POVERTY AND WELL-BEING IN MOZAMBIQUE: THE SECOND NATIONAL ASSESSMENT

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Conducting and analyzing a survey of 8,700 households is an enormous task that inevitably involves a large group of people with expertise in a diverse array of areas. It is, unfortunately, not possible to recognize each individual contribution. The institutions directly involved in writing this report would like to thank the National Institute of Statistics (INE) for their considerable efforts in data collection, data cleaning, and first stage poverty analysis. The close collaboration with INE throughout the process made the job of producing this report both considerably easier and more enjoyable. We look forward to continued close collaboration with INE.

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EXECUTIVE SUMMARY

In 1996-97, the National Institute of Statistics conducted the first nationally representative household consumption survey in Mozambique. Analysis of the survey indicated a poverty headcount of about 69 percent at the national level with poverty more prevalent in rural than urban areas. Results from this survey were employed by the Government of Mozambique to develop the Action Plan to Reduce Absolute Poverty (PARPA). The PARPA superceded the Lines of Action for the Eradication of Absolute Poverty. Both plans highlighted poverty reduction as a central goal of government.

In 2002-03, a second nationally representative household consumption survey (IAF) was undertaken. IAF 2002-03 sought to measure, as accurately as possible, progress in the fight against absolute poverty and to provide a basis for orientation of future policies. The 2002-03 IAF contains, among other items, detailed information on expenditure for a random sample of 8700 households. The sample represents the nation, rural and urban zones, and each province plus Maputo City. An important feature of the survey is an explicit attempt to be representative in time as well as space. Data collection for the survey began in July 2002 and finished in June 2003. While the process of data cleaning never ends, available indicators point to a high level of information quality.

This report has very focused objectives. It seeks to present the methodology and results of the poverty analysis of the 2002-03 IAF as well as comparisons with the 1996-97 survey results. The results point to a substantially improved poverty picture relative to 1996-97. The national poverty headcount, defined as the share of the population living in poverty, declines to 54 percent, a 15 percentage point decline from the levels registered in 1996-97. Poverty reductions are more rapid in rural than in urban zones, narrowing considerably the differences in poverty between the two zones, though poverty levels remain higher in rural compared with urban zones. Larger than average reductions in poverty are registered in Niassa, Zambézia, Nampula, Tete, Manica, and Sofala.

Consistency of these results with information from other data sources was also explored. At the national level, broad consistencies exist. National accounts indicate rapid economic growth over the period 1996-2002. The levels of poverty reduction estimated from the IAF 2002–03 are consistent with these aggregate growth levels and a pattern of growth that benefits poorer households. Steep reductions in poverty, such as the ones observed, would have to take place in the context of rapid growth of a character favorable to poverty reduction.

The 2000-01 and 2002-03 Core Welfare Indicators Surveys (QUIBB) both indicated gains in indicators correlated with poverty reduction. A detailed analysis of the QUIBB 2000-01 combined with IAF 1996-97 generated predicted poverty measures on the basis of the QUIBB indicators. This analysis pointed to reductions in poverty at the national level of around nine percentage points for the period 1996-97 to 2000-01 (Massingarela, Simler, and Harrower 2003).

Agricultural production is an important income source for most poor rural households, and data from the Famine Early Warning System (FEWS) point to growth in per capita cereal crop production of about 26% from 1996-2002. Also, agricultural household surveys (TIA) that collected income data were conducted in 1996 and 2002. In 1996, the survey focused heavily on income from crop sales while the 2002 survey was broadened to include off-farm income. The real value of *median* net income from crop production per capita increased between 1996 and 2002 by 27% using the food poverty lines developed in 1996-97 and 2002-03 as deflators.

In general, considerable work remains to fully exploit and understand the information obtained from the 2002-03 IAF survey. However, two central implications are clear. First, rates of poverty declined substantially in the period between 1996-97 and 2002-03. The goal set out in the PARPA of a poverty headcount rate of 60% by 2005 has, in all likelihood, already been achieved. Second, while progress in reducing poverty rates has been impressive, the levels remain high. More than half the population fails to attain even the very basic standard of living represented by the poverty lines.

With these levels of poverty, improvements in the standards of living of the poor will remain a central policy objective for the foreseeable future. To date, the strategies and policies reflected in the PARPA have been associated with poverty reduction. The task of using the IAF 2002-03 to achieve continued poverty reductions through policies reflecting improved understanding of the links between policy choices, economic growth, and poverty reduction moves more than ever to center stage.

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1. Introduction

In 1996-97, the National Institute of Statistics conducted the first nationally representative household consumption survey in Mozambique. Analysis of the survey indicated a poverty headcount of 69.4 percent at the national level with poverty higher in rural than urban areas. In 2002-03, a second nationally representative household survey (IAF) was undertaken.

This report has very focused objectives. It seeks to present the methodology and results of the poverty analysis of the 2002-03 IAF including comparisons with the 1996-97 survey results. As such, this report and a similar report from the National Institute of Statistics represent the beginning of the exploitation of the 2002-03 IAF. The new IAF presents a very rich database with multiple potential uses. In order to extract the full value from the survey, information from the IAF should pass into the public domain as quickly as possible.

The report is structured as follows. Section 2 describes the methods employed to measure poverty in 2002-03 and discusses issues of comparability with the 1996-97 IAF. Section 3 presents estimates of poverty levels from the 2002–03 data including comparisons with the estimates from 1996-97. Section 4 compares the poverty levels estimated for 2002-03 and the evolution of poverty levels during the period 1996-97 and 2002-03 with data from other sources. Concluding remarks are provided in Section 5.

Two central implications are clear from the analysis. First, rates of poverty declined substantially in the period between 1996-97 and 2002-03. The goal set out in the Action Plan to Reduce Absolute Poverty (PARPA) of a poverty rate of 60% by 2005 has, in all likelihood, already been achieved. Second, while progress in reducing poverty rates has been impressive, the levels remain high. More than half the population fails to attain even the very basic standard of living represented by the poverty lines. With these levels of poverty, improvements in the standards of living of the poor will remain a central policy objective for the foreseeable future.

2. Methodology

This section describes the approach taken for the analysis of poverty using the 2002-03 IAF. It begins with a brief description of the IAF 2002-03 survey and then proceeds to detail the steps taken to measure poverty outcomes. Comparisons and contrasts with the methods employed for measuring poverty in 1996-97 are provided as well. Before proceeding to the details of the analysis, a word on the philosophical approach that guided the analysis may be worthwhile.

Two primary objectives guided the design, implementation, and analysis of the 2002-03 IAF. The first objective was to provide the best possible picture of poverty and well-

being in the year 2002-03. The second objective was to provide a sound basis for comparison with the 1996-97 IAF survey. The approach and methods employed for analysis of the two surveys have been quite similar in order to satisfy the second objective. However, devotion to the second objective has not been absolute, particularly if it would compromise the first objective.

An example helps to illustrate the point. The IAF 1996-97 was conducted prior to the 1997 census. Therefore, the sample for 1996-97 was drawn from a different (and less reliable) sampling frame. The ability to use the 1997 census as a frame for drawing the sample 2002-03 represented a substantial improvement for overall data quality; however, it also poses some issues for data comparability. A salient difference between the two frames lies in the definition of rural and urban. In 1996-97, about 80% of the population was characterized as rural. Due primarily to a shift in definition, only about 70% of the population was characterized as rural in 2002-03. Consistent with the first objective, the results presented in this report are based upon the current census-based definition of rural and urban.[1]

2.1 The 2002-03 IAF Survey

The 2002-03 household survey contains detailed information on expenditure (among other items) for a random sample of 8700 households in Mozambique. Full documentation of all aspects of the implementation of both the 1996-97 and 2002-03 IAF surveys is available from the National Institute of Statistics (INE 1998, 2004). Here, we provide a brief summary of the basic features of the 2002-03 survey, which was quite similar in structure to the 1996-97 IAF.

The sample of 8700 households represents the nation, rural and urban zones, and each province plus Maputo City. The interview period for each household lasted for one week. During this time, three household visits were programmed in order to administer questionnaires on general characteristics of the household, daily expenses and home consumption, possession of durable goods, gifts and transfers received, and other expenses that tend to occur with lower frequency than daily expenditures, such as school fees or purchases of clothing. While the programmed number of interviews with each household was three, in many cases enumerators visited their assigned households every day in order to fill out the daily expense and home consumption questionnaire.[2]

A key feature of the 2002-03 IAF was an explicit attempt to be representative in time as well as space. Data collection took place over the space of a year with data collection beginning in July 2002 and finishing in June 2003. This one-year period was divided into quarters. For each sub-group of the population that the survey was designed to represent, one quarter of households were interviewed in each period. This is a more expensive

[1] The entire analysis was also done using the old definition of rural and urban. Results differ slightly but are qualitatively very similar.

[2] A verification survey of 78 households was undertaken. Of these, the large majority indicated that they had been interviewed three or more times. Three households indicated that they had only been interviewed once.

method of collecting data since it involves more travel time and expenses within each province. However, the advantages in the Mozambican context are compelling. Prices for agricultural products, which represent the bulk of expenditures for poor households, often vary from simple in the post-harvest period to double or triple in the pre-harvest period. These price variations could have substantial implications for the poverty status of households.[3] This attempt to capture the effects of seasonal price variability likely represents an improvement of methodology compared with the 1996-97 IAF. In particular, in the 1996–97 IAF, interviews of urban households tended to be concentrated in the months from January through June.

Data entry occurred throughout the period of the survey. Data cleaning was performed intensively in two phases. The first occurred in March and April 2003 using data from the first six months of the survey and the second in September and October of 2003 using the full data set. While the process of data cleaning never ends and some errors doubtless persist, the available indicators point to a relatively high level of information quality. We turn now to describing the approach for measuring welfare and poverty employed in this study.

2.2 Constructing a Measure of Household and Individual Welfare

As in the first national poverty assessment (MPF/UEM/IFPRI 1998), the present analysis uses a comprehensive measure of consumption, drawing from several modules of the household survey. This is done not only for purposes of consistency with the previous survey, but also because it is widely considered to be the best practice in poverty analysis.

One could use income or consumption to measure welfare, and both measures should, in most practical contexts, produce fairly similar results for many issues. Consumption, which is based on household expenditures and consumption of home-produced goods, is preferred to income for several reasons. First, it has a direct link to welfare theory in economics, which defines welfare over consumption rather than income. Second, consumption typically fluctuates less than income. Individuals rely on savings, credit, and transfers to smooth the effects of fluctuations in income on their consumption, and therefore consumption provides a more accurate and more stable measure of an individual's welfare over time. This consideration is likely to be even more important for a survey like the IAF, which obtains measures of income and consumption for a given household at only one point in time. Third, it is generally believed that survey respondents are more willing to reveal their consumption behavior than they are willing to reveal their income. Fourth, in developing countries a relatively large proportion of the labor force is engaged in self-employed activities and measuring income for these individuals is particularly difficult. For example, one important form of self-employment is working on the household farm, and measuring total net income from farming is both difficult and subject to considerable measurement error. In addition, an annual reference

[3] The data permit explicit analysis of the implications of seasonal price variability for poverty. Examination of this phenomenon is planned.

period is needed for adequate estimates of agricultural incomes, which either requires multiple visits to households or longer recall periods, with potentially larger errors. Similarly, many individuals are engaged in multiple income-generating activities in a given year, and the process of recalling and aggregating income from different sources is also difficult.

The approach used to calculate consumption follows closely the one described by Deaton and Zaidi (1999) and Deaton and Grosh (2000), drawing from several modules of the IAF. It measures the total value of consumption of food and nonfood items (including purchases, home-produced items, and gifts received), as well as imputed use values for owner-occupied housing and household durable goods. The only two significant omissions from the consumption measure are consumption of commodities supplied by the public sector free of charge (or the subsidized element in such commodities) and consumption of home produced services. For example, an all-weather road, or a public market, or a public water tap, presumably enhances the well-being of the people who use those facilities. Similarly, home produced services, such as cooking and cleaning, also add to welfare. However, the IAF data do not permit quantification of those benefits, and they are therefore not included in the consumption measure.[4]

As noted in the preceding section, food prices tend to follow a seasonal pattern, which implies that the purchasing power of a given amount of money varies during the year. For example, to acquire the same amount of food, a given household might have to spend twice as much in January as it spends in June. If the household consumed the same amount in real (quantity) terms in those months, it would appear to have a higher standard of living in January in nominal monetary terms. To avoid this kind of inconsistency, a temporal food price index was developed for the survey period, and all nominal values of food consumption were adjusted by the index to take into account these price fluctuations.

2.3 Cost of Basic Needs Approach

There exist a number of different approaches to the determination of poverty rates and other poverty measures. In this study—as in Mozambique's first national poverty assessment (MPF/UEM/IFPRI 1998)—we follow the cost of basic needs (CBN)[5] methodology to construct region-specific poverty lines (Ravallion 1994, 1998).[6] In the CBN approach, the total poverty line is constructed as the sum of a food and a nonfood poverty line. Once the poverty line has been constructed, households that spend less on a per capita basis than the poverty line are deemed poor. Like any poverty lines, the food

[4] This, however, is not unique to the Mozambique survey. It is rarely possible to integrate the consumption of public goods into an aggregate measure of consumption. Home produced/consumed services are also rarely tracked; these also happen to be excluded from national accounts calculations.

[5] The CBN approach should not be confused with a similarly named approach, Necessidades Básicas Insatisfeitas, which has been used at times in Latin America.

[6] Ravallion (1994, 1998) and Ravallion and Bidani (1994), among others, have shown that the cost of basic needs approach does not suffer from the problem of inconsistent poverty comparisons that often arise when the food energy intake method is used to set poverty lines. Using the 1996–97 IAF data, Tarp et al. (2002) have shown that the food energy intake approach yields inconsistent poverty lines and estimates for Mozambique.

and nonfood poverty lines embody value judgments on basic food and nonfood needs. They are set in terms of a level of per capita consumption expenditure that is deemed consistent with meeting these basic needs.

In regions where poverty is severe, such as Mozambique, measuring poverty based on the ability of the household to purchase a basket of goods consistent with meeting basic needs is very attractive. However, the approach, as applied to the 1996-97 and 2002-03 IAFs, has additional considerations beyond the omissions mentioned above, two of which warrant specific mention. First, ability to satisfy basic needs is a completely distinct concept from what is actually consumed by a given household. A household with the wherewithal to satisfy basic needs may allocate resources in a manner inconsistent with value judgments on basic needs. Nevertheless, that household would be considered non-poor. Second, no effort is made to consider intra-household allocation of resources. A household that is capable of meeting basic needs of all members may, in fact, be allocating resources within the household such that some members are impoverished. The approach employed here considers all members of a household non-poor if the household overall is able to satisfy basic needs. This decision is driven by (a) the focus on ability to meet needs rather than second-guessing consumers' decisions, and (b) the lack of detailed information in the IAF about the intra-household allocation of resources.[7]

These issues highlight the need for a variety of poverty indicators taken from a variety of perspectives. Nevertheless, consumption poverty remains a concept of strong interest, and an important component of any multi-dimensional conceptualization of poverty.

2.4 Identifying Regions for Defining Poverty Lines

Our primary interest is in examining absolute consumption poverty. Hence, we want to ensure that the poverty lines reflect the cost associated with the same standard of living, regardless of location or point in time. Prices of basic goods tend to vary across space and time, and the basic needs poverty lines need to take these price differences into account to permit consistent poverty comparisons. This is especially true when the *relative prices* of basic consumption items vary, as this will affect not only the cost of acquiring basic needs, but also the composition of the basic needs consumption bundle, as households adjust their consumption patterns in response to differences in relative prices.

Spatial differences in the relative prices of food items are significant in Mozambique, where markets are not always well integrated and transaction costs are high. In the 1996–97 poverty assessment, these spatial differences were accommodated by defining 13 region-specific poverty lines, with the consumption bundle in each region reflecting consumption patterns of the poor in that region, and the cost of the bundle calculated using the prices prevailing in that region.

[7] Lack of information on intra-household resource allocation is very common for this class of survey and is certainly not confined to IAF.

In 1996-97, these regions were defined by first separating urban and rural zones of each province, which yields 21 regions when Maputo City is treated as a separate entity. Some of the 21 regions had too few sample households to produce reliable estimates, so some regions were combined. Regions were grouped on the principles of (a) preserving the distinction between urban and rural areas, (b) grouping provinces that are relatively homogeneous in terms of prices, household composition, and consumption patterns, and (c) ensuring a minimum of about 150 households for each poverty line region. Complete details of the criteria for defining regions are given in MPF/UEM/IFPRI (1998) and Tarp et al. (2002). In the analysis of the 2002–03 IAF we use the same 13 poverty line regions. These regions are listed in Table 1.

2.5 Food Poverty Lines

For each poverty line region, the food poverty line is constructed by determining the food energy (caloric) intake requirements for the reference population (the poor), the caloric content of the typical diet of the poor in that region, and the average cost (at local prices) of a calorie when consuming that diet. The food poverty line—expressed in monetary cost per person per day—is the region-specific cost of meeting the minimum caloric requirements when consuming a food bundle comprised of goods that the poor in the region actually consume.[8]

2.5.1 Minimum Caloric Requirements

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.[9] Energy requirements vary depending on age, sex, physical activity levels, body weight, pregnancy status, and breastfeeding status. As the IAF 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).[10] 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

[8] The typical food bundle of the poor may, of course, contain more or less calories than the requirement for that region. This bundle is then proportionally scaled up or down until it yields exactly the pre-established caloric requirement, and the cost of this rescaled bundle at region-specific prices determines the food poverty line for that region.

[9] It is well understood and appreciated that food energy is only one facet of human nutrition, and that adequate consumption of other nutrients, such as protein, iron, vitamin A, and so forth, is also essential for a healthy and active life. However, like most multipurpose household surveys, the information on food consumption in the IAF data set is not sufficiently detailed to permit estimation of the intake and absorption of other nutrients. Use of energy requirements alone is also well established in the poverty measurement literature (Greer and Thorbecke 1986; Ravallion 1994, 1998; Deaton 1997).

[10] The same caloric requirements were used in 1996-97. The values actually used can also be found in MPF/UEM/IFPRI (1998).

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. As all of the sources contain information on some of the same basic food items, such as staple grains, and some of these sources have slightly conflicting values for the caloric content of specific items (because of differences in the food item itself, measurement differences, or other reasons), it was necessary to establish a preference ordering for the different sources. The sources used were, 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); and food composition tables from the University of California at Berkeley.[11] The same calorie conversion values were used for analyzing both the 1996–97 IAF and the 2002–03 IAF.

2.5.2 Reference Food Bundles

In analyses of consumption poverty, the composition of the cost of basic needs food bundle has often been held fixed across regions, with any variation in the food poverty lines attributable entirely to regional differences in the prices of the bundle components.[12] An analogous approach is typically used for updating a poverty line over time, i.e., assuming that consumption patterns remain constant, and updating the monetary value of the poverty line by using the same quantities as before, but valued at current prices.

