Ministry of Planning and Development

National Directorate of Studies and Policy Analysis

POVERTY AND WELLBEING IN MOZAMBIQUE:

THIRD NATIONAL POVERTY ASSESSMENT

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Abbreviations

Acronym	Portuguese	English
CBN	Custo de Necessidades Básicas	Cost of Basic Needs
DHS03	Inquérito Demográfico e de Saúde	Demographic and Health Survey 2003
IAF02	Inquérito aos Agregados Familiares 2002/03	Household Survey 2002/03
IAF96	Inquérito aos Agregados Familiares 1996/97	Household Survey 1996/97
INE	Instituto Nacional de Estatística	National Statistics Institute
IOF08	Inquérito ao Orçamento Familiar 2008/09	Household Budget Survey 2008/09
IPC	Índice de Preços ao Consumidor	Consumer Price Index
MICS08	Inquérito de Indicadores Multiplos	Multiple Indicator Cluster Survey 2008
NER	Taxa de escolarização líquida	Net enrolment rate
PARPA	Plano de Acção para a Reducção da Pobreza Absoluta	Poverty Reduction Strategy Paper
PQG	Plano quinquenal do governo	Five year government plan
SE	Erro padrão (desvio padrão da média)	Standard Error
SIMA	Sistema de Informação de Mercados Agrícolas	Agricultural Markets Information System
TIA	Trabalho de Inquérito Agrícola	Agricultural Survey

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Excellent collaboration existed between DNEAP and the National Institute of Statistics (INE) throughout the process—from design of the 2008/09 household survey instrument, on which this report is based, to field work, final cleaning and use of the data. The Economics Directorate of the Ministry of Agriculture also collaborated closely with respect to agriculture and rural development. The World Bank and UNICEF provided valuable analysis of the child nutrition indicators and pertinent comments on the overall survey and analysis. Many other ministries and international and local institutions provided data and insights. Any errors or omissions are the responsibility of DNEAP.

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Maputo, September 2010

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Executive Summary

This report provides a quantitative assessment of the poverty situation in Mozambique in 2008/09 and associated trends. The 2008/09 nationally representative household budget survey (IOF08), conducted by the National Institute of Statistics (INE), constitutes a significant addition to existing data sources. While drawing extensively from IOF08 and earlier household budget surveys, this assessment also integrates results from a variety of sources to provide a coherent picture of how poverty has evolved over time.

Poverty is a multi-dimensional concept. In addition to data, definitions and methods, this report covers absolute poverty (identified as consumption poverty) and a variety of non-monetary and anthropometric indicators. The consistency of the results is carefully checked by comparing with prior household budget surveys, national accounts, other surveys (such as the agricultural income surveys, known as the TIAs), supplementary welfare approaches, and available price series. Trends in inequality are also reviewed. Finally, the report carries out a macroeconomic analysis, with a linked poverty module, thereby checking that the poverty results fall within plausible ranges and providing insights into the factors that shaped the evolution of poverty over the period 2002/03 to 2008/09.

Main results

IOF08 provides solid evidence of significant progress across a range of non-monetary poverty indicators at both the national and regional levels. These include large improvements in access to education (at both primary and secondary levels); improved access to health services, particularly in rural areas; increases in asset ownership by households; and improvements in housing quality. These improved indicators attest to important positive long-run development trends as well as success in meeting strategic government priorities.

At the same time, the 2008/09 measures of poverty based on consumption, particularly food consumption, did not decrease as planned. While consumption poverty fell significantly from 1996/97 to 2002/03, the 2008/09 IOF shows that consumption poverty (as measured by the headcount rate) at the national level was essentially the same as in

2002/03, at slightly less than 55% of the population. Very distinct regional patterns of change in the headcount rate have been observed. Rural Northern regions of the country saw the largest falls in poverty (by around 13 percentage points to 46%); the urban and rural areas of the South also saw poverty fall (by around 10 and 7 percentage points respectively). In contrast, the Central regions saw an increase in poverty of 16 percentage points in rural areas and 7 points in urban areas. The volatility of poverty rates through time, especially at the provincial level, underscores the vulnerability of the large majority of the population.

Similar to the consumption poverty results, nutrition indicators for children under five years show little progress at the national level since 2002/03. The childhood nutrition indicators obtained from IOF08 are similar to the results obtained from the 2008 Mixed Indicator Cluster Survey (MICS08), especially when overlapping survey periods are considered. These nutrition results are broadly consistent with the consumption poverty results obtained, especially the high levels of vulnerability.

Interpretation

The advances observed in non-monetary poverty indicators are associated in part with the large efforts made by the government in the provision of social services. The government has invested massively in education and health, along with investments in transport infrastructure, which has resulted in significant improvements in school attendance rates and in the average proximity of health posts. Alongside these gains in social sectors, improvements in durable good owernship and housing quality were observed.

Despite these adavances, consumption poverty rates at the national level remained stable. Factors behind these results include:

1. Very slow growth rates in agricultural productivity, especially with respect to food crops, observed in the TIA surveys since 2002.
2. Weather shocks that impacted the harvest of 2008, particularly in the Central provinces.
3. Declining terms of trade due to large increases in international food and fuel prices. Fuel prices, in particular, rose substantially over the period 2002/03 to 2008/09.

These factors interacted to slow rates of consumption poverty reduction in the North and South and increase poverty in the Centre. In a nutshell, during most of the IOF08 survey period, Mozambican households found themselves facing tight supplies of domestic food, very high costs for imported food from international markets, and much higher fuel costs, which rendered distribution of imports and transportation from surplus to deficit areas substantially more expensive. Since, for poor households, approximately three quarters of consumption expenditure is dedicated to food, these factors are highly pertinent.

The national-level consumption poverty results and the provincial pattern of changes in rates of consumption poverty are also broadly consistent with:

1. Relatively rapid rates of food price increases that are observed in the CPI, the Agricultural Markets Information System (SIMA), and the household survey poverty lines. The price changes observed across these sources are remarkably consistent;
2. Changes in domestic relative prices for basic food products. Those provinces with increases in the prices of basic food products relative to the national average (as measured by SIMA) tend quite strongly to have only small changes or increases in poverty (and vice versa);
3. Changes in food shares. In regions where the share of food in total expenditure rose from the level observed in 2002/03, poverty tended to increase (and vice versa); and
4. Changes in the number of meals consumed per day. Where heads of household reported fewer meals consumed per day compared with 2002/03, poverty tended to rise (and vice versa).

When inequality measures, such as the Gini coefficient, are calculated using the same approach as in 2002/03, the IOF08 provides no evidence of a worsening of inequality. However, a range of other factors suggests that the distribution of consumption may have deteriorated since the previous household budget survey. For example, the class of household budget survey implemented may not accurately capture changes in income or consumption at the very top of the distribution, despite the fact that such changes can have large implications for inequality measures.

We highlight that accumulated experience since 1996, along with international experience with the IOF08 class of survey, points to a systematic under-counting of food

consumption, particularly in the urban South. While the precise nature and extent of undercounting cannot be ascertained with currently available data, alternative approaches to correcting this problem suggest that national poverty *levels* are likely to be over-estimated by approximately 3 percentage points in both the current and previous surveys. Nevertheless, based on the analysis conducted to date, the reported *trends* in poverty over time are broadly robust to under-counting. Thus, the conclusion that consumption poverty has stagnated at the national level over the period 2002/03 to 2008/09 remains firm.

The likely existence of under-counting complicates inferences about poverty, particularly at lower levels of geographical aggregation where sample error is already relatively large. As a result, undue emphasis should not be placed on the precision of poverty estimates at the provincial level; the same goes for the precise magnitude of changes over time in poverty for individual provinces. Nevertheless, the broad spatial pattern of changes in consumption poverty (i.e., improvements in the North and South, worsening in the Centre) is also consistently confirmed by other data sources and analytical methods.

Implications

This assessment points to both successes and challenges. Successes have been realised in expanded access to government-provided social services, particularly education and health, and private accumulation of durable goods. These are key factors for long term growth and development. The challenges highlighted here include low levels of consumption, high levels of vulnerability and the persistently high levels of child malnutrition. These challenges are clearly interrelated.

Both external and internal factors contributed to the stagnation of consumption poverty rates over the period 2002/03 to 2008/09. While Mozambique has no influence over international commodity prices, it has greater control over internal factors. A missing element—perhaps the principal missing element—in the current development process is sustained productivity growth in the family agriculture sector. Achieving greater success in stimulating the agricultural sector, particularly but not exclusively the family sector, is the central policy recommendation derived from this assessment.[1]

[1] Achieving more success in stimulating the agricultural sector should help to improve the problem of child malnutrition; however, many factors determine the nutritional status of children. For example, chronic malnutrition could be related to food consumption traditions or simple lack of information.

It is also abundantly clear that national household budget surveys occur with insufficient frequency. The current six-year gap creates a substantial information deficit in the latter half of the period, fits poorly with the government planning and electoral cycle, and effectively precludes the development of panel data sets. In addition, this gap renders capacity building for data collection and analysis far more difficult, as a low percentage of staff actually engage in repeated exercises and, for those who do, many of the lessons are lost over time. For these reasons, the National Directorate of Studies and Policy Analysis (DNEAP) within the Ministry of Planning and Development (MPD) strongly recommends the immediate piloting of alternative food consumption questionnaires and the launch of a new household survey in mid-2011.

Additional research based on the IOF08 is already planned or in progress to complement the present report. These include a detailed set of poverty profiles, including an analysis of the ultra-poor, a poverty mapping exercise, benefit incidence analysis and an extended analysis of infant nutrition. Further research should also be undertaken to more fully understand poverty dynamics, including the implications of external shocks such as AIDS deaths, changes in weather patterns, and price shocks.

Conclusion

One of the Millennium Development Goals (MDGs) for Mozambique is to reach an absolute consumption poverty rate of 40% by 2015, down from an estimated 80% in 1990. Despite the recent stagnation in consumption poverty rates, this goal remains achievable. For the second semester of the IOF08 survey, which relied principally on the 2009 harvest, the measured poverty rate was 52%. The undercounting of calories referred to above may overstate the estimated national poverty level by about three percentage points. Even without gains in agricultural productivity (but with constant international prices), the poverty rate appears to be trending down by about one percent per year. This puts the best estimate for the poverty rate in mid-2010 at about 48%. So, Mozambique has about five years remaining, or 20% of the total allotted time, and about eight percentage points of poverty reduction remaining, or 20% of the total targeted reduction.

Over the next five years, the massive investments in education referred to above are likely to yield dividends. A large number of people are set to move into the labour force with a complete primary school education or better. While the returns to education appear to be falling, they remain very significant. If these trends are combined with improved

agricultural productivity and a reasonably favorable international environment, a poverty rate of 40% in 2015 remains achievable.

Third National Poverty Assessment

1 Introduction

This report provides a comprehensive analysis of poverty and poverty trends in Mozambique. It builds on the analytical foundations provided by two previous assessments (DNPO 1998; DNEAP 2004). This assessment employs similar data and methods as previous assessments, which provides a consistent basis for measuring trends in poverty over time. In order to verify the core findings, we triangulate the results using a wide range of external information as well as alternative methods. Finally, we identify leading explanations for changes in poverty over time, particularly at the national level.

The most recent information on poverty, on which this report is based, comes principally from the 2008/09 household survey conducted by the National Statistics Institute (*Instituto Nacional de Estatística*, henceforth referred to as INE). Results from this latest survey are compared to those obtained in previous survey rounds (2002/03 and 1996/97) as well as a variety of other sources. Principally, we find mixed trends across different dimensions of poverty. Consumption poverty has stagnated since 2002/03 at the national level, driven by reductions in poverty in the South and North of the country and increases in poverty in the Centre. The nutritional status of children also has shown little improvement over the last six years. A wide range of non-monetary poverty indicators, however, have registered improvements. These include ownership of private goods as well as access to public services such as health and education. Nevertheless, these non-monetary indicators also reveal large differences in terms of both levels and trends across the country. Thus, regional disparities remain substantial.

The report is divided into eight main sections. The next section, Section 2, describes the data sources, analytical methods and definitions of poverty. In addition, some of the underlying assumptions and inherent limitations of the current analysis are discussed. Section 3 presents the main results, giving separate treatment to the consumption poverty lines (3.3), consumption poverty rates (3.4), non-monetary poverty (3.1) and trends in anthropometric indicators (3.2). Section 4 verifies the consistency of these results using a range of alternative methods and data sources. Section 8 discusses changes in poverty at the sub-national level. Section 5 provides a review of poverty correlates and their changes over time. Section 6 reviews trends in inequality. Section 7 provides a detailed macroeconomic analysis of

national trends in consumption poverty, identifying a number of driving factors behind the results. Section 9 concludes. In addition to the main body of the report, supplementary material is contained in a set of appendices located in Section 10. Section 12 contains selected tables that were more conveniently left outside of the main body of the report. Finally, section 13 provides the contents of the food poverty bundles.

2 Data, Definitions, and Methods

2.1 Sources of data

This Third Poverty Assessment relies on data from numerous sources. These include the 2007 Census, the Multiple Indicator Cluster Survey 2008 (MICS08), the IOF 2008/09 household survey (IOF08), national accounts data, and administrative data from a variety of sources. Results from these recent surveys are compared with previous surveys, especially the IAF 1996/97 and 2002/03 household surveys (hereafter IAF96 and IAF02) as well as the 1997 Census, Demographic and Health Surveys (DHS) in 1997 and 2003, and Agricultural Surveys (TIAs) undertaken in 2002, 2003, 2005, 2006, 2007 and 2008.

