, among them the province of Sofala.
- The case of poverty in Mozambique and Sofala is well documented and secondary material is readily available
- More important the primary data are available for the most recent Household Surveys, Censuses and several other surveys.
- Abundant analytical material on poverty in Mozambique is available for comparison and reference
- Primary data for other poverty related surveys are available

It is not meant that the case of Mozambique should be an example for other countries. On the contrary there are several shortcomings but they are important because they are frequent and widespread. Mozambicans and their friends can only learn from them.

Eradication of poverty is only possible if information about poverty is available and how to do it is a task all stakeholders and governments with responsibility for the well-being of the country's people have a tremendous task to shoulder.

It will be a constant trait of this document, the user handout, to refer to practical examples. The use of more sophisticated (and costly) software will be avoided. The only permanent software used in the examples is Microsoft's EXCEL. The software is readily available; if not ***Open Office*** (http://download.openoffice.org/other.html) will be the choice of software. A shareware EXCEL Add-in statistiXL (http://www.statistixl.com/) is used for the more advanced statistical exercises. This cannot substitute completely specialized software like SPSS but serves well for the purpose of the course.

Tables, Boxes and Graphs are marked and indexed separately and usually illustrate in abstract form some special subject.

The author is responsible for the content and the exercises and is readily available for comments, criticism and praise (Klaus Roeder, mail: kroedr@gmx.net, Homepage: www.klaus-roeder.com)

## 1.2 Some basic concepts

### 1.2.1 The poverty line

A poverty line typically specifies the income (or level of spending) required purchasing a bundle of essential goods (typically food, clothing, shelter, water, electricity, schooling, and reliable healthcare). Identifying the poor as those with income (or expenditures) **below** a given line brings clarity and focus to policy making and analysis.

Having a poverty line allows to count the poor, target resources, and monitor progress against a clear benchmark. Communicating the extent of poverty becomes easier, and explaining the notion of deprivation simpler.

It is also important to bear in mind differences between concepts and reality. The fact is that a poverty line (below which one is poor and above which one is not) has little empirical correspondence in the daily lives of the poor. Researchers analyzing data on households see no clear breaks or discontinuities in the relationship of income and health or nutrition, and certainly no systematic breaks in living standards that correspond to poverty lines as the term is used. Yet, poverty measures based on poverty lines serve an important descriptive purpose and should be seen in that light.

Several examples are taken from a rather recent HH Survey being conducted in Mozambique 2002 to 2003. Prior to this a first HH Survey had been conducted in 1996 to 1997. This permits comparison but also leads to rather typical problems comparing surveys with methodologies differing in details. The

data and documents coming with this example are for internal use only. Further information can be obtained form the Mozambican NSI (www.ine.gov.mz). The boxes following are numbered separately and not unusually refer to the Mozambican example.

A first Look at the Story[3]

Table : Food and Non-food Poverty Lines
Average exchange rates
(01.01.2002-31.03.2003) [1]

[1] Source: http:/ www.oanda.com/convert/fxhistory

| | | USD | 23405 | | | | |
|---|---|---|---|---|---|---|---|
| | | EURO | 24864 | | | | |
| | | Food Poverty Line | Food Share | Non-Food Poverty Line | Total Poverty Line | USD | EURO |
| 1 | Niassa and Cabo Delgado-rural | 5434 | 0.77 | 1665 | 7099 | 0,30 | 0,29 |
| 2 | Niassa and Cabo Delgado-urban | 7540 | 0.74 | 2690 | 10231 | 0,44 | 0,41 |
| 3 | Nampula-rural | 4471 | 0.75 | 1501 | 5972 | 0,26 | 0,24 |
| 4 | Nampula-urban | 4853 | 0.73 | 1807 | 6661 | 0,28 | 0,27 |
| 5 | Sofala and Zambezia-rural | 4155 | 0.76 | 1318 | 5473 | 0,23 | 0,22 |
| 6 | Sofala and Zambezia-urbana | 6591 | 0.75 | 2183 | 8775 | 0,37 | 0,35 |
| 7 | Manica and Tete-rural | 5629 | 0.81 | 1304 | 6933 | 0,30 | 0,28 |
| 8 | Manica and Tete-urbana | 7145 | 0.74 | 2545 | 9690 | 0,41 | 0,39 |
| 9 | Gaza and Inhambane-rural | 6614 | 0.73 | 2394 | 9008 | 0,38 | 0,36 |
| 10 | Gaza and Inhambane-urbana | 7264 | 0.68 | 3457 | 10721 | 0,46 | 0,43 |
| 11 | Maputo Province-rural | 11801 | 0.70 | 4963 | 16764 | 0,72 | 0,67 |
| 12 | Maputo Province-urban | 11898 | 0.65 | 6398 | 18296 | 0,78 | 0,74 |
| 13 | Maputo City | 12224 | 0.63 | 7291 | 19515 | 0,83 | 0,78 |
| | **Simple average PL** | | | | **10395** | **0,44** | **0,42** |

Note: All figures in Meticais per person per day.

### *1.1 Box: Poverty Lines in Mozambique*

## 1.2.2 Computing the total poverty line

This computation involves two steps. The first defines essential non-food basic needs and the second incorporates their cost into the food poverty line (fpl ) to arrive the total poverty line ( tpl ). Simply put, fpl has to be adjusted upward by an amount equal to or proportionate to the cost of procuring the essential non-food basic needs of a poor or nearly poor person. Clearly, essential non-food basic needs require a definition that can be measured. Developing countries generally follow one of three operational definitions or procedures.

## 1.2.3 Which are the non-food needs?

This list is created usually by a group of users and stakeholders in association with the national statistics office or the agency charged with producing the country's official poverty statistics. The list is exhaustive, covering items like clothing and footwear, shelter, fuel and light, household goods, health services, personal care, and education. Costs per person are assigned to each item. Hence, if nfpl (non-food poverty line) denotes the sum of the costs, then: *tpl=fpl+ nfpl*
This was the procedure of choice by some countries during their early years of poverty statistics compilation, and some still keep it as part of their official methodology

[3] POVERTY AND WELL-BEING IN MOZAMBIQUE: THE SECOND NATIONAL ASSESSMENT; National Directorate of Planning and Budget, Ministry of Planning and Finance, Economic Research Bureau, Ministry of Planning and Finance, International Food Policy Research Institute, Purdue University (March 2004)

Simplicity is its main appeal. However, the outcome is very much dependent on a highly subjective list. Adding or subtracting from the list affects *tpl* directly in an additive fashion. It is easy for anyone to criticize why *this* item is included while *that* item is not. Changes in the list would affect the comparability of the *tpl* time series. Similarly, different lists for different areas or sub-populations result in non-comparable statistics, for example, bread plus rice in cities versus all rice in rural areas or physician attended childbirth in urban regions versus midwife-assisted deliveries in rural areas.

### 1.2.4 Share of Food Expenditure and Engel's Coefficient

A household whose total expenditure per capita ( te ) is equal to fpl still has to spend for items other than food, and those items must be regarded as essential by the household. The set of non-food items availed of by households for whom te = fpl may then be considered to define essential non-food needs. And the average expenditure of the households for the set may be used to estimate nfpl.

Engle's Law states that household expenditures on food in the aggregate decline as income rise; in other words, the income elasticity of demand for food in the aggregate is less than one a decline toward zero with income growth.
Engel's Law doesn't imply that food spending remains unchanged as income increases: It suggests that consumers increase their expenditures for food products (in % terms) less than their increases in income

Usually the relation of food expenditure to the total expenditure (fe/te) is called the Engel's coefficient and Engel's Law claims in short, that this coefficient rises the poorer the household is

### 1.2.5 Absolute versus relative poverty

A Poverty line indicates deprivation in an absolute sense, i.e., the value of a set level of resources deemed necessary to maintain a minimal standard of well being. With such a definition, poverty is eliminated once all households command resources equal to or above the poverty line. The $1/day per capita poverty line is one example of an absolute poverty line, but most countries determine their own absolute poverty lines as well.

Many wealthier countries, on the other hand, set poverty lines based on relative standards. In the EU "relative poverty" is defined as an income below 60 percent of the national median equalized disposable income after social transfers for a comparable household. In Germany for example the official relative poverty line for a single adult person in 2003 was 938 euros per month. For a family of four with two children below 14 years the poverty line was 1970 euros per month.[4] Also bearing in mind the definition is different in terms of absolute / relative poverty and also the distinction between "per person per day" for Mozambique and "single adult person" for Germany has to be made clear, one notices a striking difference in monetary terms.

The relative benchmarks used in Europe reflect the belief that important deprivations are to be judged relative to the well-being of the bulk of society, approximated by the income level of the household at the mid-point of the income distribution. In short, inequality matters as a component of deprivation.

[4] Federal Register, Vol. 73, No. 15, January 23, 2008, pp. 3971–3972. and
http://hamburgrostock.blogspot.com/2007/02/wikipedia-on-comparative-definitions-of.html

### 1.2.6 Cost of Basic Needs Approach

The way in which statistical offices set absolute poverty lines vary but most begin with a cost of basic needs approach.

The basic approach begins with a nutritional threshold chosen to reflect minimal needs for a healthy life, and adjustments are then made for non-food expenses (e.g., housing and clothing). To set a poverty line, statisticians typically identify a basket of foods that will deliver the minimal nutritional requirements. Almost all statistical offices adopting nutritional standards set by the World Health Organization and Food and Agriculture Organization (WHO/FAO). The others set standards based on inputs from national experts.

The calorie requirements vary considerably so let's look again at the Mozambican example:

Under the cost of basic needs approach, food poverty lines are tied to the notion of basic food needs, which, in turn, are typically anchored to minimum energy requirements. Energy requirements vary depending on age, sex, physical activity levels, body weight, pregnancy status, and breastfeeding status. As the IAF (HH Survey) does not include adequate data on physical activity levels or body weight, we estimated caloric requirements using age and sex as well as estimates
From the 1997 Census on the proportion of women who are pregnant or breastfeeding, Caloric requirements for moderately active individuals by demographic characteristics were obtained from the World Health Organization (WHO 1985). Average per capita requirements in a given region will vary with the average household composition in that region. For example, a region with a greater proportion of children in the population will require fewer calories per capita than a region with a higher proportion of middle-aged adults, as children typically have lower caloric requirements.
In both the 1996–97 IAF and the 2002–03 IAF, the average daily caloric requirement per person per day was approximately 2150 kilocalories in each of the 13 poverty line regions.
To convert the physical quantities of household food consumption in grams to kilocalories, a number of different sources were used in decreasing order of preference,

- The Mozambique Ministry of Health (Ministério da Saúde 1991)
- A food table for Tanzania compiled by the Wageningen Agricultural University (West, Pepping, and Temalilwa 1988)
- An East, Central, and Southern Africa food table (West et al. 1987)
- The U.S. Department of Agriculture food composition database (USDA 1998)
- The U.S. Department of Health, Education, and Welfare food tables (USHEW 1968)
- A food composition tables from the University of California at Berkeley

### *1.2 Box: Poverty Measuring in Mozambique*

The mentioned 2150 kilocalories apply for adults; relative values will be calculated for minors, infants or breastfeeding mothers.

However, neither activity level nor weight is collected in typical household surveys. Thus, while adjustments can be made for age and gender, statisticians must make assumptions about the average activity levels and weights of individuals and different assumptions lead to different nutritional thresholds.

### 1.2.7 Households and Individuals: Adult Equivalence

Poverty is most often seen as an individual property. However, all members of a family may not be equally poor, however. For instance, a grandparent or a child might face deprivation within a

household that has adequate resources. To capture this idea, researchers would ideally collect data on individuals, and poverty measurement would take place at the individual level.

In reality researchers collect data on households as collective units (where households are often defined in surveys as those who share meals together or live under the same roof). The simplest way to proceed is to consider the per capita income of the household, calculated by simply dividing total household income by the number of household members. The same method can be applied to total expenditures. This approach is taken, for example, in calculating the widely-used $1/day and $2/day per capita poverty lines.

These per capita calculations weigh all household members identically. A forty-five year-old man is equally weighted as his seventy-five-year-old mother or his ten-year old daughter. And a household with four adults is judged equally poor as another with identical income but with two adults and two young children.

No adjustments are made for cost savings that might benefit larger households relative to smaller ones. The cost of a second child, for example, may not be as great as the cost of the first. And the cost of adding a fourth person to the household often exceeds the cost of adding a fifth. The $1/day approach, though, like many other approaches, fails to account for such changes.

Creating weights that reflect “adult equivalents” helps address the first problem, and adjusting for economies of scale helps respond to the second. The most common approach to establishing adult equivalence standards is to weight, for example, a 45-yearold male as “1” and to weight others in proportion to the resources they require. His teenage daughter may take a weight of “0.7” and his elderly mother takes a weight of “0.8”. These weightings reflect the fact the daughter and her grandmother consume less than the man to meet their basic needs. In reality, however, it is far from clear how to set specific weights.

Making adjustments for children can matter particularly when comparing changes in poverty over time. If parents give birth to a baby in a given year, per capita income or per capita expenditures will fall substantially for the family since the baby’s needs would count as much as anyone else’s. But with adjustments that reflect adult equivalence, the addition of the baby to the family - while adding costs - is counted in line with the baby’s actual needs.

### 1.2.8 Adjustment for non-food needs

The food poverty line is just one part of the overall poverty threshold. There are two common approaches to making adjustments for non-food needs.

Some countries use the „direct“method (conditional on constructing a poverty line using the „cost of basic needs“approach).

First, necessary items are selected. In the Gambia, for example, the list includes rent, clothing, firewood, transport, education and health costs. In Albania, by contrast, the list also includes tobacco and entertainment. After the list is determined, the goods are priced and the non-food line is formed.

The indirect procedure examines data on food consumption and total expenditures. With a food poverty line in hand, the method entails finding the level of non-food expenditure that would be typical of a household whose food consumption is just at the food poverty line. There are two main ways to do this. The first way is to begin by calculating the „Engel coefficient“the ratio of food consumption to total expenditures, and then to run a statistical regression that allows prediction of the Engel coefficient for the household whose food expenditure is at the food poverty line. There will be no explication of the regression approach here.

A second approach is to calculate the average Engel coefficient for households whose food consumption is in the vicinity of the food poverty line (commonly above or below by 10 percent). In either case, once the appropriate Engel coefficient has been obtained, the overall poverty line can be found by multiplying the food poverty line by the inverse of the Engel coefficient.

## 1.2.9 Setting and updating prices

With the calorie thresholds in place, statisticians can identify a basket of foods that will provide those minimum needs at least cost.

Size and composition of the basket affect the accuracy of the overall poverty line. The trade-off in moving to a larger food basket is mostly given by the added costs of collecting price data. Collecting a moderate-sized food basket (for example with 25 items) but obtaining high-quality price data will likely enhance accuracy over either smaller or larger food baskets, especially if the latter makes it more difficult to update prices.

### *1.3 Table: Use of prices in setting poverty lines.*

| | Yes(percent) | Number of observations |
|---|---|---|
| Is the general consumer price index (CPI) used to update prices for food basket? | 71 | 34 |
| Is a poverty-specific CPI used? | 9 | 34 |
| Are commodity prices adjusted for differential prices paid by the poor due to lower quantities purchased? | 7 | 30 |
| Are commodity prices adjusted for differential prices paid by the poor due to purchases at different price points? | 20 | 30 |
| Does the composition of the food basket allow for differences in regional consumption habits? | 53 | 32 |

*Source: UNSD international survey of statistical offices, May 2004.*
Some adjustment for these concerns is implicit in setting separate poverty lines for urban and rural areas and for different regions. Having multiple lines can add precision, especially in geographically diverse countries, although it drives costs up.

## 1.2.10 International comparisons

It would be helpful to find a way to slash through the multiplicity of possibilities identified above. One way is to work toward the harmonization of approaches, seeking methodological consensus across countries. Another is to start from scratch with so called international poverty lines. Poverty measures are used both to compare progress across different countries and within a single country. The United Nations and World Bank have adopted $1/day and $2/day per capita poverty lines for international comparisons, even though national poverty lines may be more appropriate for comparisons within a specific country.

As a historical remark: The UN $1/day line happens to roughly approximate India's poverty line in the 1980's. The $1/day line was not constructed, it was chosen as a simple, if arbitrary, threshold that could be used to set goals and monitor progress. One limit of the international lines is that for richer countries, the $1/day line (or even the $2/day line) captures few of those considered poor by experts in the countries themselves. The poverty line in the United States is roughly ten times higher than the $1/day line, for example. The $1/day poverty line used by the United Nations and World Bank is anchored in 1993 international prices, so it is instructive to compare the data to the 1993 poverty line in the United States. In 1993, households in the United States with two adults and two children were deemed poor if their income fell below $14,654 per year or $10.04 per day per person. The per-year figure for the US is thus ten times higher than the international benchmark.

### *1.4 Box: About 1 $ per Day*

Another problem of international comparison is the translation of US$ into local currency. The simplest approach would be to use official exchange rates. But many goods consumed by the poor are not traded, and official rates can also be distorted by government interventions. It is thus broadly accepted that official exchange rates cannot be relied on to give the appropriate conversion of purchasing power when welfare comparisons are made. These issues have led to a search for alternative methods of conversion.

The United Nations and World Bank use a set of exchange rates calculated as part of the International Comparisons Project. These rates are designed to be used for comparing national income in different countries, and similar to consumer price indices, these rates are calculated based on the relative prices of a set basket of goods in each country. The idea is to calculate conversion factors that aim to equalize the purchasing power of currencies in different countries (which is why they are termed "purchasing power parity" or PPP--adjustments).

In principle, if a certain kind of man's shirt costs $10 in the United States, then $10 converted via the PPP-adjusted exchange rate should allow a person to have exactly enough money to buy the same shirt in any other country. In practice, the PPP numbers are difficult to calculate, and corrections and refinements to the method continue. A set of numbers is available for a large number of countries, however, and the UN and the World Bank rightly favour them over official exchange rates.

Differences between PPP and official exchange rates are considerable. In late 2003, for example, the ratios of official rates to PPP rates in Brazil, Nigeria, and India were 2.3, 1.4, and 3.3, respectively. This overvaluation of official rates means that the PPP-adjusted figures **raise** the value of $1/day poverty lines when denominated in local currencies and thus the PPP method shows more poverty in the world than would a $1/day line translated into local currencies at official exchange rates.

An alternative approach would be more painstaking but more consistent with the conceptual basis for poverty measurement described above. The idea would be to focus on a set of capabilities that people throughout the world can agree are necessary for living free from the worst deprivations. Elements would likely include having adequate nutrition, health inputs, shelter, and clothing. Each element would be specified carefully in the spirit of the "cost of basic needs" approach described above. The components would be achievable through access to different bundles of goods in different places, recognizing that eating and living patterns vary considerably the world over. The task for statisticians would be to construct locally-relevant commodity baskets that reflect the international consensus on these basic capabilities and to price the baskets using local costs, avoiding the need to use international exchange rates of any sort.

One advantage of this approach is that region-specific poverty lines could be easily accommodated, free of reliance on PPP numbers. The project would no doubt require considerable international coordination and consultation (unlike current practice), but the reward would be the first truly global poverty approach. Setting new international poverty lines would be a critical first step. As highlighted

throughout this course and following [1], coordinating survey techniques and practices would be the second major step toward this ultimate goal. For now, though, many countries will continue to rely upon the $1/day and $2/day per-person poverty lines. They have proved highly effective in focusing attention on world poverty, and they provide a rough benchmark on global trends. But at the same time, their limits should be kept in mind, particularly when completing disaggregated analyses.

## 1.3 Harmonization

A key goal of this course as of the UNSD handbook is to find common ground in approaches to poverty measurement, to better understand differences in approaches, and to sharpen assessment practices. While money-based measures no longer have exclusive hold on our attention, they remain central to analyses. The past two decades of experience, though, reinforce the value of collecting health and education data, as well as other social indicators that describe broader conditions of poverty. Increasingly, researchers also find value in asking about subjective views of poverty and in seeking input on poverty through participatory exercises that involve participants from local communities. Direct measures of access to basic services and infrastructure also provide important inputs in the policy making process. Results from the 2005 United Nations Statistical Division survey on approaches to poverty measurement show a wide range of practices. The diversity partly reflects differences in national conditions and policy needs, but there remain substantial areas where greater uniformity will raise the overall quality of poverty measure and improve comparability of measures across time and location.

The $1/day poverty line approach incorporated into the United Nations Millennium Development Goals demonstrates the power of uniformity, and this introduction points to ways of going further. Several steps to consider in achieving greater comparability and transparency include decisions to:

• Base poverty measurement on expenditure data rather than income data
• Establish standards for how poverty lines are set, including how to determine both food and non-food portions of poverty lines (where the “cost of basic needs” approach is taken)
• Select a standard set of adjustments for adult equivalence
• Select a standard adjustment for economies of scale
• Create shared guidelines for household survey methods used to collect important consumption items
• Create uniform ways of handling missing data and implausibly low values of income and consumption
• Establish guidelines on whether and how to use data from national income accounts to adjust data from household surveys (many experts will suggest not doing so at all).

These simple steps will bring statistical offices closer toward a common method of measuring poverty. No set of uniform rules and procedures will be superior for everyone all the time, but achieving greater uniformity will be a vast improvement over today’s widely varying practices.

## Chapter 1 Exercises

Study the documents “POVERTY AND WELL-BEING IN MOZAMBIQUE:
THE SECOND NATIONAL ASSESSMENT” (“Poverty and Well Being 2004.pdf”) to find out the following for that HHS:

Check the main topics of this chapter in the Mozambican HHS:
How will poverty be measured?
Find out how poverty lines are set. How both food and non-food are portions of poverty lines established?
Select a standard set of adjustments for adult equivalence (see “Rebuilding after War: Micro-level Determinants of Poverty Reduction in Mozambique”)
What kind of adjustments were made to reflect different consumption patterns in Households (Scale economy- see same document).
Analyze the results of Poverty Line Head Counts of different regions and the whole country

# 2. Poverty Measures

All governments make poverty reduction part of their policy agendas, but how exactly should poverty be measured? This chapter takes up that question with respect to money-based measures: those poverty statistics that measure the degree to which individuals and households fall below a poverty line. Just as there is much diversity in how surveys are collected, the practice of calculating poverty statistics also varies widely.

This chapter focuses on ways in which statisticians aggregate survey data to answer questions such as:

- How many poor people are there in a region?
- How deep is their deprivation?
- Has poverty risen since the last survey? and
- Which are other and complementary Poverty Measures?

Any discussion of how to form poverty measures must begin with recognition that statistics have multiple constituencies (e.g., government policy makers, NGOs, researchers, and the general public), and these scattered constituencies often have competing needs and agendas.