The use of a fixed bundle is typically justified by the argument that it is the only way to be sure that the food poverty lines represent equal levels of welfare. However, if the relative prices of food vary regionally, the comparability of welfare levels across regions is only an illusion, and the use of a single consumption bundle for all regions can generate inconsistent poverty comparisons. Using the 1996–97 IAF data, Tarp et al. (2002) demonstrate that in Mozambique, large differences in relative prices across regions are associated with very different food consumption patterns among poor households, as households substitute toward the foods with lower prices in their own region. Use of a common bundle across all regions in general leads to poverty lines that are higher than they should be, which in turn leads to higher estimated poverty levels, and some re-ranking in poverty comparisons.

The same argument about the appropriate consumption bundle to use for comparisons between regions can be applied to comparisons over time. If the relative prices of items in

[11] For further discussion of the factors relevant to establishing a preference ordering of food table sources, see MPF/UEM/IFPRI (1998).

[12] The few exceptions to this practice that we are aware of include Lanjouw (1994); MPF/UEM/IFPRI (1998); Datt, Jolliffe, and Sharma (2001); Mukherjee and Benson (2003); Jolliffe, Datt, and Sharma (2003); and Gibson and Rozelle (2003). Ravallion (1998) also provides conceptual arguments in favor of region-specific basic needs food bundles.

the basic needs consumption bundle change over time, consumers will substitute away from the items that increase in price and towards less expensive items, thus changing the composition of the relevant basic needs consumption bundle. Indeed, during the period between the two IAF surveys, significant changes in relative prices of basic food commodities occurred, and the expected substitution in consumption took place. Below, we describe the steps taken to determine new food poverty lines for 2002–03. The fixed bundle approach is described first. Next, the approach used for developing flexible bundles, which take changes in relative prices since 1996-97 into consideration, is presented.

2.6 Fixed Food Bundles Through Time

The food poverty lines from 1996–97 were first updated by estimating what it would cost to acquire the food bundles defined for each of the 13 regions from the 1996–97 IAF at the prices observed during the 2002–03 IAF. The 1996–97 basic needs food bundles were defined in great detail, covering 151 food commodities consumed by the poor. It was not possible to obtain 2002–03 prices for all of these commodities, so the basic needs food bundles were simplified as follows. In each of the 13 regions, between 20 and 30 food items were identified that accounted for 95 percent of the value of food consumption in 1996-97. These bundles represented about 97.5% of the calorie requirement. The values of these region-specific food bundles were then scaled up to equal 100 percent of calorie requirements, taking into account the fact that the remaining food items tend to be more expensive per calorie. The prices used were the average value-weighted unit values (amount spent divided by quantity in grams) observed among relatively poor households in the 2002–03 IAF expenditure data.[13]

The resulting food poverty lines for the 13 regions are shown in the second column of Table 1. Under this approach, the food poverty lines are much higher than those calculated from the 1996–97 IAF data, which appear in the first column. In many regions the food poverty lines at 2002–03 prices are more than double the previous lines, which is well in excess of observed inflation (using the Maputo Beira Nampula price index) during this period.

Inspection of the expenditure data for 2002-03 revealed that at the new relative prices, the observed consumption behavior of the poor diverges significantly from the patterns observed in 1996-97. This is to be expected, given the changes in relative prices. The advantage of keeping the bundles fixed over time is that it helps assure that the standard of living associated with the poverty line is constant; that is, it represents absolute

[13] This weighted average price was calculated after imposing a 5 percent trim on the full sample. That is, household-level observations on the mean price per kilogram that were below the 5th percentile or above the 95th percentile were excluded from the calculation of the regional level mean price per kilogram. This restriction was necessary because of several extreme values of average price per kilogram observed at the household level. The extreme values are largely attributable to errors in recording the physical quantity of the food (whether in local or standard units), or the imperfect methods used to convert from nonstandard to standard units. This trim was only applied for the purpose of constructing the average price per kilogram and did not require exclusion of these households from other parts of the analysis.

poverty. However, when relative prices change significantly, the fixed bundle tends to overstate the cost of attaining that standard of living, as alternative bundles that yield the same utility are available at a lower cost. We look at this issue in more detail in the following section.

2.7 The Impact of the Substitution Effect on Poverty Estimation

Between 1996-1997 and 2002-2003, there were substantial relative price changes in all spatial domains. Because of these changes in relative prices, low-income households have incentives to change their consumption choices to take advantage of goods with relatively low prices and avoid goods with relatively high prices. This substitution effect is illustrated in Figure 1.

Figure 1 represents a simplification of economic reality, describing how consumer choices are made. Assume that the economy has only two goods: maize flour (C_1) and cassava flour (C_2). Line M_0 represents the limit of maize flour and cassava flour consumption combinations possible with the income available to consumers in 1996-97; that is, it is the budget constraint. Line M_1 represents the limit of maize flour and cassava flour combinations with the minimum income level in 2002-2003 that is consistent with constant utility levels.

The illustration represents a change in the relative price of cassava flour to maize flour. This relative price changed from $-P_{c2}^{96}/P_{cl}^{96}$ to $-P_{c2}^{02}/P_{cl}^{02}$. Since the maize flour price increased relative to the cassava flour price, poor consumers opt to reduce maize flour consumption and increase cassava flour consumption. In other words, the ideal basket for 2002 differs from the consumption basket for 1996.

With respect to poverty analysis, the crucial point is that poor consumers must spend M_2 in order to obtain the fixed basket of 1996. However, poor consumers only need to spend M_1 to maintain the same level of welfare. In short, the fixed bundle approach, by failing to capture the substitution effect across food items, tends to overestimate the food poverty line leading to overestimated poverty measures (ceteris paribus).

Figure 1 also illustrates that, if we knew the specific utility function that defined a minimum living standard, we could calculate the ideal bundle and hence the updated food poverty line using only updated price information and quantities consumed in 1996-97. Of course, we do not know this utility function. Nevertheless, some insight on the importance of relative price changes between 1996-97 and 2002-03 on poverty measures could be obtained by assuming a simple utility function and deriving the poverty lines and associated poverty measures. This analysis was performed assuming that preferences are Cobb-Douglas.

2.8 Flexible Food Bundles Through Time

A natural approach to addressing the problem with the constant, or fixed, food bundle in a setting of changing relative prices is to use the information in the current survey to update the quantities in the reference food bundle in addition to updating the prices. This

makes it possible to capture the changed consumption behavior of the poor as relative prices change.

As in the fixed bundle case, accounting for every food item that enters an average regional basket becomes a tedious process. Many food items enter the basket with a very small share in total cost. Further, because there are few observations for some items, reliable price information for these items is difficult to obtain. For the purposes of deriving the flexible baskets, the analysis concentrated on the food items comprising 90 percent of food expenditure. Consistent with observations from 1996-97, it was assumed that 90 percent of expenditure yields 95 percent of calorie needs. In other words, the cost per calorie for the final 5 percent of calorie needs is double the average cost per calorie for the preceding 95% of calories. All bundles were scaled to meet exactly 95 percent of calorie needs for each region. This procedure reduced the number of discrete items in the basket in each region by a factor of two or more, leading to approximately 20-30 goods in each regional basket. Information on the basket for each region is presented in the Annex.

The relevant food bundles and associated prices were estimated for relatively poor households using the iterative procedure described by Ravallion (1998). Households were ranked by nominal consumption per capita, with the bottom X percent identified as the relatively poor. The value for "X" may be considered as a preliminary estimate of the poverty headcount. Preliminary poverty line calculations were made, and the nominal consumption values converted to real terms (i.e., taking into account region-specific differences in the cost of acquiring the basic needs bundle). Households were then re-ranked using this first approximation of consumption per capita in real terms, and the bottom X percent of this ranking identified as the relatively poor. Observed consumption patterns and prices in this sub-sample were calculated, producing a second estimate of food poverty lines, by which the households were re-ranked again. The iterative process continues until it converges, meaning that the same, or nearly the same, sub-sample of households appears in the poorest X percent. We experimented with several starting values for X, and found that, for any reasonable value of X, the process tended to converge on 48 percent, with convergence occurring after only about five iterations.

The last column of Table 1 shows the food poverty lines that resulted from using this approach. Most of the region-specific food poverty lines lie between the 1996–97 lines and the lines derived using the fixed bundle approach, although five do not. In particular, the food poverty lines for Maputo Province, Maputo City, and Manica/Tete rural are high compared to the fixed bundle lines indicating that, in updating the composition of the bundle, a higher quality bundle was selected. In addition, the bundles derived from the iterative procedure in Nampula (rural and urban) and Sofala/Zambézia (rural and urban) are quite close to the 1996-97 line (below in the case of Sofala/Zambézia rural) and well below the fixed bundle estimate suggesting that the flexible bundle selected by the iterative procedure may be of lower quality than the 1996–97 bundle.

We thus confront the bundle quality issue that has caused many analysts to employ fixed bundles (both through space and through time) despite the well-known shortcomings of the fixed bundle approach. Recent literature applies some simple criteria, derived from

microeconomic theory, for evaluating the quality of alternative food baskets (Gibson and Rozelle 2003; Ravallion and Lokshin 2003). We turn now to these criteria.

2.8.1 Revealed Preferences

The notion of revealed preferences originated in microeconomic theory. The idea is to apply the restrictions on rational consumer behavior postulated in microeconomic theory without imposing any specific form for preferences on individual behavior. Revealed preference restrictions rely on the assumption that consumers prefer consuming more rather than less (non-satiation). From this relatively innocuous assumption, a series of implications follow. For the purposes here, these implications can be employed to investigate the quality of the flexible bundles.

Rather than continue to discuss the revealed preference concept generally, it is more straightforward to consider immediately the concept within the context of the poverty measurement problem at hand. Using the revealed preference approach, one can define three groups of conditions necessary for bundles to be of equivalent quality (e.g., to give the same level of utility) assuming a representative consumer who prefers more to less.

1. $\sum_i p02_{ir} * q96_{ir} \geq \sum_i p02_{ir} * q02_{ir}$
2. $\sum_i p96_{ir} * q02_{ir} \geq \sum_i p96_{ir} * q96_{ir}$
3. $\sum_i p02_{ir} * q02_{irq} \geq \sum_i p02_{ir} * q02_{ir}$

Where the subscripts represent sets: r- spatial domains; i- food commodities; and rq- another index for the same set of spatial domains and the variables represent: p- prices and q- quantities.

Note that the left hand side of the first condition is the fixed bundle food poverty line while the right hand side is the flexible bundle food poverty line. The first condition compares the cost of the fixed bundle at 2002-03 prices with the cost of the flexible bundle for 2002-03 also valued at 2002-03 prices. When both bundles are evaluated at 2002-03 prices, the cost of the fixed bundle must be greater than or equal to the cost of the flexible bundle.

The logic behind this restriction is as follows. For a given spatial domain r, consumers in 2002-03 had the opportunity to choose the fixed bundle previously chosen in 1996-97. However, they decided to consume a different bundle—the flexible bundle. If both bundles give the same level of welfare, the rational consumer who prefers more to less will always choose the cheaper one. Therefore, the cost of the flexible bundle must be less than or equal to the fixed bundle if consumers prefer more to less. Now, assume the contrary: the cost of the flexible bundle is higher than the fixed bundle (both evaluated at 2002-03 prices) A rational consumer would only choose a more expensive flexible bundle if the quality of the flexible bundle is superior. In this case, the flexible bundle is "revealed preferred" to the original fixed bundle and the original hypothesis of equivalent welfare levels has been rejected.

The second condition is very similar to the first. The difference is that the second condition evaluates the two bundles at prices prevailing in 1996-97. By the same logic employed in the preceding paragraph, the cost of the flexible bundle of 2002-03 at prices for 1996-97 must be higher than the cost of the fixed bundle from 1996-97 also evaluated 1996-97 prices. Again, consumers who prefer more to less will choose the least expensive bundle that supplies a given level of well-being. In 1996-97, consumers chose what we are now calling the fixed bundle. Other bundles giving the same level of welfare must be at least as expensive as the chosen bundle. Failure of this condition implies that the fixed bundle is revealed preferred to the flexible bundle.

The first two conditions evaluate revealed preference conditions for a given spatial domain through time. The third condition evaluates the 2002-03 bundles across space. In particular, it compares the cost of the chosen bundle for a given spatial domain r (the right hand side of (3)) with the cost of a bundle from another spatial domain rq (the left hand side) both evaluated at prices prevailing in spatial domain r. For example, we can compare the cost of the bundle for rural Nampula in 2002-03 to the cost of the bundle for rural Sofala and Zambézia both evaluated at prices prevailing in rural Nampula. To satisfy the third condition of revealed preferences, the cost of the rural Sofala and Zambézia bundle, evaluated at prices for rural Nampula, must be greater than or equal to the cost of the bundle of rural Nampula. The same logic applies as in the temporal case. The residents of rural Nampula had the opportunity to purchase the rural Sofala and Zambézia bundle; however, they chose the rural Nampula bundle. If the bundles represent the same level of welfare, then the chosen bundle should be least cost.

The original flexible bundles derived using the iterative procedure described in the preceding section do not meet all of the revealed preferences conditions cited above. For example, Table 1 indicates that Maputo City and Province plus Manica/Tete rural violate condition (1) since the cost of the flexible food bundle exceeds the cost of the fixed bundle when evaluated at 2002-03 prices. The failure of condition (1) indicates that the new flexible bundles in these spatial domains are of higher quality than the bundles brought forward from 1996-97. Condition (2) [not shown] is respected for most spatial domains.

Table 2 shows the results of condition (3) which compares contemporaneous but spatially distinct bundles. The spatial domains are numbered from 1 to 13, for both rows and columns. Rows refer to quantities while columns refer to prices. The diagonal elements indicate the original flexible basket food poverty lines (quantities for spatial domain r multiplied by prices for spatial domain r). Off-diagonal elements represent different price-quantity combinations.

For example, the first row of Table 2 indicates the cost of the food bundle from region 1 (Niassa and Cabo Delgado rural) evaluated at the prices for the goods in the bundle prevailing in all other regions.[14] So, the value in the first row and last column represents

[14]As indicated earlier, food baskets across the 13 spatial domains vary widely. Occasionally, items from the food basket in region i are not consumed or are rarely consumed in region j. In this case, the price vector for region j associated with the quantity vector from region i will either lack elements or have elements

the cost of the Niassa and Cabo Delgado rural bundle evaluated at prices prevailing in Maputo City. Note that the Maputo City bundle (row 13 and column 13) costs more than the Niassa and Cabo Delgado rural bundle evaluated at Maputo prices. This represents a failure of the revealed preference condition for Maputo City. Residents of Maputo City could have purchased the Niassa and Cabo Delgado rural bundle but instead elected to purchase a more expensive bundle. More generally, in order to satisfy revealed preference conditions across space, the diagonal element in each column should be less than or equal to the elements in all other rows of the column.

2.8.2 Adjusted Bundles that Satisfy Revealed Preferences.

The failure of some revealed preference conditions indicates that no rational representative consumer, who prefers to consume more to less, exists who would choose the food bundles derived using the cost of basic needs approach with region-specific bundles given the contemporaneous price vectors.[15] This is problematic as we would like for the selected food bundles to satisfy some basic conditions of quality consistency, and the revealed preference conditions are very attractive for this purpose.

To resolve this problem, we make recourse to information theory. Information theoretic approaches have been used in a variety of disciplines in order to develop a coherent picture when information is incomplete, contains error ("fuzzy"), or is even contradictory (Golan, Judge, and Miller 1996). In the present case, we wish to obtain bundles that satisfy the revealed preference conditions given above and provide the required number of calories. Bundles that satisfy these conditions meet our coherency requirements. In addition to meeting the coherency requirements, the selected bundles should also reflect, to as great an extent as possible, actual consumption patterns of the poor in each region.

To estimate coherent bundles, we treat the expenditure shares in the original flexible bundle as providing information on consumption patterns in the region. We would like to preserve the information inherent in these budget shares; however, we must alter the composition of the bundle in order to meet our revealed preference conditions. To do this, we minimize the following objective function.

$$\sum_{r} \sum_{i} S_{i,r}^{ent} \ln \left(\frac{S_{i,r}^{ent}}{S_{i,r}^{flex}} \right)$$

Where:

S_{ir}^{ent} Food shares of the adjusted flexible bundle.

S_{ir}^{flex} Food shares of the original flexible bundle.

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based on very few transactions. A minimum of five price observations were required to calculate the average price by region. If fewer than five price observations exist, the maximum price observed in any of the 13 regions was employed in order to complete the price vector.

[15] Differences in preferences across regions or changes in preferences through time could be the source of the failures; however, allowing for variation in preferences substantially weakens our already circumscribed ability to compare the living standards of two households.

i Index of goods in the consumption bundle.
r Index of spatial domains.

This objective function, called the minimum cross entropy criterion, was minimized subject to the three revealed preference conditions given above, calorie requirement constraints, and accounting conditions that derive values for the new shares, S_{ir}^{ent}, as the bundles are adjusted. The variables in the optimization problem are the quantities consumed of each good i.[16] In words, the optimization problem seeks to find, for each region, vectors of quantities that satisfy revealed preference conditions and meet calorie needs and that preserve, to the greatest degree possible, the information content in the original budget shares.

In the actual estimation, the spatial domains in Maputo (both City and Province) were excluded from the revealed preference conditions that compare bundles across space. This choice reflects the large differences in mode of living that exist in Maputo. These differences, and their implications for revealed preference calculations, are discussed in detail in a later section focusing exclusively on issues for poverty measurement in Maputo. This choice is also consistent with the analysis from 1996-97 preserving comparability between the two studies. Table 3 illustrates the spatial revealed preference conditions for the adjusted bundles for the remaining ten spatial domains. Details on the bundles for each estimated spatial domain are presented in the Annex.

2.9 Nonfood Poverty Lines

Whereas physiological needs provide the conceptual underpinning of the food poverty lines, no similar basis is readily available for defining nonfood needs. Yet, even very poor households in virtually all settings allocate a nontrivial proportion of their total consumption to nonfood items, such as shelter and clothing. Thus, a plausible way of assessing basic nonfood needs is to look at how much households who are barely in a position to meet their food needs spend on nonfood items.[17] This approach was used in the 1996-97 study and for the development of the flexible bundle poverty line for 2002-03. The fixed bundle poverty line for 2002-03 simply used the nonfood shares derived in 1996-97.

The nonfood poverty line was derived by examining the nonfood consumption among those households whose total expenditure is equal to the food poverty line (Ravallion 1994, 1998; Ravallion and Bidani 1994). The rationale is that if a household's total consumption is only sufficient to purchase the minimum amount of calories using a food bundle typical for the poor, any expenditure on nonfoods is either displacing food expenditure or forcing the household to buy a food bundle that is inferior to that normally consumed by the poor, or both. In either case, the nonfood consumption of such a

[16] If good i is not consumed in region r in the original bundle, then the quantity consumed in the adjusted bundle will also be zero.
[17] For details of an alternative approach that permits a more generous basic nonfood allowance, see Ravallion (1994) and MPF/UEM/IFPRI (1998).

household displaces "essential" food consumption. Hence, such nonfood consumption itself can be considered "essential" or "basic."