The consumption poverty analysis in this assessment is derived from the recently completed IOF08. In many respects, the IOF08 is very similar to the two earlier household surveys (IAF02 and IAF96) that were used to produce the two previous national poverty assessments. Although there are some small differences in the designs of the questionnaires, the three surveys are comparable with regards to their main objective, which is to measure consumption poverty at a given point in time. Like the two previous surveys, the 2008/09 survey contains detailed information on expenditure and consumption of food items for a random sample of 10,832 households. This sample is representative for the whole of Mozambique as well as for the rural and urban zones, and each of the ten provinces plus Maputo City.

For each household, a series of interviews were conducted over a one-week period in order to administer questionnaires. These interviews obtained information on general household characteristics, daily expenses and own consumption, possession of durable goods, gifts and transfers received, and lower frequency expenses such as school fees or purchases of clothing. In order to capture seasonality, data collection took place over the span of a year, beginning in September 2008 and finishing in August 2009. 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 data

collection method since it involves more travel time and expenses within each province. However, its advantages in the Mozambican context are compelling. Prices for agricultural products, which represent the bulk of expenditures for poor households, often double or triple between post-harvest and pre-harvest periods. These price variations, including the underlying variations in supply and demand balance that they reflect, could have substantial implications for the poverty status of households.

2.2 Definition of poverty

The concept of well-being refers to multiple dimensions of the human condition. For this reason, its definition—and consequently, the definition of deprivation or poverty—can take distinct forms. In the most general sense, well-being is considered to derive from the capacity to function within society. In turn, poverty exists when people do not have the capacity required to attain adequate levels of income, health, education, security, self-confidence, and free expression, among others (Sen 1999).

With respect to the objective of reducing poverty expressed in the Action Plan to Reduce Absolute Poverty 2006-2009 (PARPA II), Mozambique evolved from a view of poverty that was strictly monetary (in PARPA I) to a more holistic view that defined poverty as "the impossibility, due to incapacity or due to lack of opportunity of individuals, families or communities to attain minimum living conditions according to basic societal norms." In this sense, PARPA II established goals for not only the reduction of monetary poverty, with focus on consumption, but also the reduction of non-monetary poverty, with a focus on education, health, nutrition, and asset ownership.

2.3 Measuring poverty

While PARPAII provides a general definition of poverty, no single quantitative measure corresponds to this definition. A multidimensional phenomenon such as poverty requires multiple measures. Ideally, these should address all the important dimensions of poverty. However, because poverty is so multifaceted, only a relatively limited number of dimensions are measured in practice. Furthermore, existing measures are often imperfect. For example, education in Mozambique is often measured via enrollments and the highest level of education attained. These are straightforward but incomplete. While access to education services is important (especially in Mozambique where historically this has been severely

constrained), such data provide no information on education quality.[2] Similar issues exist for other public services such as health, although final health outcome indicators are available.

In this report, we focus on three main dimensions of poverty: (a) consumption poverty; (b) access to or ownership of both private and public goods and services; and (c) anthropometric measures of child well-being. The results for these measures are also compared with other sources of information, such as agricultural production, in order to verify the overall consistency of the IOF08 survey.

While each of the three above measures has its advantages and disadvantages, measurement of consumption poverty is perhaps the least straightforward. Appendix 10.1 therefore provides a detailed discussion of the methodology.[3] Briefly, the methods employed to measure consumption poverty are exactly the same as those employed to analyse IAF02 in the Second National Poverty Assessment. In particular, per capita consumption for each household in the survey is estimated using information on purchases and own consumption. In order to take into account geographic differences in costs of living, Mozambique is then divided into 13 relatively homogeneous spatial domains. Within each domain a poverty line is estimated. The poverty line contains two components: the food poverty line and the non-food poverty line. The food poverty line is obtained by deriving a bundle of food products that: (i) reflects consumption patterns of poor households within the spatial domain, (ii) provides approximately 2150 calories per person per day,[4] and (iii) passes a series of spatial and temporal revealed preference conditions that ensure comparability in the quality of the bundle across space (the 2008/09 bundle of domain A is not manifestly of higher quality than the 2008/09 bundle of domain B and vice versa) and through time (the 2002/03 bundle of domain A is not manifestly of higher quality than the 2008/09 bundle of domain A and vice versa). Prices paid by the poor for the elements of the bundles are then calculated. The food poverty line is then simply the cost of the bundle.

Because it is much more difficult to define and price a reasonable bundle of non-food items consumed by the poor, an indirect method is used to calculate the non-food poverty line. Worldwide, poor people allocate a considerable share of their total consumption to non-food

[2] Presumably, if quality fell below some minimum standard, parents would no longer bother to send their children to school, particularly older children who could help provide for the family.
[3] Greater details are found in Arndt and Simler, 2010.
[4] The exact value of calories provided by the basket of items that composes the food poverty line depends on the demographic composition of the domain. Women and children require fewer calories than adult males; therefore, domains with larger numbers of women and children relative to adult males have bundles that provide fewer calories.

items. Thus, average non-food consumption is calculated for households whose total per capita consumption is close to the food poverty line (see Appendix 10.1 for details). This expenditure is viewed as a minimum budgetary allocation required to meet basic non-food needs and is defined as the non-food poverty line. The total poverty line is then obtained as the sum of the food poverty line and the non-food poverty line.

With the poverty lines in hand, it becomes straightforward to calculate a series of poverty measures. Consistent with previous national assessments of poverty, we present consumption poverty measures using a class of poverty indices developed by Foster, Greer and Thorbecke (FGT, 1984). These indices are widely used in poverty studies because the measures obey a set of desirable properties reviewed below. For the discrete case, with representative data at the individual level, the general expression for the FGT poverty measure is given by:

$$P_\alpha = \frac{1}{n}\sum_{y<z}\left(\frac{z-y}{z}\right)^\alpha$$

where n is the population size in a given country or region, y is nominal consumption per capita and z is the poverty line. The numerator $(z - y)$ is thus the poverty gap. Dividing this by the poverty line implies that this version of the poverty index is in a normalised form.

The poverty indices belonging to the FGT class are differentiated by the parameter α. In the following we apply the poverty indices setting α equal to 0, 1 and 2, which respectively correspond to the more popular names "poverty headcount," "poverty gap," and "squared poverty gap" measures. These measures are described below.

- The **poverty headcount index,** P_0, is the proportion of people whose consumption (per capita) is below the poverty line. This index also can be expressed mathematically as $P_0 = q / n$, where q is the number of poor people and n is the total population of interest. In this case the measure provides us with the share of households or individuals in the population classified as poor.
- The **poverty gap index**, P_1, measures the average gap or distance between consumption and the poverty line as a proportion of the poverty line for all households in the sample classified as poor.[5] It indicates the extent of the difference between the poverty line and the average consumption of poor households. This measure captures changes in poverty that the poverty headcount index does not detect. For example, if all the poor remain

[5] Mathematically, this is the same as the average relative difference between the consumption levels of the poor and the poverty line ($1 - y / z$ for $y < z$) multiplied by the poverty headcount (P_0).

below the poverty line and all the non-poor remain above the poverty line, but the consumption levels of the poor all rise (without crossing the poverty line), most people would say that poverty has decreased. The poverty headcount will not change to reflect this improvement in poor people's consumption, but the poverty gap index will decrease, showing that on average the poor are not 'as poor' as they were previously.

- The **squared poverty gap index**, P_2, is the average of the square of the relative poverty gap ($1 - y / z$ for $y < z$, and 0 for $y \geq z$), again only taking into consideration poor households. It measures the severity of poverty, and takes into account inequality changes among the poor. For example, if a transfer is made from a poor person to a poorer person, the squared poverty gap index will decrease because, among the poor, the living standards of the poorer have improved. In contrast, such a transfer would affect neither the headcount index nor the poverty gap index.

2.4 Assumptions and Limitations

Before continuing to results, some words on underlying assumptions and limitations of the consumption poverty measures are required. In general, the principal limitations are:

- The consumption measure developed applies to households and not individuals. It is not possible with IOF data to estimate the consumption of each person within a household. Therefore, while the consumption of the household is known (in principle), the distribution of that consumption across household members is not. It is highly likely that, within certain households that are declared as non-poor on the basis of per capita household consumption, some members of the household are consuming well above the poverty line while others are consuming below it due to an inequitable distribution of resources within the household.
- While the average consumption basket of the poor in a domain is relevant for the associated poverty line, the estimated total consumption of any given household makes no reference to the composition of consumption. If the poverty line consumption level is 10 and a household consumes goods and services worth more than 10 on a per capita basis, then that household is considered not poor. This remains true even if the majority of household consumption is directed to beer, cigarettes, and entertainment. The measure only refers to the *capacity* of the household to purchase a bundle of goods deemed reasonable under prevailing social norms. Whether the household in fact opts to purchase a "reasonable" bundle is not addressed.

- Consumption of all public services is excluded. There is no attempt to value consumption of public services such as education, healthcare, and economic infrastructure. This is a material omission in the Mozambican context where, as will be shown, growth in use of public services has been substantial.

With respect to the specific case of Mozambique, data limitations are presented in considerable detail in Sections 10.5 and 10.6. In addition, further discussion with respect to poverty measurement can be found in Tvedten, Paulo, and Rosário (2009), who summarize results from detailed qualitative studies of three regions in Mozambique. These studies are explicitly designed to complement the quantitative survey work used to measure poverty. These authors voice concerns about, for example, the definition of the household and the attention to investment in housing in the household budget surveys (IAF02 and IOF08).

Overall, it is important to highlight that, while much progress has been made, appropriate poverty measurement remains a controversial topic characterized by substantial debate over data, definitions, and methods. This is true both within and across countries and appears to be particularly pointed in Africa. To take a recent international example, there is debate between optimists, such as Sala-I-Martin and Pinkovskiy (2010) and Young (2010), and the more sober assessments of the World Bank (2010) with respect to progress towards the Millennium Development Goals in sub-Saharan Africa.

As emphasized above, this report seeks to contribute the best possible information and analysis on poverty evolution in Mozambique while presenting as well potential shortcomings. With the approach and limitations in mind, we can proceed to the principal results.

3 Principal Results

3.1 Non-monetary poverty measures

This section considers trends in non-monetary indicators of well-being, which are an important additional dimension of poverty. We find that for a wide range of these indicators, changes are positive across all geographical areas of Mozambique for the period 2002/03 to 2008/09. Thus, with respect to many of the areas previously identified as priorities in government strategy documents (e.g., under PARPA I and II), positive results are now evident.

We focus on the accumulation of assets by households and their access to public goods and services. In general terms, these indicators reflect long-run processes of (material) development that are less prone to short-term fluctuations than are measures of consumption. These dimensions of poverty also are often explicitly identified by households as important components of their well-being and dignity, over and above their immediate capacity to meet basic consumption needs.

Nevertheless, unlike measures of consumption, there is no well-established method to map changes in a given set of non-monetary indicators over time, such as ownership of different assets, into a single composite welfare indicator. Moreover, in the absence of panel data on the same households over time, it is also not possible to associate specific levels of these non-monetary indicators to a defensible and coherent welfare level. Thus, when viewed over time, non-monetary measures are best understood as capturing changes in relative material well-being rather than changes against an absolute threshold.

With these caveats in mind, we now review trends in housing quality, ownership of durable goods and access to public goods and services. For simplicity and comparability, we only report results for the IOF08 and IAF02 household surveys.

3.1.1 Housing quality

The quality of a household's shelter or housing is a widely accepted indicator of material wealth. Housing often represents the single largest category (by value) of investments in durable assets made by individuals over the course of their lifetime. Indeed, Tvedten, Rosário and Paulo (2009) emphasise investment in housing in their qualitative work. Households will often need to save or access credit facilities in order to make housing investments, meaning that such investments typically reflect a temporal dimension of material well-being. Thus, they are a reasonable proxy for permanent income (typical/average individual income), which is a household's long-run wealth as opposed to its temporary capacity to consume. Crude differences in housing quality are also relatively easily observed, making them less prone to measurement error.

Table 3-1 reports changes over time in four measures of housing quality for the thirteen spatial domains used in the poverty analysis. Each measure is represented as a dummy variable, which takes the value of one if a household's home has the characteristic indicated and zero otherwise. Thus, the average of such a dummy variable for a population sub-group gives the share of households in that group with that characteristic. The results show that, on

average, all characteristics of housing have improved from 2002/03 to 2008/09. For example, the share of families that have roofs made of a durable material (concrete, zinc or fibrous cement [*Lusalite*]) increased by 4.4 percentage points, and the share using electricity, a generator or solar energy for lighting almost doubled from 6.9% to 13.3% of households.

Table 3-1: Indicators of housing quality 2002/03 – 2008/09, (% households).

	Durable roofing		Durable walls		Electric lighting		Toilet / latrine	
	IAF02	IOF08	IAF02	IOF08	IAF02	IOF08	IAF02	IOF08
Niassa & Cabo Delg.-rural	0.9	7.0	0.5	3.1	0.0	0.7	0.9	6.9
Niassa & Cabo Delg.-urban	29.9	23.3	18.4	7.7	18.5	20.6	26.5	20.0
Nampula-rural	3.1	4.3	4.5	2.2	0.0	1.5	0.1	1.6
Nampula-urban	22.9	33.1	15.8	12.3	12.6	27.9	13.6	18.3
Sofala & Zambezia-rural	3.3	8.5	0.9	6.4	0.4	0.3	0.4	3.5
Sofala & Zambezia-urban	60.5	59.7	32.1	35.9	18.7	34.8	29.9	37.2
Manica & Tete-rural	6.6	11.0	4.3	9.7	0.4	0.5	3.1	2.0
Manica & Tete-urbana	52.6	61.9	30.2	41.2	18.6	35.7	35.1	28.9
Gaza & Inhambane-rural	42.8	50.9	12.1	13.1	1.3	2.4	5.9	11.1
Gaza & Inhambane-urban	73.5	75.2	24.7	24.1	17.3	31.2	33.8	34.9
Maputo Province-rural	88.5	85.6	26.1	42.3	6.8	22.8	14.7	40.0
Maputo Province-urban	98.7	99.6	72.7	79.3	26.2	57.2	36.4	60.9
Maputo City	99.8	99.8	81.3	86.9	45.9	73.6	68.9	79.0
National	25.8	30.2	14.2	17.9	6.9	13.3	11.2	16.0

Notes: all housing characteristics are coded as dummy variables, taking a value of one if a given household has that characteristic; the median change (final column) is based on the percentage point changes for each characteristic over time.