Choosing which poverty measure is best depends in large part on the uses to which it will be put. Since no single statistic is likely to answer the needs of all, most statistical offices publish a range of statistics. Recommendations are made for ways to expand the data range to make comparisons easier**. Even better, although not always easy, would be to also make the raw survey data available for others to analyze** (after taking appropriate actions to protect the confidentiality of surveyed households). That is what we are doing in this course, use raw data to make meaningful statements about poverty.

## 2.1. Desirable features of poverty measures

Poverty measures are used first and foremost to monitor social and economic conditions and to provide benchmarks of progress or failure. The measures will function well as long as everyone agrees that when poverty numbers rise, conditions have indeed worsened and conversely, when poverty measures fall, that progress has been made.

A second important use for poverty measures is descriptive. Poverty statistics play critical roles in summarizing complex social and economic conditions that inform conversations around economic and social priorities. For this purpose, effective measures need not completely capture all (or even most) morally relevant aspects of poverty. But the limits of measures need to be understood, and transparency and ease of interpretation are critical here.

Let us sum up the desirable features on monetary poverty indicators

| Feature | Description |
|---|---|
| “scale invariance” | Poverty measures should be unchanged if, for example, a population doubles in size while everything else is maintained in the same proportions |
| „monotonicity“ | Holding all else constant, when a poor person’s income falls, poverty measures must rise (or at least should not fall). |
| „transfer“ | Holding all else constant, taking money from a poor person and giving it to a less poor person must increase the poverty measure. Conversely, poverty falls when the very poor gain through a transfer from those less poor. |
| „Transfer sensitivity “ | This says that the poverty reduction in the case in which a very poor person is made better off relative to her neighbour should be greater than |

| Feature | Description |
|---|---|
| | the reduction in the case in which the recipient is less poor. |
| „decomposability“ | The poverty measure should be decomposable by sub-population. Sub-populations may include, for example, residents of different regions. sub-groups have to be distinct from each other (so that there is no overlap in membership) and that together they encompass the entire Population. |
| single, unique measure that would be fully “characterized” and encompass all the prior axioms | One candidate that satisfies all of the axioms on which we agree to identify “poverty”<br><br>Unfortunately: This candidate is impossible to find, seen the previous discussions |

***2.1 Box: Desirable features of monetary poverty indicators***

## 2.2. A First Example: The Headcount measure

The simple headcount index is the most used poverty measure, but it violates several important axioms. Of the four measures described below, the one that satisfies most of the desirable axioms above--the Watts measure--turns out to be the least used. These two facts suggest an ongoing tension between the desire for simplicity and transparency pitched against the desire for rigor. The measures below will be compared in that light.

The headcount is the simplest and best known poverty measure. It identifies the share of a population whose income/ expenditure is less than the poverty line. It is, not surprisingly, the most commonly calculated poverty measure. The measure literally counts heads, allowing policymakers and researchers to track the most immediate dimension of the human scale of poverty.

The headcount is calculated by comparing the income/ expenditure yi of each household to the poverty line z. (The index i = 1..N, where N is the total number of households in the sample.) Concretely, an indicator variable is constructed for each household, taking the value 1 when income/ expenditure falls below the poverty line or 0 if income/ expenditure is greater: $I(y, z) = 1$ if $yi \leq z$
$I(y, z) = 0$ if $yi > z$

In the easiest form the number of poor in the sample is divided by the total number of the sample. This number, usually in form of a percentage, is called the headcount measure.
If a household is poor is found out by comparing the Expenditure by person per day with the Poverty Line. Is the expenditure below the PL, then the household is considered to poor, otherwise it is considered not to be poor.

## 2.3. Poverty Indices in Detail

This chapter treats details of measures of poverty. Since we started with monetary indices, the main focus will be on these.

### Foster-Greer-Thorbecke (FGT) Indices

The most widely used index is the Foster-Greer-Thorbecke (FGT) index

$$P_\alpha = \frac{1}{Nz^\alpha}\sum_{i=1}^{I}(z - y_i)^\alpha$$

, where j is a sub-group of individuals with income / expenditure below the poverty line (z), N is the total number of individuals in the sample, $y_i$ is the income / expenditure of individual i and α is a parameter that allows us to distinguish between the alternative FGT indices. When α is equal to 0, the expression simplifies to I/N or the headcount ratio, a measure of the incidence of poverty.

Poverty depth is measured by the poverty gap, which is obtained with α equal to 1. The severity of poverty (or squared poverty gap) is measured by setting α equal to 2

In a more specialized case, when we want to compare Poverty Indices of sub groups, this formula varies a little. When it comes to sample weights (roughly a number standing for how many units of the universe are represented y one sampled item), this formula becomes even more complicated.
The unnormalized simple Foster-Greer-Thorbecke poverty index FGT P(k; z; α) for the population subgroup k is as follows:

$$P_{k;z;\alpha} = \frac{1}{\sum_{i=1}^{n} sw_i^k}\sum_{i=1}^{n}(z - y_i)^\alpha$$

The normalized FGT index, which is normally used, is defined by:

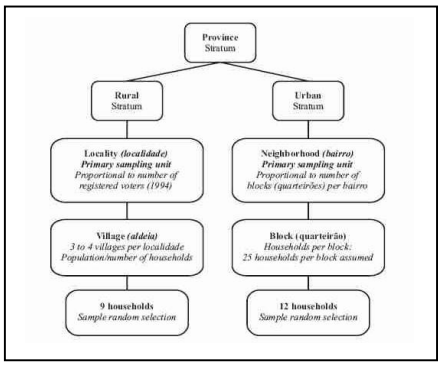
$$\overline{P}_{k;z;\alpha} = \overline{P}_{k;z;\alpha} \; / \; z^\alpha$$

| | |
|---|---|
| i | Observation number |
| Yi | the value of the variable of interest (e.g. expenditure) for observation i |
| w | the Sampling Weight. |
| wi | the Sampling Weight for observation i. |
| s | the size variable. |
| si | the size of observation i (for example the size of household i or the equivalent adult value). |
| swi | wi* si |
| k | the group variable (e.g. Age group, Sex of Head of HH, Urban/Rural). |
| ki | the group of observation i. |
| c | The selected group variable |
| swik | swik=swi if ki = c, and swki=0 otherwise. |
| n | Sample size |

## More in Headcount measure

The headcount index is simply the sample average of the variable I(y, z), weighted by the number of people in each household ni. The measure is calculated by first counting the number of poor individuals I weighted by number of people in the household, divided by all the HH in the sample: I/N. In reality, not the poor individual is counted but the poor household and then weighted (divided by Number of household members or equivalent adults).

When the sample is not representative of the underlying population (e.g., if the sampling strategy involved random stratification), population weights should also be included in the calculation (see remarks on Sample Design and Survey comparison for further discussion). The sample weight has nothing in common with the weight mentioned in the previous paragraph. While the first takes account of the size and composition of the household, the latter accounts for the different sizes of selected groups, especially in multi-stage sampling.




The headcount is an important descriptive tool. As a sole guide to allocating resources, though, the headcount can significantly mislead. There are two large tensions. First, the headcount registers no change when a very poor person becomes less poor. Nor does the headcount change when a poor person becomes even poorer. One can argue though that changes in the income / expenditure distribution below the poverty line matter (only) in a moral sense. This notion is captured by the transfer axiom above, but the headcount fails the test.

### *2.2 Graph: The Sample Design for Mozambique Household Survey 02/03*

A second tension flows from the failure of the transfer axiom, combined with the focus on whether people are above or below the poverty line. If policymakers see their task as reducing poverty as measured by the headcount, their work will be made easier by focusing on improving the lot of individuals just below the poverty line. A little improvement at this level can raise the incomes / expenditures of the “barely poor” below the poverty line and hence can reduce the poverty headcount fairly rapidly. Directing resources to very poor people, on the other hand, may be socially beneficial, but far larger income gains are required to take them over the poverty line and thus to make a dent in the poverty headcount. **So if efforts are allocated specifically to reduce the headcount, priority will likely go to helping the least poor over helping the poorest.**

The headcount remains a highly valuable measure, even if, when used on its own, it is a poor guide for resource allocation. One step to make the approach more useful is to calculate the headcount for “sub-poverty” lines at lower thresholds than the overall poverty line. These may capture, for example, the income required to purchase the food basket only, excluding non-food needs. In this context it is important to mention the „decomposability“of the FGT indices, allowing to calculate for subgroups.

## Poverty gap

This second widely-used measure has a problem similar to the headcount: it is descriptively very useful but, if used alone, would also serve as a poor guide to resource allocation. The poverty gap measures the amount of money by which each individual falls below the poverty line. It matters here whether income / expenditure and the poverty line are measured on a per capita basis or whether they have been put into adult equivalent terms or adjusted for scale economies. The appropriate formulas are given below. The starting point is to calculate the total shortfall in income / expenditure for the poor population:

$$P_{z;1} = \sum_{i=1}^{M} (z - y_i) I(z, y_i) n_i$$

where the poverty line is z, income / expenditure is y, I(z,yi) is a 0/1 indicator of poverty for each household, household size is ni, the total number of households in the sample is M, and individuals are indexed by i. The calculation gives the total sum of money that would be needed to make up for the gap between the existing incomes / expenditures of the poor and the official poverty line. The calculation above is correct only if income / expenditure is in per capita terms. When income / expenditure is made instead in adult equivalent terms (or adjusted for scale economies), the correct calculation is:

$$P_{z;1} = \sum_{i=1}^{M} (z - y_i) I(z, y_i) a_i$$

where ai gives the number of adult equivalent units in household i. The figure above, also called the shortfall may be helpful for budget planners, but it obscures the sense of individual deprivations. An alternative is to instead calculate the average shortfall for the population below the poverty line:

$$P_{z;1} / I(\text{Number of Poor})$$

When viewed together with the headcount, this version of the poverty gap measure shows the distance (on average) to be travelled in raising incomes to leave poverty behind. Because the figure is denominated in currency, conversion to a common international currency (e.g., Euro or Dollar) will aid global comparisons.

A different approach that can enhance comparability is to divide the index by the poverty line:

$$P_{z;1} /(I(\text{Number of Poor}) * \text{z})$$

Normalization puts the average gap in terms of the percentage shortfall from the poverty threshold, freeing the measure from denomination in a particular currency. The measure is now easily comparable across countries and across time, a helpful improvement. Routinely publishing poverty lines alongside the normalized poverty gap and the headcount would allow observers to calculate for themselves all three of the poverty gap variations described above.
Dividing the index by N, the total population of the sample, combines the three data points (headcount, poverty gap, and poverty line) to form another widely-used variant of the poverty gap.

### Squared poverty gap

One way to transform the poverty gap described above into a distributionally sensitive measure is to raise the individual gaps to a power greater than 1. Foster, Greer and Thorbecke propose a class of measures built on this idea which have found their way into much of the poverty analysis published by the World Bank. With income/ expenditure expressed in per capita terms, the measures take the form:

$$P_{z;2} = \frac{1}{N} \sum_{i=1}^{M} \left( \frac{(z - y_i)}{z} \right)^2 I(z, y_i) a_i$$

When income / expenditure is in household terms, the adult equivalent size $a_i$ should be replaced with the household size variable $n_i$.

For a FGT with $\alpha > 1$, the measure is distributionally sensitive and the particular case in which $\alpha = 2$ (often referred to as the squared poverty gap) is now the most widely-used distributionally-sensitive measure.

By squaring the poverty gap, improvements in the resources of the poorest individuals count most, since they are the ones for whom the initial resource gap is largest. The measure satisfies the transfer axiom but not the transfer-sensitivity axiom. To satisfy the latter, the poverty gap would have to be raised to a higher power, cubed rather than squared, say. Cubing adds .transfer sensitivity, a property that many find appealing. But it puts very heavy weight on the well-being of the poorest. Perhaps weight that would be judged too great in a social calculus at levels of α between 1 and 2, not only is transfer sensitivity not satisfied but the reverse holds: holding all else the same, a regressive transfer among the very poor increases poverty *less* than a same-sized regressive transfer among the moderately poor, a clearly undesirable feature. Distributional-sensitivity is achieved by weighing deprivations of the poor inversely to their base incomes. There are many ways to do this, and the weighting scheme in the squared poverty gap has the advantage of relative simplicity. The simplicity can help provide some intuition in understanding why the poverty measure moves over time.

## Watts index

A simple poverty measure that satisfies the transfer axiom was first put forward by Watts (1968), who argued for the following measure:

$$WIndex = \frac{1}{N}\sum_{i=1}^{M}\left(\ln(z) - \ln(y_i)\right)I(z, y_i)a_i$$

as above, when income / expenditure is in household terms, the adult equivalent size *ai* should be replaced with the household size variable *n i.*

The measure is distributionally-sensitive by virtue of its use of logarithms. The character of the logarithm function means that the Watts index is much more sensitive to changes in the lowest incomes than it is to changes for those with higher incomes. That is, transferring $10 to a very poor person counts as a far larger contribution to poverty reduction than transferring $10 to a richer (but still poor) neighbour.

Allocating anti-poverty resources to minimize the Watts index would thus tilt efforts toward the poorest, which is a feature that some analysts find appealing. The Watts index also satisfies the transfer-sensitivity axiom described above, and it is decomposable into the population-weighted sum of the poverty indices of regions or groups. (The squared poverty gap shares this feature too.) Being decomposable is useful when a population can be divided into a number of distinct groups or regions. Poverty measures can then be calculated for each group or region, and, if the poverty measure is decomposable, the individual poverty measures can be aggregated (using population shares as weights) to form the overall poverty measure for the entire population. Decomposing poverty measures in this way can help to pinpoint the groups or regions contributing most and least to overall poverty.

## Comparing the measures

Obviously all the different indices mean different things

The headcount numbers the poor (in relation to the total population)
The poverty gap shows the relative distance (on average) the poor have to travel in raising incomes to leave poverty behind.
The squared poverty gap shows the distribution of poverty among the poor, the higher it is the bigger are the differences among the poor
The Watts Index measures in log-terms the differences between the poor and the poverty lines

**A prepared of an exercise**:
Moderately few (in order not to lose track of the training purpose) sample data are displayed in a sample EXCEL Spreadsheet (PovertyLineExerciseEx3_1.xls).
This spreadsheet will be used initially for the exercises in this chapter
The spreadsheet contains two sheets:
1. Start (contains the original data)
2. Exercise (contains the same data and graph for the exercise)

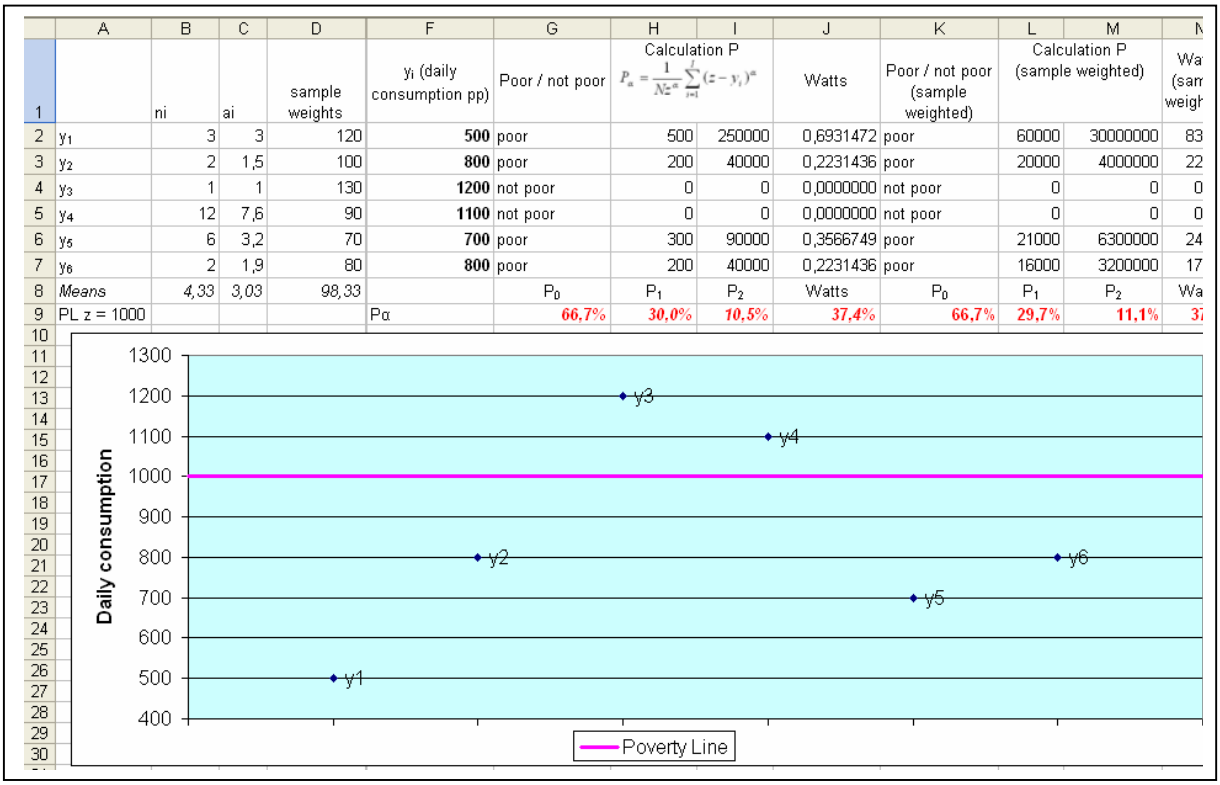
The data:
Each data line 2 to 6 represents one household

1. Daily consumptions: y1 – y6 in column F
2. Household size in Column B
3. Equivalent Adults in Column C

Both are not used for calculation but could easily be used to apply formulas from text

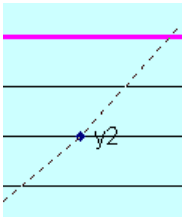
### *2.3 Graph: Comparing the FGT Indices*

| | A | B | C | D | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | ni | ai | sample weights | $y_i$ (daily consumption pp) | Poor / not poor | Calculation P $P_\alpha = \frac{1}{N z^\alpha}\sum_{i=1}^{q}(z-y_i)^\alpha$ | | Watts | Poor / not poor (sample weighted) | Calculation P (sample weighted) | | Wa (sam weigh |
| 2 | $y_1$ | 3 | 3 | 120 | **500** | poor | 500 | 250000 | 0,6931472 | poor | 60000 | 30000000 | 83 |
| 3 | $y_2$ | 2 | 1,5 | 100 | **800** | poor | 200 | 40000 | 0,2231436 | poor | 20000 | 4000000 | 22 |
| 4 | $y_3$ | 1 | 1 | 130 | **1200** | not poor | 0 | 0 | 0,0000000 | not poor | 0 | 0 | 0 |
| 5 | $y_4$ | 12 | 7,6 | 90 | **1100** | not poor | 0 | 0 | 0,0000000 | not poor | 0 | 0 | 0 |
| 6 | $y_5$ | 6 | 3,2 | 70 | **700** | poor | 300 | 90000 | 0,3566749 | poor | 21000 | 6300000 | 24 |
| 7 | $y_6$ | 2 | 1,9 | 80 | **800** | poor | 200 | 40000 | 0,2231436 | poor | 16000 | 3200000 | 17 |
| 8 | *Means* | *4,33* | *3,03* | *98,33* | | $P_0$ | $P_1$ | $P_2$ | Watts | $P_0$ | $P_1$ | $P_2$ | Wa |
| 9 | PL z = 1000 | | | | Pα | *66,7%* | *30,0%* | *10,5%* | *37,4%* | *66,7%* | *29,7%* | *11,1%* | 3 |

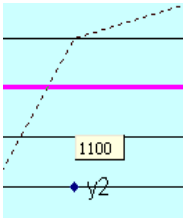



4. Sample weights to clarify how they are applied and enter into the calculation
5. Cell A9 contains the value of the poverty line (for simplicity set to 1000 currency units). This value can be modified.
6. The Poverty Indices (FGT 0,1 and 2 and Watts) are calculated in line 9
7. The cells represent the specific calculation for each household, for example, in column G: the daily consumption is compared to the fixed poverty line value. The cell contains the text “poor”, if the value falls below (or on) the PL, otherwise it contains the text “not poor”.
8. The calculations in columns H-J contain the appropriate formulas for Poverty Gap, Squared Poverty Gap and Watts Index.
9. Line 9 contains in red the calculated Poverty values
10. Line K-N contain the same calculation with applied sample weights

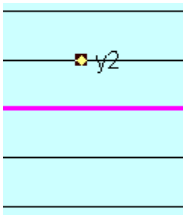
The graph below shows in simple form the Poverty line (red horizontal line) and the individual household consumptions relative to the poverty line.
Household consumption can be modified by changing the values in column F or dragging the data points (y1- y6) to the desired position, e.g. “dragging” household y2 above the poverty line




**Step 1**




**Step 2**




**Step 3**

See how the values of Poverty Indices change.

See also how the unweighted and weighted values differ

### *2.4 Graph: Modifying Expenditure and the FGT Indices in a Graph*

## Chapter2 Exercises – First Set

The sample data for the exercise:
The data are available as
EXCEL data sheets (HH_03_BasicData_HH&Ind_sofala.xls).
SPSS data sets (HH_03_Sofala_HH+IndData.sav)
The principal questionnaires used for the poverty analysis are Household Data and Individual Data (HH03_HH&Individual.pdf)

The translation of data denominations is found in the Data Dictionary (Mozambique Household Survey-Description of Variables and Values.doc)

Study the indicated documents for Mozambique. For the sake of simplicity the data are limited to the central province of Sofala to find out the following for that HHS using EXCEL commands: Use file "HH_03_BasicData_HH&Ind_sofala_Ex2_0.xls"

1. How many Households were questioned? (Use sheet: HHDataSofala)
2. How many individuals live in these households? (Use sheet: InDataSofala)
3. Look for data about consumption. These data were collected with another questionnaire and transferred to the existing ones (Variable: TotExpDia)
4. Find the appropriate PL for Sofala in the documents mentioned in the previous chapter
5. Compare the HH selected with the number of HH in Sofala (Household Numbers in Mozambique RPGHII-1997.doc)
    a. What is the sample ratio for Sofala?
    b. What do you think about this ratio, is it sufficient? This issue will be discussed if subsequent chapters
6. Use PivotTabels to find out the following:
    a. How many Urban and Rural Households?
    b. How many members in each household? (What is the average HH size)
    c. How many female headed households, how many male headed
        Solution in (HH_03_BasicData_HH&Ind_sofala_Ex2_1.xls)
    d. Equivalent Adults according to description (Adult Equivalent Calc.doc)
    e. Calculate sum for each household (Pivot Table) and transfer column to HH-sheet
        Solution in (HH_03_BasicData_HH&Ind_sofala_Ex2_2.xls)
7. Considering the weights (HHWeight) calculate a consumption (TotExpDia is the HH consumption per day) per HH Member (Hhmem) and per Equivalent Adults (EquivAd)
    a. Calculate Head Counts (Number of Poor ) for Rural, Urban and Total Population
    b. Compare Indices for Unweighted, Weighted for Expenditure per HH and , Weighted for Equivalent Adults
        Solution in (HH_03_BasicData_HH&Ind_sofala_Ex2_3.xls)

## Exit time and the value of descriptive tools

For all of the theoretical appeal of the distributionally-sensitive measures described immediately above, the headcount remains by far the most common poverty measure in use. The Millennium Development Goals, for example, focus on reducing the headcount of poverty below $1/day, rather than minimizing a distributionally-sensitive measure. One reason for the continuing use (and usefulness) of the headcount is its descriptive properties. It is a simple means for illustrating the scale of poverty. In this sense, it is an intrinsically meaningful measure. The poverty gap is also intrinsically meaningful, taking us from counting people to counting shortfalls of income / expenditure or consumption. It answers the question: how much would have to be spent to eliminate poverty through costless (and perfectly) targeted transfers. Its underlying assumptions are clearly unrealistic: in practice, transfers will never be administratively costless, nor will they ever be perfectly targeted. However, this hypothetical question still provides a helpful way to quickly gauge the scale of deprivation.