It is, of course, highly improbable that any particular household in the sample has a level of total consumption per capita that exactly equals the food poverty line. Even if such a household did exist, it would not be reasonable to base the nonfood poverty line solely on a single household's consumption pattern. Therefore, we instead examine households whose per capita total consumption is in the neighborhood of the food poverty line, with the neighborhood defined as 80 to 120 percent of the food poverty line. Using these households, the cost of the minimum nonfood bundle, z^N, is then estimated as the weighted average nonfood expenditure where observations closer to the food poverty line, z^F, are given a higher weight (Hardle 1990; MPF/UEM/IFPRI 1998; Datt, Jolliffe, and Sharma 2001). For example, households whose consumption is within 18 to 20 percent of the food poverty line are given a weight of one, households between 16 to 18 percent of the food poverty line receive a weight of two, and so forth, with the households within 2 percent of the food poverty line receiving a weight of 10. We calculate the weighted average nonfood consumption per capita in each of the 13 poverty line regions, weighting household-level observations by the product of these triangular weights, the household expansion factor, and household size. Table 4 presents the nonfood and food poverty lines, as well as the total poverty line, which is obtained as their sum.

3. Results

As in 1996-97, three measures were used to measure poverty. These are all members of the Foster-Greer-Thorbecke (1984) P_α class of poverty indexes that are routinely used to measure poverty. Mathematically, all the indexes of this class have the form:

$$P_\alpha = \frac{1}{n}\sum_{y \le z}\left(1 - \frac{y}{z}\right)^\alpha \quad , \quad \alpha \ge 0$$

where n is the population, y is consumption per capita, z is the poverty line, and α is a non-negative parameter. We use the measures with $\alpha = 0$, 1, and 2, which correspond to the poverty headcount, poverty gap, and squared poverty gap indexes, respectively.

i) *The poverty headcount* index is the proportion of people whose consumption per capita is below the poverty line. This index may also be expressed mathematically as $P_0 = q/n$, where q is the number of poor people in a given region and n is the population of the region.

ii) *The poverty gap* index is the average percentage distance that measured consumption falls below the poverty line using all households in the sample where households living above the poverty line receive a value of zero. Mathematically, this is the same as the average difference between the consumption levels of the poor and the poverty line (expressed as a proportion of the poverty line), multiplied by the poverty headcount. Thus, the poverty gap index captures changes in poverty that the poverty headcount index does not detect, because the poverty gap index measures "How poor are the poor?" For

example, if all the poor remain below the poverty line and all the nonpoor remain above the poverty line, but the incomes of the poor all rise, most people would say that poverty has decreased. The poverty headcount will not change to reflect this improvement, but the poverty gap index will decrease, to show that the poor are not as poor as they were.

iii) *The squared poverty gap* index is the average of the square of the poverty gaps. It measures the severity of poverty, and takes into account inequalities among the poor. For example, if a transfer is made from a person only slightly below the poverty line to a person far below the poverty line, the squared poverty gap index will decrease because the living standards of the poorer among the poor have improved. In contrast, such a transfer would affect neither the headcount index nor the poverty gap index.

3.1 Fixed Bundle Results

Poverty headcounts using the fixed bundle approach are presented in Table 5. The national poverty headcount using this method is 63.2 percent. These results imply that about 11 million Mozambicans lived below the poverty line in 2002-03. Compared to 1996-97, the measured poverty headcount has declined by 6.2 percentage points. Relatively strong poverty reductions in rural areas (a decrease of 7.2 percentage points) account for most of the gain at the national level. In contrast, the poverty headcount in urban areas measured essentially no change (a decline of about 0.7 percentage points). The estimated poverty incidence, however, is still higher in rural areas than in urban areas. The rural incidence is about 64.1 percent, compared to 61.3 percent in urban areas.

At the provincial level, only Cabo Delgado and Maputo Province exhibited an increase in poverty. Compared to levels observed in 1996–97, relatively large reductions in poverty are estimated in Zambezia, Tete, Sofala, and Gaza, with results for Sofala being particularly strong both in terms of levels relative to other regions in 2002-03 and rates of change since 1996-97. A more detailed discussion of the results in Sofala, Cabo Delgado, and Maputo is presented in a later section.

The national poverty gap declines from 29.3% to 25.8%. As was observed with the headcount index, the reduction in the poverty gap index is more rapid in rural areas, dropping from 29.9 in 1996–97 to 25.6 in 2002–03, while the poverty gap in urban areas only declined from 26.7 to 26.2 over the same period. One may note that the fixed bundle approach shows that when measured by the poverty gap index, poverty levels are almost the same in rural and urban areas (seeTable 5). Point estimates for the poverty gap increase in Cabo Delgado and Nampula (in the North); Manica (in the Center) and Maputo Province and Inhambane (in the South).

In regional terms, the central region reveals larger improvements than those observed in the other regions, with its poverty incidence dropping to 59.2% from the 73.8% estimated for 1996-97. The reduction in the poverty gap index and the squared poverty gap index in the central region was on the order of 9.3 and 5.7 percentage points, respectively (Table 5 and Table 6).

3.2 Results Assuming Preferences Are Cobb-Douglas

In the methodology section, considerable attention was devoted to the issue of substitution across food items when relative prices change. As indicated earlier, the fixed bundle methodology implicitly assumes consumption of food products in fixed proportions regardless of relative prices (Leontief preferences). One way to consider the potential implications of the fixed bundle (or Leontief preferences) assumption for measured poverty outcomes is to assume an alternative preference structure that permits substitutability. For this purpose, Cobb-Douglas preferences are an attractive choice since the functional relationship is well known and easy to apply.

Under Cobb-Douglas preferences, consumers maintain constant budget shares rather than constant proportions of quantities. The elasticity of substitution between all commodity pairs is equal to one, which is considered to be neither a particularly high nor a particularly low level of substitutability. In reality, the Cobb-Douglas functional form probably overstates substitutability between some commodity pairs and understates it for others. Nevertheless, the assumption that consumers have Cobb-Douglas preferences provides a reasonably robust indicator of the potential importance of substitution effects.[18]

A calibrated Cobb-Douglas utility function is simple to obtain from the 1996-97 results for each of the 13 spatial domains. With these functions in hand, the food poverty line was obtained by minimizing the cost of achieving the same utility level as observed in 1996 under prices prevailing in 2002-03. The nonfood poverty line was then obtained using the methodology described in the previous section. The sum of the food and nonfood lines gives the total poverty line.

Under the assumption of Cobb-Douglas preferences, the measured poverty rate falls to 52.1% at the national level.[19] This represents a substantial decline from the 63.2% rate obtained using the fixed bundle approach. These results imply that accounting for price variation, and consumer response, as in the flexible bundle approach, could result in measured poverty rates substantially below the levels implied by the fixed bundle approach.

3.3 Flexible Bundle Results

Using the adjusted flexible bundle total poverty line presented in Table 4, the national poverty headcount for 2002-03 is about 54.1% (Table 7). Compared with 1996-97, this

[18] While the imposition of the assumption that preferences are Cobb-Douglas introduces bias to the extent that actual preferences diverge from the Cobb-Douglas assumption, recourse to a specific utility function has some advantages. In particular, the ability to maintain welfare at exactly the same level despite price changes is attractive.

[19] For reasons detailed in the following section, Maputo Province and Maputo City were excluded from the analysis with Cobb-Douglas preferences. The national poverty rate under Cobb-Douglas preferences was calculated using the fixed bundle results for Maputo Province and Maputo City.

estimate represents an impressive reduction of 15.3 percentage points in the share of people living in poverty.[20] The PARPA goal of a poverty headcount of 60% by 2005 has, with high confidence, already been attained. While the trends are favorable, poverty levels are still high. Of an estimated population of 18.3 million, nearly 10 million people still live in poverty. Detailed results for the poverty headcount and the poverty gap are presented in Table 7 while squared poverty gap results are presented in Table 8.

The poverty gap index also shows a reduction at the national level, from 29.3% in 1996-97 to 20.5% in 2002-03. This represents an improvement of about 8.8 percentage points. In other words, not only is a smaller share of the population below the poverty line, but the average consumption levels of those remaining below the poverty line has increased in real terms. More specifically, in 1996–97 the average poor household's consumption level was 58 percent of the poverty line; by 2002–03 this had increased to 62 percent of the poverty line.

In regional terms, poverty is still higher in rural areas than in urban areas, with the rural poverty headcount ratio estimated at 55.3%, against the 51.5% observed in urban areas. However, in relative terms, poverty reduction was more rapid in rural areas during the 1996-97 to 2002-03 period (decreasing by about 16 percentage points) than in urban areas (dropping by about 10.5 percentage points). The poverty gap results are similar; that is, there is a greater reduction in the rural areas (about 9 percentage points) than in the urban areas (about 7 percentage points). However, the level is still higher in rural areas.

In provincial terms, Sofala registered the most rapid poverty reduction. The poverty incidence rate in that province fell from 87.9% in 1996-97 to 36.1% in 2002-03, which represents a reduction of about 51.8 percentage points. Other provinces that registered reductions in the incidence of poverty during the period were Nampula (16.3 percentage points), Zambézia (23.5 percentage points), Tete (22.5 percentage points), Manica (19.0 percentage points), Inhambane (1.9 percentage points), and Gaza (4.5 percentage points). On the other hand, estimated poverty headcount ratios increased in Cabo Delgado, Maputo Province, and Maputo City, by 5.8, 3.7, and 5.8 percentage points, respectively.

The changes in the poverty gap and squared poverty gap (Table 8) indices closely parallel those observed for the poverty headcount index at the provincial level. That is, provinces with large reductions in the headcount also tended to have relatively large reductions in the poverty gap and squared poverty gap measures.

Finally, the fixed and flexible bundle approaches tend to tell similar qualitative stories with poverty rates estimated at lower levels in the flexible bundle case. For example, in both the fixed and flexible bundle approaches, rural areas tend to outperform urban areas, Sofala tends to perform very well and Inhambane and Cabo Delgado tend to perform poorly. Correlations between the differences columns of the results tables for the fixed

[20] Remember that in 1996-97 the poverty incidence rate at the national level was 69.4%, which means that about two thirds of the Mozambican population lived in absolute poverty.

bundle (Table 5) and the flexible bundle (Table 7) are 0.86 for the poverty headcount and 0.90 for the poverty gap.

3.4 Sensitivity of Results to Level of Poverty Line

A natural question, especially considering the uncertainty about the ideal values for the region-specific poverty lines, is: how robust are the results to the choice of the poverty line? Clearly, a higher poverty line will generally lead to higher poverty levels, and a lower poverty line will lead to lower poverty levels. But these changes will vary for different population sub-groups and for different survey years, so it is possible that poverty comparisons (for example, 1996–97 vs. 2002–03, or urban vs. rural) will change if the poverty lines are changed. As the precise location of the poverty line is inevitably arbitrary to some degree, it is important to know if alternative poverty lines would generate the same poverty rankings or different poverty rankings.

One way to analyze sensitivity of comparisons is to specify one or more alternative poverty lines, and do comparisons using those alternative lines. An example of this is the ultra-poverty line used in the first national poverty assessment (MPF/UEM/IFPRI 1998), which was set at 60 percent of the full poverty line. A more complete comparison is given by the welfare dominance approach, which examines the entire distribution of consumption, or at least the portion of the distribution within the range of values that might be considered "reasonable" for a poverty line.[21] This is usually accomplished by plotting the cumulative distributions of the welfare measure (consumption per capita) for different sub-groups or survey years. If the lines for two groups do not cross, then the poverty ranking for the two groups does not change over that range, and the poverty comparison is robust to the choice of poverty line. If the lines cross, then the ranking will change depending upon the placement of the poverty line.

To illustrate, Figure 2 shows the cumulative distribution of consumption per capita for 1996–97 and 2002–03. The horizontal axis measures consumption per capita (expressed as a proportion of the poverty line), and the vertical axis measures the proportion of the population. Each line represents real consumption, i.e., nominal consumption divided by the relevant poverty line. The 1996–97 distribution is drawn using the poverty lines reported in MPF/UEM/IFPRI (1998). Two lines are shown for 2002–03, one corresponding to the fixed bundle poverty lines and the other corresponding to the flexible bundle poverty lines (using the minimum cross-entropy approach). For every possible poverty line along the horizontal axis, the cumulative distribution functions (CDFs) show the corresponding poverty headcount on the vertical axis.[22]

From Figure 2 it may be seen that for almost any poverty line that could be chosen, poverty has decreased between 1996–97 and 2002–03. This reduction is much sharper

[21] For example, most people would probably agree that an absolute poverty line of 500 Meticais per person per day is absurdly low, and that 100,000 Meticais would be unreasonably high.

[22] Observe that if a vertical line is drawn at 100 percent of the poverty line (1 on the horizontal axis) it crosses the CDFs at the reported national headcount indexes: 0.69 (1996–97), 0.63 (2002–03 fixed bundle), and 0.54 (2002–03 flexible bundle).

when the flexible bundle method is used. To put it another way, real consumption levels have increased since 1996–97 for all income groups. Only at very low levels of consumption do the lines coincide. More specifically, the 2002–03 (fixed bundle) distribution and the 1996–97 distribution track each other when consumption is less than 10 percent of the reference poverty lines, which corresponds to the poorest 0.1 percent of the population. The 2002–03 flexible bundle line converges with the 1996–97 line at an even lower level of consumption. Clearly, the finding of a reduced national poverty headcount index is not sensitive to the particular level of the poverty line, and when the flexible bundle approach is used, the reduction in the poverty headcount is quite large, especially within the range of 50 to 150 percent of the reference poverty line.[23]

Figure 3 shows the robustness of a different comparison, that between poverty rates in urban and rural areas in 2002–03. For the poorest 40 percent of the population, the CDFs trace one another almost perfectly, meaning that real consumption per capita levels are the same for the poorest urban and rural households. Among relatively better-off households (including those at or above around 70 percent of the reference poverty line) urban households have higher levels of consumption and lower levels of poverty.

3.5 Special Cases: Sofala, Cabo Delgado, and Maputo

3.5.1 Sofala

According to the results, Sofala has transformed itself from the province with the highest poverty headcount in 1996-97 to the province with the lowest poverty headcount in 2002-03. Furthermore, the measured poverty headcount in 2002-03 in Sofala is the lowest by a considerable margin. Given this very large shift in the status of the province, results from Sofala merit particular attention.

The very rapid growth in consumption per capita in Sofala is not a result of any particular method: all of the methods considered show extremely large increases in per capita consumption in Sofala. With respect to poverty headcounts, Sofala registers rapid reductions in poverty using both the fixed and flexible bundle approaches. Other indicators from the IAF surveys also point in the same direction. For example, INE (2004) reports cumulative growth in mean per capita expenditure nearly double the rate reported for the *second fastest* growing province (Niassa) over the period 1996-97 to 2002-03.

To achieve such growth, consumption *levels* must have been very low in 1996-97 and/or very high in 2002-03. Again, the simplest statistics are perhaps the most illuminating. The following figures are reported by INE (2004). These figures reflect no attempt to account for differences in the cost of living in the various regions of Mozambique. In 2002-03, Sofala registered the highest level of average per capita spending outside of Maputo (province and city). However, the level of average per capita expenditure registered in Sofala in 2002-03 was not inordinately high. Average nominal per capita

[23] The change in the poverty headcount for any chosen poverty line can be measured by the vertical distance between the CDFs at the point on the horizontal axis corresponding to that poverty line.

expenditure in Maputo City was more than twice the level estimated for Sofala province. Average per capita nominal expenditure in neighboring Manica province was slightly more than 10% below the level registered in Sofala. In sum, the level of nominal per capita average expenditure registered in Sofala for 2002-03 is not particularly high considering that Sofala contains Beira, the second largest city in the country.

On the other hand, the level of per capita expenditure registered in Sofala in 1996-97 appears to be low. Average per capita expenditure in Sofala—in both nominal and real terms—was the lowest of *all provinces*. Average nominal per capita expenditure in neighboring Manica in 1996-97 was nearly 60% higher than the level registered in Sofala. In light of the clear tendency for urban populations to spend more in nominal terms and the relatively large urban population in Sofala (about 41% urban in Sofala versus about 29% nationwide using data from the 1997 census), the level of average per capita expenditure estimated for Sofala in 1996-97 is surprisingly low.

Are there reasons to believe that expenditure levels in 1996-97 might have been idiosyncratically low thus pushing poverty rates idiosyncratically high? Yes, there are at least three reasons. First, flooding occurred in Sofala Province in 1996 (and again in 1997). Figure 4 shows monthly rainfall in 1995-96 and 2001-02 compared with normal rainfall levels for Beira (Meteorological Service, 2003). Rainfall in Beira was substantially above average for two consecutive months, January and February, in 1996. Data collection for IAF 1996-97 began in February 1996, coinciding almost exactly with the onset of flooding. Areas affected by flooding in 1996 overlaid with villages included in the 1996-97 IAF are shown in Figure 5.

As the larger scale flooding of 2000-01 amply illustrated, the economic impact of flooding can be considerable, can extend in geographic scope well beyond the areas with actual flooding, and can endure for a year or more. On the consumption side, flooding can ruin stocks and constrain access to outside supplies through damage to transport networks. On the income side, if transport networks are affected, non-agricultural activities can quickly grind to a halt due to an inability to obtain crucial intermediate inputs and/or an inability to transport outputs to locations with demand.

If flooding was indeed disruptive, one might expect a spike in the price of basic food products. Figure 6 indicates that maize prices in Sofala did spike well above the national average in January, February and March 1996, coincident with the heavy levels of rainfall that occurred at that time. Nevertheless, by April 1996, the maize price series for Sofala essentially returns to normal closely tracking the national average.[24] The maize prices shown in the figure reflect prices in major markets such as Beira. Since Beira is linked to outside markets by rail, ocean, and road, it is perhaps not surprising that linkages to national prices were reestablished relatively quickly. However, for rural areas and less accessible urban areas, disruption from the flooding is likely to have lasted considerably longer.

[24] The national average in this case is the simple average of all available provincial monthly price estimates.

Second, as mentioned in the Methodology section, for urban areas, IAF 1996-97 did not necessarily make a particular effort to distribute household interviews evenly throughout each province over the year in order to capture the considerable seasonal variation in prices such as in the maize price series shown in Figure 6. Consequently, the results from 1996-97 could be affected by the time-period when interviews were carried out. For nearly all provinces, interviews for urban households tended to be particularly concentrated in time.

For Sofala, more than 70% of households defined as urban were interviewed in January and February 1997. As indicated in Figure 6, the peak seasonal price for maize almost always occurs in January or February. Crops grown on a seasonal calendar similar to maize would tend also to exhibit a similar seasonal price pattern. So, the large majority of urban interviews occurred during a time period when households face high prices for basic food commodities and any home-produced stocks are likely to be depleted. This would tend to drive up estimated rates of poverty in urban zones.

Finally, Sofala is widely considered to be one of the provinces worst affected by the civil war. Hostilities ceased in 1992—only about four years prior to the launching of the IAF 1996-97 survey. With such a short interval of time between the end of the civil war and the first IAF, the effects of the war could still quite easily have been depressing living standards well below levels that might have been attained in the absence of war as well as below living standard levels in provinces where the effects of the war were less severe.