Source: MPD/DNEAP using IAF02 and IOF08.

The table also indicates substantial differences in the rates of change in these indicators across different regions. This supports the general finding, emphasised throughout the present assessment, of differentiated levels and trends in poverty across the country. For example, it is notable that the southern areas of the country (both rural and urban) show the largest increases across a range of measures, such as use of electric lighting and access to a toilet or latrine within the home. The Northern and Central rural areas, on the other hand, indicate much slower progress on these measures despite also starting from a much lower base. Thus, while in rural Maputo Province 22.8% of households used electricity to illuminate their home in 2008/09 (up from 6.8% in 2002/03), only 0.3% of rural households in Sofala and Zambézia did so (essentially unchanged from 0.4% in 2002/03).

Finally, it bears emphasising that, while the trends in housing are positive, the levels remain low. Nationally, 65% of the population in 2008/09 reported living in housing with none of the four improvements in focus in Table 3-1 (down from 71% in 2002/03). These improvements are particularly scarce in the rural North and Centre, where more than 58% of the population resides. IOF08 indicates that, in the rural North and Centre, 90% and 85% of the populations

respectively reside in households with none of the four improvements. This is a welcome improvement over 2002/03 when 95% of the population in these areas lacked any of the four improvements; nevertheless, the rarity of housing improvements limit the usefulness of these measures as an indicator of general well-being in the rural North and Center.

3.1.2 Ownership of consumer durables

It is also useful to look at patterns of ownership of durable consumer goods. These also typically represent lumpy investments that require a minimum level of income to purchase and sustain (e.g., batteries to play a radio). Thus, again, measures of this kind incorporate a temporal dimension to material well-being that may not be fully reflected in the consumption poverty measures.

Table 3-2 summarises trends in ownership for eight different goods, differentiated by urban and rural areas. Figure 3-1 then plots the average number of these goods owned by each household (ranging from zero to eight), which represents a simple composite non-monetary poverty indicator. Whichever way one looks, the trends are unambiguously positive. Perhaps the only exception is ownership of radios in urban areas; however, this is offset by the large increase in ownership of TVs, which suggests some substitution between these goods.

Four more specific points can be made. First, as with housing, while the trends are positive, the levels are low, particularly in rural areas. Rural households owned, on average, about 1.36 goods in 2008/09. Not surprisingly, the use value of durable goods represents a small share of total consumption with a median value of about 1.2% in rural areas and 3.1% in urban areas in 2008/09. The small number of durables available, particularly to rural households, and their relatively small value illustrates the limits of asset ownership as a reliable indicator of welfare as well as the limits of asset sales as a means to smooth consumption. Second, as expected, one finds much greater levels of asset ownership in urban compared to rural areas (excluding bicycles). Third, the change in the share of households owning consumer durables has been moderately larger in urban areas for many goods, thus contributing to a growing rural-urban divide in asset ownership, at least in absolute terms. For example, the average number of goods owned by rural households increased from 0.98 to 1.36 (or by 0.38) goods over the 2002/03 to 2008/09 period; in urban areas the increase was from 1.88 to 2.54 (or by 0.66) goods.[6] Finally, we see from Figure 3-1 that the increase in ownership of consumer durables has been stronger in the South, particularly in comparison to rural parts of the

[6] In terms of rate of growth, the rural rate is slightly faster than the urban rate.

Central region of the country. In fact, a simple correlation coefficient of the relationship between changes in the average number of consumer goods owned and the changes in the headcount poverty rate between IAF02 and IOF08 is -0.41% (calculated for the 13 spatial domains). This indicates that regions with the biggest increases in asset ownership have also generally seen the largest reductions in poverty. If nothing else, these results underline the very different trends in poverty over time and space, regardless of the poverty measure employed.

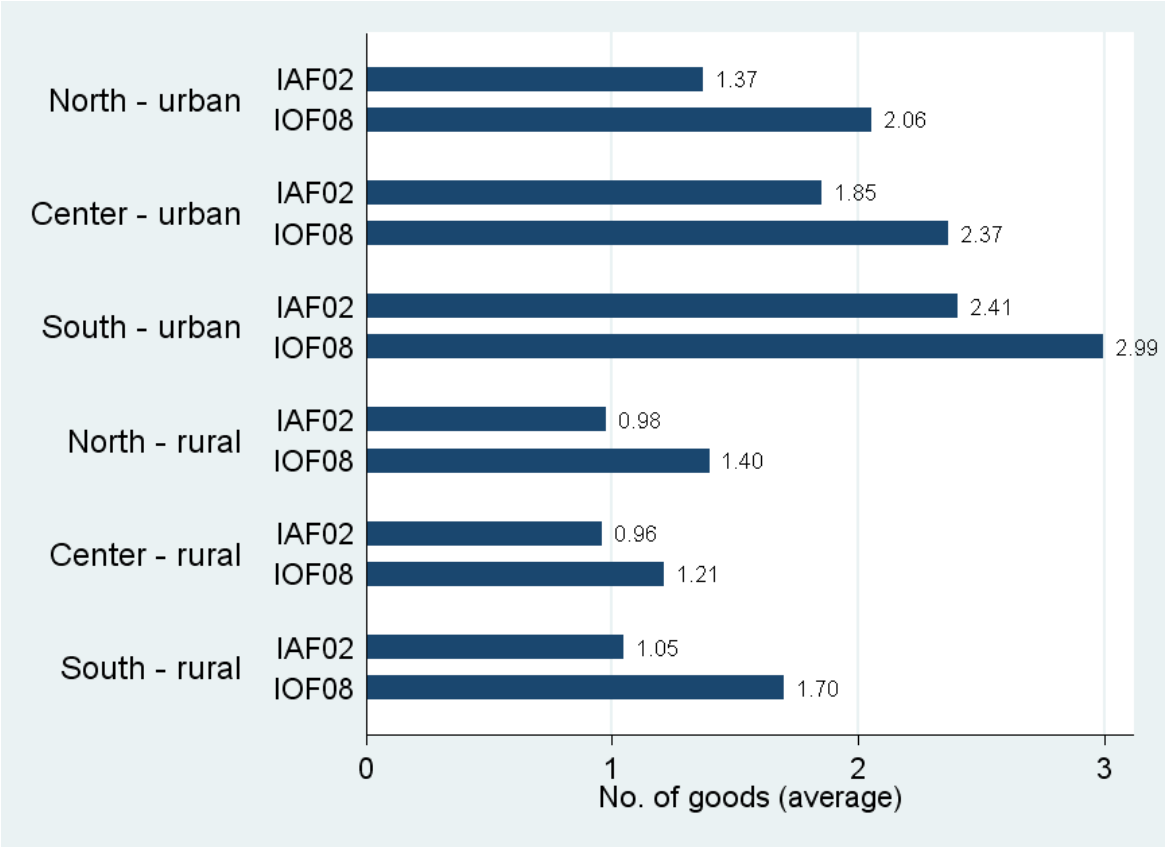
Table 3-2: Ownership of consumer durables 2002/03 – 2008/09,
(% households).

		Urban	Rural	National
Bicycle	IAF02	19.4	31.8	28.1
	IOF08	24.1	43.8	38.1
	change	*4.7*	*12.0*	*10.0*
Car	IAF02	4.3	0.4	1.6
	IOF08	5.0	0.6	1.8
	change	0.7	0.2	0.3
Motorbike	IAF02	2.3	0.7	1.2
	IOF08	5.2	2.9	3.6
	change	*2.9*	*2.2*	*2.4*
Radio	IAF02	54.9	41.5	45.5
	IOF08	47.7	44.9	45.8
	change	*-7.1*	*3.5*	*0.3*
TV	IAF02	19.5	0.7	6.3
	IOF08	35.9	2.8	12.4
	change	*16.4*	*2.1*	*6.1*
Telephone	IAF02	13.1	0.5	4.3
	IOF08	53.7	11.4	23.7
	change	*40.7*	*10.8*	*19.4*
Bed	IAF02	62.1	22.3	34.2
	IOF08	64.1	28.8	39.0
	change	*2.0*	*6.5*	*4.9*
Fridge	IAF02	12.2	0.3	3.9
	IOF08	18.4	0.6	5.8
	change	*6.2*	*0.3*	*1.9*
Average	*change*	*8.3*	*4.7*	*5.7*

Notes: all goods are coded as dummy variables, taking a value of one if a given household owns that asset; all changes are given as percentage points.

Source: MPD/DNEAP using IAF02 and IOF08.

Figure 3-1: Average number of consumer goods (out of a maximum of eight) owned by households 2002/03 – 2008/09, by regions and rural/urban



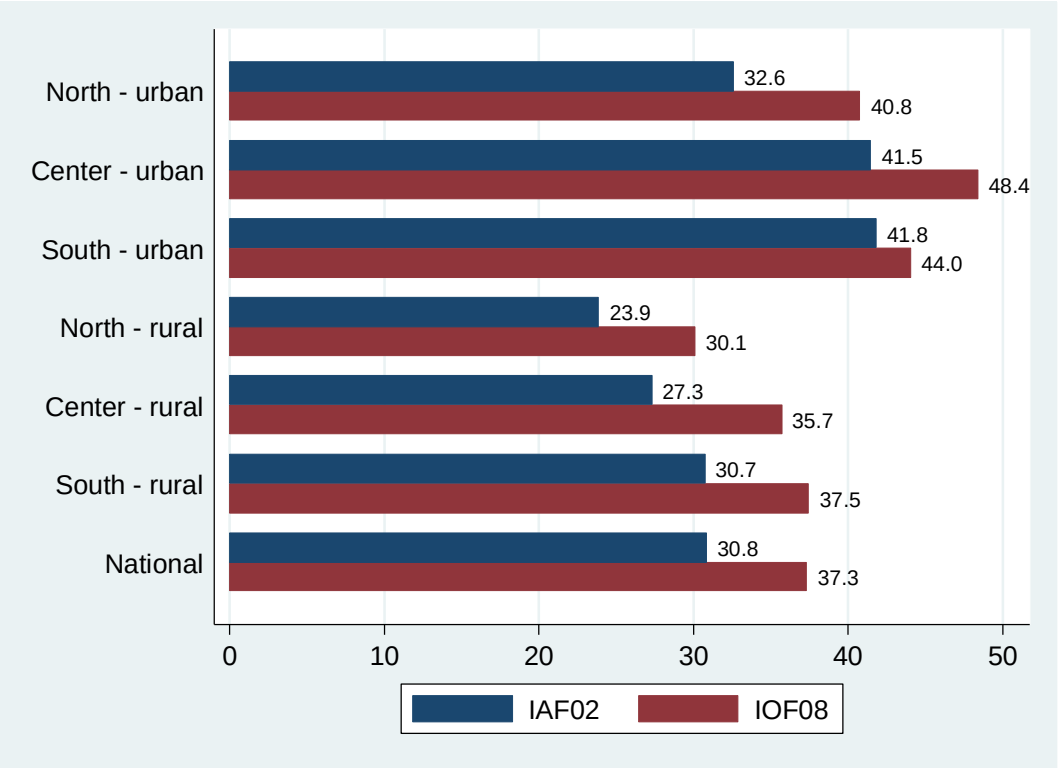
Notes: Included goods are those listed in Table 3-2.

Source: MPD/DNEAP using IAF02 and IOF08.

3.1.3 Access to education

As has been indicated in other assessment reports (e.g., MPD, 2010), Mozambique has achieved significant gains in increasing citizens' access to basic public services. These trends are confirmed by the series of household surveys. As a starting point, there has been a significant increase in the share of the entire population currently studying, regardless of age. This is shown in Figure 3-2, which indicates a 6.5 percentage point increase in the share of over fives in the population currently studying. Notably, gains have been made in both rural and urban areas, with larger increases in the North and the Centre. It means that in 2008/09, over 40% of all adults and children (not counting infants) in urban areas were engaged in some study, while in rural areas the share is around 33%. Simply put, access to education has expanded for all at a much faster rate than population growth.

Figure 3-2: Share of population (over 5 years) currently enrolled in an educational programme, by region, 2002/03 & 2008/09



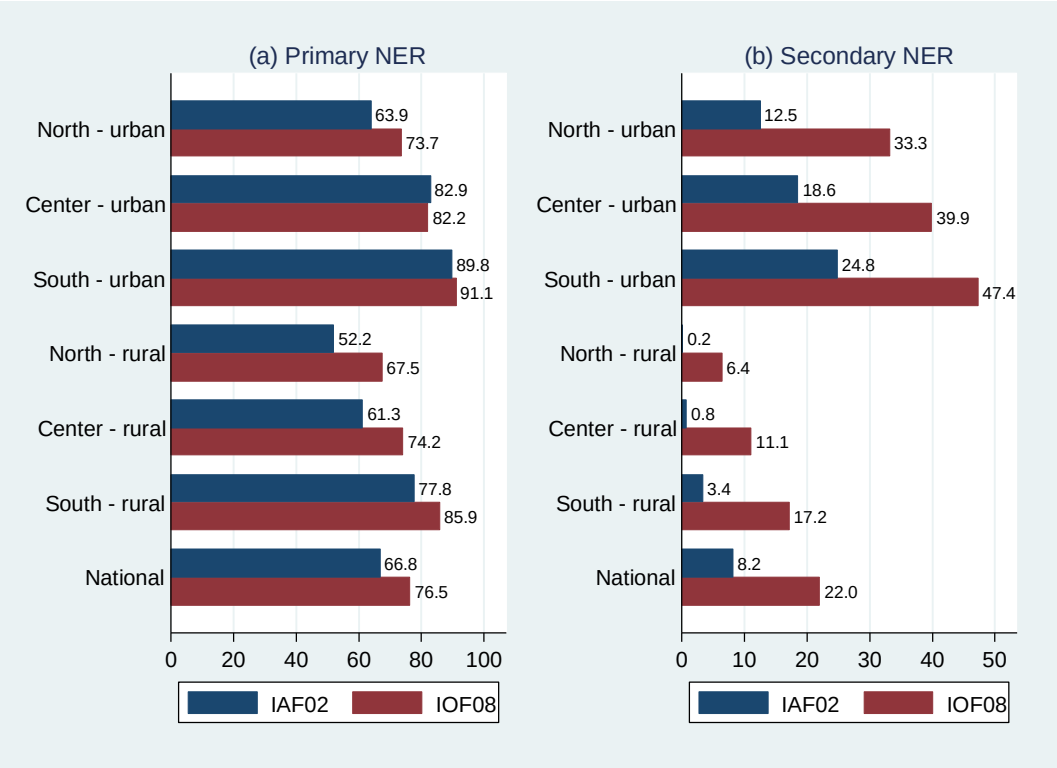
Source: MPD/DNEAP using IAF02 and IOF08.