The "average exit time" is based on a similar sort of hypothetical question. The underlying assumption is as unrealistic as that under the poverty gap, but the measure nevertheless can fruitfully frame discussions of poverty. The measure is based around the number of years that it would take poor households to grow out of poverty given a hypothetical, steady growth of income / expenditure. In practice, income / expenditure growth will seldom be steady over long periods, nor will all poor households be able to grow at the same rate. But, as with the poverty gap, asking the hypothetical question provides a quick way to gauge one important aspect of the condition of poverty. Hypothetical exit times are simple to calculate. If the assumed growth rate of income / expenditure is $g$ percent per year, an individual whose income / expenditure starts at $y_i$ will take $T$ years to exit, where $T$ solves this equation:

$$z = y_i(1+g)^{\tau}$$

The equation can be solved by taking logarithms, yielding that the number of periods of growth required before exit is $T = \ln(z/y_i) / g$. Of course, $T = 0$ for all households already above the poverty line.

The only data required are the poverty line $z$, the assumed growth rate $g$, and the median income / expenditure of the population below the poverty line $y_{Mean}$. So If the hypothetical exit time, $T_i$, for each poor household is averaged over the population below the poverty line, the "average exit time" A is:

$$A = \frac{\ln(z / y_{Mean})}{g}$$

So If the hypothetical exit time, $T_i$, for each poor household is averaged over the population below the poverty line, the "average exit time" A is:

$$A = \frac{1}{N}\sum_{i=1}^{I}\frac{\ln(z / y_i)}{g}I(z, y_i)n_i = \frac{1}{N}\sum_{i=1}^{I}T_i n_i$$

This equation is analogous to the average poverty gap described in equation (2), and it shares similar weaknesses and strengths. Its chief strength is its simplicity and descriptive value. Its main weakness is that when a less poor household exits poverty and all else is unchanged, the average exit time, $A$, will fall. This makes $A$ not a very good candidate to be the sole measure of poverty. However, $A$ can still be a very useful component for the analysts. As the FGT Indices the

average exit time is that it can be decomposed explicitly to show the impact of inequality below the poverty line.

The exit time has a useful relationship to another established measure. If exit times are calculated for the entire population of a country (with those above the poverty line having 0 exit times), the average turns out to be simply the Watts poverty index divided by *g*, the hypothetical annual growth rate

This measure, the “population average exit time” naturally shares all properties of the Watts index, satisfying both the transfer axiom and the transfer-sensitivity axiom. But it has the addition of a new interpretation, akin to the interpretation of the poverty gap described by equation (3) above.

With economic growth very much a part of the poverty reduction policy agenda, tools like exit times provide ways to summarize data in a manner relevant to policy debates on growth-based poverty strategies. They complement the other measures described above.

Importantly, it should be remembered that exit times describe possibilities based on simple assumptions as used here, the exit times are not based on actual forecasts or careful predictions. These simple exit times, though, can be useful in identifying opportunities and constraints to guide policy.

## Measurement Limits and Errors

No survey is perfect, but some collection methods are far more reliable than others. Particular problems arise when expenditures (or incomes) are either substantially over-counted or under-counted, and the biases can be exacerbated by the choice of poverty measure. Under-counting leads to exaggerations of poverty rates, and the distributionally-sensitive measures described here are particularly susceptible to the exaggeration of under-counting in the lower tail of the income distribution (Squared Poverty Gap and Watts Index).

### Mean

The result of summing the ratios and dividing the result by the total number ratios.

e.g. . the mean of daily consumption per EQAdult in Sofala

### Median

The value such that number of ratios less than this value and the number of ratios greater than this value are the same.

e.g. the median of daily consumption per EQAdult in Sofala

### Quantiles / Percentiles

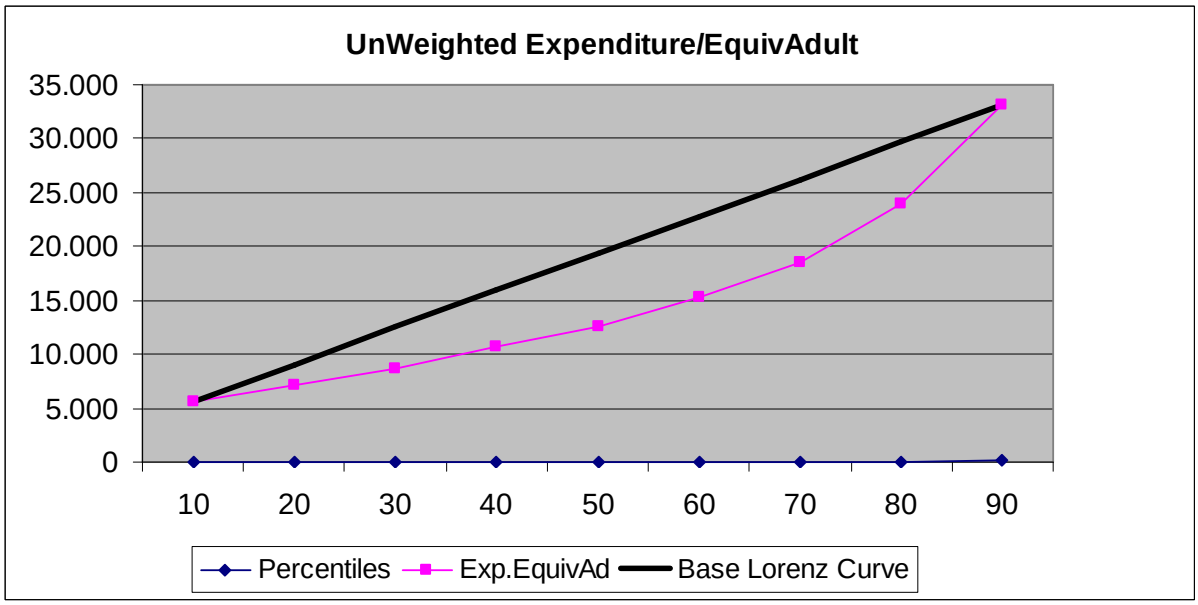
Quantiles are points taken at regular intervals from the cumulative distribution function of a random variable.

There are several special cases of Quantiles: Percentile is the value below which the specified percentage of cases falls. So the median value is the 50 Percentile.
Commonly used Quantiles are Quartiles(25,50,75), Quintiles (20,40,60, 80) and Deciles (10,20,30,40,50,60,70,80,90), the Percentile in its original meaning (1,2,…98,99)

## Lorenz Curve

The Lorenz curve is a graphical representation of the cumulative distribution function of a probability distribution; it is a graph showing the proportion of the distribution assumed by the bottom y% of the values. It is often used to represent income distribution, where it shows for the bottom x% of households, what percentage y% of the total income they have. The percentage of households is plotted on the x-axis, the percentage of income on the y-axis. It can also be used to show distribution of assets. In such use, many economists consider it to be a measure of social inequality.

### *2.5 Graph: Lorenz Curve for Expenditure in Sofala*




Graph2.1 from “HH_03_BasicData_HH&Ind_sofala_Ex3_4.xls”

If all individuals are the same size, the Lorenz curve is a straight diagonal line, called the line of equality. If there is any inequality in size, then the Lorenz curve falls below the line of equality. The total amount of inequality can be summarized by the Gini coefficient (also called the Gini ratio), which is the ratio between the area enclosed by the line of equality and the Lorenz curve, and the total triangular area under the line of equality. The degree of asymmetry around the axis of symmetry is measured by the so-called Lorenz asymmetry coefficient.

The Lorenz curve shows in graphical form the distribution of Household expenditures or income broken down by Quantiles. For the exercise the weighted expenditures were split into 10 equidistant groups. The Lorenz curve would be straight at a 45º inclination, if the expenditure would be equally distributed. The result for Sofala show that the reality is far from this.

It is somewhat simpler to look at the Gini-Coefficient to have numerical indicator for the equality or inequality of e variable distribution. The Gini- Coefficient (between 0 an 1) measures the area between the Lorenz curve and the Base Line, it would be 0 for a complete fit and 1 for extreme inequality. This means the closer the Gini coefficient is to 0,the more uniform the expenditure is distributed. The Gini Coeffient is the ratio of the mean of expenditure among the group members (the 10 percentiles) divided by the group mean

### Gini Coefficient

$$Gini = \frac{1}{(2n^2 y_{Mean})} \sum_{i=1}^{n} \sum_{j=1}^{n} \left| y_i - y_j \right|$$

The Gini coefficient (or Gini ratio) is a summary statistic of the Lorenz curve and a measure of inequality in a population. The Gini coefficient is most easily calculated from unordered size data as the "relative mean difference," i.e., the mean of the difference between every possible pair of individuals, divided by the mean size ,

If the y values are first placed in ascending order, such that each y has rank i, the some of the comparisons above can be avoided and computation is quicker and easier: - where y is an observed value, n is the number of values observed and i is the rank of values in ascending order.

$$G = \frac{2}{n^2 y_{Mean}} \sum_{i=1}^{n} i(y_i - y_{Mean})$$

The Gini coefficient ranges from a minimum value of zero, when all individuals are equal, to a theoretical maximum of one in an infinite population in which every individual except one has a size of zero. It has been shown that the sample Gini coefficients defined above need to be multiplied by in order to become unbiased estimators for the population coefficients.

## Concluding Remarks

Focusing on the most commonly used measures promotes comparability across countries. These include the headcount index, poverty gap, and squared poverty gap. This section has described how to calculate and interpret these measures (in addition to the Watts index), and identifies their respective strengths and weaknesses.
Statistical offices can go further, though, by also publishing simple statistics that provide a richer picture of conditions. These statistics are seldom very costly to compute and can substantially enrich analysis. The first is the median income of the poor population. The median gives the income level below which the bottom 50 percent of the poor population lives. This simple measure indicates whether the bulk of the poor population is close to or far away from the poverty line. In section 3.5 above, it was also shown how median income can be employed in the exit-time framework.

Going further, it would be helpful to also publish the income of households at the 25th percentile and the 75th percentile of the income distribution below the poverty line. Ultimately, publishing the entire Lorenz curve (the mapping of population shares to income/expenditure shares) would be most revealing and would add little extra cost. The median, though, is the natural place to start, followed by incomes at other important focal points of the distribution.

One of the most valuable steps that statistical offices can take is to put in place ways to make the raw data for poverty analyses available to researchers. Steps would have to be taken to secure confidentiality to households in the survey, but fortunately methods to do so are now well-established. Broadening access to data will allow analysts to better compare conditions and to develop new tools that can ultimately benefit statistical offices, policy makers, and citizens.

## Chapter2 Exercises –Second Set

Compare the mentioned indices in a simple spreadsheet exercise (PovertyLineExerciseEx3_1.xls).:

1. What is your opinion about sample weighted and sample unweighted results. Try to change some of the weights and see what happens
2. Try to estimate how many currency units (CU ) it needs to transfer the two "least poor" households above the PL
3. Try to estimate how much currency units (CU ) it needs to transfer all household above the PL
4. What happens, if all the expenditure of households is raised by 100 CU
5. What happens, if the expenditure of the two "least poor" households is raised by 100 CU
6. What happens, if the expenditure of the two "poorest" households is raised by 100 CU
7. What happens, If money is transferred (100 CU each) from all the "not poor" households to "poor households"
8. What happens, If money is transferred (100 CU each) among the two "least poor" households to two "poorest" households

Please note the results of the exercises in a table comparing the 8 Indices, like

| Exercise | unweighted | | | | weighted | | | | Comment |
|---|---|---|---|---|---|---|---|---|---|
| | $P_0$ | $P_1$ | $P_2$ | Watts | $P_0$ | $P_1$ | $P_2$ | Watts | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |

Please apply the Calculation exercise, calculating the indices (weighted) for Urban and Rural Population in Sofala in EXCEL File (HH_03_BasicData_HH&Ind_sofala_Ex3_1.xls)

| | Type of Index | Total | Urban | Rural |
|---|---|---|---|---|
| 9 | $P_0$ | | | |
| 10 | $P_1$ | | | |
| 11 | $P_2$ | | | |
| 12 | Watts | | | |

Please calculate the average exit time for Sofala and the population groups "Urban" and "Rural" separately. Calculate for two hypothetical growth rates 3% and 10%. Use prepared Exercise sheets (PovertyLineExerciseEx3_2.xls)

| | Type of Index | Total | Urban | Rural |
|---|---|---|---|---|
| 13 | Average Exit Time (3%) | | | |
| 14 | Average Exit Time (10%) | | | |

Use the exercise "HH_03_BasicData_HH&Ind_sofala_Ex3_4.xls". Watch the calculation and the way EXCEL is used to calculate the Gini Coefficient for the Total Population of Sofala and calculate Gini Coefficients for Urban and Rural Population separately

| | Type of Index | Total | Urban | Rural |
|---|---|---|---|---|
| 15 | Gini | | | |

# Poverty Reduction Strategies, Plans and Action

This section focuses on the formulation of poverty reduction policies. It shows how various poverty tools can be of considerable value to policy makers in strengthening the poverty alleviation impact of government spending. Poverty profiles can play an important role in understanding poverty and formulating poverty reduction policies. In this chapter, we provide some country specific examples to illustrate how poverty profiles can be constructed and how they can be utilized to design policies.

The primary step in determining the degree of poverty is establishing a poverty line that specifies in monetary terms a society's judgment regarding the minimum standard of living to which everybody should be entitled[5]. Once the poverty line is determined, one can construct poverty profiles, which provide overall estimates of poverty, distribution of poverty across sectors, geographical regions and socioeconomic groups, and a comparison of key characteristics of the poor versus non-poor.

Geographical targeting is also becoming an important means for channelling public resources to the poor. Many governments use it to target programs, such as food aid, public works, and delivery of health care and education. This approach is commonly referred to as "poverty mapping". This chapter provides a brief review of methodology used in the construction of poverty maps. It also points out the effectiveness and limitations of poverty mapping.

## Poverty monitoring and poverty profiles

The three poverty indices discussed in the previous section are often used as a tool to monitor poverty over time at the aggregate level. Needless to say that monitoring poverty at the aggregate level is important because policy makers want to know if the government policies are helping the poor.

Poverty profiles show how poverty varies by geography and subgroups across society. Divisions include regions, communities, sector of employment, and household size and composition. Profiles can also show how rates of economic growth in different sectors and regions affect aggregate poverty. Accordingly, poverty profiles are extremely useful in formulating the most effective economic and social policies to combat poverty. They identify regional location, employment, age, gender and other characteristics of the poor. This information can be used to formulate poverty alleviation policies. Profiles can also help answer a wide range of questions such as:

- Who are the poor?
- Where do they live?
- What do they do?
- On what sectors do they depend for their livelihood?
- Do they have access to economic infrastructure and support services such as social services and safety nets? ,
- How can the government target resources to them?

Look at the document "Poverty and Well Being 2004.pdf" and answer the questions above - Group Activity:

Discuss this issue (Poster: Poster_PRS-Strategy_ Metaplan.doc) – Group Activity

The three FGT poverty measures -incidence of poverty, poverty gap ratio and severity of poverty- have the attractive property of being additively decomposable poverty measures (see previous section). This property is essential and quite useful in analyzing poverty profiles.

[5] Watch the difference in definition to the previous chapters

Contribution of each region to total poverty can be used as an indicator for allocating public assistance to each region. Since most of the poverty is found (where?), government spending to reduce poverty should be concentrated in that region. There is no consensus about the distribution of economic growth across various socioeconomic and demographic groups. Household survey data can be used to investigate how economic growth affects poverty among various groups.

Although poverty profiles are very useful in understanding the nature of poverty, they are limited to showing bivariate associations between various socioeconomic groups and poverty measures. In other words, they do not control for other omitted variables, which also have an impact on poverty. In many instances, this profiling approach can generate misdirected policies.

This poses the otherwise crucial question: “Which is the reason for poverty?”

We may construct poverty profiles by simple model transformation, regressing the probability of being poor on a large number of relevant household characteristics that are generally used in poverty profiles. From these models, one can estimate the marginal effects, or elasticity, of probability of being poor with respect to any explanatory variable included in the model. We will do some exercises on this in the next chapter. The main attraction of these models is that we can isolate the effect of a single variable by controlling for all other variables included in the model.

To illustrate this point, look at the just mentioned document and consider the document “IFPRI_hasDevelopmentbeenProPoor.pdf” to discuss the point that the wealth has increased among the poor. The IFPRI document reflects the views of the official politics. Another document illustrates quite a different picture “Joseph Hanlon_Poverty.pdf” using a different approach (which one?).

## Capability deprivation

The income-poverty line, which identifies the poor from the non-poor, can never perfectly distinguish between individuals who are able and unable to enjoy a minimum set of capabilities Thus, it is important to investigate whether the poor suffer greater capability deprivation than the non-poor. If they do, more effective policies can be devised to raise their living standards, such as providing cash or in-kind transfers or greater access to government services. This section investigates whether the poor (defined in income terms) actually suffer greater capability deprivation. Looking at the following table:

Table 12: Changes in school enrollment, 1996--2002

| Percentage of children 7 to 17 years old (at the time of the survey) who: | IAF96 | QUIBB00 | IAF02 |
|---|---|---|---|
| Ever attended school | | | |
| National | 60.8 | 69.0 | 79.7 |
| Rural | 54.8 | 62.1 | 75.0 |
| Urban | 82.6 | 82.3 | 89.4 |
| | | | |
| Were attending school (at the time of the survey) | | | |
| National | 48.8 | 61.3 | 67.8 |
| Rural | 43.7 | 55.0 | 62.5 |
| Urban | 67.7 | 73.5 | 78.8 |

***3.1 Table: Comparing Scholl Enrolment in Sofala***

This table does not indicate any differences between poor and non-poor as it could do to show the difference, although the QUIBB00 would not provide for any poverty figures. However it shows the differences in enrolment between urban and rural households.
What political decision will be the result of these findings is another issue altogether. The distribution of wealth or diminution of poverty is the next challenge. The result of not alleviating these differences: excluding social or regional strata from economical welfare will heighten tension and increase social unrest.
Africa with different communication standards might react a bit different from other world region, but with record cell phone increase rates for sub Saharan Africa, the communication gap is closing for the urban population, at least in countries with governments open to the western economical system.

This raises the further question: “Which are the indicators of capability deprivation to be observed?”

Indicators of capability deprivation can be:

***Drinking Water***
This index measures the quality of drinking water

***Toilet or Sanitary Facilities***
Human waste disposal is another important factor related to people’s capability to live a healthy life. Unhygienic toilet facilities can spread infectious diseases. The index of toilet facilities measures quality of toilets available to a household.

***Cooking Fuel***
Gas and electricity are the cleanest and most convenient fuels for cooking. But they can be expensive, and they may not even be available in the areas where poor people live. The index of cooking fuel reflects its cleanliness and convenience.

***Availability of Electricity***
Percentage of the population with access to electricity

***Housing Condition***
Data on the number of rooms (and The number of sleeping rooms) in each dwelling. The data are used to calculate the rooms (and sleeping room) available per 100 persons.

***Access to household consumer durables***
Data on the use of bicycles, telephones, air conditions, and washing machines

***Productive assets held by poor and non-poor***
One of the important reasons why poverty persists is that the poor do not possess productive assets (Fixed assets, Financial assets, Housing etc.) and the productivity of the assets they do own may be low

Many developing countries use micro credit to help the poor acquire productive assets. There are many other policy options, such as marketing training to help the poor get better prices for their produce and services. However, the more challenging issue is devising policies that would be targeted to the poor. Poverty mapping that helps identify the poor is an increasingly important tool to better target anti-poverty programs

## Poverty mapping

Geographic targeting is becoming an important tool for allocating public resources to the poor. It is commonly regarded as a more efficient way to reduce poverty than untargeted, universal programs. Many governments in developing countries are giving greater importance to decentralization, whereby the district or provincial governments play an important role in poverty reduction policies. To implement such policies, it is important to know the spatial distribution of poverty. Poverty mapping is

the spatial analysis of poverty. It maps the incidence of poverty within each region and sub-region of a given country. A number of methods have been devised to measure spatial distribution of poverty. There is not enough space in this chapter to present all the methods that have been used in practice.

Household surveys are the most important data source for measuring poverty. However, usually their sample sizes are too small to provide precise estimates of poverty for small geographical units, such as provinces and districts. Alternative data sources are population censuses, which do not suffer from small sample problems, but typically provide very limited information from each household. For instance, censuses do not offer information on households, consumption expenditures or incomes, preventing income poverty from being measured directly. However, small-area estimation is a statistical technique that combines household survey and census data to estimate income poverty at small geographical units. It has been used by the U.S. government for planning and targeting. And recently, the World Bank staff have refined this technique and applied.

The techniques of poverty mapping will not be discussed in detail. The main obstacle for most African countries is the data availability on the most basic level. This will be discussed in the next chapter. More detailed information in [1, Chapter VII]

Construction of poverty maps requires having access to census data at the household level. Statistical offices of many countries do not allow, for reasons of confidentiality, such detailed information be made available to individual researchers. Some statistical authorities, however, make available aggregated census data, which unfortunately, leads to loss of precision of poverty map estimates, particularly at the lower level of disaggregation. A further requirement of poverty mapping is that the household surveys have a large subset of variables that are also used in the census, which may not always be the case. However Household Surveys could be adapted to increase the harmonization with the census. If this is not the case variables that are available in both household survey and census may not be sufficiently correlated with the household consumption. In this case, the regression model will not be able to predict poverty maps accurately. Finally, poverty mapping assumes that the explanatory variables (e.g. the poverty indicator: consumption) in the household survey are produced from the same data-generating process as the census data. This assumption, however, can be statistically tested. The minimum requirement for this assumption to hold is that both household and census surveys should correspond to the same period. The maximum allowable time difference will depend on the rate of economic change that is taking place in the country. Many countries do not have census and household surveys for the same period.