In summary, poverty measures in Sofala appear to have been idiosyncratically high in 1996-97. The results for 2002-03 partly reflect recovery from temporary negative effects due to flooding, a better distribution of interviews throughout the year to avoid putting undue weight on the "hungry season," and a return to more normal levels of income and consumption as war recovery progresses. These factors explain some, but certainly not all, of the remarkable poverty reductions measured for Sofala. To achieve such an outcome, substantial and reasonably well distributed economic growth must also have underpinned the performance in Sofala. Identifying the sources and character of this growth represents an important topic for future research.

3.5.2 Cabo Delgado

As detailed in INE (2004), sampling problems have plagued Cabo Delgado for both IAF surveys. For example, in 2002-03, the standard error on the value of mean consumption, measured as a percentage of the mean value, exceeds the value estimated for most other provinces by a factor of three or four resulting in an almost absurdly wide confidence interval on the value of mean consumption for Cabo Delgado. This high standard error on consumption was driven primarily by a few enumeration areas containing households with consumption levels far above the average for the province and for the country as a whole. These relatively few households exert a strong impact on the estimated mean and an even stronger impact on the estimated standard deviation.

In contrast, for the purposes of poverty measurement, these relatively few wealthy households exert only a minor influence. Consequently, the sampling issues with respect

to poverty measurement in 2002-03 are quite likely considerably less important. However, other concerns about Cabo Delgado remain. In particular, revealed preference tests undertaken on the food bundles used to determine the food poverty line in 1996-97 (performed after the publication of the report for 1996-97) pointed to a low quality bundle for Cabo Delgado and hence a likely underestimate of the poverty rate.[25] Also, sampling issues in 1996-97 were of a more general character and hence were potentially more germane to the estimated poverty rate.

In sum, a greater than normal degree of uncertainty surrounds the estimated change in poverty rates for Cabo Delgado due primarily to uncertainty around the estimated poverty rate for 1996-97. However, there is little reason to expect that the estimated poverty rate for 2002-03 using the flexible bundle approach is substantially less reliable than the rates for other provinces.[26] This estimated poverty rates sits well above the national average. Unless the poverty rate in 1996-97 was strongly underestimated, the results indicate a relatively poor performance in poverty reduction in Cabo Delgado.

3.5.3 Maputo

From a pure poverty measurement perspective, Maputo province in general and Maputo City in particular present the greatest challenges. With the benefit of the IAF 2002-03 data, one observes a substantial transformation in the mode of living in Maputo City including modes of living for the poor. In particular, for the population living near the food poverty line in 2002-03, the share of the total budget that must be allocated to nonfood increased by about 10 percentage points from about 27.5% of the budget in 1996-97 to about 37.4% of the budget in 2002-03. In 1996-97, the share of the nonfood poverty line in the total poverty line in Maputo City differed little from the nonfood shares measured in other regions of the country. In contrast, in 2002-03, the nonfood share in Maputo City was the highest in the nation by a considerable margin with only the nonfood share for Urban Maputo Province (primarily Matola) coming close. This growth in nonfood expenditures reflects particularly rapid growth in expenditures on housing and transport. At the same time, as indicated in the Methodology section, even relatively poor consumers are electing to choose a higher quality food bundle with a higher cost per calorie compared with the bundle selected in 1996.

A key question is whether these changes in the mode of living of the poor are discretionary or forced. In the discretionary case, consumers could be viewed as opting to purchase better housing, more transport services, and a higher quality food basket. In this view, the poverty line is likely too high and poverty rates are overestimated. In the latter view, changing circumstances force the poor to spend more on items such as processed foods, housing, and transport in order to maintain the same standard of living. For

[25] In 1998, the time of the publication of the report, revealed preference tests had not, to our knowledge, been employed anywhere in the world for the measurement of poverty.

[26] The careful reader will note that, using the fixed bundle approach, Cabo Delgado registers a dramatic increase in poverty indicating, perhaps, dismal performance with a constant quality bundle. Unfortunately, Cabo Delgado registers the largest difference between measured poverty rates using the fixed bundle and Cobb-Douglas preferences approaches indicating that the impact of relative price changes on measured poverty rates were particularly profound for Cabo Delgado. Hence, the fixed bundle result for Cabo Delgado is a particularly poor indicator.

example, if a need for cash forces more members out of the home in order to work, low cost meals prepared at home might have to be sacrificed for higher cost meals, including preparation services, purchased outside of the home driving up the cost per calorie but not necessarily the standard of living. In this view, the cost of maintaining a roughly equivalent standard of living has increased. In short, in Maputo, the difficulties associated with defining a reasonably constant standard of living are profound and relate to both food and nonfood expenditure.

Adding to the difficulties, cash income is clearly more important in Maputo than in most other regions and opportunities to earn cash are more readily available. As a result, household members in Maputo City are more frequently confronted with decisions of whether to work inside or outside the home. The choice between working inside and outside the home is important since it has strong effects on the value of measured consumption without necessarily having strong effects on the standard of living. In particular, the method employed to measure consumption counts all expenditures made outside the home but ignores services produced and consumed at home, such as food preparation or clothes washing performed by a household member.[27]

For example, consider a family with three dependents and three adults. Two adults work outside the home while the third engages in domestic tasks within the home. Suppose that the third adult decides to take a job outside of the home. While this adds to income, the domestic tasks remain to be performed. Suppose, for the sake of simplicity, that the household uses all earnings by the third adult to pay for transportation expenses to get the third adult to work, more expensive foods that require less preparation time, and the occasional hiring of help to perform domestic chores. In this situation, average living standards within the household have probably changed rather little. However, in the approach employed under both IAF surveys, measured consumption has increased by the full salary of the third adult (since that salary is fully spent).

If the level of effort allocated to home produced/consumed services is relatively constant, then this methodological shortcoming is not particularly important. If not, then the measurement of poverty becomes more problematic. It should be highlighted that the direction of bias in measured poverty rates (if any) stemming from a dramatic shift in the amount of resources allocated to home consumed services is not clear in principle. While measured consumption will change, the measured poverty lines will also tend to change in the same direction leaving the impact on measured poverty unclear.

In the event, two estimates, the fixed bundle and the adjusted flexible bundle, for Maputo City are presented. These estimates differ solely with respect to the value for the nonfood poverty line. The fixed bundle uses the 1996-97 nonfood share while the flexible bundle uses the updated 2002-03 nonfood share. The value for the food poverty line is the

[27] This bias in consumption surveys is essentially the same as the bias in the national accounts, which exists in all countries. Home produced/consumed goods, such as agricultural products, are valued while home produced services, such as cooking and cleaning, are not.

same.[28] The headcounts between the two methods differ by about eight percentage points with the lower estimate, the fixed bundle, leading to a slight measured reduction in poverty and the upper, the flexible bundle, leading to a measured increase in poverty versus the estimates for 1996–97.

Correction of a small error in the 1996-97 calculation of poverty rates for Maputo City changes the qualitative story somewhat. The corrected estimate for poverty in Maputo City is about four percentage points higher than the published estimate (this published estimate is maintained in all Tables).[29] Comparing fixed and flexible bundle results with this revised estimate for 1996-97, measured poverty in Maputo City has either dropped appreciably (fixed bundle case) or remained essentially unchanged. Generally, the interval of uncertainty around the poverty headcount for Maputo is even wider than the range of these two estimates depending largely on one's view of whether the changes in food and nonfood consumption patterns are discretionary or forced.

More certainly, at least one idiosyncratic event has quite likely had a negative effect on living standards in Maputo.[30] Over the period January 2002 to June 2003 (a few months before the beginning of the IAF 2002-03 to the end of data collection), the value of the Rand appreciated by about 40% against the Metical. Since Maputo relies heavily on imports of South African food and nonfood products, this very significant move in the exchange rate has potentially substantial implications for the cost of meeting basic living standards. Indeed, indices of the Rand/Metical exchange rate and the Maputo Price Index given in Figure 7 point to rapid price increases over the same period. Had the exchange rate shift been less dramatic, measured poverty rates in Maputo would quite likely be somewhat lower in 2002–03.

4. Comparisons with Other Information Sources

This chapter compares IAF 2002–03 results with other data sources, namely: the 1997 Population and Housing Census, IAF96-97, QUIBB 2000–01, QUIBB 2002-03, TIA 2002, HIV prevalence data, data from INE's National Accounts and the Famine Early Warning System (FEWS) at MADER. The objective of this analysis is to assess the degree to which the preceding analysis of poverty is, or is not, consistent with these other sources of information. Moreover, careful consideration of these other information sources helps to provide a better understanding of the various factors underlying the estimates of poverty levels and changes.

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[28] Revealed preference constraint number one from the methodology section, which states that the cost of flexible food bundle must be less than or equal to the cost of the fixed bundle when valued at 2002-03 prices, is binding.

[29] Tea turned out to be an exceedingly inexpensive—and unreasonably large—source of calories in the basic needs bundles for urban Maputo (City and Province). Dropping tea and rescaling remaining items to meet calorie needs increased the cost of the food basket by a little more than five percent. This was the only error of any significance found in the 1996-97 poverty calculations.

[30] The implications of rural-urban migration on poverty rates in Maputo is another potentially interesting avenue for inquiry. The 2004 demographic and health survey will provide some information on population growth in Maputo and the role of migration in this growth.

4.1 Core Welfare Indicators Questionnaires (QUIBB) (2000–01 and 2002–03)

As has been seen in the preceding sections of this report, collection and analysis of data on household consumption levels is a long and complex process. In an effort to provide less costly and more timely information about changes in living standards, INE has conducted surveys of basic, or core, indicators of well-being. These surveys are known as the QUIBB (*Questionário de Indicadores Básicos de Bem-estar*) or CWIQ (Core Welfare Indicator Questionnaire). While the IAF 1996-97 contained many questions that later appeared in QUIBB surveys, the first formal QUIBB was carried out from October 2000 through May 2001, and the second was conducted as part of the IAF2002–03. Some of the key welfare indicators collected by the QUIBB survey are ownership of assets and quality of housing. Information is also collected on educational attainment and a set of "poverty predictors" that are correlated with poverty.

4.1.1 Asset Ownership

Many of the household assets included in the QUIBB survey were also included in the 1996–97 IAF. Assets play several roles in household and individual welfare. Arguably, their two most important roles are the direct benefits they provide to the household, and their role as a store of wealth, which can be drawn upon in times of crisis. As living conditions improve over time, households and individuals tend to accumulate assets. Asset ownership is an attractive indicator of welfare because it is much more straightforward than measuring consumption and adjusting for changes in the cost of living, least-cost food bundles, and other considerations.

Many of the assets included in the IAF and QUIBB surveys are owned by only a small percentage of households. For example, in each of the IAF and QUIBB surveys fewer than 10 percent of households reported owning an automobile, a motorcycle, a television, an electric fan, an air conditioner, or a refrigerator. Although ownership of such assets has become slightly more common since 1996–97, the increases are small, and tend to occur only among nonpoor households. For this reason, we choose to examine the trends in ownership of two of the most common assets, which are owned by some—but by no means all—poor households. In particular, we consider bicycles and radios.

Table 9 presents data showing, for each of the three surveys, the percentage of households that owned at least one functioning bicycle. At the national level, the percentage of households owning a bicycle doubled between the 1996–97 IAF and the 2000–01 QUIBB, and increased slightly more by the time of the 2002–03 IAF. Similar patterns are observed within rural and urban zones. At the provincial level, the patterns over time are more varied, in part because the smaller sample size at the provincial level produces less precise estimates. Even so, in each province the percentage of households owning a bicycle in 2002–03 is higher than it was in 1996–97. In addition, the largest increases in bicycle ownership occurred in those provinces where the poverty estimates presented in the previous section decreased the most: Zambézia, Sofala, Manica, and Niassa.

Table 10 shows similar data for radio ownership, including an additional column for the percentages recorded by the 1997 Census, which also collected this information. As expected, the percentages reported by the Census are close to those recorded in the 1996–97 IAF, which was completed only four months before the Census. Somewhat surprisingly, in most areas the ownership of radios appears to have been highest during 2000–01, before falling slightly in 2002–03. It should be noted, however, that in most cases radio ownership was higher in 2002–03 than it was in 1996–97. Most of this growth took place in rural areas, and especially in Nampula, Manica, and Sofala provinces. The percentage of households owning radios reportedly declined in Inhambane and Gaza provinces, and in Maputo City, areas where the estimated reduction in poverty was relatively low (or negative) during this period.

The relationship between bicycle and radio ownership and poverty levels can be investigated slightly more formally through correlation analysis. For this analysis, we focus on the differences between 1996-97 and 2002-03 measures for provincial (plus Maputo City), national, and rural/urban measures (14 observations in all). Across these results, the correlation between the change in the share of the population that owns at least one functioning bicycle between 1996-97 and 2002-03 and the change in the poverty headcount over the same period is -0.67 for bicycles. The analogous measure for radios is -0.59. These correlations indicate that regions with above average reductions in the share of the population living in poverty tended also to have above average increases in the share of households owning at least one functioning bicycle or radio.

4.1.2 Housing Characteristics

In addition to accumulating assets in the form of consumer durables, it is also frequently observed that households invest in better quality housing as their incomes rise. Like durable goods, improved housing serves both as a store of wealth, and as a means of directly improving living conditions (by making the home more comfortable to live in). Thus, it is expected that if poverty has been reduced, the housing quality of poorer households will have improved over this period.

Figure 8 compares data from four data sources on the quality of roofing materials. The data from the 1996-97 IAF, the 1997 Census, the 2000-01 QUIBB, and the QUIBB section of the 2002–03 IAF show a modest but consistent improvement in the quality of roofing materials. During this period the percentage of households with roofs made of improved materials such as zinc or lusalite increased from 14 to 23 percent, while there was a matching decrease (from 84 to 75 percent) in the percentage of households whose houses had thatched roofs.

Household sanitation facilities also improved during this period, as Figure 9 shows using the same four data sources. The percentage of households without any toilet or latrine dropped from 65 to 55 percent, while the percentage with a latrine increased from 32 to 41 percent. In the case of sanitation facilities, this represents not only an improvement for individual households, but also for their communities, as more widespread access to toilets and latrines has a positive effect on public health.

4.1.3 Education

As households move out of poverty, they usually do not limit their investments to better housing and more consumer durable goods. They also invest in their children, especially children's education. Moreover, as education has been identified as an important determinant of well-being, investing in children's education is an essential mechanism for sustaining poverty reduction over the longer term. Table 12 shows that for children between the ages of 7 and 17 (inclusive), there has been rapid growth in school enrollment since 1996–97. The percentage of children in this age group who had ever attended school increased from 61 percent to 80 percent, with particularly rapid growth in rural areas. Similarly, the percentage of children who were enrolled in school at the time of the surveys increased steadily, from less than one-half to slightly more than two-thirds. Again, the increase has been more rapid in rural areas. Although the "enrollment gap" between rural and urban areas has been narrowed considerably, it still exists and remains large.

4.1.4 Number of meals consumed during previous day

Often in times of hardship, especially during the pre-harvest hungry season, poor households cut back on the number of meals they consume. One of the poverty indicators included in the QUIBB surveys was a question about how many meals the household had the day before the interview. Table 11 shows that in 2002-03 rural and urban households had on average about the same number of meals per day. In terms of provinces, Sofala registered the highest number of meals per household per day, and is also the province with the lowest poverty incidence, while Cabo Delgado and Inhambane present a lower average number of meals per household per day and have the highest poverty incidences. At the provincial level there is a negative correlation (–0.71) between the average number of meals and the poverty headcount rate.

4.1.5 Estimates of poverty indexes from the QUIBB 2000–01

The QUIBB survey is designed to be a rapid, low-cost survey that does not collect comprehensive income or expenditure information. Nevertheless, it is possible to use the information on poverty indicators from the QUIBB survey to estimate, or predict, poverty levels. Massingarela, Simler, and Harrower (2003) used data from the 1996–97 IAF to econometrically estimate the relationship between consumption per capita and poverty indicators such as demographics, asset ownership, housing characteristics, educational levels, and geographic characteristics. Under the assumption that the relationship between the indicators and consumption remained stable between the IAF 1996–97 and the QUIBB 2000–01, it is possible to estimate consumption levels in 2000–01 based on changes in the poverty indicators.[31]

[31] This assumption can, and will, be tested using the data from the IAF 2002–03, which contains both the QUIBB poverty indicators and a comprehensive measure of real consumption.

Table 13 shows the poverty headcount estimates based on measured consumption from the 1996–97 and 2002–03 IAF surveys, and the poverty headcounts estimated from consumption levels that were predicted using the 2000–01 QUIBB. At the national level, and for the rural zone, the estimates from QUIBB 2000–01 are approximately midway between those from the two IAF surveys. This would be consistent with a steady reduction in poverty between the two IAF surveys. For urban areas, the poverty estimate for 2000–01 is almost exactly equal to that estimated for 2002–03. The same pattern of steadily declining poverty (at least for the years of the surveys) appears in several of the provinces, but not all of them. It should be noted that the method used for estimating poverty from the QUIBB surveys is not very precise at the provincial level, which contributes to the unevenness of the provincial results. Also, because there tends to be higher inter-annual variability at greater levels of disaggregation, the provincial estimates would be expected to exhibit less of a clear trend over time than the national estimates.

4.2 National Accounts

Published information on the evolution of macro-aggregates certainly allow for the possibility of rapid reductions in poverty. Real GDP per capita grew by a cumulative 62% between 1996 and 2002. Real consumption per capita registered a slightly lower but still impressive cumulative growth of 50% over the same period. In light of the highly circumscribed possibilities for income redistribution, growth is a critical necessary condition for poverty reduction. And, the official data indicate that at least this necessary condition has been satisfied. Nevertheless, for poverty reduction, growth alone is not sufficient. The character of growth is also important. Concentration of the benefits of growth in the top income/classes would obviously reduce the impact of growth on poverty. While the evolution of the income distribution remains a topic for future research, results from the IAF provide a global level confirmation of rapid growth in consumption and indicate that a considerable share of the benefits of the growth accrued to lower income elements of the population.

4.3 HIV Prevalence and Poverty

The scope of the AIDS pandemic has led to concerns about implications for growth and development prospects generally. The estimated poverty reductions presented in this report are not immediately consistent with concerns about negative implications of the pandemic for growth prospects (Arndt 2003). For example, the best performing province in terms of poverty reduction as well as absolute levels of poverty, Sofala, was also estimated to have in 2002 the highest HIV prevalence rate of any province (Republic of Mozambique 2003).

There are a number of reasons why HIV prevalence figures and poverty measurements might give apparently contradictory signals. In the Mozambican context, the maturity of the pandemic provides the most likely explanation. While economists do not agree on the exact level of economic impact imposed by HIV/AIDS, there is fairly wide agreement that the time dimension is crucial. AIDS deaths and AIDS effects cumulate with time generating gradually increasing burdens and gradually reduced rates of growth. In a study

examining growth prospects for Mozambique, Arndt (2003) estimated average reductions in per capita annual growth rates of between 0.3 to 1.0 percent due to AIDS over the period 1997-2010. However, the implications are rather light during the first half of the period (up to 2003) and more profound in the latter half of the period (2003-2010). For most provinces, sufficient time has not passed for economic effects to be noticeable.