Enhancing access to primary education has been a major government priority. Trends in this domain can be assessed using traditional measures, such as the net enrolment rate (NER). This is defined as the share of all children of official school age[7] who are enrolled in a school whose official age range corresponds to the child's age. Thus, it gives the share of children of a given official school age enrolled at their 'expected' level.

The NER for primary schooling is shown in panel (a) of Figure 3-3, distinguished by regions and urban/rural. The NER for secondary schooling is given in panel (b). The two panels show unambiguous increases for both ratios across virtually every region. At the national level, in 2008/09 we find that 76.5% of all children aged 6-13 are attending primary school, up from 66.8% in 2002/03.

[7] Primary school ages are 6-13 years; secondary school ages are 14-18 years.

Figure 3-3: Net enrolment rates (NER), primary and secondary schooling by region 2002/03 & 2008/09



Notes: NER is defined as the share of all children of official school age (primary: 6-13 years; secondary: 14-18 years) who are enrolled in a school whose official age range corresponds to the child's age; secondary school includes technical schools.

Source: MPD/DNEAP using IAF02 and IOF08.

Similarly, the secondary school NER has more than doubled (from a relatively low base) to 22.0% from 8.2%. National level results mask even larger gains in specific areas. Access to primary schooling has increased most where it was lowest, thereby reducing regional educational inequality. For example, in the rural North the primary NER has risen to 67.5% compared to 52.2% in 2002/03. Also, increases in the secondary NER have been spectacular in rural areas; previously net enrolment rates were below 1% in the rural North and Centre and below 4% in the South. They now stand at 6.4% and 17.2%, respectively. The conclusion is that expansion of the school network and access to education has been impressive.

3.1.4 Access to health services and clean water

Finally, we consider access to public health services, which has also been a major area of government investment. Two indicators are employed here: (a) walking distance to the nearest primary health facility, measured in time taken; and (b) access to a safe water source, defined as potable water of some form (i.e., not from an untreated or unprotected source). Figure 3-4 and Figure 3-5 provide summary results for these two measures respectively.

Figure 3-4: Share of households with less than 45 minutes walk to nearest primary health facility, 2002/03 & 2008/09.

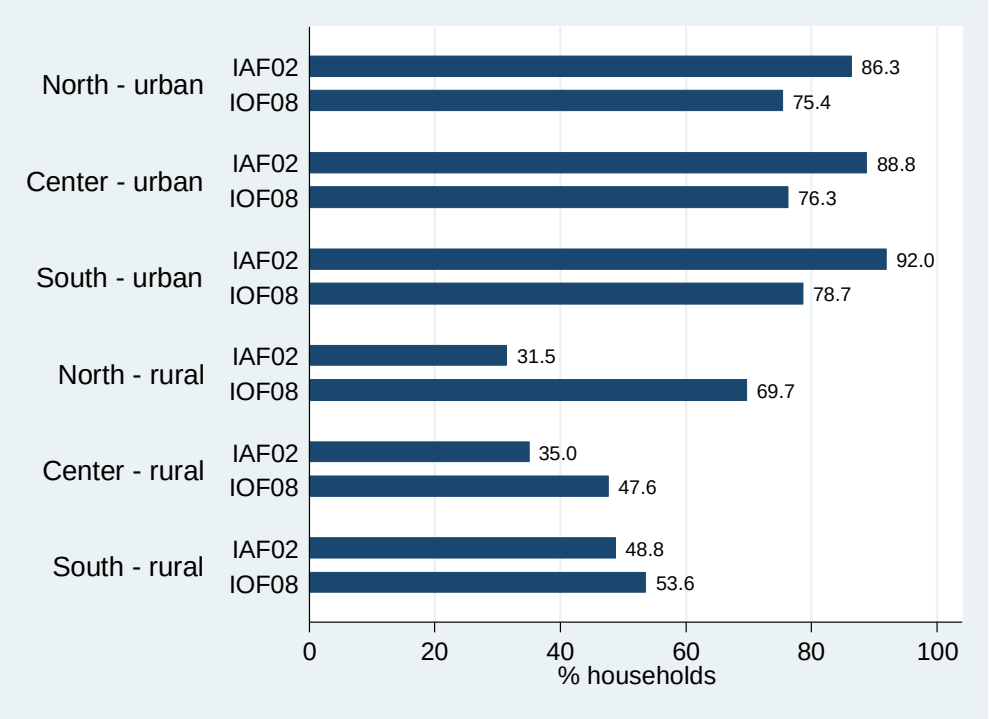
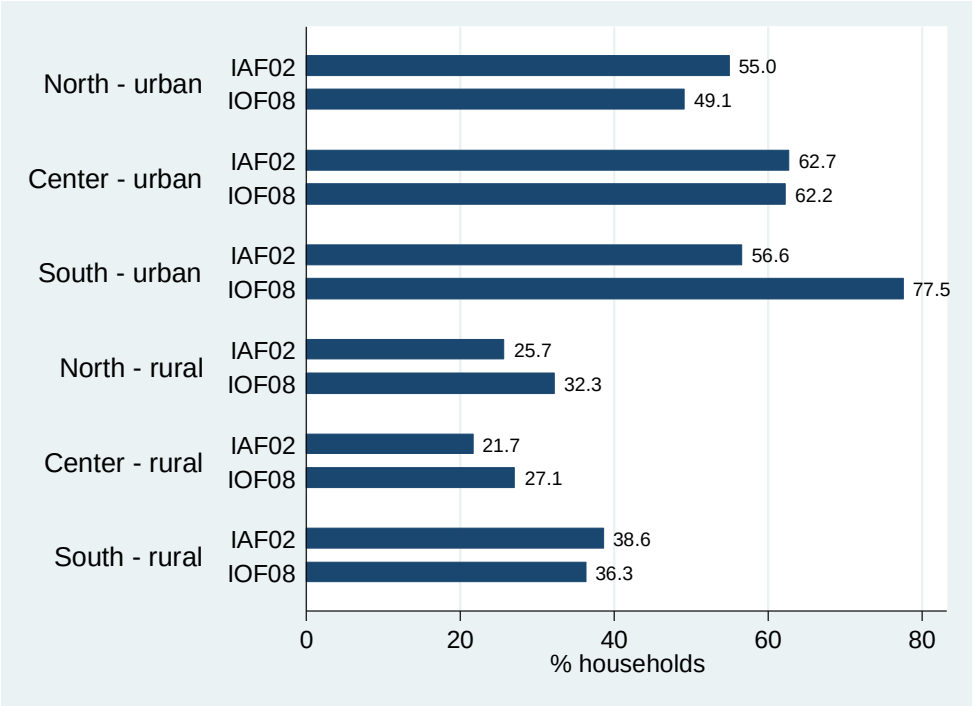


Figure 3-5: Share of households with access to a safe water source, 2002/03 & 2008/09



Sources: MPD/DNEAP using IAF02 and IOF08.

With respect to distance to the nearest primary health facility, the most important finding is of a large improvement in rural areas. In 2008/09 in the rural North, for example, 69.7% of households are now able to access such a facility within a 45 minute walk compared to only 31.5% in 2002/03. Access in the rural Centre and South has also improved, but not quite so quickly. Interestingly, access in urban areas to primary health facilities appears to have worsened, as a slightly smaller share of households report they are able to reach a facility on foot within 45 minutes. This may be due to a number of factors such as urbanization, with higher population growth in the periphery of cities where access to public facilities is lower; and a greater reliance on hospitals and other medical facilities in urban areas, thus reducing demand for basic primary facilities.

Evidence concerning access to safe water is probably the least impressive of the non-monetary indicators surveyed in this section. As Figure 3-5 above shows, the only unambiguous increase in access to a safe water source occurred in the urban South, where access was already relatively good. Thus, in 2008/09, we find that less than one third of all households in the rural Centre and rural North of the country has access to a safe water source.

Once again, we are faced with large regional disparities in both the levels and trends of poverty measures, across many of its dimensions. Among these disparities, the Central region of the country, especially in its rural areas, appears to be increasingly disadvantaged relative to the rest of the country.

3.2 Anthropometric measures of well-being

This section examines the well-being of the population from the point of view of access to nutrition. The risks and implications of poor nutrition are particularly critical for children under five years of age, as nutritional deficiencies can exert a strong influence on their subsequent growth and development. Assessing the nutritional status of children is a first step in fighting against malnutrition and is an important broad indicator of well-being.

In addition to the 2008/09 household survey, a number of previous studies provide useful information about the nutritional status of children. These include: (a) the 1996/97 household budget survey (IAF96), which included a survey of anthropometric data; (b) the 2003 Demographic and Health Survey (DHS03); and (c) the 2008 Multiple Indicator Cluster Survey (MICS08). In general, these studies indicate that the prevalence of malnutrition in Mozambique has decreased slowly over time but remains high in absolute terms.

The objective of this section is to use the IOF08 survey data to determine the prevalence of malnutrition in children aged 0 – 59 months. To assess validity and investigate trends over time, we compare these findings to the information contained in previous surveys. For all surveys we apply new reference population data from the World Health Organization (WHO, 2006), which provides a more accurate and relevant basis from which to assess child nutrition.[8]

3.2.1 Defining and measuring malnutrition

The anthropometric parameters usually used to assess the nutritional status of children are their weight and height. As recommended by the WHO, these parameters are used to calculate three standard anthropometric indices: weight/age, height/age and weight/height.

Since 1977, the WHO has recommended that the anthropometric assessment of the nutritional status of children should be carried out by making comparisons to a reference population. The latter provides established cut-off points for anthropometric indices, thereby enabling a transparent and comparable means to quantify the nature and severity of nutritional challenges. The reference population used here is from the WHO's 2006 data. It is produced from globally representative data and provides a single international standard that best represents the expected distribution of the growth (in height and weight) of children under five years of age.

Measures of malnutrition focus on the distance of a given indicator for a child (e.g., height for age) relative to the reference population. Specifically, for each child, a *Z*-score can be calculated as: $Z_i=(h_i - H_r)/ \sigma_r$, where h_i refers to an anthropometric indicator for child i, H_r the median value for that indicator in the reference population, and σ_r the standard deviation (SD) in the reference population. Thus, the lower the level of the *Z*-score, the higher the level of malnourishment. Using this definition, the WHO recommends that children should be considered as malnourished if they have a *Z*-score of negative two or less in relation to a given anthropometric index. Malnutrition is considered to be moderate when the *Z*-score is between negative three and negative two, and severe when it is less than negative three.

Based on these conventional cutoffs, aspects of malnutrition are operationally defined as follows:

[8] Note that use of the new reference population renders direct comparison with previously published figures (that are based on the old reference population) misleading.

Height / age (chronic malnutrition, stunting): low height-for-age reflects the cumulative effects of under-nutrition and infections. This measure indicates poor environmental conditions and/or long-term restriction of a child's growth potential.

Weight / height (acute malnutrition, wasting): low weight-for-height indicates acute weight loss, which is a deficit in the amount of tissue and fat compared to the amounts expected for children with the same height.

Weight/age (underweight): this is a composite measure that may reflect either stunting or, less commonly, wasting. This measure is more difficult to interpret and may be driven by short-term factors, such as recent illness or moderate seasonal fluctuations in food supply, as well as longer term deficiencies in access to adequate foods.

3.2.2 Estimates of malnutrition

Table 3-3 summarises the extent of malnutrition in Mozambique estimated from the IOF08 survey data. At the national level, 46.4% of children less than 60 months are stunted (chronically malnourished), 18.7% are underweight and 6.6% are wasted (acute malnutrition). The incidence of severe stunting is 23%. Rural areas tend to show a higher incidence of malnourishment with respect to underweight and stunting. Also, on average, male children tend to show a higher incidence of malnourishment relative to females.

Table 3-3: Nutritional status of children aged 0-60 months (by gender and region).