In Mozambique the HH Surveys were conducted in 1996/7, 2002/3 and 2008/9, the censuses in 1997 and 2007.

Look at the Recommendation of IMF's GDDS concerning poverty data
http://dsbb.imf.org/Applications/web/gdds/gddstableb/

### *3.2 Box: Proposing Poverty Measures by IMF's GDDS*

| | | | | |
|---|---|---|---|---|
| Poverty | Income poverty: number and proportion of people or households with less than minimum standard of income or consumption; valuation of minimum consumption bundle<br><br>Other poverty measures: measures of deprivation or insecurity used to identify the population living in poverty, such as evidence of malnutrition, endemic diseases, educational achievement, and lack of access to basic services | Measures of the distribution of household or per capita income or consumption<br><br>Separate poverty estimates for urban and rural populations or for major regions, states, or provinces. Disaggregation of data by subnational or regional units, as appropriate | 3-5 years | 6-12 months following the survey |

In most developing counties, the census is conducted every ten years. Household surveys, however, are conducted more frequently. The ten-year period is too infrequent, leading to the creation of poverty maps that are outdated long before the next poverty mapping exercise is undertaken. Outdated poverty maps can lead to misallocation of scarce public resources. Given so many problems in combining household survey and census, an alternative method of constructing partial poverty maps is proposed later. This approach does not require the use of census data.

For the purpose of formulating a poverty reduction policy, one wants to know which districts are poor so that policymakers can target policies to them. The first task is to define a poor district. Since the poverty rate at the national level was 38.6 percent in 1997-98, it is reasonable to assume a district to be poor if more than 50 percent of its population is living in poverty. The null hypothesis is that the percentage of poor people in a district is 50 percent or less. The alternative hypothesis will obviously involve districts where more than 50 percent of the population is poor. Thus, one can identify a district as poor if one rejects the null hypothesis at the 5 percent significance level.

(1)
$$100 * \sqrt{\frac{0.5 * 0.5}{n_i}}$$

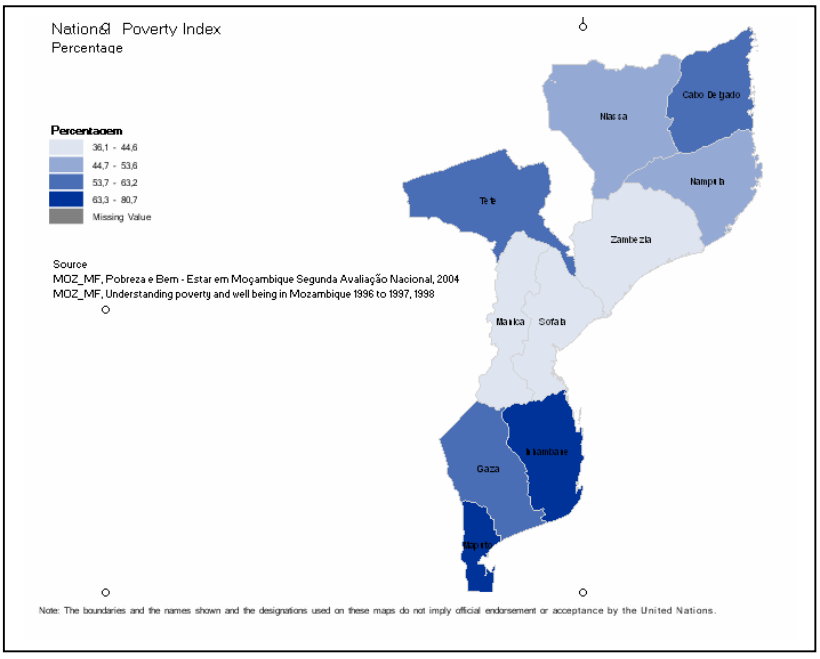
If pi is an estimate of the percentage of poor in the ith district based on a sample of size ni, then its standard error under the null hypothesis will be (1)

(2)
$$p_i > 50 + 1.67 * 100 * \sqrt{\frac{0.5 * 0.5}{n_i}}$$

Using a one-tailed test, the hypothesis will be rejected at the 5 percent significance level if (2):

Test this procedure “HH_03_BasicData_HH&Ind_sofala_Ex4_1.xls”. We will see that none of the districts will be considered to be poor.

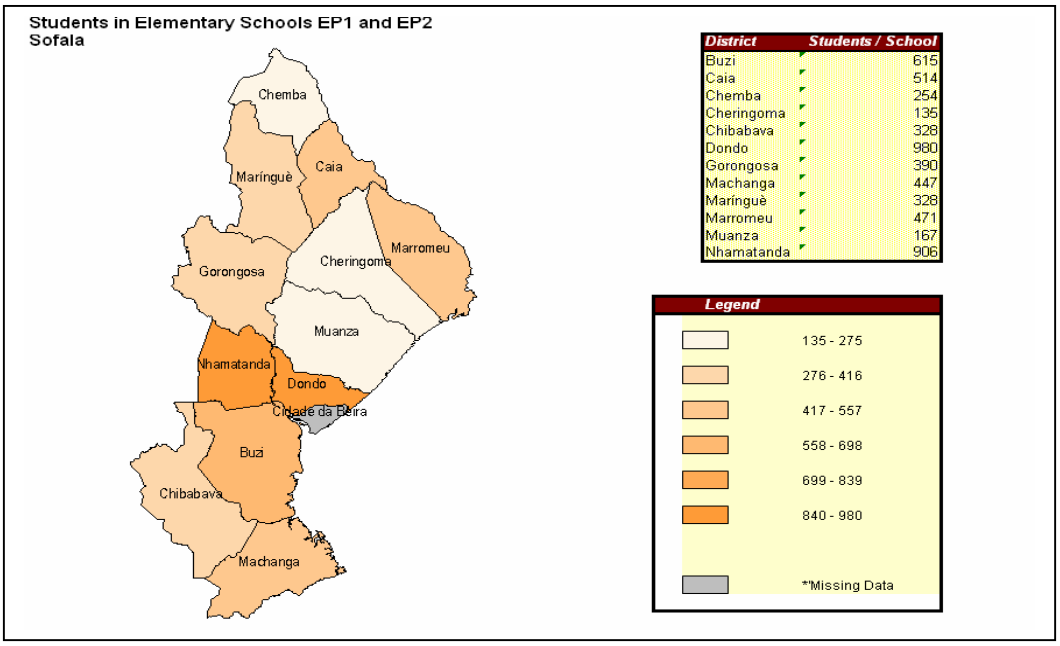
## Poverty Mapping and National Comparison with DevInfo




DevInfo 5.0 is an advanced database management system to keep track of the commitments towards human development. It is endorsed by the UN to report on the progress towards the Millennium Goals. With DevInfo, you are “literally a few mouse clicks away from facts that help you to” (☹ this is PR speak for DevInfo but anyway):

- Analyze data for evidence-based decision making.
- Undertake results-based monitoring and evaluation.
- Link different levels—national, sub national and regional—of planning.

### *3.3 Graph: Standard Poverty Mapping with DevInfo for Mozambique*




### *3.4 Graph: Customized Poverty Mapping with DevInfo for Sofala*

The advantage of DevInfo Data is, that the owner has full control over the quality and source of the data contrary to sources like WDI (World Development Indicators). The DB Development Pack (DevInfo 5.0<Current Version> Data Admin) is readily available for download and allows for display of customized data. It goes without saying that GIS Data (coordinates for the poverty maps) have either to be available or have to be substituted or added by the Data Admin Pack.

Typical household surveys, which are the basis of most poverty estimates, comprise a sample of several thousand households. Although this provides a rich information base on the living standards of the sample households, the sample size is usually only sufficiently large to estimate poverty to the first subnational administrative unit, such as a province or state.

By combining the detailed information of a household survey with the comprehensive coverage of a national census, one may estimate poverty levels for much smaller areas. Although these small area estimates are indirect and are calculated with a certain degree of statistical error (or uncertainty), they may be suitably precise to be useful for policy purposes ([16])

At least two data sets are required to implement the method. One is a detailed household survey that includes a measure of welfare, which is typically consumption per capita. The other data source is a national census or, alternatively, a large national survey that includes a significant share of the country's population.

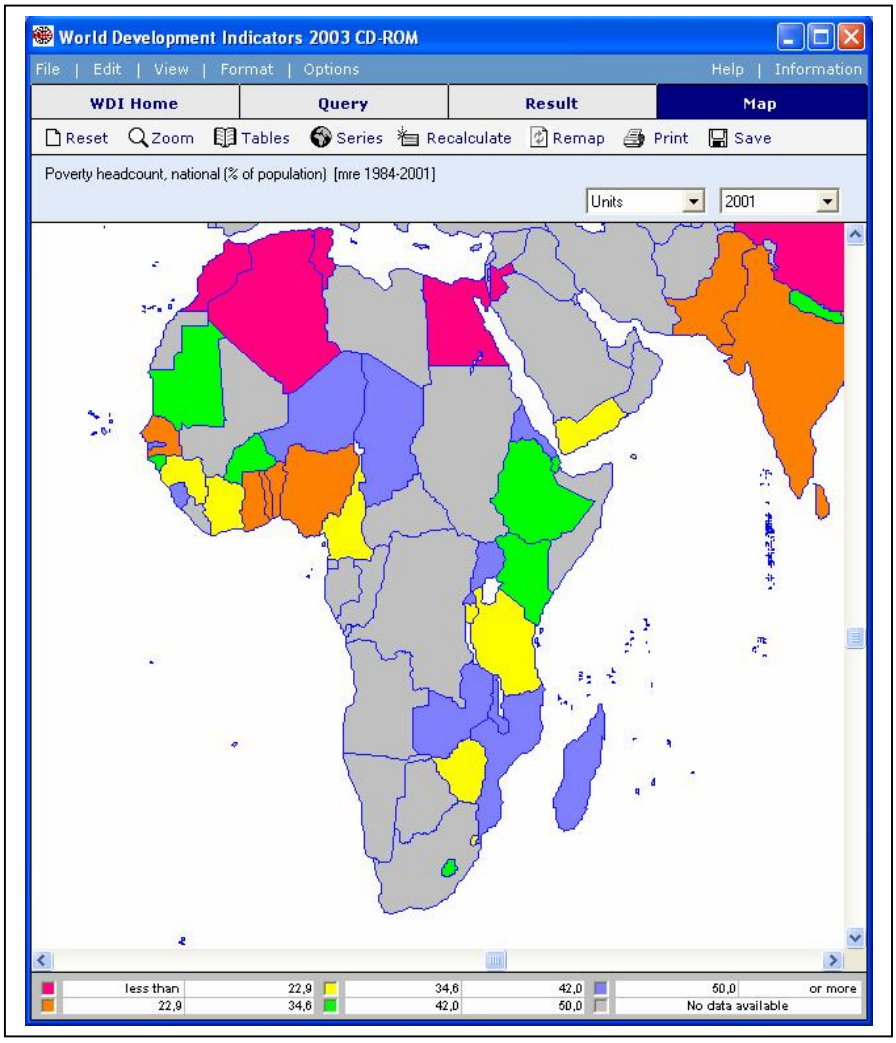
In the first stage, the analysts use multiple regression analysis to estimate a model of household consumption. The variables in the model are restricted to those variables that are available in both the survey and the census, and the data sources are examined to ensure that they are indeed comparable. See a good exercise on regression

In the second stage, the estimated model parameters are applied to the census data. Simulation methods are used to introduce a random disturbance term, which is required because the model does not predict consumption perfectly. The simulations provide an estimate of consumption per capita for every household in the census. These estimates are then used, along with the appropriate poverty lines, to estimate poverty measures at various levels of aggregation, such as province, state, district, subdistrict, and municipality. The method also produces an estimate of the standard error of the poverty measure, which is used to construct a confidence interval for the poverty estimate. The estimates are then typically merged with a map in a geographic information system (GIS) to facilitate the presentation and visual analysis of patterns.

The World Bank has since developed special-purpose poverty mapping software, **PovMap**, that is freely available at http://iresearch.worldbank.org. **PovMap** (http://iresearch.worldbank.org/povmap/PovMap2/PovMap2Main.asp ) has a graphical user interface that greatly simplifies the small area estimation of poverty and inequality. Also **PovcalNet** a comparison program of the WB for comparing Poverty Estimators can be accessed on the same site (http://iresearch.worldbank.org/PovcalNet/jsp/CChoiceControl.jsp?WDI_Year=2007)
What is said below about accuracy and transparency is true here. Nevertheless the programs have their

## *3.5 Box: Methods for combining HH surveys and Census data for using small area estimates*

**International Comparison with WDI (World Development Indicators)**




### *3.6 Graph: Standard Poverty Mapping with WDI for Africa*

These Data are nice for general comparison but are not suited for in-depth comparison. Moreover the origin of data is not always transparent.

## Chapter3 Exercises

1. Find “poor” Districts and compare the Rural and Urban Areas using the formula (2) in “HH_03_BasicData_HH&Ind_sofala_Ex4_1.xls”.

2. Look at the document “MOZ PARPA II 2006 English.pdf” and compare it briefly to the previous PRSP “Mozambique_PRSP.pdf” in the supporting documents.

3. Look at the Recommendation of IMF’s GDDS concerning poverty (text in the 3.3 Box) http://dsbb.imf.org/Applications/web/gdds/gddstableb/

4. Use the evaluation document: UN QUESTIONNAIRE ON POVERTY MEASUREMENT from the UN Handbook
   *Support document*: CheckingYourPovertyMeasureSituation_from_UN_HBook2005.pdf
   Complete it in groups. **It is not important to complete the whole questionnaire (use only part A: poverty line)**

5. Recommend alongside these recommendations a set of indicators for a political measure to be able to combat poverty. (Use poster “Poster_RecomendationsPovertyMeasures.doc”)
   a. Which indicators would be needed
   b. Which indicators have higher or lower priority
   c. Which are your strategies to communicate poverty figures
   d. Which information have high, which ones low priority
   e. Try to estimate costs for a 10 year period for the statistical Surveys proposed , (Use the Cost Effectiveness Poster in Group Work)

      Consider a Poverty Reduction Strategy based on your consideration

# 3. Special Subjects towards a Poverty Monitoring System

This section deals with additional information suitable for adding value to the formulation of poverty reduction policies. It shows how additional and cross-sectional techniques can enhance the various poverty tools. It is unrealistic to think that international standards will enable full comparison of all countries and regions. The standardization of statistics about industrialized countries is rather advanced (see OECD statistics) and an economical necessity. Rarely can these standards be transferred easily to countries on different levels of economical development. It is of fundamental importance to adjust appropriate means for sound political measures in these countries. Without this and the permanent support of the international community, the capacity of national leadership cannot succeed to improve local well-being and reduce poverty.

## 4.1. Non-income measurement methods

The minimum basic needs (MBN) (also called unmet basic needs (UBN)) approach has been used in a number of countries instead of or in addition to the income-based basic needs approach. In this approach non-monetary indicators representing different dimensions of poverty are chosen, estimated and monitored. The subset of Millennium Development Goals [MDGs] minus the income indicators provides excellent

Examples:

- Proportion of underweight children to represent malnutrition
- School enrolment, primary school completion, and youth illiteracy rates to represent basic education;
- Infant and under-five mortality rates, maternal mortality ratio, and births attended by skilled health staff to represent primary health care; and the
- Ratio of girls to boys in primary and secondary school, ratio of literate females to males,
- proportion of seats held by women in parliament, and
- share of women employed in the non-agriculture sector to represent the gender equality dimension or goal.

Note the parallelism to some MDG Indicators

Many, though not all, of these indicators are long-term outcomes or output indicators. Case in point: a child being underweight is the result of years of chronic under nourishment. Also, these UBN indicators are expressed in different units of measure. This has made producing a composite index a difficult and perpetually subjective task. However, this has not prevented agencies, particularly international bodies, from constructing such indexes. These include the Human Development Index (HDI - http://en.wikipedia.org/wiki/Human_Development_Index)[6] and other indices that UNDP puts out annually for each country in *Human Development Report (*http://hdr.undp.org/en/reports*).* These may have added value more as devices for advocacy than as monitoring tools. It shows clearly the limits of international comparison. Few developing countries compile composite indexes, preferring to use the indicators individually and collectively in much the same way that they will be used to monitor progress in the MDGs.

National statistical systems have also been compiling many of the UBN indicators long before the international development agencies declared poverty reduction their overriding strategic objective. Many are extracted from population and housing censuses, demographic and health surveys, civil registries and other administrative reporting systems. In fact, choice of indicators in a country's UBN

[6] The HDI – human development index – is a summary composite index that measures a country's average achievements in three basic aspects of human development: health, knowledge, and a decent standard of living. Health is measured by life expectancy at birth; knowledge is measured by a combination of the adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio; and standard of living by GDP per capita (PPP US$).

information system is often determined by existing data collection systems; seldom is a new system established just to meet the additional requirements for new indicators.

However, unlike income poverty statistics compilations, there are differences in the selection of dimensions and indicators for the basic needs, partly owing to variations in data availability. The three broad categories of basic needs often considered are dwelling characteristics, access to safe water, and access to sanitation facilities. Basic education and economic capacity (e.g., GDP growth rate) are sometimes included in an expanded UBN set of indicators. In the ECLAC, the UBN approach has a solid conceptual foundation as it measures actual satisfaction or dissatisfaction of needs rather than the capacity to satisfy them. In this light, it is complementary to the income poverty line approach. Dimensions of basic needs chosen are often those highly correlated with income, so much so that they have been used to identify households under extreme poverty. Assessment and monitoring of poverty through the UBN approach is far from widespread in Africa.

The main poverty dimensions considered are basic education, primary health, and housing characteristics, such as access to safe water, toilet facilities and building materials used. UBN methods can and are being brought down to sub-national levels.
When it comes to updating poverty indices, the frequency of HH surveys, the main source of income / expenditure measures is not sufficient to reflect changes or long term trends. Other measurement systems have to be considered to complete a national or regional poverty monitoring system.

We will present two systems with results produced for Mozambique and calculate examples to illustrate these measurement systems. In addition the limits and comparability problems will be discussed.

## 4.2. An Asset Based Survey to Monitor Poverty

How to classify groups of economical strength (poverty) or status if no direct data of income or expenditure are available? This section follows the approach of Fimer and Pritchett []. This will enable the reader to follow up the methodology in more detail in that document although the data set and purpose of it is quite different.

Looking at a set of available data a very simplistic albeit reasonable approach is to look at the assets the household owns to define its wealth group. All analysis takes into consideration only the data of the selected sample. Like in every inductive statistics it is assumed that the sample is randomly selected and represents the behaviour of the universe. Here a principal component approach is proposed to define wealth groups. This approach uses the factor analysis procedure to calculate a wealth index (called asset index in our example). Descriptive statistics are calculated for this asset index to calculate mean and standard deviation and the quintiles dividing the sample into 5 almost equally sized groups named as below:

### 4.1 Table: Comparing Asset Groups in Sofala

| | Asset Groups | | | | | Total |
|---|---|---|---|---|---|---|
| | Very Few Assets | Few Assets | Neither Few nor Many Assets | Many Assets | Very Many Assets | |
| Rural | 132 | 65 | 51 | 51 | 16 | 315 |
| Urban | 43 | 36 | 83 | 57 | 104 | 323 |
| Total | 175 | 101 | 134 | 108 | 120 | 638 |

The groups are further combined to the Lower 40% comprising group “Very Few Assets and Few Assets” , the Middle 40% comprising “Neither Few nor Many Assets and Many Assets” and the Upper 20% owning “Very Many Assets” This Asset Index (AI) is not better than any other poverty index but it is easy to calculate, robust and a good indicator of long –run wealth.

### 4.2 Table: Comparing Rural an Urban Asset Groups in Sofala

| | | | | | | |
|---|---|---|---|---|---|---|
| Rural | Poor | 63% | Not Poor | 32% | Wealthy | 5% |
| Urban | Poor | 24% | Not Poor | 43% | Wealthy | 32% |
| All | Poor | 43% | Not Poor | 38% | Wealthy | 19% |

Basic knowledge of factor analysis with principal components is required to understand the process of generating the AI and the Asset Groups. In order to explain how these Asset groups are calculated a short explanation is necessary although more comprehensive explanation is left to specialized text-books [31][32].

In order to avoid the use of licensed SPSS, the statistiXL shareware add-in for Factor Analysis (among others) for EXCEL, which is not part of the standard analysis Add-in for EXCEL (http://www.statistixl.com).

#### 4.2.1. Some basic principles of Factor Analysis

In social and economical analysis the researcher is often confronted with complex terms: "Intelligence", "Entrepreneurship". "Economical wealth and status" ca also be regarded as such. It would be possible to analyse special variables to determine these complex terms The Factor Analysis takes into consideration many variables and tries to find out, if there is a hidden "background" variable common to the observed variables and not directly visible. These "background" variables are called factors. It is the aim of the factor analysis to reduce the complexity of information to isolate few common factors. Once running the factor analysis, the result resembles an equation of regression:

$$ExpVarF = a_1 * Fac1 + a_2 * Fac2 * + .. + a_n * Facn + \mathrm{Re}s$$

where *ExpVarF* is the Explained Variable which contrary to the Regression approach does not appear in the data set. The "Variables" *Fac1..n* corresponding to the explaining variables of the Regression are called the (common) Factors or components,( if derived by the method of principal components, these are called components) or explaining sets of variables to be named by the analyst. The coefficients a1..n corresponding to the Regression coefficients are called the factor loadings and explain in numerical terms how much a Factor contributes to the explanation of the explained Variable. The variable Res is the residual containing the unexplained rest. Let us repeat: Factors and ExpFacF are unknown entities, which as a result of the Factor analysis and the judgement of the analyst become named entities. Explaining the steps to calculate the Factors in the below mentioned example might show more clearly the meaning of these denominations.

#### 4.2.2. The Asset Index: Factor Analysis extracting only one factor

The Asset Index is a simplified calculation of a factor analysis, considering ExpVarF the long- run material wealth of the respondents or in short *EconomicalStrength*. The only factor to be taken into consideration is the first factor or the other factors have been deliberately excluded from the analysis is the first one and this is by choice the assets being available in the household or let us name it simply *Assets*. So the Formula in our example reads:

$$EconomicalStrength = a \ * Assets + Res$$

So like in Regression this formula is a vector calculation, so that this calculations really means

$$EconomicalStrength = \begin{pmatrix} a_1 \\ a_2 \\ .. \\ a_n \end{pmatrix} * (Asset_1, Asset_2, ..., Asset_n) + Res$$

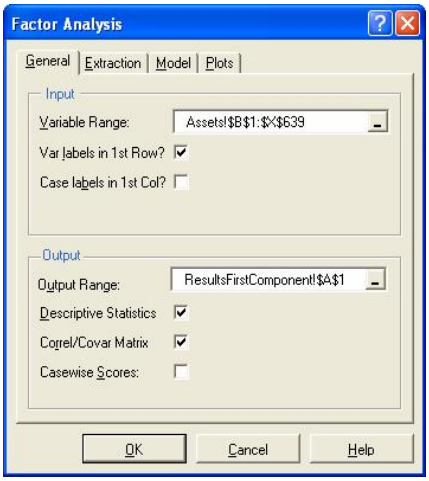
**Formula 1**

..and so the value of *EconomicalStrength* of each household is calculated by multiplying the factor loadings of the n assets with the corresponding values of each asset in the household.