Even in the Central provinces where the available demographic estimates indicate that the pandemic is the most mature, the number of AIDS deaths was still projected to be increasing rapidly in the years prior to 2002-03 (and immediately following) with a relatively small number of accumulated deaths compared with the situation projected for 2010 (INE et al. 2002). Finally, given the paucity of historical information on HIV prevalence and numbers of AIDS deaths, estimates of the maturity of the pandemic are highly uncertain. If the actual pandemic were only slightly less mature than the projections indicate, then the economic impacts would be exceedingly mild over the time interval 1996-97 to 2002-03.

It is also worth mentioning that uncertainty on the maturity of the pandemic coexists with substantial uncertainty about economic impacts especially on a per capita basis. The range provided by Arndt (2003) is illustrative of this uncertainty; nevertheless many estimates fall outside of this range both on the low and high sides. However, very few estimates of the economic impacts of HIV/AIDS preclude positive economic growth. If, in the Mozambican context, AIDS deaths eventually reduce per capita growth rates from four percent to three percent per annum for a period of time, this imposes an enormous economic cost. Nevertheless, significant poverty reduction could still occur at a three percent annual per capita growth rate.

4.4 Agricultural Income and Production

4.4.1 National Agricultural Survey (TIA)

The Ministry of Agriculture and Rural Development (MADER) has conducted several agricultural household surveys (Trabalho de Inquérito Agrícola, or TIA). TIA surveys were carried out in 1996 and in 2002, at approximately the same time as the two IAF surveys, so these can provide a useful basis for comparison.

The TIA surveys are similar to the IAF in that they are conducted at the household level, but there are at least three important differences. First, the survey is intended to be representative of farming households, so the TIA sample focuses on rural areas. Second, the TIA does not collect comprehensive expenditure information, so it is necessary to use income for a monetary measure of welfare, even though for the conceptual and practical reasons mentioned earlier, expenditure is usually the preferred basis for poverty analysis in settings such as Mozambique. Third, in 1996, the TIA focused heavily on income from crops having only limited information on income from other sources. Thus, the TIA income measure is most useful as a measure of welfare for households or areas where agricultural income, and especially crop income, is a large share of total income. This happens to be true for a large segment of the Mozambican population.

At the time of this writing, data from the 2002 TIA are still being processed, and only limited information is available for comparison in this report. The key information available is indexes of real income from crop sales for 1996 and 2002, based on the median crop sales income at the provincial and national levels. The first column of Table 14 shows the index for 1996, which shows, for example, that real median crop income in Nampula was 63 percent higher than the national average, whereas in Zambézia it was only 75 percent of the national average.

How has this component of income increased or decreased from 1996 to 2002? To make comparisons between 1996 and 2002, the nominal crop sales income for 2002 has been deflated using the spatial cost of living indexes implied by the fixed and flexible bundle poverty lines. The crop sales indexes for 2002 are shown in columns 2 and 3 of Table 14. We observe that over this 6 year period, median crop incomes have only increased by 8 percent if the fixed bundle deflator is used. The increase is much larger, at 27 percent, when the conversion from nominal to real is made using the flexible bundle (which, for reasons described earlier in this report, is the preferred method). Growth in real median consumption measured by the IAF surveys for rural areas using the same deflator turns out to be about 28%.

When one compares the provincial-level changes in median income in Table 14 with the changes in poverty in Table 7, a number of similarities are evident. For example, the TIA shows relatively sharp increases in median crop income in Niassa, Zambézia, Tete, and Sofala, which are all provinces where the IAF indicates large reductions in poverty.[32] In Manica, the flexible bundle shows modest growth in median crop incomes, but rapid poverty reduction, so the qualitative story is the same, but the magnitudes are different. As for declines in living standards, the TIA shows median crop incomes falling in Cabo Delgado, where poverty has increased according to the IAF.

For the remaining four provinces, the TIA and the IAF surveys appear to point in opposite directions. In Nampula, the TIA shows a small reduction in median crop incomes, compared to the indication of strong poverty reduction in IAF. With respect to IAF, Nampula differed from the national trend in that poverty reductions were more rapid in urban rather than rural zones. With respect to TIA, the 1996 crop income index for Nampula is exceptionally high. This may be an over-estimate, or an idiosyncratically high year, either of which would serve to make income growth over the period look smaller. The contradictory results in the three southern provinces (Inhambane, Gaza, and Maputo) may arise because crop sales income represents a smaller share of total income, and therefore often deviates from expenditure and consumption levels, which are also influenced by other income sources such as wages, remittances, and earnings from non-agricultural enterprises.

4.4.2 Early Warning Department

As noted earlier, crop production is an important source of income (measured both as sales and production for home consumption) for a large proportion of Mozambican

[32] While the direction is similar in Sofala, the TIA does not indicate the same rapidity of growth.

households. It is expected that for real consumption (or income) to grow at the rates estimated by the IAF surveys, there must have been substantial growth in agricultural production. The Famine Early Warning System (FEWS, or *Aviso Prévio*) is the main source of crop production data in Mozambique. While crop production data is not a particularly good measure of welfare[33], it does provide useful information to supplement that found in other sources.

Figure 10 presents the annual total production of cereals (maize, sorghum, millet, and rice) from the 1994–95 season through the 2001–02 season. It shows a doubling of cereal production over this period, and a remarkably steady pattern of growth, with the exception of 1999–2000, when severe flooding wiped out thousands of hectares of crops.

Figure 11 presents cereal production figures somewhat differently, disaggregating by province and showing the growth rates in per capita cereal production between 1996 and 2002. As with the TIA data, there are some provinces where the results are consistent (i.e., changes in per capita crop production and poverty levels moving in opposite directions) and other provinces where they are not. As an example of the latter, crop production per capita increased in Cabo Delgado and Maputo Province, but poverty increased, and the converse occurred in Inhambane. As an example of the former, per capita crop production increased and poverty decreased in Niassa, Nampula, Zambézia, Tete, Manica, Sofala, and Gaza.

5. Conclusions and Looking Forward

This report has presented the methodology and results of the poverty analysis of the 2002-03 IAF including comparisons with the 1996-97 survey results. In addition, the report has sought to compare results from IAF 2002-03 with results from other available data sources.

Two central implications are clear from the analysis of the IAF data. First, rates of poverty declined substantially in the period between 1996-97 and 2002-03. The goal set out in the Action Plan to Reduce Absolute Poverty (PARPA) of a poverty rate of 60% by 2005 has, in all likelihood, already been achieved. Overall, the bulk of indicators from other sources (National Accounts, QUIBB, TIA, and FEWS) tell a similar qualitative story of growth and poverty reduction.

Second, while progress in reducing poverty rates has been impressive, the levels remain high. According to IAF 2002-03, more than half the population fails to attain even the very basic standard of living represented by the poverty lines. All other data sources are unequivocal on this point as well. To take just one example, data from the QUIBB indicate that nearly two million more people had access to a latrine in 2002-03 than the share from the 1997 census would indicate (see Figure 9)—a considerable achievement. Nevertheless, about 10 million people still lack access to basic sanitation. With these

[33] In particular, it takes no account of the prices received for crops sold, or of non-agricultural income sources.

levels of poverty, improvements in the standards of living of the poor will remain a central policy objective for the foreseeable future.

In sum, progress has been achieved, but the challenges ahead remain immense. The task of using the IAF 2002-03 to achieve continued poverty reductions through policies reflecting improved understanding of the links between policy choices, economic growth, and poverty reduction moves now to center stage.

Looking forward, to fully take advantage of IAF 2002-03, a sub-sample of the 8,700 households surveyed under IAF should be followed through time using essentially the same sets of questionnaires. This panel data set would provide annual indications of the evolution of poverty making estimates of poverty less subjective in the period between major surveys. In addition, since the same households would be interviewed again, insight could be gained into the probability that a poor household will climb out of poverty or that a non-poor household will become poor. The relative importance of households that are subjected to transitory poverty versus households that are mired in poverty has substantial implications for poverty reduction policies. Also, a panel has the potential to provide insight into how households cope with shocks such as drought or the death of an adult family member. Finally, capacity building objectives become more difficult to achieve with a five year interval between surveys. The critical task of building institutional memory and expertise in poverty measurement and poverty analysis requires the sustained effort implicit in the development of a panel.

6. Tables

Table 1: Food poverty lines using basic needs food bundles for 1996–97 and 2002–03.

	Spatial Domain	1996-97 Food Poverty Line (1996-97 Bundle at 1996-97 Prices)	2002-03 Fixed Bundle Food Poverty Line (1996-97 Bundle at 2002-03 Prices)	2002-03 Unadjusted Flexible Food Poverty Line (2002-03 Bundle at 2002-03 Prices)
1	Niassa and Cabo Delgado-rural	3011	6246	4756
2	Niassa and Cabo Delgado-urban	3687	7857	7717
3	Nampula-rural	2742	5277	2752
4	Nampula-urban	3642	8275	3749
5	Sofala and Zambezia-rural	3719	5175	3548
6	Sofala and Zambezia-urbana	5370	7483	5902
7	Manica and Tete-rural	3845	6838	6937
8	Manica and Tete-urbana	5548	11176	9656
9	Gaza and Inhambane-rural	4971	6858	5438
10	Gaza and Inhambane-urbana	5714	7461	6613
11	Maputo Province-rural	5418	11801	12584
12	Maputo Province-urban	6047	11898	13741
13	Maputo City	6192	12224	13211

Note: All figures in Meticais per person per day.

Table 2: Results of Revealed Preferences Tests for Original Flexible Bundle.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	**4756**	***6397***	3991	4472	4007	***5621***	***5508***	***6330***	5580	***6250***	***6536***	***8436***	***9984***
2	5903	**7717**	4501	5490	4922	6601	***6420***	***7599***	7090	7972	***8791***	***10409***	***10300***
3	***3500***	***4470***	**2752**	***3660***	***2907***	***4713***	***3041***	***2492***	***4703***	***3539***	***3499***	***4820***	***7099***
4	4879	***5853***	3542	**3749**	***3058***	***5232***	***4471***	***5956***	5816	***5429***	***5216***	***7833***	***7397***
5	4589	***6167***	3663	4399	**3548**	***5459***	***4768***	***5090***	***5041***	***5080***	***5691***	***7033***	***9124***
6	5730	***7402***	4216	5358	4446	**5902**	***6180***	***7006***	6331	6811	***8102***	***8177***	***9389***
7	6770	8770	4741	7210	5090	7741	**6937**	***9584***	9608	10260	***12430***	15311	***11361***
8	7737	9813	5646	7079	6058	8910	7863	**9657**	9087	10128	***12221***	***13032***	***11770***
9	4454	***5813***	3389	4014	3577	5601	***4587***	***4950***	**5438**	***5932***	***10243***	***8752***	***8969***
10	5090	***6728***	3943	5048	4303	6753	***5580***	***6419***	6458	**6613**	***9812***	***9279***	***9451***
11	7102	10317	5677	7657	6376	9478	7291	***9532***	9663	10422	**12584**	13772	13816
12	8158	10971	5860	8153	7482	11599	9158	11329	10938	11580	13881	**13741**	13700
13	7866	10626	5653	7837	7146	11458	8921	11179	10766	11433	13501	***13270***	**13211**

Notes: The shaded values show the food poverty line using the original flexible bundle. The bolded values indicate the regions where there were violations to the revealed preferences, while the "normal" values indicate the regions where revealed preferences are satisfied. All figures in Meticais per person per day.

Table 3: Post Adjustment Spatial Revealed Preference Tests for 2002-2003.

	1	2	3	4	5	6	7	8	9	10
1	**5434**	***7541***	***4471***	5146	4424	6679	6137	7573	***6614***	7808
2	5642	**7541**	***4471***	5290	4746	***6591***	6190	7355	6627	7707
3	5988	8912	**4471**	5762	4502	7804	***5628***	***7145***	7856	8297
4	7014	8900	5067	**4853**	***4155***	7312	6603	9937	7936	8359
5	5816	8340	4600	5486	**4155**	7162	5772	***7145***	***6614***	***7264***
6	6060	8209	***4471***	5836	4673	**6591**	6411	7564	6790	7666
7	6087	10244	***4471***	8629	4182	8286	**5628**	9806	11301	10810
8	6118	7541	4648	5786	4935	7003	6039	**7145**	7435	8010
9	5823	7553	***4471***	5380	4920	7954	5937	***7145***	**6614**	8936
10	5564	7541	***4471***	5605	4713	7468	5990	***7145***	6839	**7264**

Note: All figures in Meticais per person per day.

Table 4: Food and Nonfood Poverty Lines

		Food Poverty Line	Food Share	Non-Food Poverty Line	Total Poverty Line
1	Niassa and Cabo Delgado-rural	5434	0.77	1665	7099
2	Niassa and Cabo Delgado-urban	7540	0.74	2690	10231
3	Nampula-rural	4471	0.75	1501	5972
4	Nampula-urban	4853	0.73	1807	6661
5	Sofala and Zambezia-rural	4155	0.76	1318	5473
6	Sofala and Zambezia-urbana	6591	0.75	2183	8775
7	Manica and Tete-rural	5629	0.81	1304	6933
8	Manica and Tete-urbana	7145	0.74	2545	9690
9	Gaza and Inhambane-rural	6614	0.73	2394	9008
10	Gaza and Inhambane-urbana	7264	0.68	3457	10721
11	Maputo Province-rural	11801	0.70	4963	16764
12	Maputo Province-urban	11898	0.65	6398	18296
13	Maputo City	12224	0.63	7291	19515

Note: All figures in Meticais per person per day.

Table 5: Poverty Headcount and Gap Measures Using the Fixed Bundle Approach.

	Poverty Headcount			Poverty Gap		
	1996-97	2002-03	Difference	1996-97	2002-03	Difference
National	69.4	63.2	-6.2	29.3	25.8	-3.5
Urban	62.0	61.3	-0.7	26.7	26.2	-0.5
Rural	71.3	64.1	-7.2	29.9	25.6	-4.3
North	66.3	68.1	1.8	26.6	27.7	1.1
Center	73.8	59.2	-14.6	32.7	23.5	-9.2
South	65.8	63.6	-2.2	26.8	27.1	0.3
Niassa	70.6	61.2	-9.4	30.1	21.8	-8.3
Cabo Delgado	57.4	72.3	14.9	19.8	28.1	8.3
Nampula	68.9	68.1	-0.8	28.6	29.1	0.5
Zambezia	68.1	58.6	-9.5	26.0	21.1	-4.9
Tete	82.3	71.6	-10.7	39.0	34.2	-4.8
Manica	62.6	60.2	-2.4	24.2	26.3	2.1
Sofala	87.9	48.4	-39.5	49.2	16.6	-32.6
Inhambane	82.6	80.1	-2.5	38.6	41.3	2.7
Gaza	64.6	58.6	-6.0	23.0	19.7	-3.3
Maputo Province	65.6	66.9	1.3	27.8	28.9	1.1
Maputo City	47.8	45.5	-2.3	16.5	16.2	-0.3

Table 6: Squared Poverty Gap Index Using the Fixed Bundle.

	1996-97	2002-03	Difference
National	15.6	13.5	-2.1
Urban	14.6	14.0	-0.6
Rural	15.9	13.3	-2.6
North	13.9	14.2	0.3
Center	18.0	12.3	-5.7
South	13.9	14.7	0.8
Niassa	16.1	10.0	-6.1
Cabo Delgado	9.1	13.6	4.5
Nampula	15.3	15.6	0.3
Zambezia	12.3	10.1	-2.2
Tete	22.5	20.9	-1.6
Manica	11.7	15.0	3.3
Sofala	32.1	7.5	-24.6
Inhambane	21.4	25.3	3.9
Gaza	10.9	8.7	-2.2
Maputo Province	14.7	15.7	1.0
Maputo City	7.7	7.5	-0.2

Table 7: Poverty Headcount and Poverty Gap Index Using the Flexible Bundle Approach.

	Poverty Headcount			Poverty Gap		
	1996-97	2002-03	Difference	1996-97	2002-03	Difference
National	69.4	54.1	-15.3	29.3	20.5	-8.8
Urban	62.0	51.5	-10.5	26.7	19.7	-7.0
Rural	71.3	55.3	-16.0	29.9	20.9	-9.0
North	66.3	55.3	-11.0	26.6	19.5	-7.1
Center	73.8	45.5	-28.3	32.7	16.0	-16.7
South	65.8	66.5	0.7	26.8	29.1	2.3
Niassa	70.6	52.1	-18.5	30.1	15.8	-14.3
Cabo Delgado	57.4	63.2	5.8	19.8	21.6	1.8
Nampula	68.9	52.6	-16.3	28.6	19.5	-9.1
Zambezia	68.1	44.6	-23.5	26.0	14.0	-12.0
Tete	82.3	59.8	-22.5	39.0	26.3	-12.7
Manica	62.6	43.6	-19.0	24.2	16.8	-7.4
Sofala	87.9	36.1	-51.8	49.2	10.7	-38.5
Inhambane	82.6	80.7	-1.9	38.6	42.2	3.6
Gaza	64.6	60.1	-4.5	23.0	20.6	-2.4
Maputo Province	65.6	69.3	3.7	27.8	31.1	3.3
Maputo City	47.8	53.6	5.8	16.5	20.9	4.4

Table 8: Squared Poverty Gap Index Using the Flexible Bundle Approach

	1996-97	2002-03	Difference
National	15.6	10.3	-5.3
Urban	14.6	9.6	-5.0
Rural	15.9	10.7	-5.2
North	13.9	8.9	-5.0
Center	18.0	7.9	-10.1
South	13.9	16.0	2.1
Niassa	16.1	6.7	-9.4
Cabo Delgado	9.1	9.5	0.4
Nampula	15.3	9.3	-6.0
Zambezia	12.3	6.1	-6.2
Tete	22.5	15.3	-7.2
Manica	11.7	9.2	-2.5
Sofala	32.1	4.3	-27.8
Inhambane	21.4	26.0	4.6
Gaza	10.9	9.3	-1.6
Maputo Province	14.7	17.2	2.5
Maputo City	7.7	10.3	2.6

Table 9: Percentage of households owning a bicycle, 1996–2002

	IAF96	QUIBB00	IAF02
National	13.3	27.3	28.1
Rural	14.0	30.7	31.8
Urban	10.0	17.9	19.4
Niassa	24.1	47.0	56.9
Cabo Delgado	14.8	24.9	24.1
Nampula	10.9	23.3	26.7
Zambézia	13.9	46.8	38.7
Tete	20.3	37.1	27.9
Manica	18.3	25.9	38.5
Sofala	11.9	25.4	35.5
Inhambane	7.8	12.5	11.7
Gaza	14.4	15.3	16.7
Maputo Province	9.4	9.6	10.2
Maputo City	2.6	9.1	7.8

Table 10: Percentage of households owning a radio, 1996–2002

	IAF96	Census 1997	QUIBB00	IAF02
National	28.9	28.9	49.6	45.5
Rural	23.6	21.4	43.7	41.5
Urban	53.9	51.1	65.4	54.9
Niassa	27.3	22.6	39.2	43.0
Cabo Delgado	24.5	21.3	42.3	43.0
Nampula	16.5	20.8	49.4	48.3
Zambézia	22.5	20.9	48.9	39.4
Tete	29.4	26.3	41.2	45.1
Manica	35.1	34.3	53.7	63.6
Sofala	25.1	36.2	54.2	52.3
Inhambane	38.1	32.1	41.7	32.9
Gaza	42.7	37.3	43.6	34.1
Maputo Province	46.7	49.1	64.1	53.4
Maputo City	77.2	73.3	80.8	61.8

Table 11: Average number of meals consumed the previous day, 2002–03

	IAF 2002–03
National	2.33
Rural	2.28
Urban	2.42
Niassa	2.21
Cabo Delgado	2.04
Nampula	2.24
Zambézia	2.45
Tete	2.48
Manica	2.43
Sofala	2.60
Inhambane	2.07
Gaza	2.19
Maputo Province	2.35
Maputo City	2.45

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

Table 13: Comparison of poverty headcount estimates from IAF surveys and predictions from the 2000–01 QUIBB

	IAF 1996–97	QUIBB 2000–01	IAF 2002–03
National	69.4	60.7	54.1
Rural	71.3	64.5	55.3
Urban	62.1	51.6	51.5
Niassa	70.6	72.4	52.1
Cabo Delgado	57.4	50.7	63.2
Nampula	68.9	61.7	52.6
Zambézia	68.1	60.3	44.6
Tete	82.3	75.7	59.8
Manica	62.6	35.3	43.6
Sofala	87.9	81.5	36.1
Inhambane	82.6	69.3	80.7
Gaza	64.7	56.9	60.1
Maputo Province	65.6	49.4	69.3
Maputo City	47.8	41.0	53.6

Table 14: Indices of Income from Crop Sales

				Variação %	
Provincia	1996	Fix ´02	Flex ´02	Fix ´02	Flex ´02
Niassa	0.88	1.44	1.66	63	87
Cabo Delgado	1.26	0.97	1.12	-23	-12
Nampula	1.63	1.36	1.61	-17	-2
Zambezia	0.75	1.11	1.38	48	84
Tete	0.52	0.99	1.21	91	132
Manica	0.82	0.71	0.86	-14	5
Sofala	0.82	0.86	1.07	5	31
Inhambane	0.94	1.23	1.28	31	36
Gaza	0.82	0.61	0.63	-26	-23
Maputo	0.20	0.59	0.59	189	189
National	1.00	1.08	1.27	8	27

Source: Trabalho de Inquérito Agrícola (TIA), MADER, Adapted.