	Underweight		Stunting		Wasting	
	Moderate (-2SD)	Severe (-3SD)	Moderate (-2SD)	Severe (-3SD)	Moderate (-2SD)	Severe (-3SD)
National	18.7	4.9	46.4	22.9	6.6	2.1
Male	20.6	6.1	48.2	24.5	7.8	2.8
Female	17.1	3.9	44.7	21.5	5.4	1.5
Urban	13.1	2.8	36.2	15.8	6.5	2.1
Rural	20.7	5.7	49.9	25.4	6.6	2.1

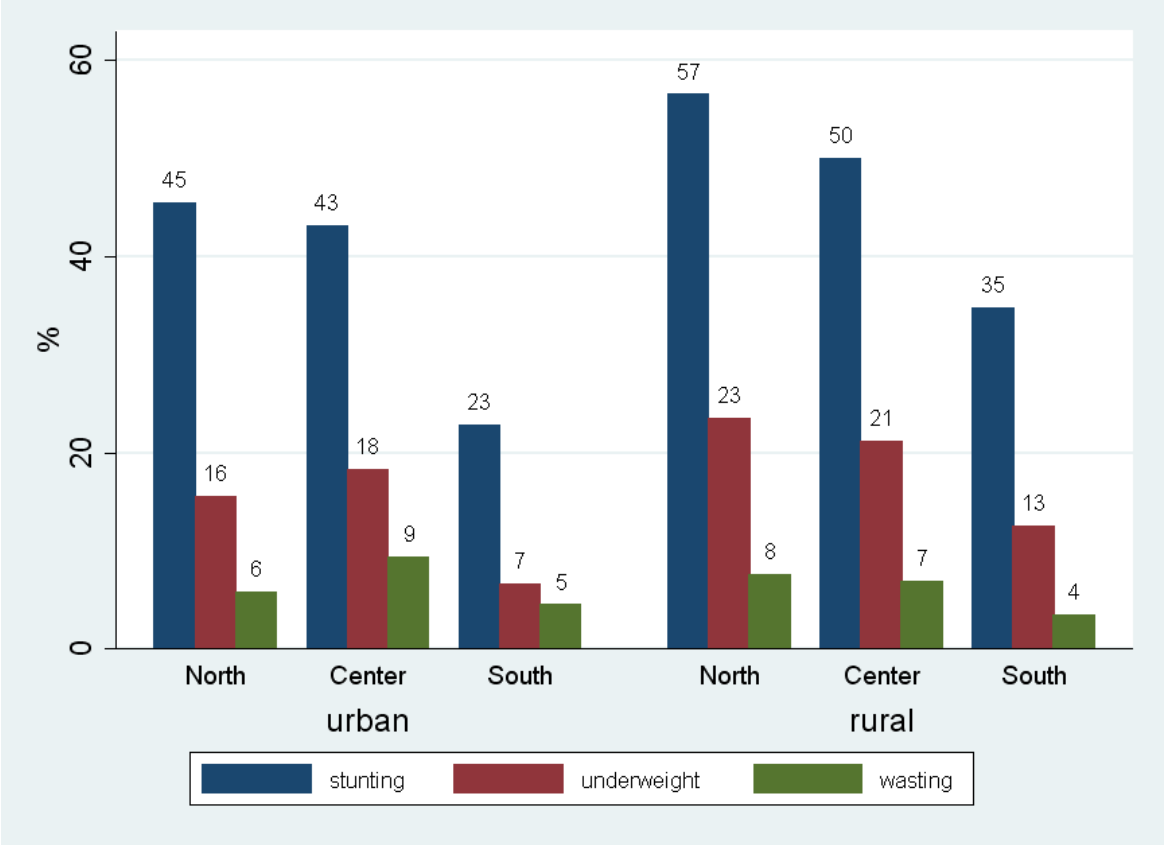
Notes: see text for definition of malnutrition measures.

Sources: MPD/DNEAP using IOF08 and WHO (2006).

Figure 3-6 illustrates trends in measures of child malnutrition by geographic region (also using IOF08 survey data). Here we see further disparities between population sub-groups. The prevalence of child malnutrition is very high in the North and Centre, and with greater intensity in the countryside. Averaging across regions, the chronic malnutrition rate reaches 50% in rural areas against 36% percent in urban areas (not shown in the Figure). These differences are consistent with the results of previous studies and are driven by a large

number of factors. Rural areas tend to have lower incomes and tend to face additional disadvantages such as more limited access to public health, education and sanitation facilities.

Figure 3-6: Child malnutrition, % infants, by region and area.



Sources: MPD/DNEAP using IOF08

Table 3-4 shows rates of malnutrition by age groups. Here one notes that the three different indicators have different trends over time: chronic malnutrition increases with age while wasting tends to decrease with age.

Table 3-4: Prevalence of child malnutrition by age.

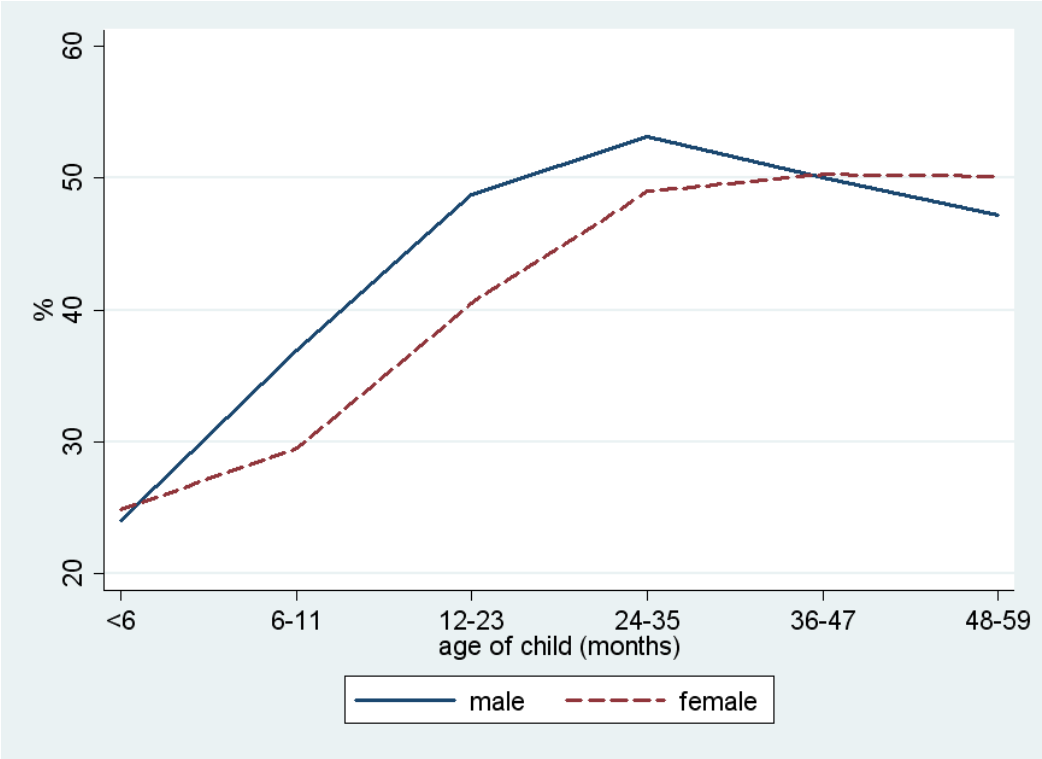
	Underweight		Stunting		Wasting	
Age (months)	Moderate (-2SD)	Severe (-3SD)	Moderate (-2SD)	Severe (-3SD)	Moderate (-2SD)	Severe (-3SD)
0-5	19.6	8.6	24.4	13.5	15.9	6.6
6-11	17.4	4.1	28.3	10.8	10.8	2.5
12-23	22.3	6.6	48.9	25.5	8.2	2.8
24-35	18.9	4.8	54.3	27.8	6.1	2.3
36-47	16.0	4.4	48.3	22.7	3.7	1.2
48-60	17.7	2.8	48.8	24.1	3.2	0.5
National	18.7	4.9	46.4	22.9	6.6	2.1

Notes: See text for definition of malnutrition measures.

Sources: MPD/DNEAP using IOF08 and WHO (2006).

As illustrated in Figure 3-7, the largest increase in chronic malnutrition occurs between 6 and 23 months, when (many) children are moving from exclusive breastfeeding to a diet determined by available food in the household. This is a critical period for infant nutrition where inadequate nutritional intake, either due to lack of access to food, a poor diet, or prolonged illness may have long-term consequences.

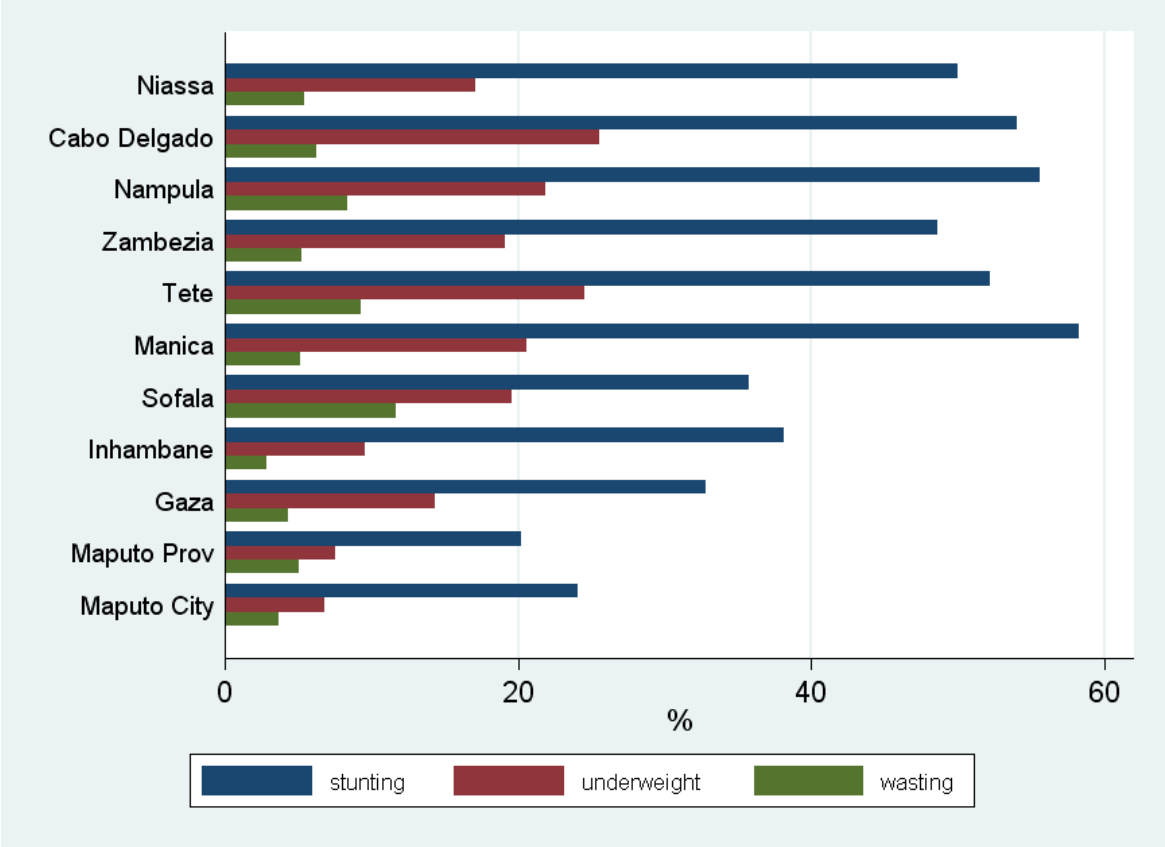
Figure 3-7: Stunting (chronic malnutrition), % infants by age and gender.



Sources: MPD/DNEAP using IOF08.

Looking more closely at regional differences, Figure 3-8 below shows that the prevalence of chronic malnutrition is highest in the provinces of Manica (58%) and Nampula (56%), closely followed by Cabo Delgado, Niassa, Tete and Zambezia (54%, 50%, 52% and 49%, respectively). The prevalence of chronic malnutrition is 36% in Sofala, while in the Southern provinces it varies from 38% in Inhambane to 20% in Maputo Province, which has the lowest rate of chronic malnutrition in the country.

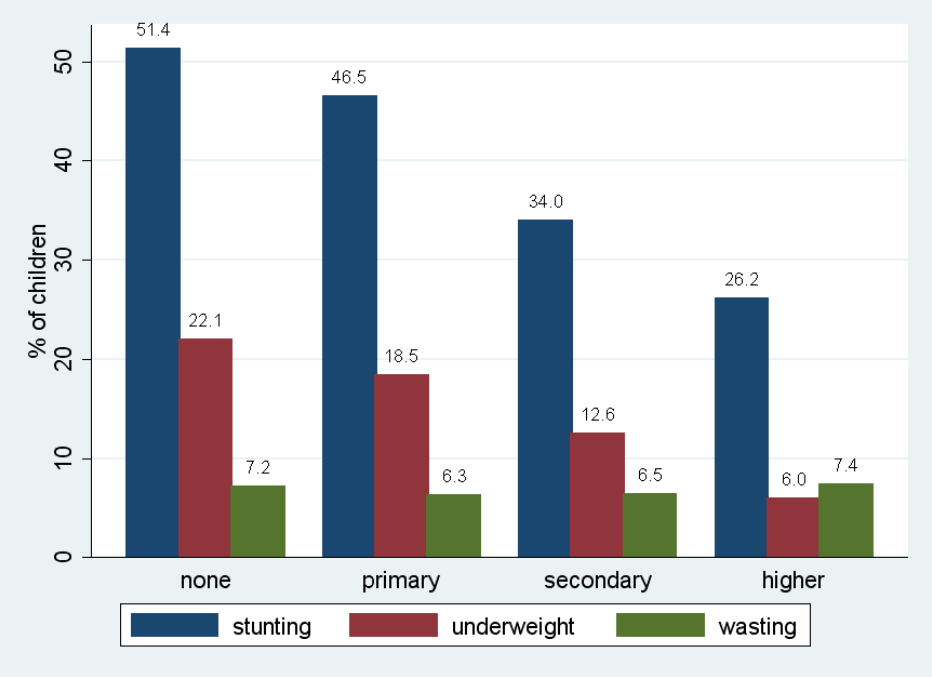
Figure 3-8: Moderate malnutrition, % infants by province.