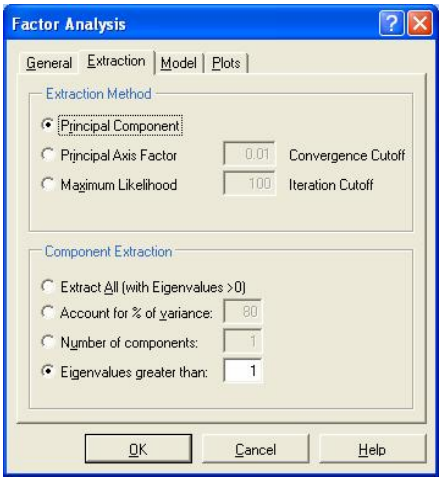
**How is it done in EXCEL:**
You must have installed the statistiXL Add-in.
Use the data file “Assets_SofalaEx5_1.xls”. The sheets “Assets” and “Assets2” have been extracted from the HH survey for Sofala that they contain the Households and a list of Fixed Assets. The indication shows, if the asset is not owned by the Household (“0”) or how many items are owned by the household (“Number”)
Call from the menu <statistiXL /Factor Analysis>
From the different menus choose

1. The variable range like and where the results will be displayed: An empty sheet “ResultsFirstComponent” has been created to contain the results.
2. Choose the Extraction
3. Model
4. Plots

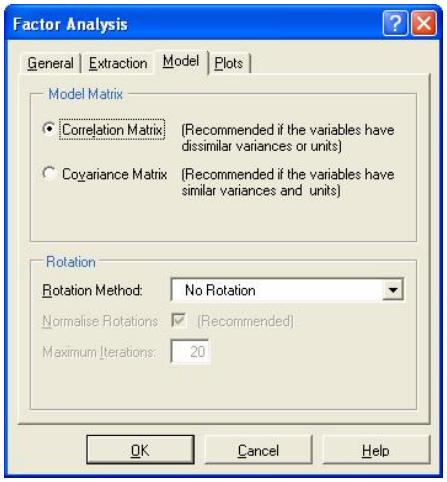
## 4.3 Graph: Factor(Principal Component) Analysis with EXCEL



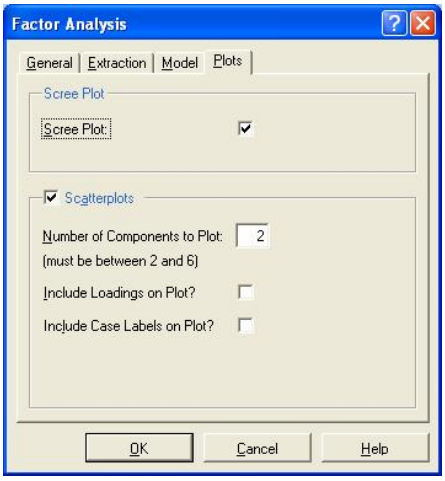

**Factor 1**




**Factor 2**




**Factor 3**




**Factor 4**

We choose all the 23 asset variables to be included in the Factor analysis and all the 638 households which declared to own some assets.

No rotation is necessary because only one factor only will be regarded.

As a result we first observe the following

Having accepted the model we shall remain looking at he results of the "Communalities" and "Eigenvalues", denominations crucial to the understanding of the Factor analysis. The following table indicates how much of the total standard deviation of all variables will be explained by the component/ factor. This means that the first factor "explains" 6,383 or 27% of the

| Explained Variance (Eigenvalues) | | |
|---|---|---|
| Value | Factor 1 | Factor 2 |
| Eigenvalue | 6,383 | 1,934 |
| % of Var. | 27,753 | 8,408 |
| Cum. % | 27,753 | 36,161 |

total deviation
(all variables are automatically transformed to z-scores: normalized to mean 0 and standard deviation 1 before). In a more stringent and fully executed Factor analysis, the five factors/components with values higher than 1 would probably be accepted in the model, but the question of explaining the "factors" would be more difficult. This might be easier to understand if one looks at the final result of the Factor analysis, the Component matrix. These values for the only chosen component indicate in which respect the chosen variable (being all part of factor1) contributes to the calculation of the explained variable EconomicalStrength.
and these are the values to be multiplied by the values of the respective household to calculate the value of the Asset Index (asindx1).or the variable EconomicalStrength like in Formula 2, which is the more explicit form of Formula 1, where f1 is the first scoring factor or factor loading (fN is last) as defined in the Component Matrix, aji is the jth household value for the ith asset and $\overline{a}$i and si are the mean and standard deviation of the ith asset for all households

$$ExpVarF = f_1 * (a_{j1} - \overline{a_1}) / (s_1) * ..... * f_N * (a_{jN} - \overline{a_N}) / (s_N)$$

**Formula 2**

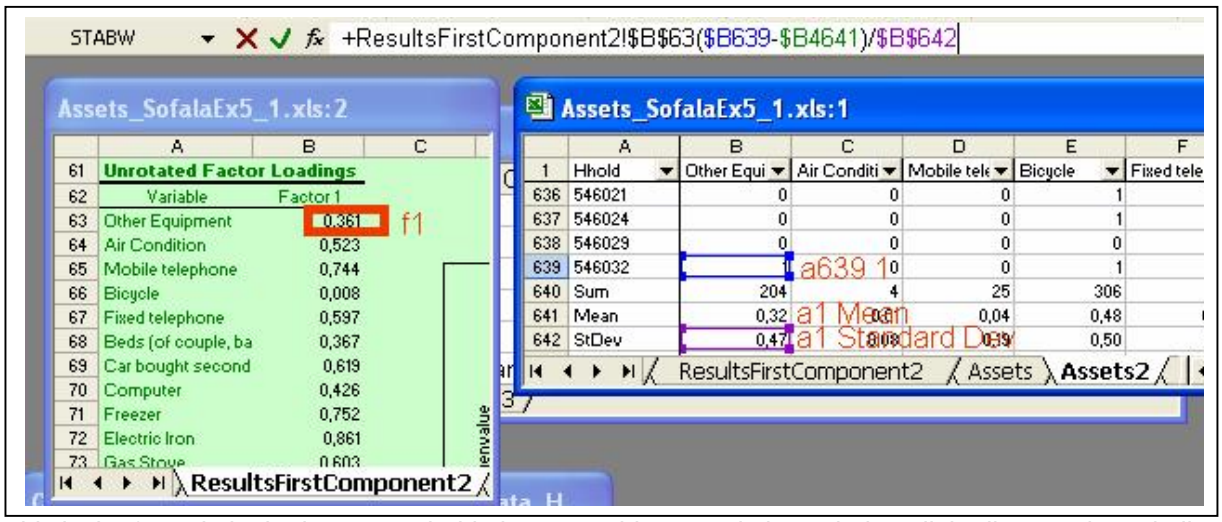
**Unrotated Factor Loadings**

| Variable | Factor 1 |
|---|---|
| Other Equipment | 0,362 |
| Air Condition | 0,515 |
| Mobile telephone | 0,745 |
| Bicycle | 0,010 |
| Fixed telephone | 0,589 |
| Beds (of couple, bachelor, children and bunks) | 0,366 |
| Car bought second hand | 0,624 |
| Car bought new | 0,269 |
| Computer | 0,446 |
| Freezer | 0,754 |
| Electric Iron | 0,858 |
| Gas Stove | 0,593 |
| Electric Stove | 0,576 |
| Mixed Stove | 0,284 |
| Fridge | 0,732 |
| Printer | 0,269 |
| Sewing Machine | 0,426 |
| Washing Machine | 0,442 |
| Motorcycle | 0,260 |
| Radio | -0,083 |
| Clock (wall, pulse or pocket) | 0,283 |
| Television set | 0,696 |
| Ventilator | 0,772 |

There have been some attempts without the asset "Radio" and "New Car" and with the additional That variable "Radio" yields a negative factor loading which means this asset contributes negatively to the *EconomicalWealth* or in other words having a computer makes the Household poorer (?). This does not make much sense. The reason for this behaviour lies in the fact that a full Factor analysis would yield different factors like "Basic Assets" and "Sophisticated Assets". The "Radio" and "New car" will probably contribute positively to this second component together with assts like "Printer" and "Computer". You can see by the sums that only 1 household bought a new car in the last 12 months and only 4 households in the sample own a computer. For the sake of simplicity this issue has not been followed up further.
From the calculation in Assets2 the Columns "Radio" and "Car bought new" have been eliminated, so 21 asset variables remain.
The formula to calculate the ASSINDX is simply added to the last column for each household.

Maybe it is easier to understand showing how the formula in the column ASSINDX is constructed and so on..

## 4.4 Graph: Applying Factor Loadings in EXCEL




This is the formula in the last Household Line 639. This Formula is copied to all the lines and a quintile calculation allows for separating the Groups of "Asset Wealth".
As one can compare the results to the income / expenditure based indices, these are quite different.

This is not very surprising, because assets of the kind collected in the survey are more likely found in urban areas.

Nevertheless an Asset Based Index has several advantages.

- The answers are much easier obtained
- The results is a long time indicator (past investments)
- The survey to obtain results can be conducted with much less effort and costs

Alternatively the "Principal Component" option of statistiXL could be used

```
=+ResultsFirstComponent2!$B$63*($B639-$B$641)/$B$642
+ResultsFirstComponent2!$B$64*($C639-$C$641)/$C$642
+ResultsFirstComponent2!$B$65*($D639-$D$641)/$D$642
+ResultsFirstComponent2!$B$66*($E639-$E$641)/$E$642
+ResultsFirstComponent2!$B$67*($F639-$F$641)/$F$642
+ResultsFirstComponent2!$B$68*($G639-$G$641)/$G$642
+ResultsFirstComponent2!$B$69*($H639-$H$641)/$H$642
+ResultsFirstComponent2!$B$70*($I639-$I$641)/$I$642
+ResultsFirstComponent2!$B$71*($J639-$J$641)/$J$642
+ResultsFirstComponent2!$B$72*($K639-$K$641)/$K$642
+ResultsFirstComponent2!$B$73*($L639-$L$641)/$L$642
+ResultsFirstComponent2!$B$74*($M639-$M$641)/$M$642
+ResultsFirstComponent2!$B$75*($N639-$N$641)/$N$642
+ResultsFirstComponent2!$B$76*($O639-$O$641)/$O$642
+ResultsFirstComponent2!$B$77*($P639-$P$641)/$P$642
+ResultsFirstComponent2!$B$78*($Q639-$Q$641)/$Q$642
+ResultsFirstComponent2!$B$79*($R639-$R$641)/$R$642
+ResultsFirstComponent2!$B$80*($S639-$S$641)/$S$642
+ResultsFirstComponent2!$B$81*($T639-$T$641)/$T$642
+ResultsFirstComponent2!$B$82*($U639-$U$641)/$U$642
+ResultsFirstComponent2!$B$83*($V639-$V$641)/$V$642
```

## 4.3. Poverty Dynamics

The previous text focused almost exclusively on analysis of poverty at a single point in time. Yet, in a given time period, people may be poor either because they have always been poor or because they have suffered a negative shock that temporarily pushed them below the poverty line. With a single cross-sectional survey, it is difficult to separate these two types of poverty even though each may require different policy prescriptions.

Therefore, with the ambition to recommend some guidelines for poverty monitoring, the following text extends the analysis to many time periods, and thus is concerned with the dynamics of poverty.

Examining changes in poverty over time raises difficult issues. But it also provides a richer and more realistic portrait of the nature of poverty. Individuals and households typically live for many decades,

which implies that a person's poverty status may change over time. If it does not change over time, it would be trivial to extend static analysis to dynamic settings. As will be seen below, the poverty status of many individuals and households appears to change a great deal over time, a finding that is surprising to both researchers and policymakers. This chapter assumes that income / expenditure is an effective variable for measuring welfare. While this assumption may narrow the scope of poverty analysis, it is needed to keep the scope of topics manageable.

Even with a single-variable study, many important issues can arise in dynamic analysis that are not simple to resolve. Thus, despite the increased interest in poverty dynamics collecting and analyzing survey data on poverty dynamics is a difficult task for any statistical agency. The chapter starts by examining three important conceptual issues in poverty analysis:

- Relationship between income inequality and poverty at a single point in time and income mobility over time,
- Distinction between chronic and transient poverty
- Issues concerning the measurement of income growth among the poor.

The possibility that people's poverty status can change over time raises several conceptual issues. This section discusses three of the most important:

- Understanding the relationship between income inequality and income mobility at a single point in time (which has direct implications for the relationship between income mobility and the dynamics of poverty),
- Distinguishing between chronic (long-run) and transient (short-run) poverty
- Measuring income growth of the poor.

## 4.4. Census and Household Data for Small-Area Estimates in Mozambique

This chapter is based on [25]. The method proposed is to combine data of the Mozambique National Household Survey of Living Conditions (1996–97) with the 1997 National Population Census to generate small-area (sub-district) estimates of welfare, poverty, and inequality.
Even though the data are not very recent, the method is altogether quite promising for future use.

Typical living standards surveys can provide a wealth of information about welfare levels, poverty, and other household and individual characteristics. However, these estimates are necessarily at a high level of aggregation, because such surveys usually include only a few thousand households. In addition, these surveys are typically only representative down to the level of the sample strata, which tend to be the first administrative subdivision, such as provinces or states. Larger data bases, such as national censuses, provide enough observations for more disaggregated analysis, but typically collect very little socioeconomic information.

### 4.4.1. Methodology

On the surface, the methodology is straightforward. The household survey data are used to estimate the statistical relationship between the empirical variable used to measure welfare (consumption per capita, adjusted for spatial and temporal variation in prices) and a set of independent variables that are expected to be correlated with welfare. The set of variables considered for the right-hand side of the regression equation is limited to those variables that appear in both the household survey and the population census. The estimated regression coefficients are then applied to the census data to produce estimates of consumption per capita for each of the households in the census. The estimates of consumption per capita are used in turn to calculate summary measures of poverty and inequality, such as the Foster-Greer-Thorbecke (FGT) class of $P_\alpha$ poverty measures, the Gini index, or generalized entropy (GE) inequality measures. Because consumption estimates are available for the entire population, it is possible to calculate welfare measures for small subgroups of the population, be they geographic regions (such as subdistricts), occupational classifications (e.g., fishermen), or some other classification. This method for linking surveys with census-type data is used in

geography for small-area estimation. [16]

### 4.4.2. The Data

The household survey (Inquérito Nacional aos Agregados Familiares sobre as Condições de Vida, 1996–97 (National Household Survey of Living Conditions)), also known by the shorthand IAF96, has been used for numerous poverty studies in the years prior to the next and most current survey (IAF03).
The second data source is the II Recenseamento Geral de População e Habitação (Second General Population and Housing Census), which was conducted in August 1997.
In addition to providing the first complete enumeration of the country's population since the initial post-independence census in 1980 and basic demographic information, the 1997 census collected information on a range of socioeconomic variables. These include educational levels and employment characteristics of those older than 6 years old, dwelling characteristics, whether the household owned a functioning radio, and possession of agricultural assets. The 1997 census covers approximately 16 million people living in 3.6 million households.
It is convenient that the census and the IAF96 are almost contemporaneous, as a pivotal assumption of the method is that the parameters estimated from the survey data are equally applicable to the period covered by the census.

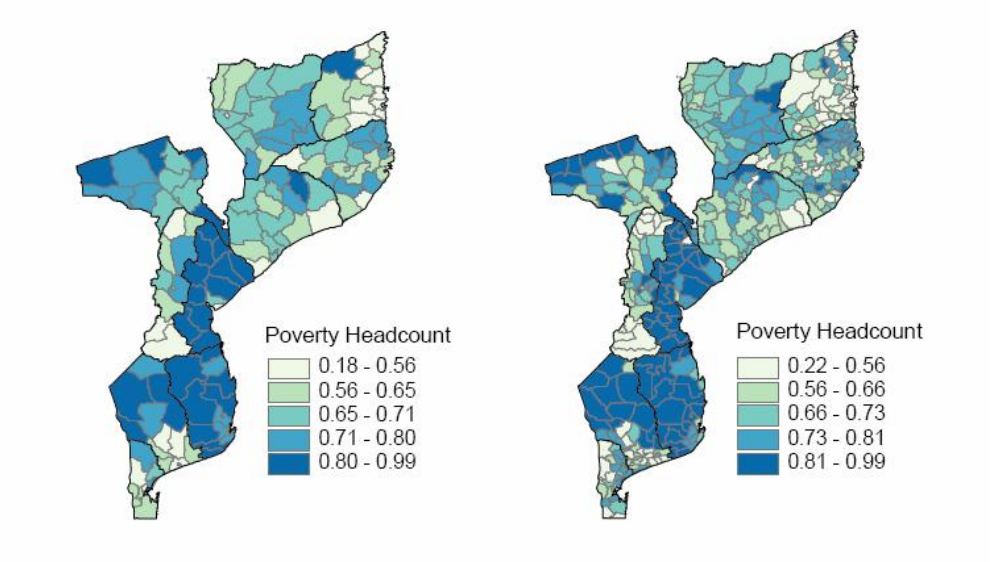
The empirical modelling of household consumption is limited by the set of variables that is common in the two data sets. Common variables include the age and sex composition of the household, the sex of the head of household, educational levels, employment characteristics, dwelling characteristics, and possession of agricultural and other assets. Close examination of the data revealed that several variables that appear to be the same in the two data sets were really quite different, with differences in the position and distribution of the variables that are inexplicably large, given the close timing of data collection.

One possibility is that because of differences in definitions or field protocols, the two exercises measured distinctly different things for these variables. Another possibility is that the survey simply was not representative of the population for those variables. Either explanation is sufficient justification for excluding the variable(s) for consideration in the model. It is unlikely that the timing of data collection (i.e., over 14 months for the household survey versus concentrated in two weeks for the census) is a significant factor, because the common variables are not subject to a great deal of intra-annual variation.

### 4.4.3. The Results for Mozambique from [25]

The estimated poverty headcount for each of Mozambique's 128 districts is shown in Figure 2. Some of these results closely mirror the more aggregated information from the household survey alone, such as the high poverty rates throughout Sofala Province, with the exception of the port city of Beira and the adjoining district of Dondo.

### 4.7 Graph: Poverty Headcount, by District and Administrative Post in 1997




## 4.5. A combined Model approach to analyze poverty in Sofala

This example for the combination of the Census 97 and IAF96 has been repeated for the IAF03 data. Some other analytical techniques have been applied in addition. Although the Census 97 and the IAF03 have a severe time gap, the technique will be useful to explore especially if census and HH surveys fall into chronological vicinity in the future (For Mozambique this will be the case for the Census 07 and IAF 08)

### 4.5.1. Defining Poverty

This chapter will try to compare the mentioned FGT indices with other models and measures. It is an example to apply statistical techniques like cluster analysis and factor analysis to existing survey data. It should encourage statisticians to do their analysis on their own terms. It goes without saying that the results have to abide with the confidentiality of statistics and have to be supervised and commented prior to publication. Although a statistical package (SPSS 10.0) has been used for the analysis, the proposed software for this course (statistiXL Add-in or Regression with the Analysis Add-in for EXCEL) can easily substitute the SPSS-software.

It will be the purpose to define a base line for development rather than poverty to compare future results in developing the province. It goes without discussion that reducing poverty is one of the foremost aims of projects, planning and politics, but economic poverty/consumption is a rather limited figure among others. It is rather volatile, might change quickly due to natural and economic casualties. It has moreover some methodological drawbacks as mentioned in other literature. One important shortcoming is the de-facto exclusion of extra-vulnerable target groups. It is clear, that these groups, for example homeless, street-children etc. do not constitute the important group at which development is aimed, but their existence and their socio-demographic development constitutes an important indicator of society's processes. There has been extensive discussion of this topic in the document about measuring development on district level based on a qualitative survey carried out in Sofala [28] .

Another aim would be to identify predictors, parameters most likely to reduce poverty. At last the expenditure distribution is compared among the different districts. Where are the most striking inequalities to be detected and where can one observe a rather uniform pattern of expenditure (poverty)

### 4.5.2. Cluster Analysis

This procedure attempts to identify relatively homogeneous groups of variables based on selected characteristics, using an algorithm that starts with each variable in a separate cluster and combines clusters until only one is left. Distance or similarity measures are generated by the Proximities procedure. Statistics are displayed at each stage to help you select the best solution. This procedure allows to identify rather “close” variables on province level and enables an analyst to group variables, joining them for further consideration and analysis. This is another attempt to characterize “poverty” on province level, which might be very distinct from other areas.
The most intuitive approach is to look at the Dendogram, showing in graphical form the cluster “construction”. As a help for interpretation, a line is drawn where a reasonable and interpretable number of clusters is identified.

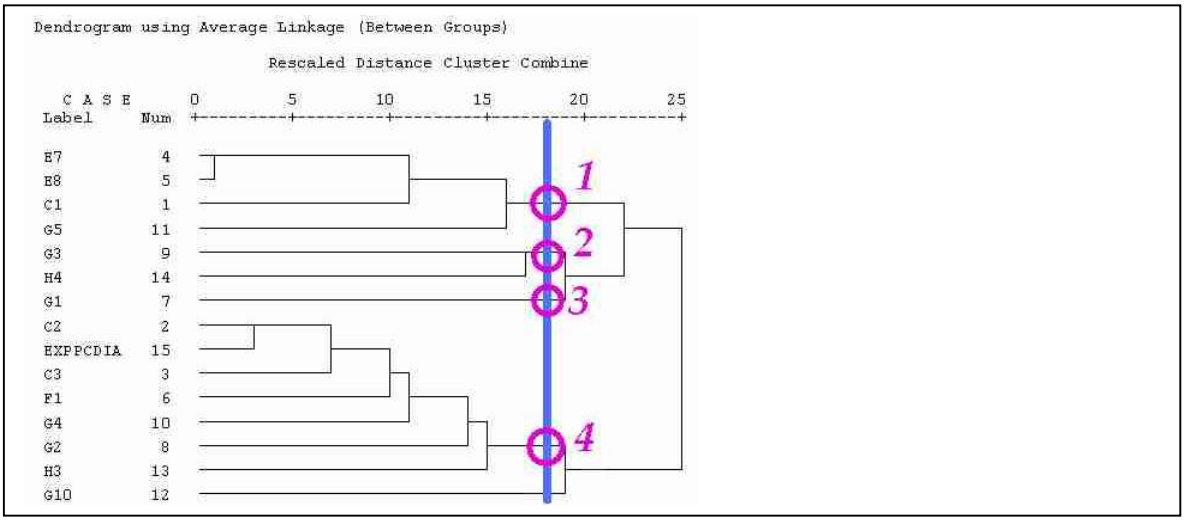
We identify 4 clusters with the contents of the given variables above

Here the package statistiXL generates a little problem. Since EXCEL allows only 256 columns and the clusters are generated line wise. So we let the results be interpreted by SPSS in graph 4.5

The closest variables to the welfare measure (expenditure) are C2 and C3, education measures which also appear in the Factor Analysis.