7. Figures

Figure 1: Impact of Changes in Relative Prices.

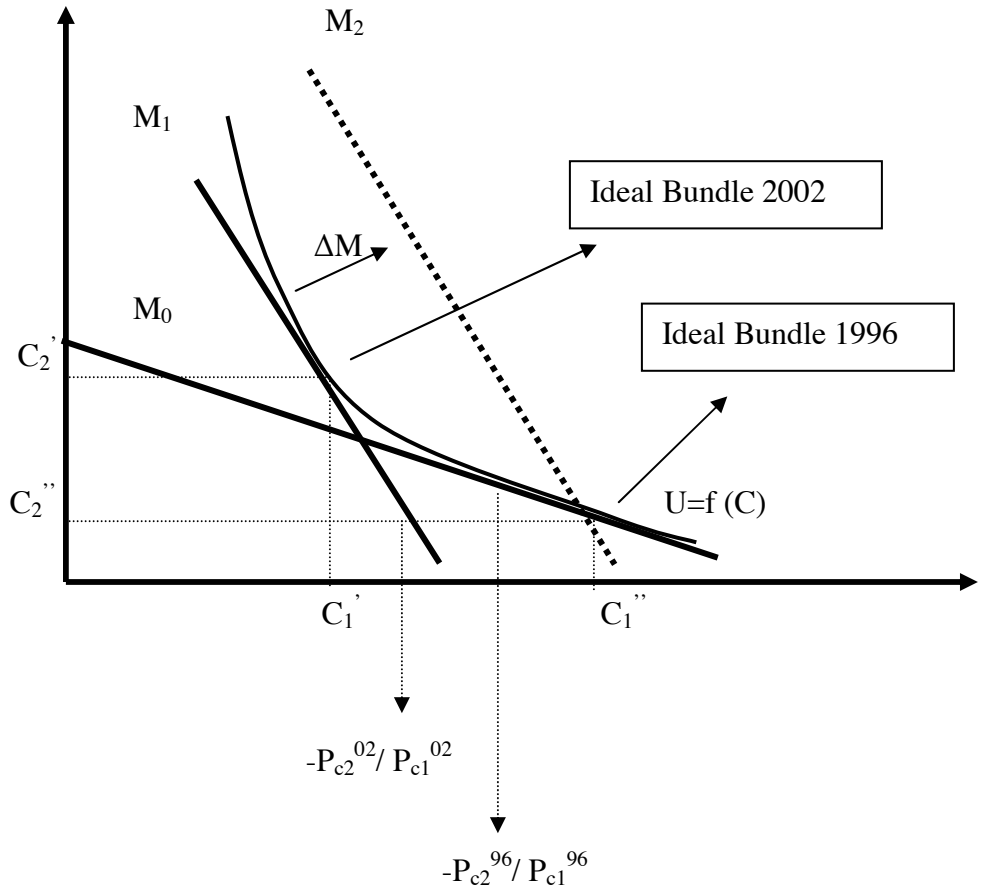


Figure 2: Distribution of consumption per capita, 1996–97 and 2002–03

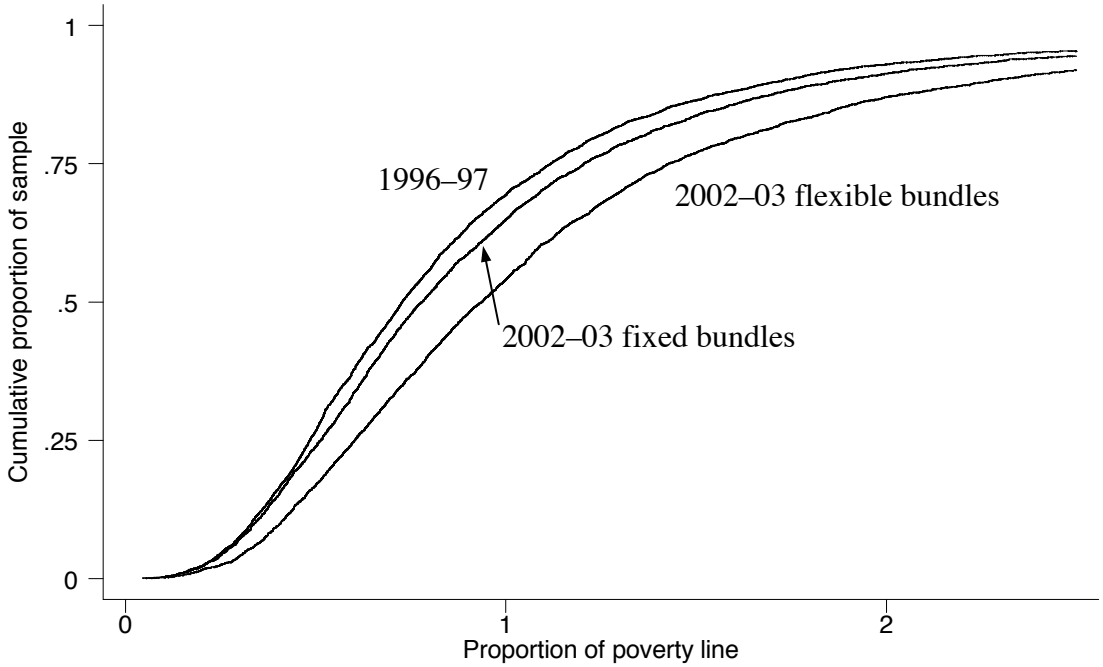


Figure 3: Distribution of consumption per capita by zone of residence, 2002–03

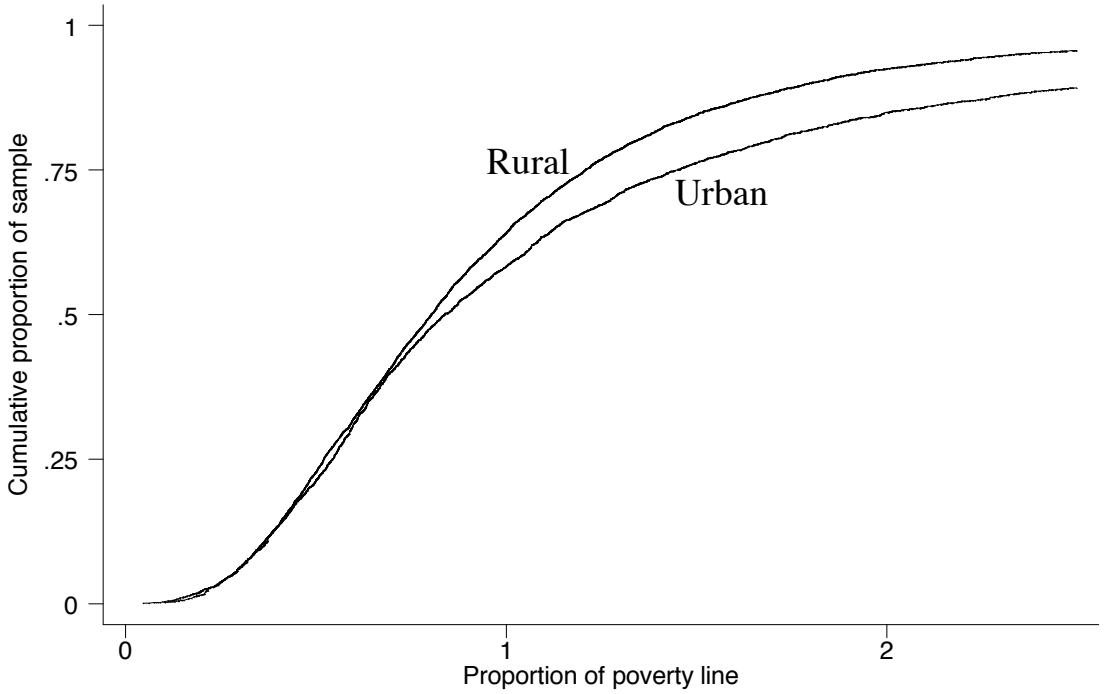


Figure 4: Precipitation in Beira.

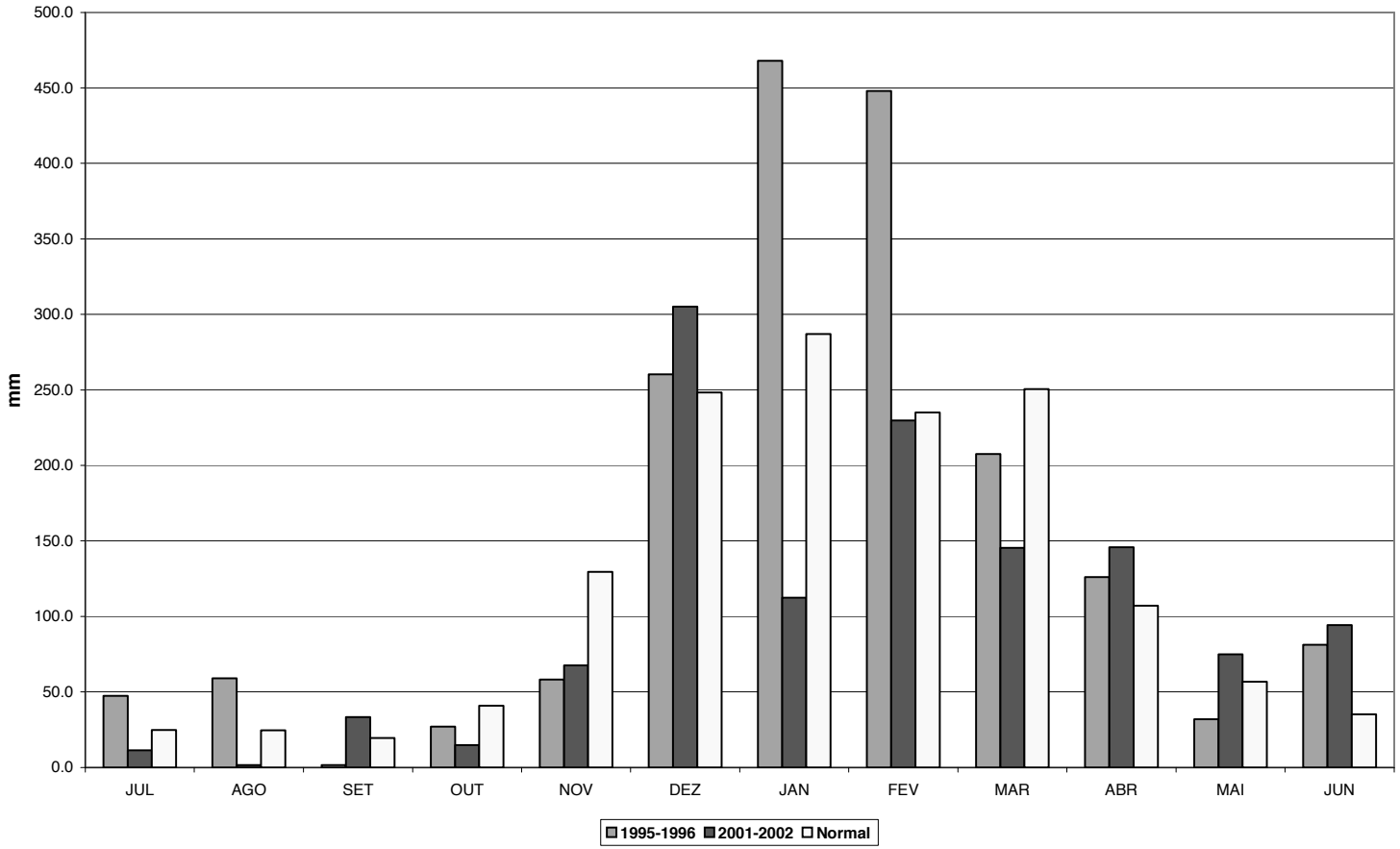


Figure 5: Regions Affected by Flooding in Sofala in 1996.

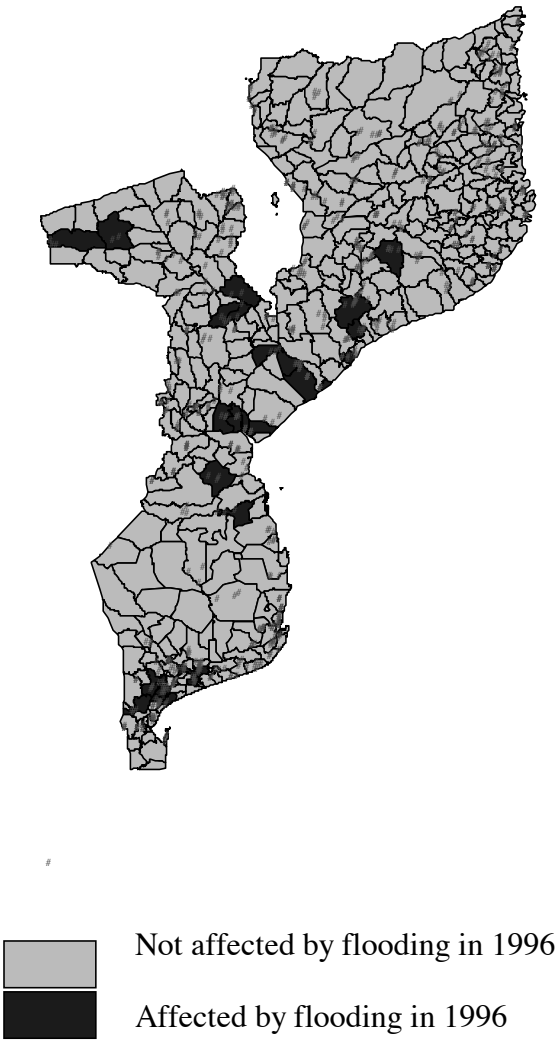


Figure 6: Maize Prices in Sofala Compared with the National Average.

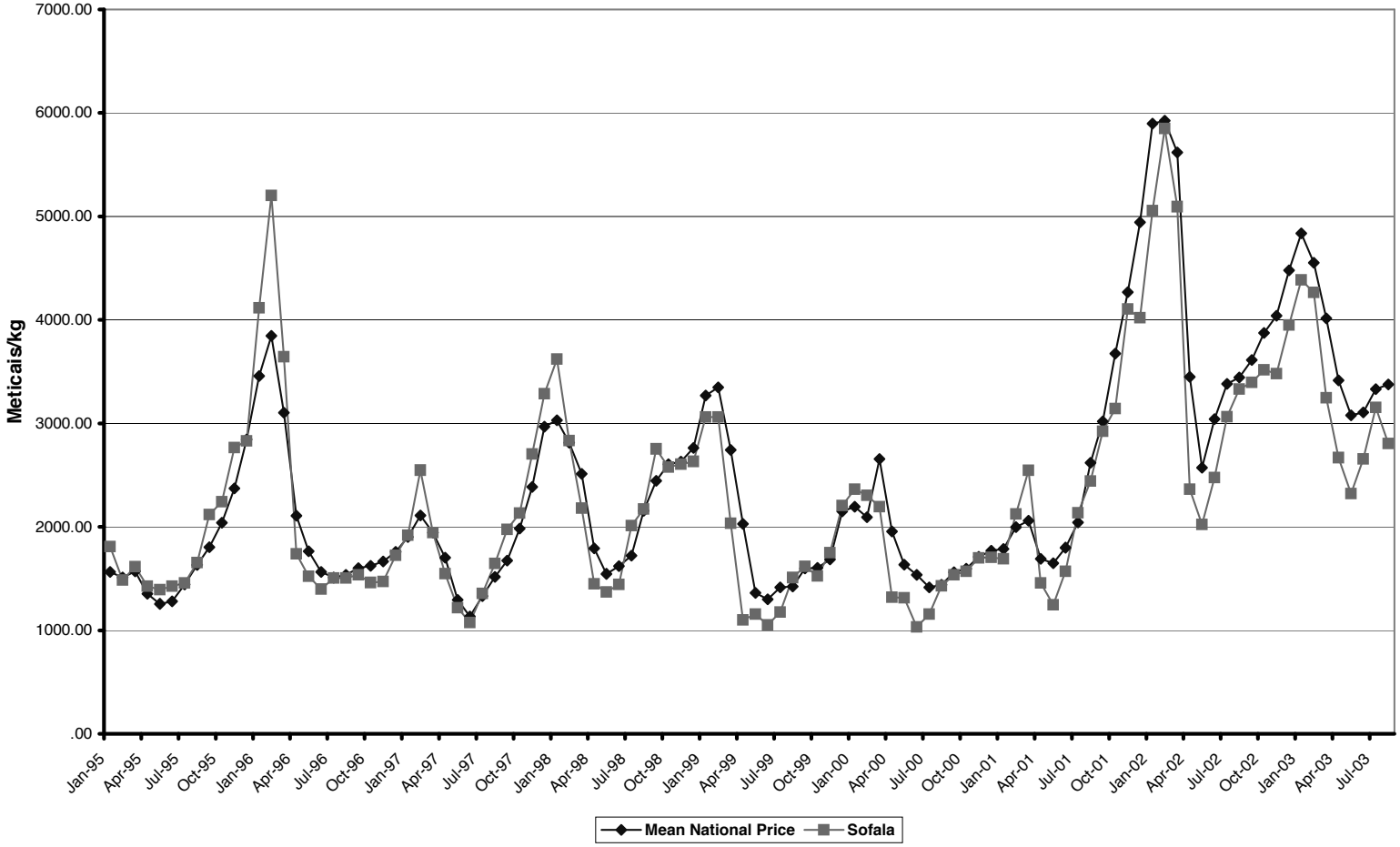


Figure 7: Index of the Metical/Rand Exchange Rate and the Maputo Price Index.