Sources: MPD/DNEAP using IOF08

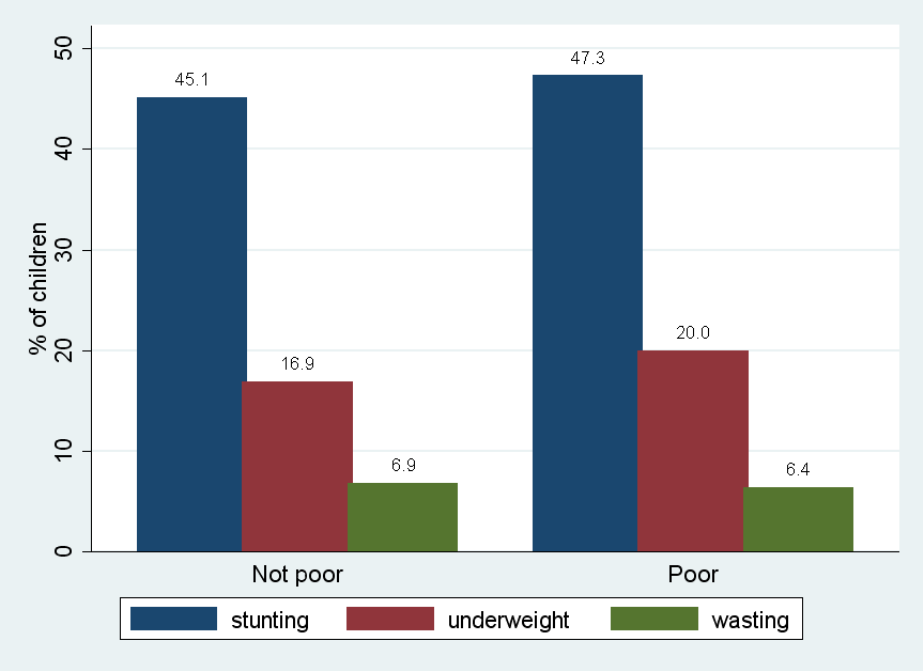
Figure 3-9 and Figure 3-10 show the relationship between malnutrition and other indicators measured at the household level. We find a strong negative association between parental education (in this case the head of the household) and malnutrition. For example, chronic malnutrition among children who reside in households whose head has no formal schooling is 51.4%, while the rate of chronic malnutrition for children who reside in households whose head has completed higher education is only 26.2%. Nevertheless, there is a weaker relation between stunting and per capita household expenditure. This is shown in Figure 3-10, which shows only small differences in the incidence of malnutrition by poverty status. This weak relation is well established elsewhere and reflects the multifaceted nature of malnutrition, as well as the fact that monetary poverty is sensitive to temporary fluctuations in consumption power while malnutrition measures capture longer-run dynamics (UNICEF, 2007).

Figure 3-9: Prevalence of malnutrition by head of household's level of completed education (% infants).



Sources: MPD/DNEAP using IOF08

Figure 3-10: Prevalence of malnutrition by consumption poverty status, % infants.

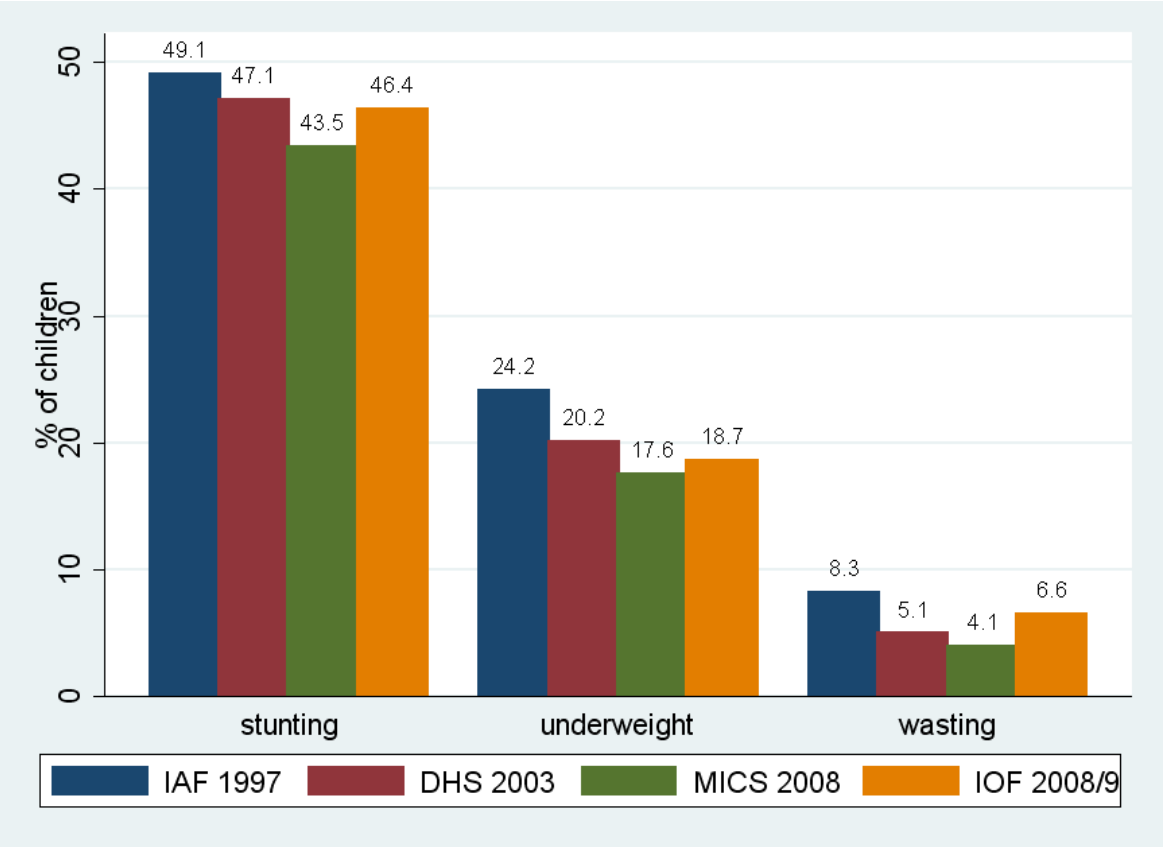


Sources: MPD/DNEAP using IOF08

Figure 3-11 compares estimates of child malnutrition in the IAF96, DHS03, MICS08 and IOF08 surveys. A slowly declining trend of falling malnutrition is observed across all indicators from 1996/97 until the MICS08 survey. The IOF08 survey, however, indicates a

moderate regression relative to MICS08—for example, chronic malnutrition increases from 44% to 46%.

Figure 3-11: Trends in malnutrition across surveys, % infants (1996/97 – 2008/09).



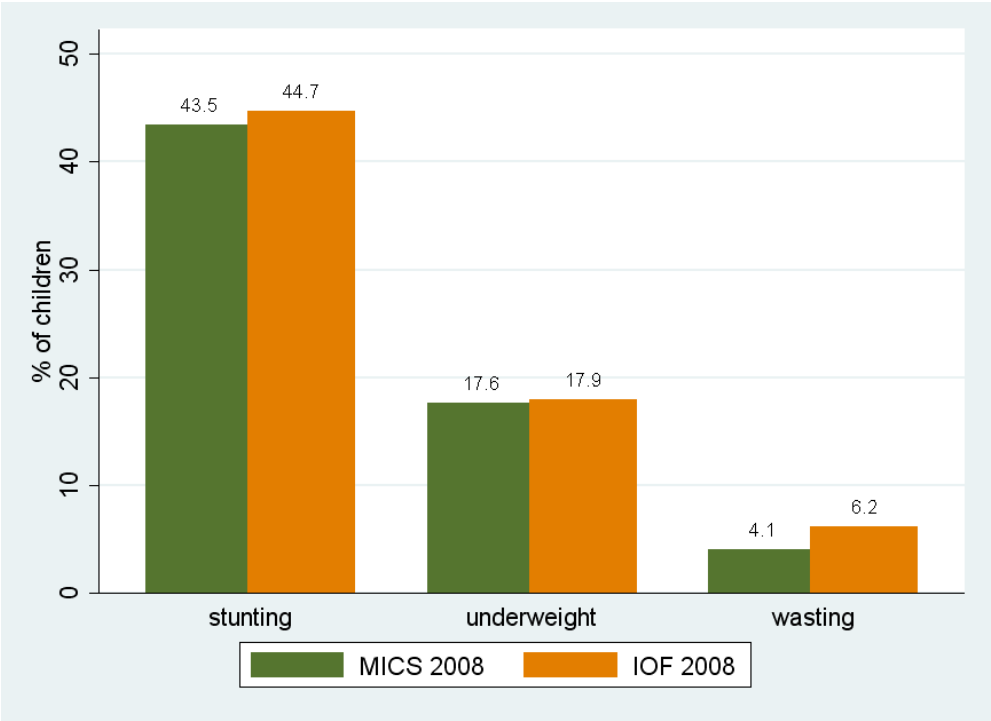
Sources: MPD/DNEAP using IAF96, DHS03, MICS08 & IOF08.

As a sensitivity analysis, we restrict the analysis of MICS08 and IOF08 to households surveyed during the same period of 2008 (the MICS was conducted between September and November 2008 while IOF ran from September 2008 to August 2009). This analysis is shown in Figure 3-12 and indicates effectively no differences between the national averages for the three indicators. Of course, if the September to November 2008 malnutrition indicators from IOF08 are lower than the full sample average, this implies that the December 2008 to August 2009 malnutrition indicators must be higher than the full sample average.

In sum, measures of infant malnutrition capture an important aspect of well-being that is only weakly correlated with consumption expenditures at a given moment in time. Data regarding both the level and trends in infant malnutrition indicate that ensuring sufficient nutrition to children remains a major challenge for Mozambique. The persistence of large regional disparities in malnutrition also is indicative of substantial differences in access to food and

public services. Evidence from the MICS08 and IOF08 surveys suggests a very slow rate of improvement in child malnutrition.

Figure 3-12: Comparison of malnutrition in IOF08 and MICS08 for survey overlap period, % infants.



Sources: MPD/DNEAP using MICS08 & IOF08.

3.3 Poverty lines

Poverty lines for 2002/03 and 2008/09 are presented in Table 12-1 in Section 12. As was found in 2002/03, Maputo City and the urban zone of Maputo province exhibit the highest costs of living. The two zones with the lowest cost of living, the rural zones of Sofala/Zambézia and Nampula also remain the same between the two surveys (although the rankings switch among the two). Overall, the cost of living at the poverty line is estimated to have increased by a factor of about 2.30.[9] The rate of increase in the cost of living varies fairly dramatically by spatial domain. The most rapid rate of price increase was observed in the rural areas of Manica and Tete (ratio of 2.80) while the least rapid rate of price increase was observed in the rural area of Maputo (ratio of 1.48). The food share, calculated as the share of the food poverty line relative to the total poverty line, varies between 63.0% and 79.1% in 2008/09, which is similar to the range of values observed in 2002/03. On average, the share of food in the poverty line bundles rose slightly between 2002/03 and 2008/09. The contents of the bundles and associated unit prices are presented completely in Section 1.

[9] Consistency with other sources on the rate of inflation is investigated in section 4.3.

3.4 Consumption poverty

This section presents the FGT measures of consumption poverty using the IOF08 household survey data based on the methods described above and in Appendix 10.1. The results are presented at the national level and at different disaggregated levels (e.g., rural/urban, North, Centre, and South, and provinces). These results are also compared with results from previous poverty assessments. A detailed series of consistency checks are conducted in Section 4.

3.4.1 Poverty headcount measure

The most recent household survey (IOF08) indicates that out of Mozambique's almost 21.5 million people, nearly 12 million lived below the poverty line in 2008/09. As shown in Table 3-5 below, the national headcount ratio was 54.7% during the IOF08 survey period. In comparison, in the first comparable survey conducted in 1996/97, the headcount ratio was 69.4%. Poverty thus decreased 14.7 percentage points over the twelve-year period from 1996/97. However, compared to the previous survey in 2002/03 (with a headcount ratio of 54.1%), consumption poverty rates have stagnated. The increase of 0.6 percentage points since 2002/03 is nowhere near statistically significant. Thus, the rates obtained from IAF02 and IOF08 are appropriately viewed as being the same.

Both rural and urban areas contributed to poverty reduction over the period 1996/97 to 2008/09. Over the more recent period (2002/03 to 2008/09), however, we find a moderate increase in rural poverty (from 55.3% to 56.9%) and a moderate reduction in urban poverty (from 51.5% to 49.6%). Again, however, neither of these changes is statistically significant.

Table 3-5: Poverty headcount (P_0 measure).

	Levels, %			Difference, % points	
	1996-97	2002-03	2008-09	1996-97 to 2002-03	2002-03 to 2008-09
National	69.4	54.1	54.7	-15.3	0.6
Urban	62	51.5	49.6	-10.5	-1.9
Rural	71.3	55.3	56.9	-16	1.6
North	66.3	55.3	46.5	-11	-8.8
Center	73.8	45.5	59.7	-28.3	14.2
South	65.8	66.5	56.9	0.7	-9.6
Niassa	70.6	52.1	31.9	-18.5	-20.2
Cabo Delgado	57.4	63.2	37.4	5.8	-25.8
Nampula	68.9	52.6	54.7	-16.3	2.1
Zambezia	68.1	44.6	70.5	-23.5	25.9
Tete	82.3	59.8	42.0	-22.5	-17.8
Manica	62.6	43.6	55.1	-19	11.5
Sofala	87.9	36.1	58.0	-51.8	21.9
Inhambane	82.6	80.7	57.9	-1.9	-22.8
Gaza	64.6	60.1	62.5	-4.5	2.4
Maputo Province	65.6	69.3	67.5	3.7	-1.8
Maputo City	47.8	53.6	36.2	5.8	-17.4
Dispersion:					
Provinces	11.7	12.6	13.2	17.2	18.3
Correlation coefficients:					
Consecutive surveys		-0.001	-0.006		-0.633
Initial level and change	-0.683	-0.668			
Destination level and change		0.731	0.726		

Notes: Dispersion of the poverty rates and changes in poverty rates is measured by the standard deviation of the provincial rates and changes in rates across provinces. The correlation coefficient for consecutive surveys shows the correlations for each column with the preceding column. Initial level and change shows the correlation starting with the first levels column and the first rates column. Destination level and change shows correlations starting with the second levels column and the first rates column. All correlations are performed on province

Source: MPD/DNEAP based on IOF08, IAF02, IAF96.