Factor Analysis can be used to identify the variables for further analysis with Cluster Analysis ore vice versa. Usually the benefit of Factor Analysis is to identify a handy set of variables for further use.

### 4.5 Graph: Dendogram of 14 Variables generating 4 clusters




The variables are explained in the following Cluster Membership Table. A more detailed look at the Distance is possible in the Proximity Matrix

**Cluster Membership Table**

| Variable | Description (Port.) | Description (English) | Cluster |
|---|---|---|---|
| C1 | Sabe ler e escrever | Know to read and to write? | 1 |
| C2 | Alguma vez freqüentou a escola? | Some time frequented a school? | 2 |
| C3 | Qual e o grau de ensino mais alto que completou? | Which highest degree of education completed? | 2 |
| E7 | Como foi pago na ocupação principal? | Which highest degree of education completed? | 1 |
| E8 | Para quem trabalhou na ocupação principal? | For whom did you it worked in the main occupation? | 1 |
| F1 | A quem pertence a Habitação onde vive o agregado? | For whom did you it worked in the main occupation? | 2 |
| G1 | Algum membro do agregado contratou mão de obra na ultima campanha agrícola? | Some member of the aggregate contracted work in the recent agricultural campaign? | 3 |
| G2 | Algum membro do agregado familiar trabalhou como trabalhador sazonal ou eventual na ultima campanha | Some member of the family contracted seasonal or temporary work in the recent agricultural campaign? | 2 |
| G3 | 0 agregado recebe remessas regularmente de um membro da família que está a trabalhar fora? | Do you regularly receive remittances from a member of the family who works outside? | 4 |
| G4 | 0 agregado cria aves? | Do you raise poultry/ birds? | 2 |
| G5 | 0 agregado usa normalmente detergente para lavar roupa? | Do you normally use detergents to wash clothes? | 1 |
| G10 | Como e que compara a situação econômica do agregado em relação há um ano atrás? | How does s the economic situation of the household compare in relation to the previous year? | 2 |
| H3 | Quando tem de andar a pe, sozinho, a noite, na sua vizinhança, corno e que se sente? | When do you of walk, alone, at night, in your neighborhood, how do you feel? | 2 |
| H4 | Durante os últimos 12 meses, o(a) senhor(a) ou algum membro do seu agregado foi vitima de algum roubo, aggressão, violência sexual, rapto ou outro crime ? | During last the 12 months, you or some member of your household was victim of some robbery, aggression, sexual violence, abduction | 4 |
| EXPPCDIA | Expenditure per Person per day | Despesas por dia por pessoa | 2 |

The household variables were analysed according to normality and then gradually deselected. The interesting results are is the indicators of education (Cluster 1), housing and economic characteristics (Cluster 2), employment characteristics (Cluster 3) and security issues (Cluster 4). These clusters are not strictly identifiable; sometimes one variable seems at an odd cluster. This issue will be approached at the following chapter.

### 4.5.3. Factor analysis

Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. Factor analysis is often used in data reduction to identify a small number of factors that explain most of the variance observed in a much larger number of manifest variables. Factor analysis can also be used to generate hypotheses regarding causal mechanisms or to screen variables for subsequent analysis This is exactly what has been tried here. Actually three factor were identified, tentatively named:

1. Occupation/ Education/ Employment
2. Living Conditions/ Housing
3. Security

It is interesting to find a similar pattern to the cluster analysis in the previous chapter:

The Kaiser-Meyer-Olkin Measure with 0.75 does not give a tremendously strong indicator, but everything above 0.7 is acceptable

**Table: KMO and Bartlett's Test**

| | | | |
|---|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | | .749 |
| | Bartlett's Test of Sphericity | Approx. Chi-Square | 729.126 |
| | | df | 45 |
| | | Sig. | .000 |

The Table of Eigenvalues shows the outstanding importance of the first 3 factors

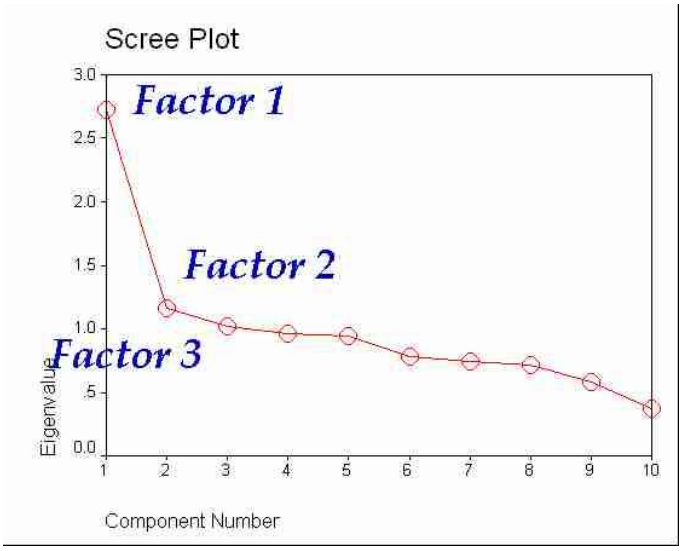
**Table of Eigenvalues: Total Variance Explained**

| | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| Component | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.727 | 27.274 | 27.274 | 2.727 | 27.274 | 27.274 | 1.948 | 19.475 | 19.475 |
| 2 | 1.165 | 11.646 | 38.919 | 1.165 | 11.646 | 38.919 | 1.633 | 16.327 | 35.802 |
| 3 | 1.016 | 10.160 | 49.079 | 1.016 | 10.160 | 49.079 | 1.328 | 13.277 | 49.079 |
| 4 | .964 | 9.644 | 58.723 | | | | | | |
| 5 | .938 | 9.385 | 68.108 | | | | | | |
| 6 | .780 | 7.797 | 75.905 | | | | | | |
| 7 | .740 | 7.399 | 83.303 | | | | | | |
| 8 | .719 | 7.189 | 90.492 | | | | | | |
| 9 | .580 | 5.804 | 96.296 | | | | | | |
| 10 | .370 | 3.704 | 100.000 | | | | | | |

Extraction Method: Principal Component Analysis.

The scree plot does show this even better:

### 4.6 Graph: Screeplot of 3 Factors analysing Household Variables




The attribution of the variables to the different factor is shown in the Rotated Component Matrix:

**Rotated Component Matrix / Factor Loadings**

| Variable | Description (English) | Description (Port.) | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|---|---|
| C3 | Which highest degree of education completed? | Qual e o grau de ensino mais alto que completou? | -.610 | | |
| E7 | Which highest degree of education completed? | Como foi pago na ocupação principal? | .810 | | |
| E8 | For whom did you it worked in the main occupation? | Para quem trabalhou na ocupação principal? | .886 | | |
| F1 | For whom did you it worked in the main occupation? | A quem pertence a Habitação onde vive o agregado? | | .554 | |
| G2 | Some member of the aggregate contracted work in the recent agricultural campaign? | Algum membro do agregado familiar trabalhou como trabalhador sazonal ou eventual na ultima campanha | | .567 | |
| G4 | Do you raise poultry/ birds? | 0 agregado cria aves? | | | |
| G5 | Do you normally use detergents to wash clothes? | 0 agregado usa normalmente detergente para lavar roupa? | | | |
| H3 | When do you of walk, alone, at night, in your neighborhood, how do you feel? | Quando tem de andar a pé, sozinho, a noite, na sua vizinhança, corno e que se sente? | | | -.682 |
| EXPPCDIA | Expenditure per Person per day | Despesas por dia por pessoa | | .657 | |
| H4 | | Durante os últimos 12 meses, o(a) senhor(a) ou algum membro do seu agregado foi vitima de algum roubo, agressão, violência sexual, rapto ou outro crime ? | | | .774 |

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 5 iterations.

This analysis identifies the 3 mentioned factors. Although the analysis is very short and rather superficial, the findings are quite obvious

### 4.5.4. Multiple Regression analysis using poverty predictors

Since document [29] has done excellent and profound work on this issue, it would surpass the scope of the report to repeat this analysis in the depth found there for Sofala, because the report is on national level for the IAF 96/97 and shows results as predictors for different regions (North, Central, South) and Urban and Rural. With kind permission of the authors I would like to mention the basic results and suggest some similar work for the most recent IAF

The analysis shows that education—including basic literacy and primary education—is an important factor in raising living standards. This is especially true of women's education. Sustained and broad-based economic growth is also necessary to reduce poverty, especially in a country like Mozambique, where more than half of the population used to be below the poverty line. The analysis shows that such growth can be facilitated by increased productivity of smallholder farming and greater investment in infrastructure, particularly in rural areas.

The model uses the combination of household and individual file

This experiment is repeated for Sofala, using the exogenous variables where it was possible. It is not explained in detail [29] what the economic infrastructure index is, an exercise quite easy to be done on the community data. These variables are however omitted for the IAF03 because they would hardly be

comparable. Some variables where not requested in the IAF 02/03 like the ones concerning land tenure and number of trees and poultry.

This is rather unfortunate because it prevents the regression model to take agricultural inference into account. However the document [29] has proven for 96/97 the importance of agricultural development and its influence on poverty and development

So these variables are omitted as well. It is not so much the aim of this chapter to find new explaining variables for the household expenditure as the measurement of poverty, but compare the factors for the different regions rural and urban in Sofala and compare them with the national data of the IAF 96/97

The data file combines information about the head of household with information from the individual file.

The logarithm of consumption is used as the dependent variable; the explaining variables are listed below:

Determinants of Urban Expenditures (Poverty)

### Urban Predictors

| Model Summary | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| | 0.927 | 0.86 | 0.196 | 1.1915 |

| ANOVA | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| | Regression | 34.926 | 19 | 1.838 | 1.295 | 0.443 |
| | Residual | 5.678 | 4 | 1.42 | | |
| | Total | 40.604 | 23 | | | |

| Coefficients | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| (Constant) | | 14.11 | 5.791 | | 2.436 | 0.07 |
| Demographic variables | | | | | | |
| Quantos anos no seu ultimo aniversario? | Age | 0.03 | 0.126 | 0.38 | 0.26 | 0.81 |
| Sexo | Sex | -1.65 | 1.326 | -0.52 | -1.25 | 0.28 |
| Idade 0-9 | Age 0-9 | 0.37 | 1.086 | 0.38 | 0.34 | 0.75 |
| Idade10-17 | Age 10-17 | 0.78 | 0.902 | 0.51 | 0.87 | 0.44 |
| mulheres 18-59 | Women 18-59 | 0.09 | 1.265 | 0.05 | 0.07 | 0.95 |
| homens 18-59 | Men 18-59 | -1.31 | 1.575 | -1.06 | -0.83 | 0.45 |
| Idade >=60 | Age >=60 | -0.49 | 2.209 | -0.14 | -0.22 | 0.84 |
| Número ao quadrado | Squared number | -0.10 | 0.094 | -2.49 | -1.09 | 0.34 |
| Education variables | | | | | | |
| homens >15 saben ler | Men > 15 can read | 0.18 | 2.523 | 0.14 | 0.07 | 0.95 |
| mulheres >15 saben ler | Women > 15 can read | -0.02 | 1.751 | -0.01 | -0.01 | 0.99 |
| homens >15 com EP1 | Men > 15 have EP1 | 1.73 | 2.891 | 1.46 | 0.60 | 0.58 |
| mulheres >15 com EP1 | Women > 15 have EP1 | 0.43 | 1.134 | 0.25 | 0.37 | 0.73 |
| Nível mais alto de ed. | Higher edu. level | -0.10 | 0.841 | -0.11 | -0.12 | 0.91 |
| Employment variables | | | | | | |
| trabalha na industria, | Works in industry or | -4.51 | 9.474 | -1.29 | -0.48 | 0.66 |

| Coefficients | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| construção | construction | | | | | |
| trabalha em outro sector | Works in another sector | 0.89 | 0.581 | 0.73 | 1.52 | 0.20 |
| Quantas occupações | How many jobs | 0.34 | 0.483 | 0.36 | 0.71 | 0.52 |
| Selected interaction terms | | | | | | |
| Homens saben ler * trabalham agric | Men can read * work in Agriculture | 1.50 | 2.695 | 0.23 | 0.56 | 0.61 |
| Homens saben ler * trabalham indus ou constr | Men can read * work in industry or construction | 0.04 | 3.971 | 0.03 | 0.01 | 0.99 |
| Mulheres saben ler * trabalham indus ou constr | Women can read * work in industry or constr. | 4.35 | 2.287 | 1.93 | 1.90 | 0.13 |
| Dependent Variable: LN_WEXPD | | | | | | |

**Rural Predictors**

| Model Summary | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| | 0.844 | 0.712 | 0.44 | 0.8481 |

| ANOVA | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| | Regression | 32.016 | 17 | 1.883 | 2.619 | 0.025 |
| | Residual | 12.946 | 18 | 0.719 | | |
| | Total | 44.962 | 35 | | | |

| Coefficients | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| (Constant) | | 16.22 | 1.702 | | 9.53 | 0.00 |
| Demographic variables | | | | | | |
| Quantos anos no seu ultimo aniversario? | Age | -0.02 | 0.024 | -0.29 | -0.97 | 0.35 |
| sexo | sexo | -0.54 | 0.477 | -0.19 | -1.12 | 0.28 |
| 0-9 | Age 0-9 | -0.28 | 0.188 | -0.63 | -1.51 | 0.15 |
| 10-17 | Age 10-17 | -0.58 | 0.212 | -0.67 | -2.72 | 0.01 |
| mulheres 18-59 | Women 18-59 | 0.06 | 0.379 | 0.07 | 0.17 | 0.87 |
| homens 18-59 | Men 18-59 | -1.12 | 0.458 | -1.12 | -2.45 | 0.03 |
| >=60 | Age >=60 | 0.07 | 0.511 | 0.04 | 0.13 | 0.90 |
| Número ao quadrado | Squared number | 0.01 | 0.008 | 0.64 | 0.91 | 0.38 |
| Education variables | | | | | | |
| homens >15 saben ler | Men > 15 can read | 0.77 | 0.353 | 0.78 | 2.17 | 0.04 |
| mulheres >15 saben ler | Women > 15 can read | 0.00 | 0.886 | 0.00 | 0.00 | 1.00 |
| homens >15 com EP1 | Men > 15 have EP1 | -0.33 | 0.538 | -0.32 | -0.61 | 0.55 |
| mulheres >15 com EP1 | Women > 15 have EP1 | -0.81 | 0.72 | -0.39 | -1.12 | 0.28 |

| Coefficients | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| Nível mais alto de ed. | Higher edu. level | 0.46 | 0.479 | 0.40 | 0.97 | 0.35 |
| Employment variables | | | | | | |
| trabalha na industria, construção | Works in industry or construction | -2.32 | 1.017 | -0.47 | -2.28 | 0.04 |
| trabalha em outro sector | Works in another sector | 0.68 | 0.383 | 0.40 | 1.77 | 0.09 |
| Quantas occupações | How many jobs | -0.14 | 0.264 | -0.27 | -0.53 | 0.61 |
| Selected interaction terms | | | | | | |
| Mulheres saben ler * trabalham indus ou constr | Women can read * work in industry or constr | 1.43 | 1.503 | 0.21 | 0.95 | 0.36 |
| Dependent Variable: LN_WEXPD | | 16.22 | 1.702 | | 9.53 | 0.00 |

The first observation is about the model fit. For both regions the fit is excellent, quite superior to the one mentioned in [18], but this might be due to various factors. The fit for the urban region is superior to the rural region, but for both regions the F-Statistics indicate the validity of the model.

For both regions there are strong indication that family size (variable: “Número ao quadrado”) and number of adult men have negative effects on the endogenous variable. Also sex, somewhat difficult in this model as a dichotomous variable, shows that female headed households tend to have lower expenditures and this more significant in the urban regions. In the education variables, the effect of adult men being able to read and write is positive for the household expenditure as is the variable “trabalham em outro sector”) about the number of people in the household earning income from other sources than agriculture.

In urban areas the number of people working in areas other than agriculture is that low, that the variables have been removed by the software (SPSS 10.0)

### 4.5.5. On Linear Regression

Linear regression explains the variation in one variable, a dependent numerical variable (Y), in terms of one or more predictor variables, independent numerical variables (X1, X2, ... , Xm). It assumes a linear (straight line) relationship between the dependent variable and the independent variable(s) of the form

$Y = a + bX$

where a is the intercept and b is the slope.

The dependent variable (Y) is a numerical variable that is measured and is thought to depend on the magnitude of its corresponding Independent variable (X) or variables (X1, X2, ... , Xm). It is considered to have an associated measurement error.

The independent variable (X) is a numerical variable that is measured and assumed to not be determined or affected by the dependent variable (Y). There may be more than one independent variable (X1, X2, ... , Xm) associated with a dependent variable. In normal least-squares linear regression, the independent variable is assumed to be measured with no error. In other regression models (such as major axis, reduced major axis) there is error in the measurement of X.

Note that in terminology for linear regression, X is a numerical variable not a categorical variable.

### 4.5.6. The Chicken example

Open File “EggsByAge.xls”

To explain better the concepts of regression we use a very simple example. 16 hens in a “chicken-house” lay eggs with the following weekly frequency. The proprietor of the hens assumes that the age of the hens has to do with the number of eggs laid. He makes a table of the egg production of one week determined with eggs ranking the hens according to their egg production and including the age of each hen in months.

| | Eggs | Age (month) |
|---|---|---|
| **Hen1** | 0 | 2 |
| **Hen2** | 0 | 1 |
| **Hen3** | 1 | 4 |
| **Hen4** | 1 | 7 |
| **Hen5** | 1 | 10 |
| **Hen6** | 2 | 14 |
| **Hen7** | 2 | 12 |
| **Hen8** | 2 | 9 |
| **Hen9** | 2 | 6 |
| **Hen10** | 3 | 8 |
| **Hen11** | 3 | 10 |
| **Hen12** | 4 | 23 |
| **Hen13** | 4 | 8 |
| **Hen14** | 4 | 9 |
| **Hen15** | 5 | 12 |
| **Hen16** | 5 | 18 |

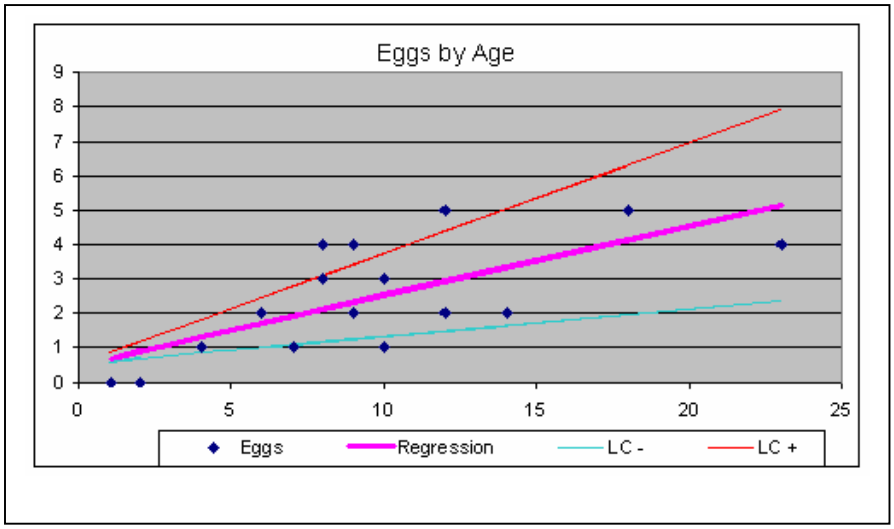
We then calculate the regression with eggs as the dependent variable and age as the independent variable.

We arrive at an equation of simple regression in the following form:

Eggs = 0.523+0.200*Age

The quality of the Regression (R2=0.4714/ 0,434 with statistiXL) is good but not exceptional.

## Graph of the Regression Equation

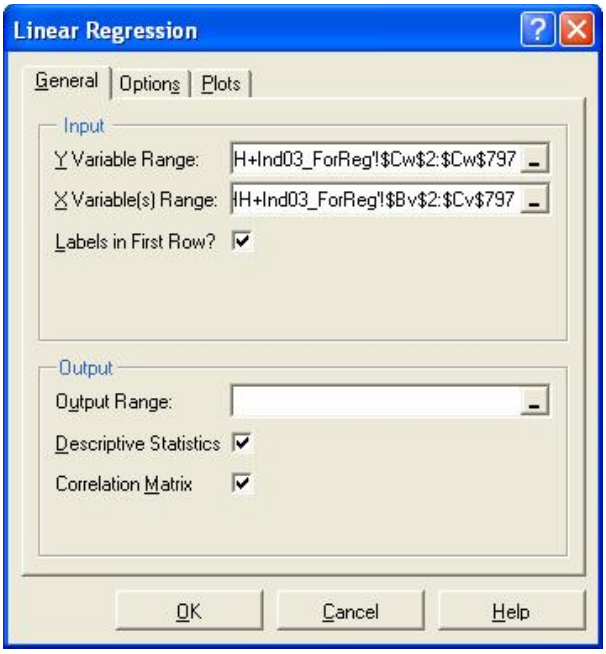



To explain this we include the data of the regression in a graph created with EXCEL
The eggs appear as diamond points in the graph. The fat central line in the graph indicates the equation of the regression. The Intercept is the distance between point 0 and the point where the line of the regression crosses the Y-axes. The coefficient of the regression (x=0.2) is the tangent of the angle between the line of the regression and X. axes, often interpreted as: While the dependent variable varies in one unit the independent variable in accordance to the coefficient of the variable.
In the example: with one month more of age, it is expected that the hens lay 0.2 more eggs. Getting 5 months older, it can be expected that a hen lays an extra egg.
To represent the errors in the model, extracts a vertical line from each point to the regression line. The length of these segments between the line and the points of the graph is called the residual and is an estimator for the errors in the model. SPSS uses the method of Least Square Estimates to calculate the inclination and intercept. This method minimizes the squared sums of residuals squares (that is, the sum of the squared vertical line segments).