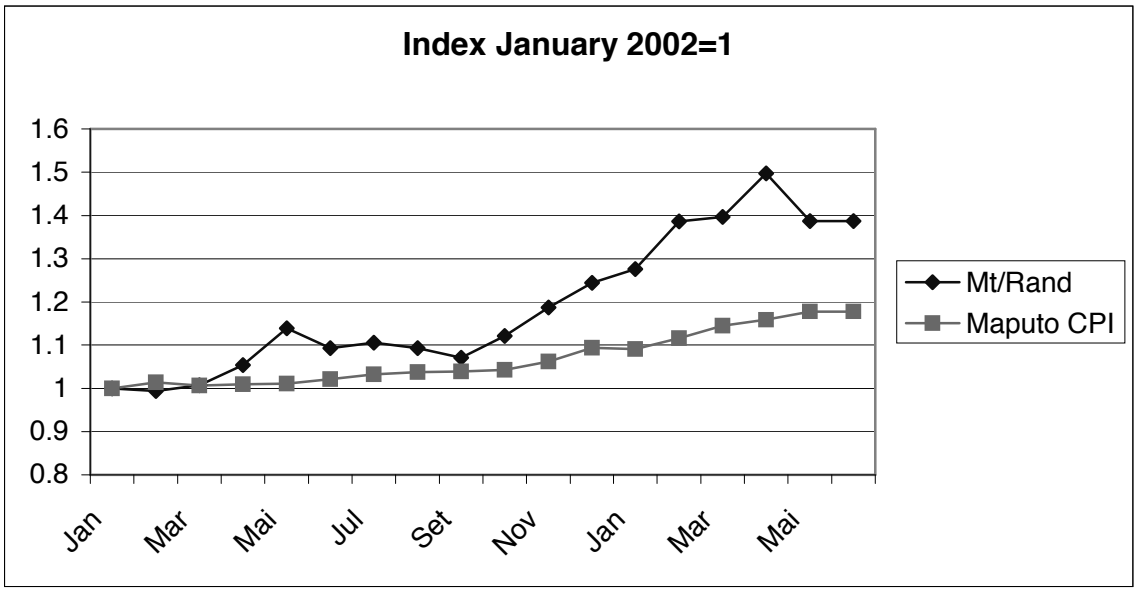


Figure 8: Change in household roofing construction materials, 1996--2002

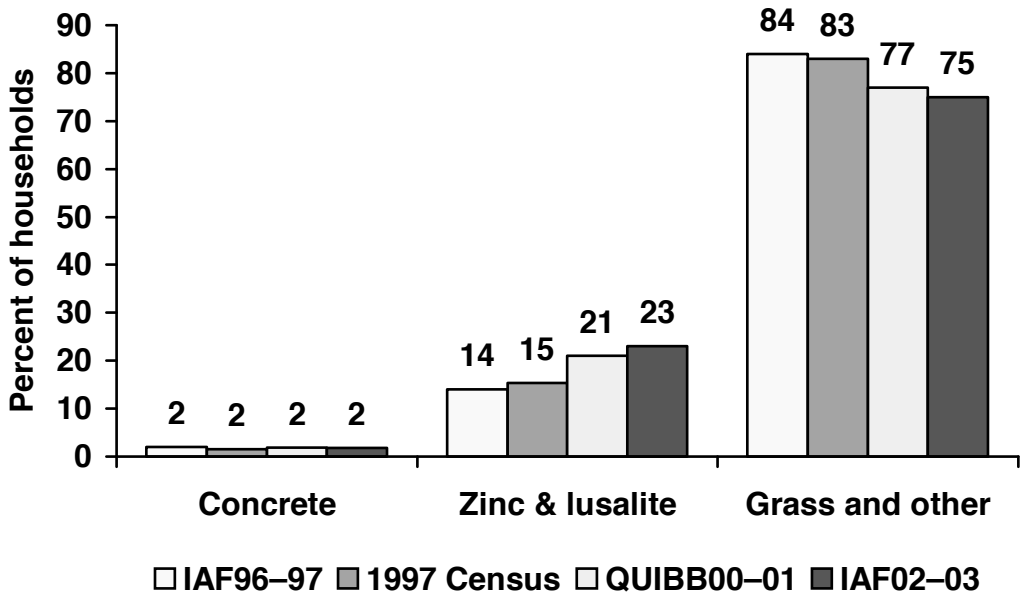


Figure 9: Change in household sanitation facilities, 1996–2002

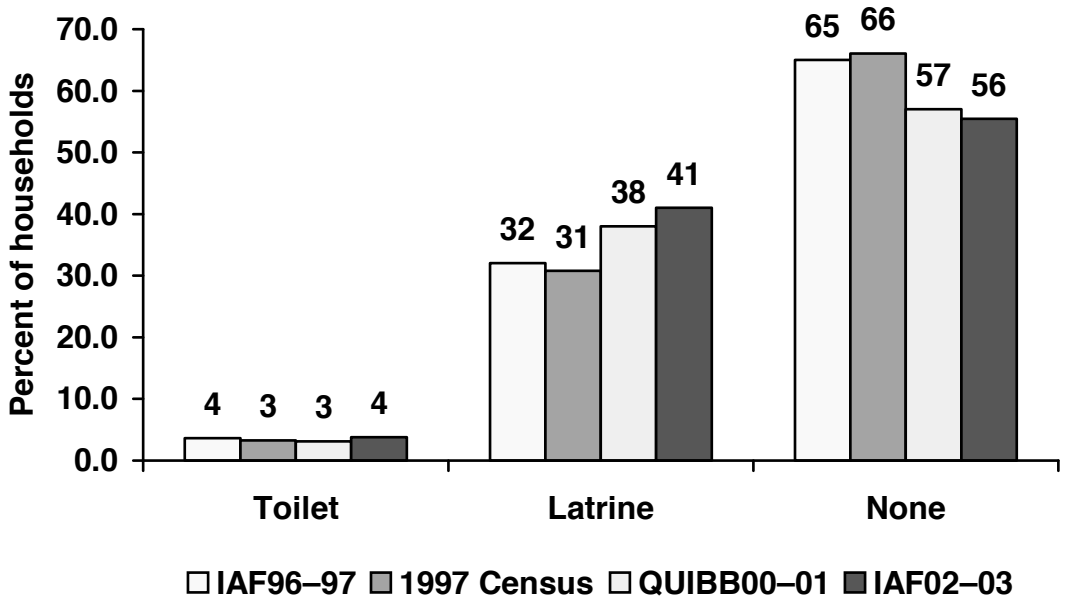


Figure 10: Trends in the Production of Cereals 1994-2002.

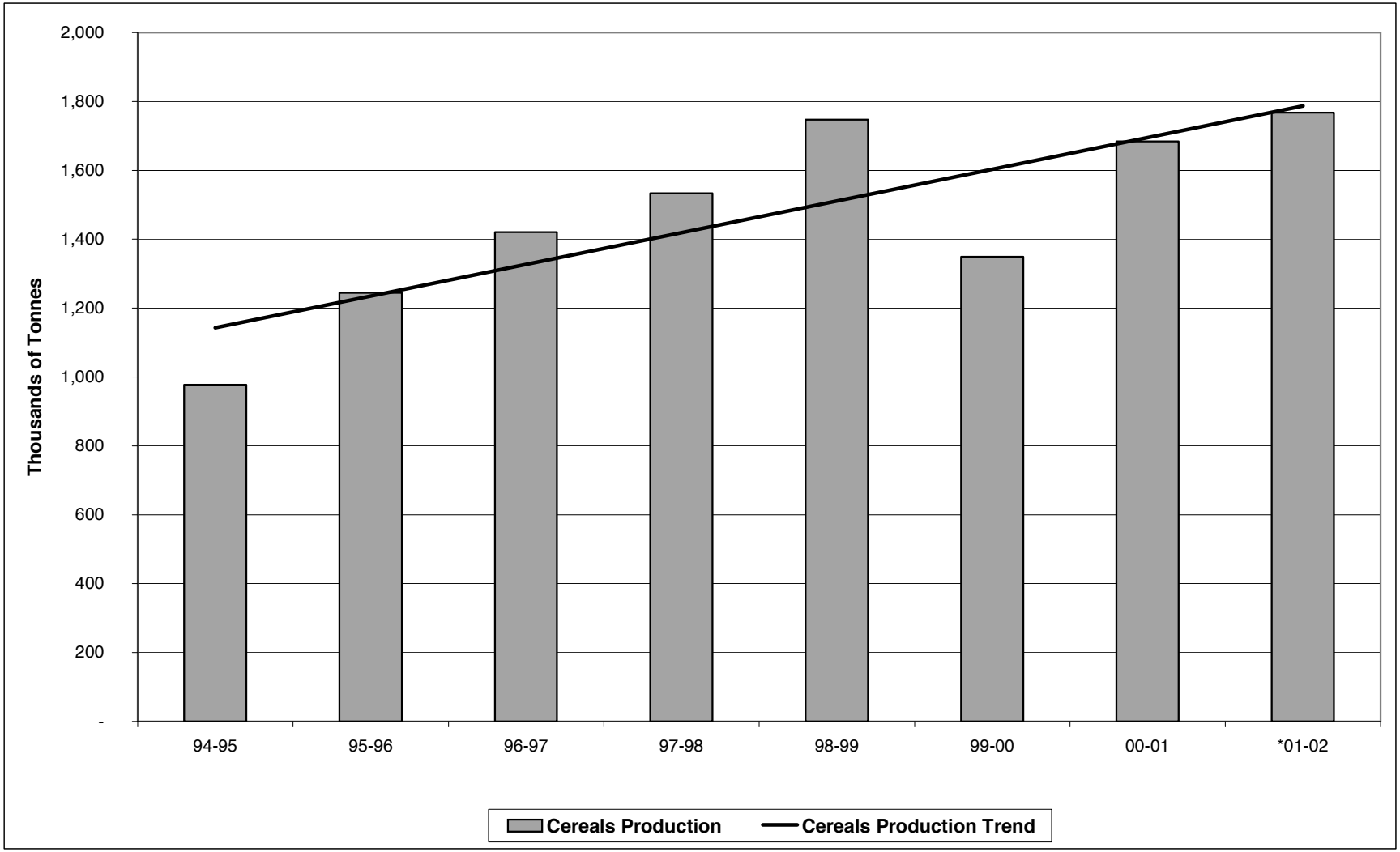
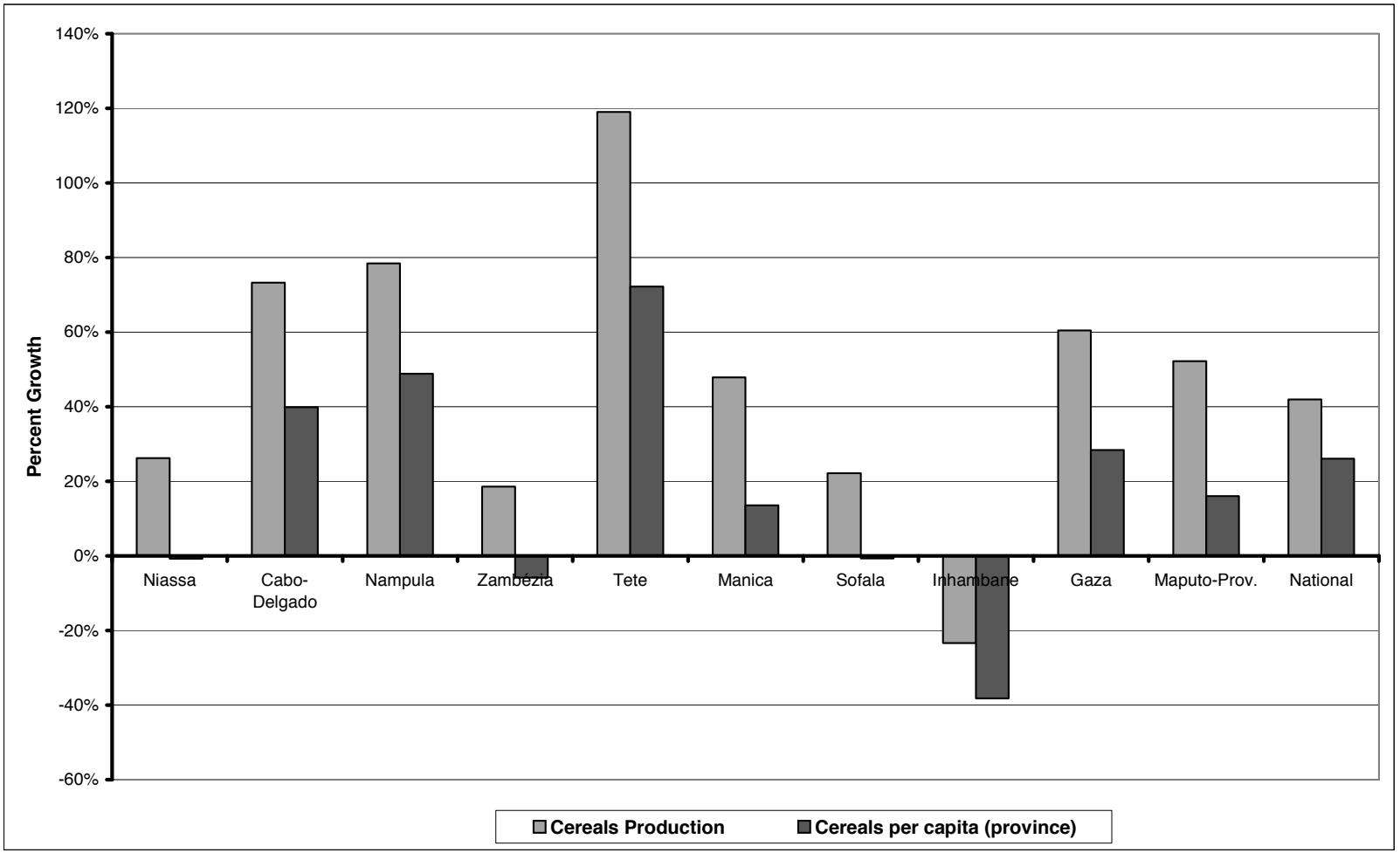


Figure 11: Cumulative Growth in the Production of Cereals Total and per Capita, 1996-2002



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9. Annex Tables

The following tables illustrate the original estimated basket using the iterative procedure of Ravallion (1994) and the adjusted baskets that satisfy revealed preference for each spatial domain. The total values of the "original flexible bundle" and "ajusted flexible bundle" in meticais per person per day are found at the bottom row the respective quantity columns. These values are obtained by first summing the quantities consumed per day (in grams), multiplied by the respective price per gram. These quantities are sufficient to cover 95% of calculated per capita calorie needs in each region (total calorie needs per person per day for each spatial domain are shown at the bottom row of the calories per gram column). We assume that 90% of expenditure is necessary to cover 95% of calorie needs (viewed another way, the cost of the final 5% of calories is double the average cost of the preceding 95%). So, to obtain the food poverty line shown in the bottom row, the total cost of the basket is divided by 0.9. Also, the total calories shown in the bottom row reflects the total calories required which is equal to the sum of the calories provided by the basket divided by 0.95.

The budget shares reflect the adjusted bundle. These sum to 90% reflecting our focus on the major food consumption items.

Niassa & Cabo Delgado_Rural Products	Quantity Consumed per day (in grams). Original Flex Bundle"	Quantity Consumed per day (in grams). Adjus. Flex Bundle"	Price per gram (MT/grs)	Calories per gram	Percentage of expenditure over poverty line "Adjus. Flex Bundle"
Rice	30.71	33.58	8.99	3.53	5.56
Butter beans	10.91	16.57	7.67	3.35	2.34
Mango	16.31	23.97	2.24	0.41	0.99
Fresh, refrigerated or frozen fish	9.88	15.95	10.18	0.72	2.99
Fresh cassava	79.00	66.30	1.38	1.30	1.68
Cassava flour	133.86	99.50	4.13	3.42	7.56
Tomato	22.21	39.41	2.95	0.18	2.14
Other vegetables w/ fruit (incl. fresh maize)	16.03	27.50	3.10	0.49	1.57
Fresh fish	2.57	4.12	13.17	0.72	1.00
Refined cooking salt	11.68	23.24	2.88	0.00	1.23
Sorghum flour	49.44	31.57	4.92	3.55	2.86
Pigeon pea	17.21	13.19	3.67	3.08	0.89
Cassava leaves	45.97	80.11	2.94	0.27	4.33
Pumpkin leaves	15.12	25.51	4.42	0.22	2.08
Dried cowpea	29.92	36.18	6.32	3.39	4.21
Dried fish (except cod)	5.00	6.53	39.70	3.09	4.77
Peanut	19.92	27.95	10.93	4.07	5.62
Pea	22.88	23.91	4.13	1.04	1.82
Maize flour	233.26	257.92	6.98	3.54	33.14
Chicken (live)	2.08	4.31	26.43	0.83	2.10
Pumpkin	41.05	53.26	1.17	0.25	1.14
Total cost of the bundle, total necessary calories and sum of shares	4756.07	5433.78		2143.97	90.00

Niassa & Cabo Delgado_Urban Products	Quantity Consumed per day (in grams). Original Flex Bundle"	Quantity Consumed per day (in grams). Adjus. Flex Bundle"	Price per gram (MT/grs)	Calories per gram	Percentage of expenditure over poverty line "Adjus. Flex Bundle"
Butter beans	21.86	18.77	11.05	3.35	2.75
Chicken (live)	3.34	2.96	44.36	0.83	1.74
White maize	18.00	22.79	3.44	2.42	1.04
Dried fish (except cod)	10.67	9.37	40.35	3.09	5.01
Portuguese spring greens	7.97	6.15	5.23	0.22	0.43
Granulated brown sugar	13.69	13.87	16.68	3.89	3.07
Fresh cassava	45.62	55.71	2.43	1.30	1.79
Fresh, refrigerated or frozen fish	15.87	12.34	23.35	0.72	3.82
Pumpkin	34.77	35.90	1.39	0.25	0.66
Cassava leaves	21.60	22.25	3.47	0.27	1.02
Sweet potato	37.90	39.59	1.89	0.96	0.99
Rice	94.69	94.02	9.49	3.53	11.84
Onion	9.19	12.50	9.48	0.40	1.57
Millet	14.72	14.21	4.73	3.38	0.89
Maize flour	220.51	211.77	9.75	3.54	27.38
Cooking oil	9.32	9.70	30.17	9.00	3.88
Coconut	52.33	49.36	3.13	1.95	2.05
Dried cowpea	29.50	28.89	7.94	3.39	3.04
Pumpkin leaves	11.82	11.88	4.51	0.22	0.71
Pea	10.01	13.54	7.06	1.04	1.27
Peanut	14.18	14.57	12.66	4.07	2.45
Fresh fish	10.00	7.89	24.79	0.72	2.59
Tomato	45.57	50.61	4.69	0.18	3.15
Cassava flour	51.28	56.60	5.81	3.42	4.36
Wheat bread	19.60	21.72	8.66	2.53	2.50
Total cost of the bundle, total necessary calories and sum of shares	7717.12	7540.27		2204.76	90.00