As expected, greater variation in changes in poverty rates is seen when we look at a more geographically disaggregated level. As shown in Table 3-5, between 2002/03 and 2008/09, poverty declined 8.8 percentage points in the Northern regions (from 55.3% to 46.5%) of the country and 9.6 percentage points in the Southern regions (from 66.5% to 56.9%). The Central regions experienced an increase of 14.2 percentage points (from 45.5% to 59.7%). Even larger changes are found at the provincial level. The largest reduction in poverty rates was found in Cabo Delgado (-26 percentage points) and Inhambane (-23 percentage points). In contrast, Zambézia (26 percentage points) and Sofala (22 percentage points) stand out as the two provinces showing the largest increases in poverty incidence since 2002/03.

Compared to the 2002/03 survey results, smaller increases in poverty rates were observed for Nampula, Gaza, and Manica. These ranged from two to 12 percentage points. Critically, therefore, the stagnation in the overall poverty rate since 2002/03 is principally due to substantial increases in measured poverty in Zambézia and Sofala, which offset the large declines in poverty observed in five provinces.

The statistical significance of the changes in poverty rates is presented in Table 3-6.[10] It confirms that the stagnation in national and rural/urban poverty rates masks genuine variation at lower levels of aggregation. Changes in poverty rates at the regional level (North, Centre, South) are all statistically significant, as are seven of the 11 provincial measures (including Maputo City).

Table 3-6: Confidence intervals and statistical significance.

	2002/03		2008/09				Confidence	
Region	Headcount	SE	Headcount	SE	Difference		interval	
National	54.1	1.7	54.7	1.8	0.6	±	4.9	
Urban	51.5	2.6	49.6	2.2	-1.9	±	6.6	
Rural	55.3	2.1	56.9	2.3	1.6	±	6.1	
Northern	55.3	3.2	46.5	3.2	-8.8	±	8.8	*
Central	45.5	2.8	59.7	2.9	14.2	±	7.9	*
Southern	66.5	1.7	56.9	2.9	-9.6	±	6.6	*
Niassa	52.1	5.5	31.9	4.8	-20.2	±	14.3	*
Cabo Delgado	63.2	3.7	37.4	5.2	-25.8	±	12.5	*
Nampula	52.6	4.8	54.7	3.8	2.1	±	12.0	
Zambézia	44.6	5.0	70.5	4.2	25.9	±	12.8	*
Tete	59.8	4.2	42.0	4.6	-17.8	±	12.3	*
Manica	43.6	4.1	55.1	5.6	11.5	±	13.6	
Sofala	36.1	3.5	58.0	4.9	21.9	±	11.9	*
Inhambane	80.7	2.4	57.9	4.5	-22.8	±	10.0	*
Gaza	60.1	3.5	62.5	4.2	2.4	±	10.8	
Maputo Province	69.3	3.0	67.5	3.8	-1.8	±	9.6	
Maputo City	53.6	3.2	36.2	3.3	-17.4	±	9.0	*

Notes: a * (last column) indicates a statistically significant difference in the poverty rate between 2002/03 and 2008/09. The confidence interval is the confidence interval for the difference. The standard error (SE) of the difference in poverty rates is the square root of the sum of the squares of the standard errors in 2002/03 and 2008/09. Because the distribution of the poverty rate is unknown, confidence intervals are defined as plus or minus twice the standard error. Confidence intervals on the levels can be obtained via simple calculation.

Source: MPD/DNEAP based on IOF08, IAF02, IAF96.

[10] For further discussion of confidence intervals for poverty rates, see Appendix 10.2 and Simler and Arndt, 2007.

3.4.2 The variation of poverty at the provincial level over time

The changes in poverty rates at the provincial level merit further discussion. In general terms there are three main sources of variation that need to be distinguished. These are: (i) true variation in the poverty rates; (ii) variation due to sample error; and (iii) variation due to non-sample error. Each source of variation is considered in turn.

True variation. It is highly likely that true poverty rates vary substantially through time in Mozambique, particularly for limited geographic areas. As illustrated in Table 12-1 (in Section 12), food shares represent nearly three quarters of total consumption. In poor, rural households, home consumption of own production accounts for around 75% of food consumption. Given that poor households in Mozambique have relatively few options for stabilizing consumption over time, household consumption becomes highly dependent on agricultural production, food prices, and dependability/availability of income-earning opportunities outside of agriculture. The available evidence indicates strongly that none of these are stable even at relatively high levels of aggregation. Shocks to agricultural production and crucial prices can be expected to influence poverty rates strongly. This will be analysed at some length in subsequent sections.

Sample error. Table 3-6 shows standard errors for poverty rates in 2002/03 and 2008/09. Bearing in mind that these standard errors are themselves estimates, one notes that the confidence intervals on poverty rates (defined here as the estimate plus/minus twice the standard error) are quite wide, on the order of plus/minus ten percentage points in many provinces (e.g., a standard error of around five). Sample error stems from the use of samples. Because it is impractical to measure the consumption of every household, INE interviews a randomly selected sample of households. By pure chance, the sample could be somewhat wealthier or somewhat poorer than the population. The likelihood of divergence from the characteristics of the true population declines as the sample size increase. Because lower levels of geographical aggregation are associated with smaller samples, sample error tends to be higher at the provincial level and lower at the national level.

Non-sample error. Non-sample error reflects mistakes anywhere along the long chain of events in producing the poverty rates. Enumerators may not pose questions correctly. Respondents may not respond completely or correctly. The declarations of respondents may be improperly noted on the questionnaire. There may be errors in data processing or analysis.

These are only a few examples. Non-sample error is present in all surveys. At least two important sources of non-sample error have been identified in IOF08.

First, as pointed out by Deaton (2005, p. 16), compared with rural areas, tracking consumption in urban areas is often much more difficult because multiple household members are engaged in purchases and a high number of meals are consumed while individuals are outside of the home. Hence, undercounting of consumption may be a more significant problem in urban areas. In Mozambique, with the benefit of the accumulated survey data mentioned above, there is compelling evidence of undercounting of consumption in Maputo Province and Maputo City. The remaining Southern Provinces and urban zones of provinces in Northern and Central provinces may suffer from a degree of undercounting as well.

The evidence for undercounting is detailed in Appendix 10.6. Briefly, nearly all non-monetary indicators of poverty, including nutrition indicators obtained from IOF08 and presented in the next subsections, are substantially more favourable in the South in general and Maputo Province and Maputo City in particular. Yet, estimated calorie consumption in Maputo Province and Maputo City is low. While it is well established that only a weak correlation exists between observed household consumption and nutrition indicators (see section 3.2 and UNICEF, 2007), the divergence between the calorie consumption estimates and the child malnutrition estimates derived from IOF08 (and supported by other surveys) is simply too large to be plausible. The most likely explanation for the extent of divergence between the nutrition indicators (among others) and consumption indicators in Maputo Province and City is undercounting of consumption.

As detailed in Appendix 10.6, the tendency to undercount consumption in Maputo was also present in 2002/03. Our preferred attempt at correcting for undercounting reduces poverty levels in Maputo Province and Maputo City but has relatively mild impacts elsewhere. This is true in both 2002/03 and 2008/09. Conclusions with respect to the evolution of poverty between 2002/03 and 2008/09 remain qualitatively the same for all correction approaches attempted. At the same time, after correcting for undercounting, conclusions with respect to the ranking of provinces across space can change fairly significantly. In particular, the preferred correction procedure employed revises poverty rates substantially downwards for urban households and southern households (see Table 10-4 for poverty rates employing the preferred correction procedure). With these corrections in place, urban zones in the South

rank as some of the least poor regions in the country with Maputo City as the least poor region in the country.

Second, modifications to the questionnaire between 2002/03 and 2008/09 implied that consumption of non-work related receipts-in-kind from other households are missing in 2008/09. Evidence for this omission, which is not huge but is material, as well as the correction procedures employed, are detailed in Appendix 10.5.

In summary, if we were omniscient and could perfectly observe every household in every province through time, we would, in all likelihood, observe that consumption poverty rates vary through time with favourable conditions pushing poverty rates down and unfavourable conditions pushing poverty rates up. However, as a practical matter, we cannot observe every household, so we are forced to rely on samples and statistical methods to inform our understanding of reality. As a result, sample error is added to the inherent variation in poverty rates. Finally, we are human, and error inevitably creeps into our observations of households in the sample. As a result, non-sample error influences the estimates adding a third source of variation. For these three reasons, the provincial poverty rates are quite variable through time.

Later sections of this report illustrate the systematic tendencies in the poverty rates, identify the sources of vulnerability, and explain the changes in observed consumption poverty. However, before proceeding, a series of other measures are presented.

3.4.3 Poverty gap measures

Results for the poverty gap and the squared poverty gap measures are presented in Table 3-7 and Table 3-8. As is often the case, there is a high correlation between the poverty headcount and these additional measures. The correlation coefficient in 2008/09 between the poverty rate levels and the poverty gap and the squared poverty gap is 0.95 and 0.83, respectively. With respect to changes between 2002/03 and 2008/09, the correlations between the changes in poverty rates and changes in the gap measures are 0.91 and 0.81 respectively. Approximately the same correlations are found when comparing 1996/97 with 2002/03.

Table 3-7: Poverty gap (P_1 measure).

	Levels, %			Difference, % points	
	1996-97	2002-03	2008-09	1996-97 to 2002-03	2002-03 to 2008-09
National	29.3	20.5	21.2	-8.8	0.7
Urban	26.7	19.7	19.1	-7.0	-0.6
Rural	29.9	20.9	22.2	-9.0	1.3
North	26.6	19.5	16.6	-7.1	-2.9
Center	32.7	16.0	24.3	-16.7	8.3
South	26.8	29.1	22.1	2.3	-7.0
Niassa	30.1	15.8	12.3	-14.3	-3.5
Cabo Delgado	19.8	21.6	11.5	1.8	-10.1
Nampula	28.6	19.5	20.0	-9.1	0.5
Zambezia	26.0	14.0	27.9	-12.0	13.9
Tete	39.0	26.3	16.5	-12.7	-9.8
Manica	24.2	16.8	21.1	-7.4	4.3
Sofala	49.2	10.7	27.0	-38.5	16.3
Inhambane	38.6	42.2	20.9	3.6	-21.3
Gaza	23.0	20.6	28.3	-2.4	7.7
Maputo Province	27.8	31.1	25.6	3.3	-5.5
Maputo City	16.5	20.9	11.8	4.4	-9.1
Dispersion:					
Provinces	9.5	8.8	6.5	12.5	11.4

Note: Dispersion of the poverty gap and changes in the poverty gap is measured by the standard deviation of the provincial gap rate and changes in gap rate across provinces.

Source: MPD/DNEAP based on IOF08, IAF02, IAF96.

Given these high correlations, it is not necessary to comment in great detail. Two observations, however, are of interest. First, consistent with the poverty headcount results, the poverty gap and the squared poverty gap also decrease from 1996/97 to 2008/09, but change little from 2002/03 to 2008/09. This means that the real income of the poor relative to the poverty line has increased from 1996/97 to 2008/09, but has been relatively constant from 2002/03 to 2008/09. Second, in contrast to the poverty headcount results, the provincial coefficient of variation (dispersion over average) in the poverty gap and the squared poverty gap follow a decreasing trend from 2002/03 to 2008/09. This means that the poor in different provinces have become somewhat more equal in terms of their real level of consumption.