In the equation, y is the dependent or the explained variable, what you are trying to predict; x is the independent variable or the predictor. The intercept and the inclination are coefficients of the model or the equation of the regression.

If the model will be a good explanation of the relation between the variables, you can use the estimates of the coefficients to forecast the value of the dependent variable for new cases.

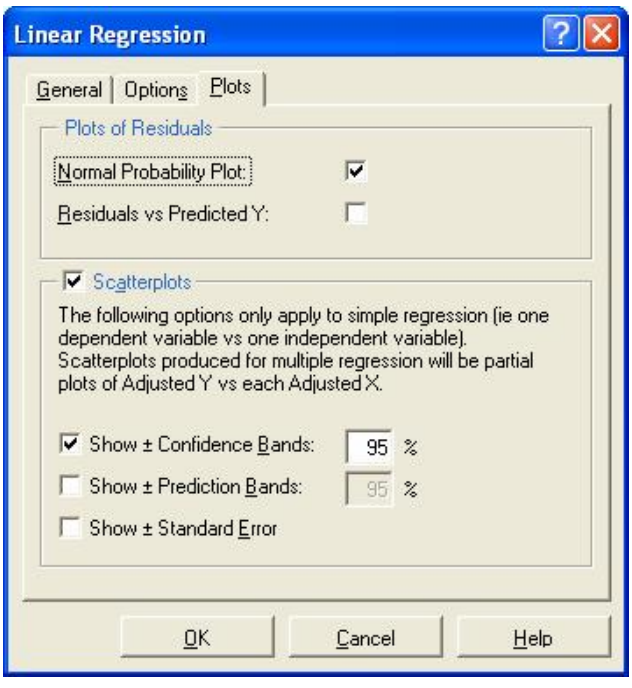
In the example: It can be predicted how many eggs a hen puts with the age of 36 months. Use the formula: Eggs = 0.523+0.200*Age and the result is 8 eggs.
The weakness of the forecasts of the regression is shown in this example. It does not take the life cycle of a hen into account. The old hen does not lay more eggs, even the opposite!
Moreover, any statistical forecast is subjects the uncertainty of the static induction. There are the confidence intervals, that allow calculating the lower confidence line (LC -) and the upper (LC+) with the respective values for intercept and the coefficient; then the equation for lower confidence line is
EggsLC- = -0.812+ 0.079*Age
and the equation for upper confidence line is
EggsLC+ = 1.859 + 0.322 * Age
In the graph these lines appear to be sketched with a finer line. Depending on this sample, it can be expected that, for another hen and in 19 of 20 cases, the relation between eggs and age will fall into this confidence band. However in one case among between 20, this value will be outside this band. This is another problem for a regression based forecast.




Now we come back to the poverty example calculating a wealth indicator based on the [29]

## How is it done in EXCEL:

You must not have installed the statistiXL Add-in, you can also use the standard EXCEL analysis Add-in, but the statistiXL Add-in has significant advantages, most important: it lets you control the choice of explaining variables
Choose Exercise File: “HH+Ind_IAF_for Regression_Ex4_3.xls” This file combines data from the household file (e.g How many occupations has the Head of household) with the individual file (e.g. number of men > 15 who know to read). This file has been prepared in order to ease the use of the Regression function. Applying the solution from [29] and having adapted several of the mentioned independent variables. Even if the task would be to find a new set of variables explaining the welfare indicator, a given set of pre-selected variables is not a bad choice. The regression selection will eliminate unsuitable variables.




Use Sheets “HH+Ind03_ForReg”.

Call <statistiXL /Regression>

Choose Dependent and independent Variables (The Variable Names have been labelled). If no Output Range is selected, a

new sheet will be used for the results

Use Options and choose Method of selecting the independent variables

Choose “Forward Stepwise” as selection.

For forward stepwise regression, the P to Enter (0-1) value indicates the probability level required for a variable to be entered into the regression (default = 0.05). Only the variable with the lowest P, equal to or smaller than this level, will be included in each regression step. Values must be between 0 and 1.

With this method unsuitable independent variables are omitted from the model.

This option is not available in the standard EXCEL analysis Add-in for Regression.

The output shows a moderate performance of the $R^2$.with 0,496 or 0,487 for the adjusted $R^2$.

It is quite interesting interpreting the

**Step 14: Summary**

| $R^2$ | R | Adj. $R^2$ | .E. of Estimate |
|---|---|---|---|
| 0,496 | 0,704 | 0,487 | 0,956 |

explaining variables:

Whereas Age of Head of HH has a slightly positive effect the on Welfare, all problematic age groups (young and old) have an adverse effect on the Welfare Indicator.

Not surprising is the positive predictor for highest education level and the positive effect of women in the household having completed a basic education.

**Step 14: Regression Coefficients**

| Source | Coefficient |
|---|---|
| Intercept | 15,673 |
| Squared number of HH members | 0,017 |
| Sex | -0,226 |
| Age | 0,005 |
| Age 0-9 | -0,488 |
| Age 10-17 | -0,596 |
| Women 18-59 | -0,554 |
| Men 18-59 | -0,624 |
| Age >=60 | -0,709 |
| Women > 15 have EP1 | 0,244 |
| Highest edu. level | 0,101 |
| works in Agriculture | 1,161 |
| works in industry or construction | 0,196 |
| Works in another sector | 0,195 |
| Men can read * work in Agriculture | -0,433 |

The Regression model can be useful for several purposes:

- It can interpret predictors for welfare indicators
- It can be used to apply small scale estimates for welfare indicators based on census results

## 4.6. Relationship between inequality and mobility

Assuming that income, or some other measurable variable, is a reasonably good indicator of welfare, poverty can be defined by a person’s income relative to some poverty line. One’s income determines one’s poverty status, and changes in one’s income effects changes in one’s poverty status. Therefore, it is useful to begin by examining the distribution of income, and changes in the distribution of income before discussing poverty and changes in poverty.

First consider the relationship between income inequality at a single point in time and income mobility over time. For simplicity, consider a scenario with only two time periods. Let y1 and y2 be income in time periods 1 and 2, respectively. If people's incomes were unchanged in both time periods, then the distribution of y1 would be the same as the distribution of y2. The extent of poverty (measured by comparing the distribution of income to some poverty line) would be unchanged over time (and the poverty status of all individuals would be the same in both time periods). But the converse does not hold; the finding that the distribution of income has not changed over time, and thus that the extent of poverty is the same in both time periods, does *not* imply that everyone's income (and poverty status) is unchanged. It is also possible that some people who were poor in the first period escaped from poverty in the second period, while an equal number of people who were not poor in the first time period fell into poverty in the second period.

If it were the case that everyone's incomes had remained unchanged over time, then the correlation coefficient between y1 and y2 would equal one: $\rho(y1, y2) = 1$. On the other hand, if some people's incomes had increased between the two time periods so that they escaped poverty, and they were replaced by an equal number of people who fell into poverty over time, then the correlation between y1 and y2 would be less than one: $\rho(y1, y2) < 1$. Another way of expressing this phenomenon is to say that there is a certain amount of income mobility. Indeed, a common measure of income mobility, which can be denoted by $m(y1, y2)$, is one minus the correlation coefficient: $m(y1, y2) = 1 - \rho(y1, y2)$

After this theoretical outlook let us look at Surveys measuring change. For this we introduce the concept of Qualitative Surveys for two reasons.

- The significance of Qualitative Surveys (collecting opinions) is generally not much estimated
- The Results of Quantitative Surveys (measuring facts, numbers) are rarely combined with Qualitative Surveys

It is one purpose of this course to advocate all means of information gathering to be combined for the sake of knowledge increase and hopefully sound decision making and politics.

## 4.7. Qualitative Studies and Participatory Assessments

A better understanding of how people survive living under adverse conditions can be obtained from in-depth qualitative studies. These inquiries are usually non-official and often of a one-off nature. For the most part, their value depends on expert assessment and analysis of fieldwork. These studies may be subjective, reflecting a consensus of personal views and assessments of respondents themselves [whom, it might be argued, are best placed to describe their own condition]. Or they may represent the unique testimony of an individual key informant.

The qualitative approach covers such important issues as identification of perceived and actual constraints and obstacles that impede the betterment of peoples' lives. To resort to qualitative and subjective perspectives, including participatory assessments by the poor themselves, helps to identify many of the undisclosed features of poverty. It allows analysts to relate these factors to the social and cultural environment and observed conditions in which poor households survive. Subjective surveys, in particular, permit researchers to reach out and take note of the silent voices. that can give them a better insight into why certain households engage in various activities, how household members behave, what their overall coping strategies might be, and how households and their members arrange their specific mechanisms to ensure their daily survival. Observed responses of poor people to given economic situations and strategic initiatives, or the lack of them, can be used to guide future policy and to identify groups at most risk of not making progress.

Qualitative assessments are very useful survey instruments for identifying the characteristics of the poor and the extent of their deprivation. In contrast with the quantitative methods and conventional monetary approaches favoured by officials and used in most household based surveys, qualitative methods are less concerned with mathematical precision. The crucial issue, however, is not whether quantification is possible but whether the problems faced by poor people and the level of an

individual's or household's standard of living can be reduced to a simple quantitative dimension and still remain significant.

Theoretical underpinnings of qualitative methods rest with a belief that they can shed more light on the diverse manifestations and dynamics of poverty, enabling analysts to explore the various possible links between the different factors assumed to influence actual as opposed to expected poverty outcomes. Key factors include intra-household transfers and gifts in kind, commonly linked to cultural, religious and behavioural attributes that are not comprehensively captured through conventional household inquiries.

## 4.8. More on Qualitative methods

Despite wide recognition of the relevance and usefulness of data obtained from qualitative methods for assessing individual welfare, and more broadly, for identifying aspects of welfare omitted in the standard poverty measure, qualitative techniques are still not widely accepted by officials. Moreover, they are not fully integrated with the conventional income-based poverty assessments. Because qualitative techniques rely on group interviews and approach subjects in a non-specific way and make widespread use of less formal methods of questioning, many question their results.

In contrast, quantitative approaches place more emphasis on objective data collection through household interviews and written questionnaires. The latter demand, however, a certain minimal level of literacy and numeric skills as well as formal and informal record keeping skills some poor respondents may not possess. The method of enumeration by officials also frightens some respondents. Participatory techniques, while giving a particular emphasis to personal subjective perceptions, are often claimed by those social anthropologists and other analysts who conduct them to be incompatible with more traditional poverty assessments, whether these are qualitative or quantitative.
However, they do reflect what people really feel and experience.

Given the scarcity of resources, qualitative and quantitative poverty studies frequently compete with one another for funds, failing to complement each other's investigative value.

There may be broader advantages to combining the two methods in the earlier interview phase, for example, by asking subjective and qualitative question in the same survey (as has been don in Mozambique 2002/03 on some issues. Unfortunately the analyses of these sections have not been really merged). Not only will the traditional poverty assessments be stronger, but also new facets of the problem could be opened up by in-depth probing using direct inquiry. A multi-dimensional approach to poverty analysis comprising a review of expenditures on market goods--along with non-income measures of access to non-markets goods and indicators of intra-household distribution--would be informative.

Carvalho and White [19] wrote a review of methods for combining qualitative and quantitative data. Qualitative surveys are usually undertaken to explain, rather than to simply describe, human behaviour,--identifying what issues matter to people. These surveys tend to be based on prescribed and pre-selected [sometimes with defined quotas] non probability samples of particular population groups. Survey outcomes may then be employed to highlight those questions considered important and worthy of further investigation in a subsequent national survey. The nature of the responses can also be used to determine the appropriate strata for refining the operational conduct of a more comprehensive inquiry. From a statistical perspective, such techniques can reduce overall sampling error and identify cost-saving strategies in planning larger surveys. Primarily, however, qualitative methods are used to examine a more limited number of subjects in depth. They explore relational patterns and identities, examining the existence of various attributes rather than determining exact measurement of variables. A wide variety of survey techniques, consequently, can fall under the general description of qualitative.

Users can then approach relevant focus groups to guide the direction of studies towards the gathering of data about certain disadvantaged sections of the population. People who are “engaged” in an issue are usually better informed about its nature. It is often possible to get a closer consensus of the problems encountered by asking people directly rather than surveying a randomly selected section of the population. All these approaches tend to draw attention to the broad common relationships rather than measuring the magnitude of any assumed effects.

One of the main advantages of qualitative surveys arises from their in-depth and often open probing into issues that observers do not notice at first sight, but which respondents believe are important. When carried out by well-trained and qualified analysts who understand the objectives of the study and identify with the purpose of the inquiry, the process can prove quite valuable. Enumeration methods may well be unstructured, but the range of topics covered and questions to be raised should conform to a predetermined list of all the key concerns on which information must be elicited. The smaller non-sampling error achieved by this approach has to be balanced against the unknown and incalculable sampling error involved in the employment of higher quality investigative techniques at the respondent level.

This matters little if there is no variable that needs to be quantified. The survey then simply records the presence or absence of a characteristic. But sometimes it is desirable to have a sense of magnitude and to know if a problem is growing [and at what rate], and how important it is to those affected. Then there is a need for a calibrated scale or marker against which to classify the interview outcomes. In general, survey technicians rarely resort to qualitative methods to find out about actual outlays and incomes. Further, they are reluctant to adopt them in inquiries that require quantification of variables and a precise comparison of magnitudes because of the potential for confusion and ambiguity of responses.

## 4.9. Qualitative Methods with a Development Index: A Survey Measuring Development in Sofala on District Level

### 4.9.1. Background

To monitor the development of a certain area, preferably districts in the province of Sofala, a qualitative survey for Monitoring Development (SMD) is proposed based using after the discussions and findings about development and poverty indices, a base line as the development status for a given target area. The SMD should be used to monitor in regular intervals the changes in status of different development sectors. These sectors are derived form the District Development Plans and follow roughly the subdivision of a proposed Planning Matrix. The advantage of using a survey is obtaining qualitative albeit measurable indices indicating the progress or development in a specific area over a given time. These indices will be de-composable (can be aggregated on whatever level required). The proposed indices will be explained further in another chapter

### 4.9.2. The General Problems and Goals

Different agents of public administration and improving planning on the provincial level are confronted with the question of how to evaluate the progress of development and how to monitor the achievements of defines goals

The classical tools to monitor the success of planning and administration are plans and various means to evaluate the implementation of plans.
This holds true for international and national level. It is unanimously accepted that aims like defined in the Poverty Reduction Strategy Papers have to be monitored by nationally and internationally comparable statistical tools. This explains the relative popularity and acceptance of household surveys as measurement tools for consumption and thus measuring poverty.
These data however don not have the only purpose of measuring consumption, they in conjunction with other statistical information permit to analyse the living conditions of the population, hence measuring development.

Any further measure to improve development should be eager to find out, which are the benefits of different input measure like public spending or project investment, which are the mostly affected and neglected groups of the population

Household surveys are the almost perfect information source defining the situation of development of a given population group. If these information are detailed enough and the level of disaggregation low enough, information about target groups can be easily compiled, arriving at development baselines. These baselines can easily be tailored for specialized purposes: Poverty, Education, Health or Poverty Profiles are some examples. In these specialized cases, it would seem reasonable to resort to supplement and specialized sources of statistical information available.

The objective of measuring development or progress is however complex and surveys of these kind IAF (Household survey), QUIBB (General Welfare Survey) or IDS (Health survey)are extremely costly, use rather complex methodology both for sampling techniques as for analysis and need a lot of resources. It will not be possible to repeat these “big” surveys annually or even more often on a regular basis.

Regular monitoring however needs constant feedback of changes and implementation of measures and its results. Responding to the necessities of measuring these is the objective of this project.

### 4.9.3. Household survey and qualitative monitoring Provinces and Districts

The discussion of the measurements of poverty or rather development and the possibilities of qualitative surveys are discussed in a more general and theoretical paper A qualitative survey would be suitable for monitoring changes on the district level taking the information derived from the HH Survey as the basis of information. The qualitative survey asks for relative changes for the period requested, for example changes in the last year, changes in the last three months according to a number of selected subjects. The respondent to these questions answers gives his/her **opinion**, not necessarily the measured results. These results, if available, could only be collected by administrative procedures on district level. The past has proven that this collection of administrative results is very cumbersome and rarely successful endeavour and not very likely to produce consistent and cohesive results. The simple qualitative survey could produce immediate results being publishable within days after the data collection.
The results would be available at regular intervals and published in form of tables, graphs and time series. Results will be tailored to the requests of the task owners; questionnaires and scope of survey will be adapted to the necessity and wishes of the task owner

### 4.9.4. Implementation of SMD

For simplicity it is assumed, that the SMD is carried out in one District to monitor development annually. Any adjustments in scope and periodicity are simple and quickly done.
The SMD will be implemented like any small survey. As of the first time, the survey needs a pilot stage and training phase. All technical details can be adapted to the wishes of the task owner, like questionnaire design, area and periodicity of the survey.
All preparation will be done in the premises of INE or the task owner. Pilot phase and training on the spot will be done in the district
The survey will be implemented in one week, assuring cohesion in time and reducing costs. In the week following the survey, results will be available and publishable.
New repetitions of surveys might need a repeated training; if the periodicity is quite long (1 year) ad/or the questionnaire design has changed in the meantime.

### 4.9.5. Structure of the Control Areas, Sample Size

The Districts divide into Administrative areas and Villages. The enumeration areas selected for the IAF can be located in the Enumeration area plan for Sofala. These areas are indicated by their name and

the centroids of their Longitude and Latitudes of the Graphical Information System, thus can be identified exactly.
It should be envisaged the areas used for the SMD should be the same as use for the IAF. When this is not possible, the enumeration area has to be substituted by another. The number of envisaged Households to be included in the SMD is calculated in an annexed table. The sample size calculation was based on the standard formula for identifying minimum sample sizes based on known sample deviation (s2) and desired confidence intervals b (width of response amplitude). These figures where calculated for each response area by analysing the question G10 of the IAF questionnaire[7]. This is one of the few qualitative questions and its scope is that wide and unspecific, that it seems to be justified, to assume the amplitude and standard deviation of this question as an indicator for the desired outcome of the qualitative questions in the SMD

$$n \geq \frac{4 * (z_{1-\alpha/2})^2}{b^2} * \sigma^2$$ where z is the appropriate value from a t distribution table, as the well known 1.96 the 95% and indefinite degrees of freedom. This leads to the proposed minimum number of households to be questioned, using the 95% probability limit. See the proposed number of households to be included in each district an village of the IAF in the Annex

$$n \geq \frac{16 * s^2}{b^2}$$

The only adjustment to the sample size is taken in that respect, that if the proposed minimum number of households to be questioned is inferior to the sample size in the IAF area (this is very seldom the case), than the higher of the two values is taken

### 4.9.6. Methodology

It is proposed to use a qualitative questionnaire, designed in the annex. The questionnaire is very simple can be answered by the head of household or the substitute and would not require neither extended length of permanence in the household nor extended processing requirements.
It contains basically 18 questions with 5 possible answers (usually from deteriorated very much.. to… improved very much) This technique has been applied to longitudinal surveys, monitoring development over time and permits to get quick responses with quick tendency results. The qualitative results are elaborated and indexed allowing immediate information about improvement ore deterioration in the questioned area. The result of these interviews is of course opinions and not facts. Therefore the quality of results have to be controlled by the next quantitative survey, preferably the Census, IAF again or the QUIBB. By using a survey over a longer period, both quantitative and qualitative surveys can complete each other perfectly, the SMD being the quick and easy one, the big surveys delivering the framework and baselines and controlling the quality of the qualitative surveys

### 4.9.7. How is it done in ACCESS and EXCEL:

For the capture of data a questionnaire of 18 qualitative questions directed to Family units was used chosen teams and answered by the respective head or its substitute. The results of these interviews are of course opinions and not factsThe applied questionnaire will count 18 questions with 5 possible answers

See the Questionnaire in the Annex (“Prototype Questionnaire_SMD.doc”)
Presentation (“Presentation_EN_SMD051007Short.ppt”)
The Data are captured by an ACCESS data entry system (“SMD_DataEntry_Sofala(port.).mdb”)

### 4.9.8. The simple Indices

To compare the development simple indices and composites simple are produces. These indices are measures of development in the opinion of the population. The qualitative results are represented in numerical indices, with comparable and inductive answers. Thus the responses are codified “very

[7] G.10 How do you compare the economic situation of the Household in relation to one year ago?
Answers : Much worse now ; Little worse now; The situation is the same; A little better now; Much better now ; does not know

negative (--)" in "-2 ", " negative (-)" in " - 1 ", " neutral (0)" in " 0 ", " positive (+)" in " 1 ", " very positive (++)" in " 2 ". The "did not answers" are coded (99) and do not enter in calculation.

SMD Response Coding

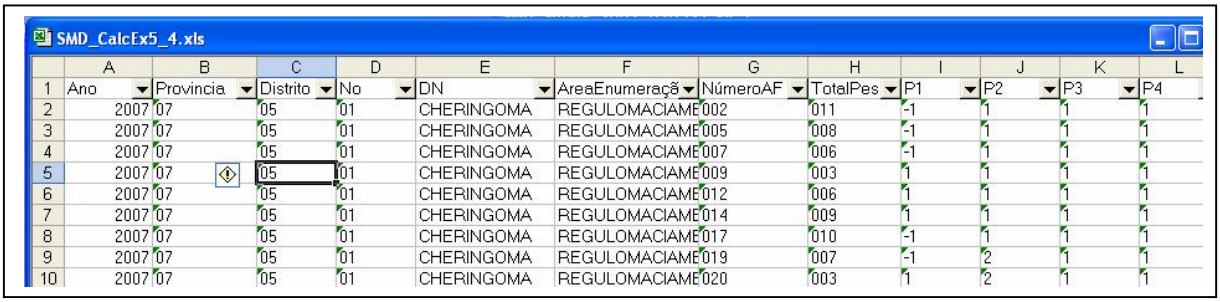
| Response | Codes |
|---|---|
| Very negative(--) like "Deteriorated very much" | -2 |
| Negative(-) like "Is a little far" | -1 |
| Neutral(0) like "Is the same" | 0 |
| Positive(+) like "Improved a little" | 1 |
| Very positive(++) like "Improved very much" | 2 |
| Did not answer | 99 |

The indices are calculated by summing the coded responses to a question, dividing by 2 * Number of valid answers

A positive value (52%) indicates a positive opinion or favourable, a negative value (-12%) implies the opposite.

See an example:
Open File "SMD_CalcEx5_4.xls"
Observe the results of 4 Districts, look at sheet "SMD_Sofala_2007-4Districts" answers to the 18 Questions for 237 Households or 4 Districts : CHERINGOMA,GORONGOSA,MARINGUE,MUANZA.