Nampula_rural Products	Quantity Consumed per day (in grams). Original Flex Bundle"	Quantity Consumed per day (in grams). "Adjus. Flex Bundle"	Price per gram (MT/grs)	Calories per gram	Percentage of expenditure over poverty line "Adjus. Flex Bundle"
Feijão jugo	4.77	6.94	5.39	3.08	0.84
Dried cowpea	48.78	106.94	4.02	3.39	9.61
Mango	55.05	104.51	1.90	0.41	4.43
Cassava leaves	27.95	68.37	2.91	0.27	4.45
Broad bean	5.98	0.49	2.05	3.08	0.02
Sweet potato	8.53	15.36	1.35	0.96	0.46
Mushrooms	5.12	16.44	2.75	0.25	1.01
Fresh cassava	51.14	45.85	2.54	1.30	2.61
Tomato	5.77	43.30	3.21	0.18	3.11
Dried fish (except cod)	3.92	8.57	28.41	3.09	5.45
Dried cassava	206.04	37.69	2.06	3.42	1.74
Fresh, refrigerated or frozen fish	10.45	55.61	6.66	0.72	8.28
Other vegetables	4.82	10.57	5.18	0.22	1.22
Maize flour	27.71	93.63	5.22	3.54	10.93
Peanut	19.45	75.92	6.62	4.07	11.24
White maize	18.87	17.51	3.09	2.42	1.21
Cassava flour	183.96	128.49	3.36	3.42	9.67
Papaya	9.18	14.44	2.68	0.27	0.86
Pumpkin leaves	4.98	13.31	3.54	0.22	1.05
Rice	5.67	16.34	5.70	3.53	2.08
Sorghum grain	37.29	24.35	3.32	2.49	1.81
Fresh fish	3.78	34.66	7.71	0.72	5.97
Banana	14.11	25.14	2.27	0.77	1.28
Pigeon pea	10.14	7.15	4.14	3.08	0.66
Total cost of the bundle, total necessary calories and sum of shares	2751.68	4471.45		2151.66	90.00

Nampula_Urban Products	Quantity Consumed per day (in grams). Original Flex Bundle"	Quantity Consumed per day (in grams). Adjus. Flex Bundle"	Price per gram (MT/grs)	Calories per gram	Percentage of expenditure over poverty line "Adjus. Flex Bundle"
Wheat bread	7.23	13.43	8.91	2.53	2.47
Fresh fish	69.12	141.70	5.77	0.72	16.85
Cassava leaves	14.32	30.33	3.42	0.27	2.14
Granulated brown sugar	5.26	9.74	14.31	3.89	2.87
Cooking oil	1.78	4.60	25.51	9.00	2.42
Fresh cassava	104.65	111.08	2.17	1.30	4.97
Rice	17.44	26.33	7.52	3.53	4.08
Dried fish (except cod)	7.11	11.21	26.48	3.09	6.12
Maize flour	98.44	121.62	5.39	3.54	13.50
Peanut	8.39	12.87	9.35	4.07	2.48
Coconut	46.02	23.82	1.41	1.95	0.69
Dried cowpea	13.76	17.44	5.55	3.39	1.99
Fresh, refrigerated or frozen fish	8.40	13.64	14.69	0.72	4.13
Shrimp/prawns, fresh, refrigerated or frozen	25.37	52.78	4.31	0.35	4.69
Dried cassava	281.88	195.86	3.18	3.42	12.85
Cassava flour	64.36	77.16	4.88	3.42	7.75
Total cost of the bundle, total necessary calories and sum of shares	3748.91	4853.22		2153.93	90.00

Sofala & Zambézia_Rural Products	Quantity Consumed per day (in grams). Original Flex Bundle"	Quantity Consumed per day (in grams). Adjus. Flex Bundle"	Price per gram (MT/grs)	Calories per gram	Percentage of expenditure over poverty line "Adjus. Flex Bundle"
Cowpea leaves	4.98	5.88	5.03	0.11	0.71
Pumpkin leaves	27.61	38.60	3.66	0.22	3.40
Cassava flour	154.14	107.96	4.88	3.42	12.69
Peanut	3.79	5.59	9.31	4.07	1.25
Tomato	13.82	25.81	3.14	0.18	1.95
Papaya	22.99	43.15	0.88	0.27	0.91
Cassava leaves	41.43	55.58	3.33	0.27	4.46
Sweet potato	41.00	52.08	1.25	0.96	1.56
Banana	11.04	18.35	2.33	0.77	1.03
Chicken (live)	2.01	3.80	26.23	0.83	2.40
Pigeon pea	18.19	14.75	4.39	3.08	1.56
Fresh, refrigerated or frozen fish	14.34	33.40	5.73	0.72	4.61
Fresh cassava	104.76	104.41	1.23	1.30	3.10
Refined cooking salt	10.06	15.13	3.34	0.00	1.22
Coconut	96.08	56.67	0.84	1.95	1.15
Maize flour	152.60	201.59	5.27	3.54	25.58
Dried cassava	17.19	11.27	1.94	3.42	0.53
Mango	64.30	131.20	0.89	0.41	2.80
Butter beans	5.36	10.85	6.27	3.35	1.64
Sorghum flour	43.06	30.51	3.80	3.55	2.79
Fresh fish	8.19	21.99	5.74	0.72	3.04
Dried cowpea	6.66	9.34	5.24	3.39	1.18
White maize	27.70	28.91	2.76	2.42	1.92
Rice	20.62	20.99	7.73	3.53	3.90
Dried fish (except cod)	10.86	15.87	12.13	3.09	4.63
Total cost of the bundle, total necessary calories and sum of shares	3547.64	4155.08		2111.82	90.00

Sofala & Zambézia_Urban Products	Quantity Consumed per day (in grams). Original Flex Bundle"	Quantity Consumed per day (in grams). Adjus. Flex Bundle"	Price per gram (MT/grs)	Calories per gram	Percentage of expenditure over poverty line "Adjus. Flex Bundle"
Portuguese spring greens	8.79	9.60	5.01	0.22	0.73
Pigeon pea	10.19	12.70	5.49	3.08	1.06
Rice	92.74	94.71	7.91	3.53	11.37
Granulated brown sugar	8.66	9.31	15.77	3.89	2.23
Other vegetables w/ fruit (incl. fresh maize)	29.37	64.05	1.80	0.49	1.75
Butter beans	12.11	15.30	12.83	3.35	2.98
Maize flour	176.76	167.24	7.36	3.54	18.66
Fresh fish	14.46	21.70	13.28	0.72	4.37
Fresh cassava	36.60	32.76	2.48	1.30	1.23
Mango	7.57	9.79	5.39	0.41	0.80
Dried cowpea	9.88	12.34	6.48	3.39	1.21
Onion	3.26	3.90	16.94	0.40	1.00
Tomato	16.30	26.64	9.66	0.18	3.90
Sorghum flour	40.81	34.03	4.57	3.55	2.36
Cassava leaves	15.75	22.38	4.13	0.27	1.40
Pumpkin leaves	15.62	22.44	5.34	0.22	1.82
Sweet potato	137.88	125.68	1.28	0.96	2.45
Wheat bread	16.19	18.09	10.69	2.53	2.93
Dried fish (except cod)	17.38	17.85	15.90	3.09	4.31
Coconut	87.57	55.24	1.38	1.95	1.16
Banana	11.64	26.82	3.27	0.77	1.33
Cassava flour	61.25	71.18	6.69	3.42	7.23
Refined cooking salt	6.70	10.07	5.35	0.00	0.82
Fresh, refrigerated or frozen fish	20.01	32.23	11.33	0.72	5.54
Cooking oil	6.44	7.42	35.19	9.00	3.96
Dried shrimp	1.38	1.54	42.51	3.20	0.99
White maize	23.49	24.62	4.20	2.42	1.57
Peanut	3.39	3.30	16.49	4.07	0.83
Total cost of the bundle, total necessary calories and sum of shares	5902.12	6591.27		2200.05	90.00

Manica & Tete_Rural Products	Quantity Consumed per day (in grams). Original Flex Bundle"	Quantity Consumed per day (in grams). Adjus. Flex Bundle"	Price per gram (MT/grs)	Calories per gram	Percentage of expenditure over poverty line "Adjus. Flex Bundle"
Chicken eggs	16.17	66.75	2.72	1.39	3.22
Pumpkin leaves	72.63	33.72	2.97	0.22	1.78
Chicken (live)	9.28	3.65	20.56	0.83	1.33
Other vegetables	43.26	22.23	3.41	0.22	1.35
Sweet potato leaves	8.69	3.42	4.00	0.37	0.24
Okra	27.33	14.68	4.02	0.30	1.05
Refined cooking salt	6.98	1.92	6.17	0.00	0.21
Butter beans	31.86	19.11	9.52	3.35	3.23
Other vegetables w/ fruit (incl. fresh maize)	52.60	21.71	3.75	0.49	1.44
Sorghum flour	13.36	12.59	7.78	3.55	1.74
Cowpea leaves	19.77	9.84	3.08	0.11	0.54
Banana	23.26	23.26	2.02	0.77	0.84
Fresh, refrigerated or frozen fish	12.46	5.76	6.88	0.72	0.70
Peanut	5.63	4.48	10.96	4.07	0.87
Meat of hunted animals, fresh, refrigerated or frozen	7.19	2.34	10.56	0.89	0.44
Goat meat (fresh, refrigerated or frozen)	1.82	0.73	20.34	1.07	0.26
Granulated brown sugar	6.50	5.69	11.57	3.89	1.17
Pumpkin	90.48	52.62	1.35	0.25	1.26
Cashew nut	4.57	9.31	7.96	5.89	1.32
Sorghum flour	21.50	17.45	7.10	3.33	2.20
White maize	45.74	144.34	2.89	2.42	7.41
Dried cowpea	13.85	15.92	6.61	3.39	1.87
Malambe (a local wild fruit)	25.21	9.88	2.07	0.39	0.36
Smoked fish	1.30	0.37	28.68	1.77	0.19
Dried fish (except cod)	8.44	4.77	22.46	3.09	1.90
Rice	8.24	6.85	9.17	3.53	1.12
Cassava leaves	22.66	12.14	2.30	0.27	0.50
Maize flour	349.27	302.48	8.75	3.54	47.03
Cooking oil	2.60	1.71	31.07	9.00	0.94
Portuguese spring greens	26.45	7.98	2.54	0.22	0.36
Tomato	15.79	5.52	4.68	0.18	0.46
Watermelon	123.68	70.10	0.97	0.32	1.21
Sweet potato	36.46	43.00	1.90	0.96	1.45
Total cost of the bundle, total necessary calories and sum of shares	6936.99	5628.79		2134.18	90.00

Manica & Tete_Urban Products	Quantity Consumed per day (in grams). Original Flex Bundle"	Quantity Consumed per day (in grams). Adjus. Flex Bundle"	Price per gram (MT/grs)	Calories per gram	Percentage of expenditure over poverty line "Adjus. Flex Bundle"
Cowpea leaves	21.58	11.85	3.49	0.11	0.58
Dried fish (except cod)	33.36	20.48	19.45	3.09	5.58
White maize	103.53	264.79	3.05	2.42	11.29
Butter beans	39.82	24.99	13.88	3.35	4.85
Portuguese spring greens	52.84	19.19	4.50	0.22	1.21
Fresh, refrigerated or frozen fish	8.86	4.02	19.74	0.72	1.11
Pumpkin leaves	45.24	74.14	3.37	0.22	3.50
Tomato	59.32	20.92	7.36	0.18	2.16
Dried cowpea	18.56	28.08	7.04	3.39	2.77
Granulated brown sugar	22.08	19.49	13.72	3.89	3.74
Sweet potato	43.24	133.36	1.61	0.96	3.00
Fresh fish	18.62	8.70	19.42	0.72	2.37
Okra	20.28	8.13	4.74	0.30	0.54
Yam	23.92	23.78	2.95	1.53	0.98
Wheat bread	35.67	29.86	11.24	2.53	4.70
Rice	41.64	45.86	8.92	3.53	5.73
Sweet potato leaves	15.12	6.60	4.36	0.37	0.40
"Carapau" Fish, fresh, refrigerated or frozen	2.80	1.34	20.52	0.51	0.39
Onion	6.68	1.93	14.35	0.40	0.39
Maize flour	232.44	144.86	11.61	3.54	23.54
Refined cooking salt	14.91	6.57	4.86	0.00	0.45
Peanut	6.12	3.45	16.21	4.07	0.78
Goat meat (fresh, refrigerated or frozen)	10.59	4.69	26.53	1.07	1.74
Chicken (live)	2.98	1.22	44.33	0.83	0.76
Beef (fresh, refrigerated or frozen)	2.90	1.17	34.17	2.10	0.56
Dried shrimp	2.23	0.95	27.89	3.20	0.37
Cooking oil	18.56	13.77	33.86	9.00	6.52
Total cost of the bundle, total necessary calories and sum of shares	9656.47	7144.75		2170.84	90.00

Gaza & Inhambane_Rural Products	Quantity Consumed per day (in grams). Original Flex Bundle"	Quantity Consumed per day (in grams). Adjus. Flex Bundle"	Price per gram (MT/grs)	Calories per gram	Percentage of expenditure over poverty line "Adjus. Flex Bundle"
Chicken (live)	1.43	1.93	52.88	0.83	1.55
Pumpkin leaves	38.26	48.04	5.97	0.22	4.33
"Tseque" (Amarantus)	6.39	4.96	5.70	0.24	0.43
Sweet potato	16.43	15.21	2.77	0.96	0.64
"Tihacana ("Cacana" fruit)	15.76	8.60	3.87	1.20	0.50
Maize flour	10.19	14.11	9.07	3.54	1.93
Tomato	20.65	50.68	4.47	0.18	3.42
Cowpea leaves	37.83	65.32	4.77	0.11	4.71
Green cowpea	15.88	23.75	5.12	0.47	1.84
Dried fish (except cod)	2.37	5.12	19.62	3.09	1.52
Peanut	8.66	9.74	19.24	4.07	2.83
Dried cowpea	9.40	8.76	11.08	3.39	1.47
Cassava flakes	19.56	7.07	4.31	3.42	0.46
Rice	65.56	83.62	8.12	3.53	10.27
Watermelon	73.83	92.88	1.00	0.32	1.41
Fresh fish	3.32	6.22	14.48	0.72	1.36
Granulated brown sugar	4.39	6.22	15.04	3.89	1.41
Cassava leaves	67.72	87.46	4.67	0.27	6.18
Sweet potato leaves	14.84	23.20	4.25	0.37	1.49
Cassava flour	7.78	3.88	3.72	3.42	0.22
Cooking oil	0.94	1.20	35.69	9.00	0.65
Fresh, refrigerated or frozen fish	10.47	24.10	11.68	0.72	4.26
Dried cassava	6.10	3.39	4.54	3.42	0.23
Wheat bread	6.92	9.55	11.59	2.53	1.67
Cashew nut	7.64	4.46	14.63	5.89	0.99
Fresh cassava	199.46	204.97	2.29	1.30	7.10
Papaya	13.99	22.84	2.34	0.27	0.81
"Cacana" (momordica balsamica)	57.57	59.35	6.61	0.58	5.93
Meat of hunted animals, fresh, refrigerated or frozen	7.52	42.37	4.63	0.89	2.97
White maize	88.86	78.55	5.19	2.42	6.17
Coconut	401.68	367.08	1.30	1.95	7.23
Other vegetables	6.56	14.10	4.19	0.22	0.89
Nuts	1.74	1.02	26.36	5.89	0.41
Onion	2.25	4.26	14.90	0.40	0.96
Other vegetables w/ fruit (incl. fresh maize)	5.80	6.92	5.58	0.49	0.58
Portuguese spring greens	14.11	16.71	4.62	0.22	1.17
Total cost of the bundle, total necessary calories and sum of shares	5437.99	6613.84		2086.44	90.00

Gaza & Inhambane_Urban Products	Quantity Consumed per day (in grams). Original Flex Bundle"	Quantity Consumed per day (in grams). Adjus. Flex Bundle"	Price per gram (MT/grs)	Calories per gram	Percentage of expenditure over poverty line "Adjus. Flex Bundle"
Dried fish (except cod)	1.33	1.95	22.66	3.09	0.61
Coconut	386.53	356.96	1.25	1.95	6.14
Pumpkin leaves	44.56	53.85	5.01	0.22	3.71
White maize	36.99	35.46	4.56	2.42	2.22
Cassava flakes	34.13	20.74	3.96	3.42	1.13
Spaghetti	1.67	1.75	23.19	3.30	0.56
Cooking oil	3.26	3.51	39.84	9.00	1.92
Peanut	33.01	34.64	17.54	4.07	8.36
Cabbage	5.43	10.61	5.79	0.19	0.84
Onion	5.86	7.47	15.76	0.40	1.62
Rice	99.52	111.02	7.82	3.53	11.95
Fresh fish	11.28	13.95	18.83	0.72	3.62
Fresh cassava	133.52	139.24	2.49	1.30	4.77
Crab (fresh, refrigerated or frozen)	7.67	8.41	10.01	0.24	1.16
Lettuce	6.05	6.44	8.20	0.12	0.73
Granulated brown sugar	12.59	15.00	15.04	3.89	3.11
Stocks	1.05	1.02	107.60	3.25	1.51
Wheat bread	59.51	69.47	10.14	2.53	9.70
Shrimp/prawns, fresh, refrigerated or frozen	3.29	4.93	17.68	0.35	1.20
Sweet potato	19.19	18.80	2.67	0.96	0.69
Butter beans	4.84	4.58	20.33	3.35	1.28
Portuguese spring greens	26.22	28.53	4.78	0.22	1.88
Cassava leaves	34.06	38.66	4.95	0.27	2.63
"Cacana" (momordica balsamica)	26.55	27.46	8.08	0.58	3.05
Cowpea leaves	41.85	54.29	5.40	0.11	4.03
Maize flour	12.18	13.11	10.50	3.54	1.89
Sweet potato leaves	12.89	15.04	4.60	0.37	0.95
Tomato	27.36	30.88	8.27	0.18	3.51
Dried cowpea	7.52	7.22	13.24	3.39	1.32
Mafura	2.60	2.05	10.44	2.69	0.29
Fresh, refrigerated or frozen fish	12.66	16.24	16.11	0.72	3.60
Total cost of the bundle, total necessary calories and sum of shares	6613.05	7263.92		2157.52	90.00