## 4.8 Graph: The SMD Results of the Data Entry System



SMD_CalcEx5_4.xls

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ano | Provincia | Distrito | No | DN | AreaEnumeraçã | NúmeroAF | TotalPes | P1 | P2 | P3 | P4 |
| 2 | 2007 | 07 | 05 | 01 | CHERINGOMA | REGULOMACIAME | 002 | 011 | -1 | 1 | 1 | 1 |
| 3 | 2007 | 07 | 05 | 01 | CHERINGOMA | REGULOMACIAME | 005 | 008 | -1 | 1 | 1 | 1 |
| 4 | 2007 | 07 | 05 | 01 | CHERINGOMA | REGULOMACIAME | 007 | 006 | -1 | 1 | 1 | 1 |
| 5 | 2007 | 07 | 05 | 01 | CHERINGOMA | REGULOMACIAME | 009 | 003 | 1 | 1 | 1 | 1 |
| 6 | 2007 | 07 | 05 | 01 | CHERINGOMA | REGULOMACIAME | 012 | 006 | 1 | 1 | 1 | 1 |
| 7 | 2007 | 07 | 05 | 01 | CHERINGOMA | REGULOMACIAME | 014 | 009 | 1 | 1 | 1 | 1 |
| 8 | 2007 | 07 | 05 | 01 | CHERINGOMA | REGULOMACIAME | 017 | 010 | -1 | 1 | 1 | 1 |
| 9 | 2007 | 07 | 05 | 01 | CHERINGOMA | REGULOMACIAME | 019 | 007 | -1 | 2 | 1 | 1 |
| 10 | 2007 | 07 | 05 | 01 | CHERINGOMA | REGULOMACIAME | 020 | 003 | 1 | 2 | 1 | 1 |

Use Pivot Tables to calculate simple indices for each question:
Look at sheet: “All Indices P1-P18”. The indices are copied in separate sheets in order to keep the calculation very simple
The index for an individual Question is calculated very simple:

**Table: Index calculation in SMD**

| Number P17 | P17 | | | | | | sum |
|---|---|---|---|---|---|---|---|
| DN | -2 | -1 | 0 | 1 | 2 | 99 | |
| CHERINGOMA | 1 | 11 | 4 | 40 | 8 | | 64 |
| GORONGOSA | 1 | 6 | 4 | 73 | 12 | 2 | 96 |
| MARINGUE | 1 | 8 | | 43 | 2 | 3 | 54 |
| MUANZA | | 4 | | 12 | 2 | | 18 |

=+(J59*(-2)+K59*(-1)+M59+2*N59)/
(2*SUMME(J59:N59))

| "--" | "-" | "0" | "+" | "++" | Index P17 |
|---|---|---|---|---|---|
| 1 | 11 | 4 | 40 | 8 | 34% |
| 1 | 6 | 4 | 73 | 12 | 46% |
| 1 | 8 | 0 | 43 | 2 | 34% |
| 0 | 4 | 0 | 12 | 2 | 33% |

The Pivot Table contains the coded values for the Question (e.g.P17). If not all values are available the respective columns would be missing. The numbers are transferred to the cells to the right to maintain the same format.
The order of columns in the Pivot tables might not be in the desired form ( from most negative to most positive and the “non responses” in the next column) but can be exchanged simply by mouse movements.
The formula to calculate the indices reads simply like 2*(number of (-2))+number of (-1) + number of (1) + 2*(number of (2)) / divided by 2* sum of all numbers.

It can easily be verified that the index varies between -1 and 1 or in percentages -100% and 100%. The SMD index is a rather simple but talkative response to the question, especially for comparison of the situation in different districts. The question about the quality of administration does not show many differences, but regarding the index for P5 (distance of next health service) the differences are stunning.

### 4.9.9. Composite Indices

The Composite Indices group answers to coherent areas and allow to measure in form of an index, the opinion on (e.g.) Education or Health. The Composite Indices allow to a-hoc situation analyze the situation of a particular area of interest or past or possible intervention, an example would be economical situation. Finally the 18 indices are grouped to form one index of district development allowing comparing (superficially) the ad-hoc situation among the districts

The table below proposes weights for the different question indices to become the

**Weights for Composite Indices in SMD**

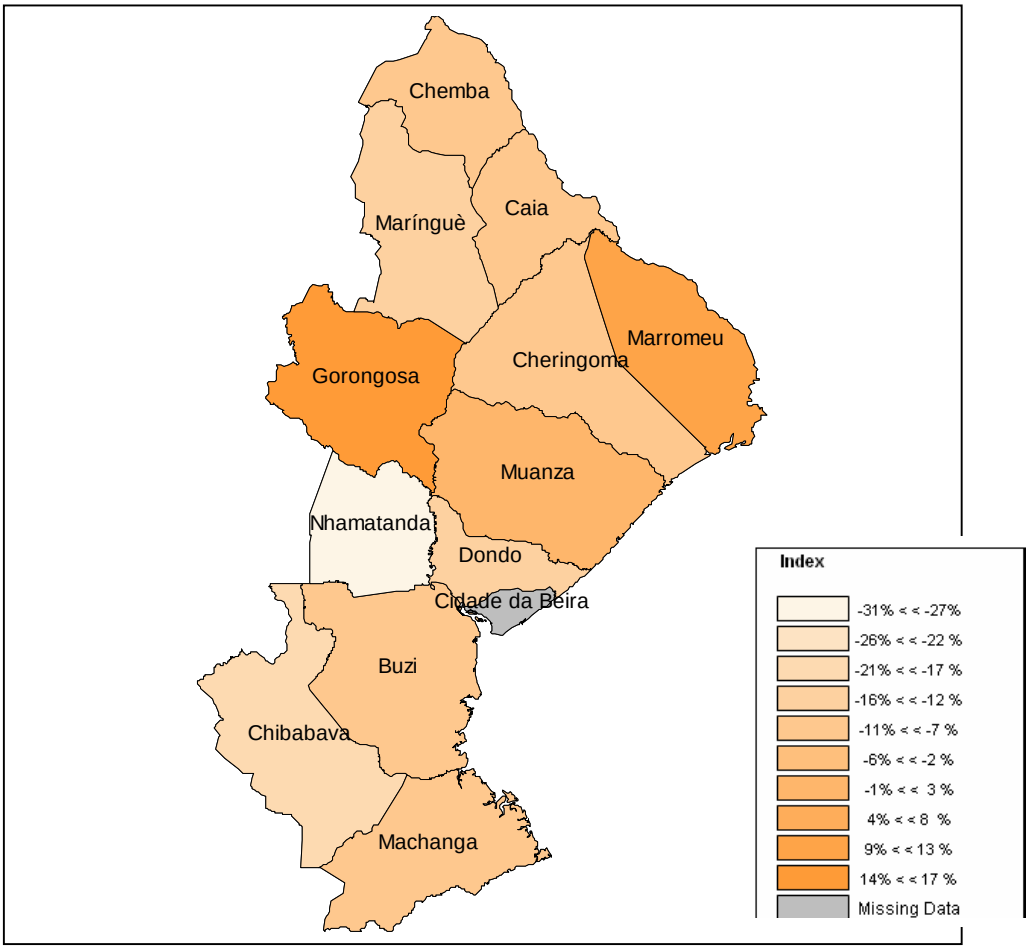
| Index for | | Questions | Weight | |
|---|---|---|---|---|
| 1. Economic. Well-being | 1.1 General Situation/ Employment | 1, 13, 14 | 0,3 | 0.65 |
| | 1.2 Agriculture/ Infrastructure | 8, 9, 10, 11, 12, 15, 16 | 0,5 | |
| | 1.3 Administration | 17, 18 | 0,2 | |
| 2. Education | | 2, 3 | | 0.15 |
| 3. Health | | 4, 5, 6, 7 | | 0.20 |

It goes without saying that these questions seem to be highly subjective and is a proposal reflecting the local situation. In the case for Mozambique, the District Development Plans and the agreed targets in these Plans were the blueprints for the questions.

The system does not allow for immediate assistance for district planning, also for assessing district performance by provincial administration. The system would make sense in combination with long term measuring system and other ad-hoc quantitative systems ( for example of child health and under nourishment and gender statistics)

## 4.9 Graph: District Development in Sofala as seen by the System of Monitoring Development SMD: Results 2005/2006/2007

A display of result together with graphical representation of the overall SMD index is shown below



## 4.10. Planning a Poverty Monitoring System

### 4.10.1. A Swot Analysis


**SWOT Analysis**, is a strategic planning tool used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project or in a business venture. It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favorable and unfavorable to achieving that objective.

If SWOT analysis does not start with defining a desired end state or objective, it runs the risk of being useless. A SWOT analysis may be incorporated into the strategic planning model.

- **S**trengths: attributes of the organization that are helpful to achieving the objective.
- **W**eaknesses: attributes of the organization that are harmful to achieving the objective.
- **O**pportunities: *external* conditions that are helpful to achieving the objective.
- **T**hreats: *external* conditions that are harmful to achieving the objective.

Identification of SWOTs is essential because subsequent steps in the process of planning for achievement of the selected objective may be derived from the SWOTs.

First, the decision makers have to determine whether the objective is attainable, given the SWOTs. If the objective is NOT attainable a different objective must be selected and the process repeated.

### 4.10.2. Creative Use of SWOTs: Generating Strategies

If, on the other hand, the objective seems attainable, the SWOTs are used as inputs to the creative generation of possible strategies, by asking and answering each of the following four questions, many times:

- How can we Use each Strength?
- How can we Stop each Weakness?
- How can we Exploit each Opportunity?
- How can we Defend against each Threat?

Ideally a cross-functional team or a task force that represents a broad range of perspectives should carry out the SWOT analysis. For example, a SWOT team may include a statistician, a health expert, an administrator and an agricultural expert.

- Set objectives – defining what the organization is intending to do
- Environmental scanning - Internal appraisals of the organizations SWOT, this needs to include an assessment of the present situation as well as a portfolio of products/services and an analysis of the product/service life cycle (Existing costs)
- Analysis of existing strategies, this should determine relevance from the results of an internal/external appraisal. This may include gap analysis which will look at environmental factors (Existing costs)
- Strategy defined – key factors in the development of a plan which needs to be addressed by the organization
- Develop new/revised strategies – revised analysis of strategic issues may mean the objectives need to change
- Establish critical success factors – the achievement of objectives and strategy implementation
- Preparation of operational, resource, projects plans for strategy implementation
- Monitoring results – mapping against plans, taking corrective action which may mean amending objectives/strategies

### 4.10.3. Implementing a Poverty Monitoring System

Look at the PRSP Cycle (Graphics Courtesy of GTZ)


Where in this cycle is the Poverty Monitoring System?
Who are the Actors?
Who benefits?

## Chapter4 Exercises

1. Find poor" Districts in Rural and Urban Areas using the Asset Based Index in Assets_SofalaEx5_2.xls". Where do results diverge from previous results, where do they coincide?

2. Use the file "HH+Ind_IAF_for Regression_Ex4_4.xls" and calculate regression predictors for Urban and Rural Households for Sofala. How do they differ?

3. Apply the SMD Analysis "SMD_CalcEx5_5.xls", sheet "SMD_Sofala_2007-3moreDistricts" on three more districts and compare the data to the results of the other Districts in 2007

4. Look at the results for three years. Compare the results and interpret the results

5. Look at the Composite Indices in file "SMD_CalcEx5_6.xls" sheet "ResultsCompSMD2007" and point at the poverty risks for each district.

6. Look at Graphics in the same file for completing the analysis

| SMD Indices - | 2005 | 2006 | 2007 |
|---|---|---|---|
| Buzi | -14% | -11% | |
| Caia | -16% | -9% | 34% |
| Chemba | 7% | -8% | 34% |
| Cheringoma | 0% | -7% | 40% |
| Chibabava | -4% | -21% | |
| Dondo | -8% | -14% | |
| Gorongosa | 19% | 17% | 43% |
| Machanga | 0% | -11% | |
| Maringue | -1% | -12% | 24% |
| Marromeu | 8% | 12% | |
| Muanza | 2% | -1% | 35% |
| Nhamatanda | | -31% | 15% |

7. Start a SWOT Analysis for a Poverty Monitoring System (PMS)
   a) Which are the objectives of your PMS
   b) Which are the Strengths of the organization
   c) Which are the Weaknesses of the organization
   d) Which external conditions might help in achieving your objectives
   e) Which external conditions might threat to achieve your objectives

8. Design a 5 years plan with objectives, tools, costs and monitoring tools to design the Poverty Monitoring System (PMS). Prepare a concise Presentation of the Working Group. Use two Posters (“SWOT Analysis of Poverty Monitoring Systems.doc”) and (“Recommend 5_10 years PMS.doc”)

# 5. Annex

## 5.1. Questionnaire SMD

Draft of Prototype Questionnaire: Survey for Monitoring Development (SMD)
This questionnaire is a draft and as such NOT ready for usage.

Please describe the situation in your household in relation to the last year 200.. with exception of questions 2, 5, 15 and 16. For these questions please mention the current situation. For question 17 choose the appropriate administrative agency (City council for urban area, Administrative Post for agricultural area). Interviewer: please mark in which type of the area the Area of Enumeration is located: urban or rural. This is usually defined by the sample plan of the IAF.

**Identification**

| | | | |
|---|---|---|---|
| **Province:.....** | | | |
| **District :.....** | | | |
| **Name and Number of Enumeration Area SMD:.....** | | | |
| **Number do Household (AF):.....** | | | |
| **Total Persons in Household (AF)** | | | |
| **Name of Head of Household (AF)** | | | |

1.

How would you describe the economical situation of your household over the last year? The situation has

- Deteriorated very much
- Deteriorated a little
- Is the same
- Improved a little
- Improved very much
- Did not answer

2.

How would you describe the distance of nearest school from your residence? The distance

- Is very far
- Is a little far
- Is not far not close
- Is rather close
- Is very close
- Did not answer

3.

How would you describe the situation of Education (teachers, lessons, school equipment) in your area over the last year? The situation has

- Deteriorated very much
- Deteriorated a little
- Is the same
- Improved a little
- Improved very much
- Did not answer

4.

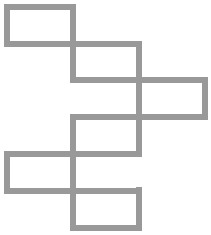
How would you describe the quality to health services (doctors, hospitals-health centres, attendance), in your area over the last year? The situation has

- Deteriorated very much
- Deteriorated a little
- Is the same
- Improved a little
- Improved very much
- Did not answer

5.

How would you describe the distance of the nearest health post from your residence? The distance

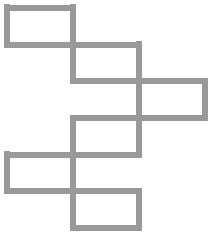
- Is very far
- Is a little far
- Is not far not close
- Is rather close
- Is very close
- Did not answer



6.

How would you describe the assistance to families/individuals affected by HIV/AIDS (information, treatment and other measures) over the last year? The situation has

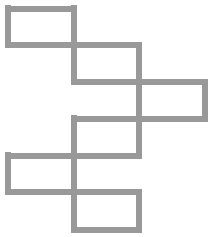
- Deteriorated very much
- Deteriorated a little
- Is the same
- Improved a little
- Improved very much
- Did not answer



7.

If your behaviour to prevent an infection with HIV/AIDS over the last year has changed, how did it change? You took more or less precautions? If you took more precaution, if improved, if you took fewer precautions, it deteriorated.
My behaviour..

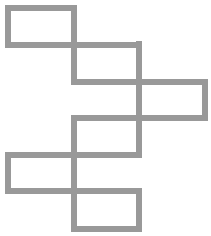
- Deteriorated very much
- Deteriorated a little
- Is the same
- Improved a little
- Improved very much
- Did not answer



8.

How would you describe the roads and transport (access, quality) in your area over the last year? The situation has

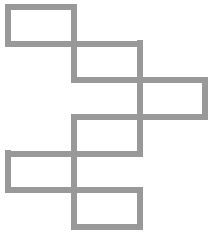
- Deteriorated very much
- Deteriorated a little
- Is the same
- Improved a little
- Improved very much
- Did not answer



9.

How would you describe the agricultural production in your area over the last year? The situation has

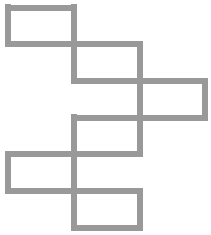
- Deteriorated very much
- Deteriorated a little
- Is the same
- Improved a little
- Improved very much
- Did not answer



10.

How would you describe the conditions of marketing and sales of agricultural products in your area over the last year? The situation has

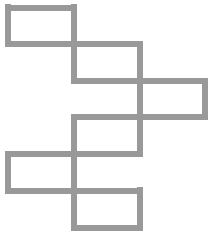
- Deteriorated very much
- Deteriorated a little
- Is the same
- Improved a little
- Improved very much
- Did not answer



11.

How would you describe the conditions to maintain livestock and the situation of livestock production in your area over the last year? The situation has

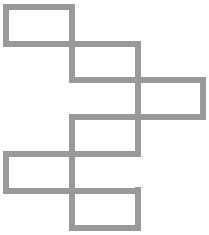
- Deteriorated very much
- Deteriorated a little
- Is the same
- Improved a little
- Improved very much
- Did not answer



12.

How would you describe the access to technical assistance in the area of agriculture, livestock and forestry in your area over the last year? The situation has

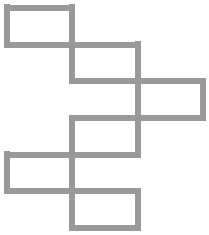
Deteriorated very much
Deteriorated a little
Is the same
Improved a little
Improved very much
Did not answer



13.

How would you describe the employment possibilities in area other than agriculture like industry, commerce, tourism or public services in your area over the last year? The situation has

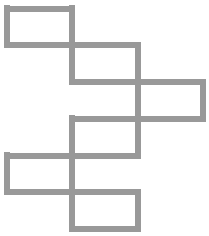
Deteriorated very much
Deteriorated a little
Is the same
Improved a little
Improved very much
Did not answer



14.

How would you describe the quality of life of your household over the last year (number of meals, purchasing power)? The situation has

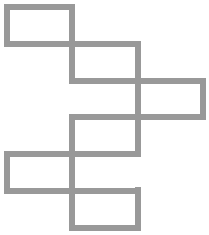
Deteriorated very much
Deteriorated a little
Is the same
Improved a little
Improved very much
Did not answer



15.

How would you describe the distance of the nearest source of drinking water from your residence? The distance

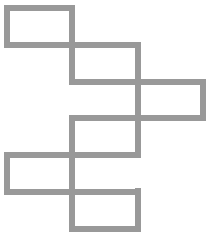
Is very far
Is a little far
Is not far not close
Is rather close
Is very close
Did not answer



16.

What do you think about of the quality of the nearest source of drinking water from your residence?. The quality.

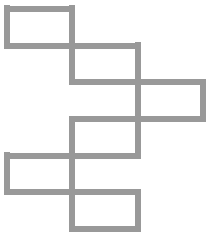
Deteriorated very much
Deteriorated a little
Is the same
Improved a little
Improved very much
Did not answer



17.

How would you describe the quality of district administration / administrative outlet over the last year? The situation has

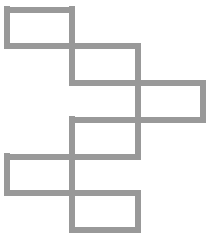
Deteriorated very much
Deteriorated a little
Is the same
Improved a little
Improved very much
Did not answer



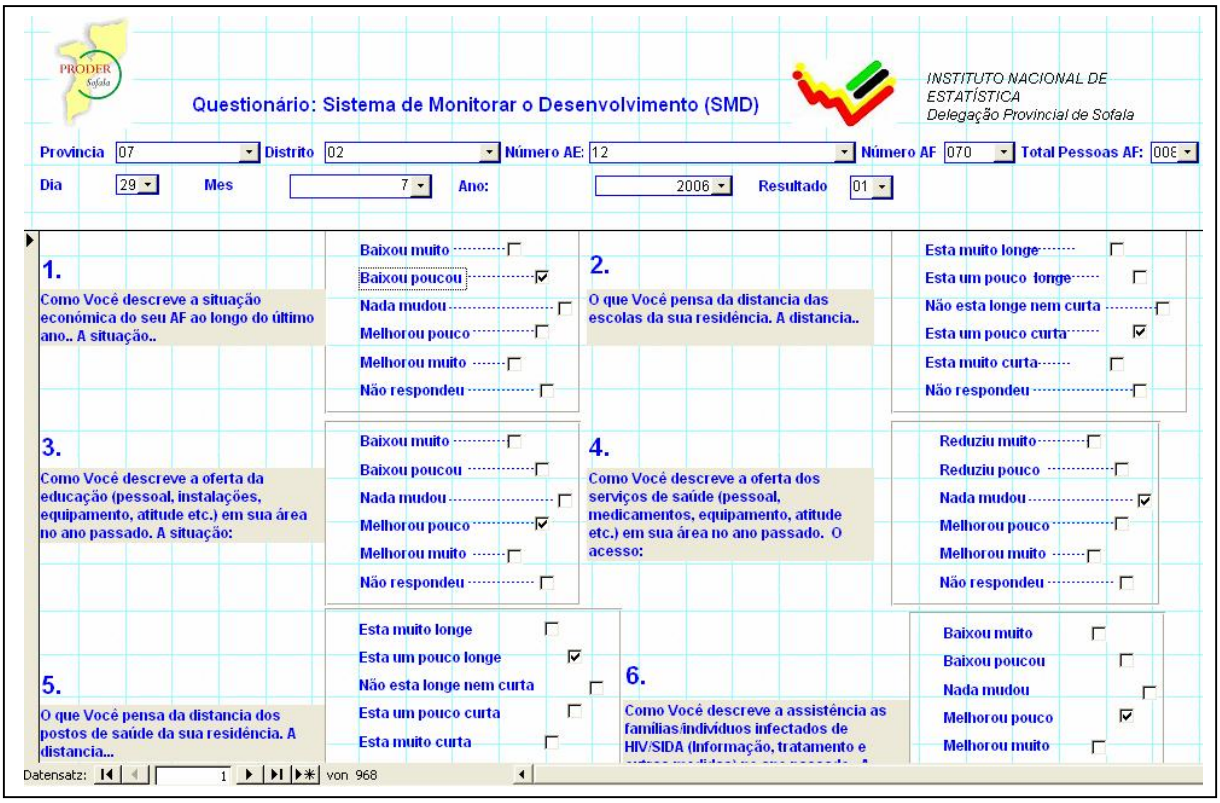
18.

Did you have the possibility to contribute with your opinion in the decisions regarding the spending of public money in the district / in the village? The situation has

Deteriorated very much
Deteriorated a little
Is the same
Improved a little
Improved very much
Did not answer



## 5.2. Data Entry Screen- SMD



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