Table 3-8: Squared poverty gap (P_2 measure)

	Levels, %			Difference, % points	
	1996-97	2002-03	2008-09	1996-97 to 2002-03	2002-03 to 2008-09
National	15.6	10.3	11.0	-5.3	0.7
Urban	14.6	9.6	9.6	-5.0	0.0
Rural	15.9	10.7	11.6	-5.2	0.9
North	13.9	8.9	8.0	-5.0	-0.9
Center	18.0	7.9	13.0	-10.1	5.1
South	13.9	16.0	11.4	2.1	-4.6
Niassa	16.1	6.7	6.5	-9.4	-0.2
Cabo Delgado	9.1	9.5	4.8	0.4	-4.7
Nampula	15.3	9.3	9.8	-6.0	0.5
Zambezia	12.3	6.1	13.9	-6.2	7.8
Tete	22.5	15.3	8.9	-7.2	-6.4
Manica	11.7	9.2	11.1	-2.5	1.9
Sofala	32.1	4.3	17.1	-27.8	12.8
Inhambane	21.4	26.0	10.1	4.6	-15.9
Gaza	10.9	9.3	16.7	-1.6	7.4
Maputo Province	14.7	17.2	12.5	2.5	-4.7
Maputo City	7.7	10.3	5.2	2.6	-5.1
Dispersion:					
Provinces	7.1	6.2	4.2	8.9	8.0

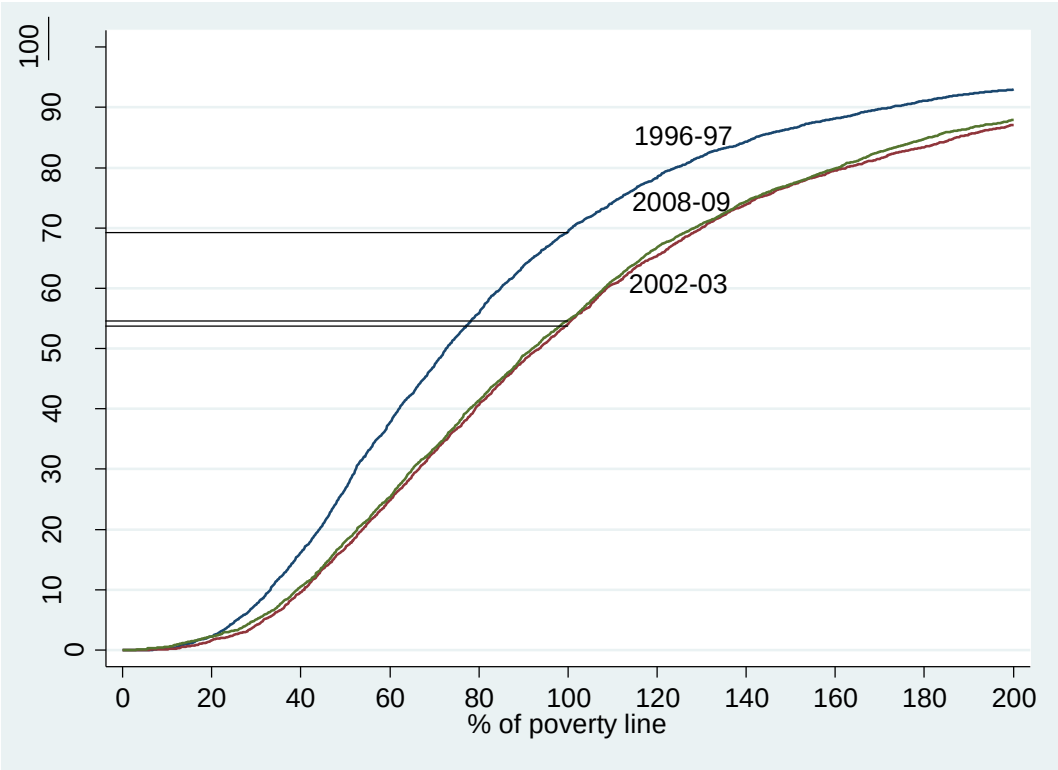
Note: Dispersion of the squared poverty gap and changes in the squared poverty gap is measured by the standard deviation of the provincial gap rate and changes in gap rate across provinces.

Source: MPD/DNEAP based on IOF08, IAF02, IAF96.

3.4.4 The distribution of real consumption

A potential disadvantage of the measures presented above is their dependence on a particular level of welfare that is reflected by the poverty line. Analysis of the distribution of real consumption can provide additional insight. The distributions of real consumption in 1996/97, 2002/03, and 2008/09 are presented in Figure 3-13. The horizontal axis represents consumption measured in terms of a percent of the poverty line. The graph is censored at 200% of the poverty line (or twice the poverty line level of expenditure) for purposes of exposition. The vertical axis represents the percentage of the population. Each point on the distribution function shows the percentage of the population (vertical axis) falling below the specified consumption level (horizontal axis).

Figure 3-13: Distribution functions of real consumption.



Source: MPD/DNEAP based on IOF08, IAF02, IAF96.

The official poverty rates are found at the poverty line levels, indicated by the vertical line that crosses 100 on the horizontal axis. The poverty levels in all survey years can be read from the distribution functions at the point where the function crosses the vertical line that indicates 100% of the poverty line. The conclusion of substantial improvements between 1996/97 and 2002/03 and then stagnation in consumption between 2002/03 and 2008/09 holds across the full distribution.

4 Consistency with Alternative Sources

This section investigates the extent to which the results presented in Section 3 are consistent with alternative sources of information, such as additional data from the household surveys (IAF02 and IOF08) as well as external data sources. The main objective is to verify the estimates for consumption poverty in Table 3-5, both at the national and regional levels.

The next three sections examine the degree of consistency between external and survey-based measures of assets, consumption, and prices. Afterwards, section 4.5 presents alternative measures of poverty based on indicators of food consumption. Finally, section 4.6 analyses

trends in agriculture, agricultural production, and rural income since 2002 using the separate set of Agricultural Surveys (TIAs) administered to rural households.

4.1 Access to services

The improvements in indicators of access to basic services are in line with the public investments realized in the last few years. The following observations emerge using administrative data from 2004-2007.

4.1.1 Electricity

During the analysis period, the electricity sector registered a positive performance derived principally from the expansion of the grid. The number of new consumers of electricity increased by 250,000. This is more than three times the number of new consumers planned for in the PQG. The expansion of the power grid in part corroborates the growth in per capita use of goods that require electricity such as a fridge, cell phone, and television among others (Governo de Moçambique, 2010).

4.1.2 Education

In the area of eduction, public investment continued to focus on expansion of access, reduction in gender inequalities, improvement in quality, and overall institutional capacity building. With respect to expansion of the system, the number of schools increased from 9,659 schools in 2004 to 11,455 in 2007 with this growth spread across all education levels. As a result of expansion of the system, the number of children attending school has increased from 3,670,991 in 2004 to 4,844,077 in 2007. This corresponds to achieving 93% of the level targeted in the five year plan in the space of three years. Focusing uniquely on lower primary school (EP1), the number of schools grew from 8,373 in 2004 to 9,303 schools in 2007 with the number of students enrolled growing from 3,071,564 to 3,866,906.

With respect to secondary school (first cycle), the number of schools nearly doubled passing from 140 schools in 2004 to 252 in 2007. A concomitant rise in the number of students served was also observed with the number of students enrolled in the first cycle of secondary school rising from 168,798 to 313,692 over the same period. With respect to the second cycle of secondary school, the number of schools rose from 30 to 58 while the number of students passed from 21,350 to 47,388 over the period 2004-2007 (Governo de Moçambique, 2010).

4.1.3 Water and sanitation

In the area of water and sanitation, activities have been focused on the improvement of coverage and institutional mechanisms for sustaining water supplies in rural, peri-urban and urban zones. With respect to water supplies for rural areas, administrative data point to the construction or rehabilitation of 5,163 source of water divided between 2,503 holes (furos), 392 wells, and 2,268 sources rehabilitated over the period 2004-2007. These investments have helped to increase the percentage of families with access to potable water from about 35.6% in 2002-03 to about 40.5% in 2008-09 (Governo de Moçambique, 2010). The IOF08 data show that improvements in the areas of water and sanitation have varied by region (see section 3.1.4).

4.1.4 Health

One of the fundamental objectives of the government is to improve the quantity and quality of health services delivered to the population with particular attention paid to areas that are poorly served. With the goal of achieving these objectives, the following activities were undertaken over the period 2004-2007:

- 300 rehabilitations or new constructions adding to the primary health system were concluded. The PQG only envisioned 137 rehabilitations/new constructions implying that the target has already been surpassed.
- 23 interventions (promotions, rehabilitations, and new constructions) adding to the secondary health system were concluded. The PQG envisioned 41 interventions of these types implying that 41% of the target has been achieved.
- 15 rehabilitations of provincial hospitals were concluded. The PQG envisioned 6 rehabilitations implying that this target has already been surpassed.
- 5 central hospital blocks were rehabilitated against 17 planned (29% of target realized).
- 2 training centres were rehabilitated against a target of one.

The data from IOF08 indicate that these and other activities have been successful in increasing access to health posts, particularly in rural areas. Overall, the share of households within 45 minutes walking distance from a health post increased from 54.5% in 2002-03 to 65.2% in 2008-09.

4.2 Nominal consumption

To begin, we consider the consistency of the nominal consumption estimates derived from the household budget surveys with those taken from national accounts. Here, standards of comparison are relatively low as there are often large differences between these sources, particularly in developing countries (Ravallion, 2003). Typically, estimates of total household consumption derived by national accounts are larger than estimates of total consumption derived from nationally representative household surveys (Deaton, 2005).[11] The reasons for this difference are that (i) the very wealthiest households are often not present in household consumption surveys, (ii), as mentioned earlier, survey-based measures have a tendency to undercount consumption due to non-sample error, and (iii) consumption in national accounts is not measured directly, but is rather estimated as a residual. Also, consumption *growth* in national accounts tends to be faster than in household surveys because formalization of the economy means that more spending is captured. Nevertheless, we expect these two estimates to be broadly consistent.

Table 4-1 provides nominal private consumption as estimated by national accounts (available at the national level only) and as estimated by IAF02 and IOF08. Nominal consumption is defined as the total value of consumption with no attempt to adjust for changes in prices. The first row gives the national accounts estimates produced by INE. To ensure temporal comparability with the household surveys, the national accounts entries for 2002/03 and 2008/09 are simple averages of nominal private consumption for the two years referenced by each survey.[12]

As is often the case, the household survey-based estimate of total nominal consumption falls below the national accounts estimate. Less typically, growth in the nominal consumption aggregate is more rapid using the survey than the national accounts. Hence, the difference between the estimate provided by national accounts and the estimate provided by the household budget survey is smaller in 2008/09 than in 2002/03. At a minimum, the household survey reinforces the growth rates in nominal consumption published by national accounts.

[11] For sub-Saharan Africa, the ratio of consumpttion estimates from surveys to those from natinal accounts is in fact one. The average for all other regions is about 0.81. The SSA region also exhibits by far the highest standard deviation. As Deaton points out, the high ratio is more likely an indication of large-scale underestimation in the national accounts in Sub-Saharan Africa than a cause for celebration. It is unlikely that Mozambican national accounts are grossly underestimated; hence the ratios presented in Table 4-1 are as expected.

[12] The 2009 national account aggregate consumption figure is preliminary.

Table 4-1: Comparison of household survey-based and national accounts measures of nominal consumption (2002/03 and 2008/09).

	Nominal consumption (total)			Nominal consumption (mean pc)		
	2002/03	2008/09	% change	2002/03	2008/09	% change
National accounts	93,119	202,459	117.4	5,088	9,400	84.7
Survey total	72,792	188,867	159.5	3,976	8,773	120.6

Notes: all values stated in millions of New Mozambican Meticais.

Sources: MPD/DNEAP using data from INE (for national accounts), IAF02 & IOF08.

Table 12-2 (in Section 12) employs the survey data to consider annual nominal consumption by the spatial domains (13 regions) used in the poverty analysis. Three measures of nominal consumption are provided: total consumption, mean per capita consumption, and median per capita consumption. The final row of the Table gives the correlation between changes in the headcount poverty rate between 2002/03 and 2008/09 by spatial domain and the corresponding measure of change in consumption given in the same column. These survey-based measures of average and median nominal consumption indicate very substantial differences in the growth rate of nominal private consumption across spatial domains. For example, while median nominal consumption in rural Niassa and Cabo Delgado grew by nearly 200% between 2002/03 and 2008/09, it grew by only 77% in rural Sofala and Zambézia.

As the bottom row of the table demonstrates, these regional disparities in growth rates of nominal consumption are quite consistent with estimated changes in the headcount poverty rate. The correlation coefficient between changes in the poverty rates by spatial domain and changes in median nominal consumption is -0.74, which means that domains with above average increases in nominal consumption tend to have above average decreases in the poverty rate (and vice versa). This is important: it implies that the poverty results are driven substantially by declarations of households on the value of their consumption. However, for the purposes of poverty analysis, nominal consumption is not of interest in and of itself. As described in the methodology section, poverty analysis focuses on real consumption, where real is defined as the capacity to purchase a minimally acceptable bundle of food and non-food commodities. The following subsections consider comparisons of price changes across surveys.

4.3 Consumer Price Index

As already illustrated in Table 12-1, the poverty lines developed for IAF96, IAF02, and IOF08 can be used to develop a price index. Specifically, the ratio of the poverty lines, by domain, provides a measure of the change in the cost, measured in Meticais, of living at exactly the poverty line level. By design, this particular measure of inflation is most relevant for the poor as the contents of the food bundle reflect items that are consumed by the poor. It is relevant to consider whether these IOF08/IAF02 survey-based measures of changes in consumer prices are reasonably consistent with other measures of price inflation. We begin with INE's consumer price index (CPI) series and compare these against changes in the aggregate and food poverty lines constructed in the poverty analysis.

Before proceeding, it is important to point out that price indices derived from the poverty lines diverge from the CPI measures published by INE in at least two important ways. First, the former specifically reflect the consumption patterns of the poor as opposed to a very broad basket of goods. Second, the INE indices typically retain a relatively narrow geographic coverage, notably using observed prices from the cities of Maputo, Beira, and Nampula only. The INE indices do not at all account for rural price information, which may be a significant omission as markets appear to be poorly integrated (Cirera and Arndt, 2008). In contrast, the household survey-based measures of prices are derived from consumption records taken from a large and geographically representative sample of households.

Table 4-2 below summarises these various price inflation measures. For comparability with INE's series we focus exclusively on the cities of Maputo, Beira and Nampula. To accomplish this, the survey-based measures of price inflation in the table are selected from the corresponding urban regions in the survey. So, the Sofala and Zambézia urban region is assumed to correspond to Beira. This is imperfect as the Sofala and Zambézia urban region also includes cities like Quelimane as well as smaller towns whose populations are categorised as urban in the household survey. Column (I) of the table gives consumer price inflation between 2002/03 and 2008/09 based on INE's published aggregate CPI series. Column (II) uses the same underlying data, but employs a weighting scheme based on the observed pattern of expenditures found in the 2002/03 household survey (IAF) in order to enhance comparability between the CPI and the survey-based measures.[13] Column (III)

[13] The reweighting proceeds as follows. Items in INE's CPI basket that poor people manifestly do not consume, such as airline tickets, are given a weight of zero. Weights on basic food items are adjusted on the basis of the

provides the ratio of the aggregate poverty lines by spatial domain. The final three columns of the table repeat these measures, but focus only on food items in the CPI series (columns IV and V) and the survey-based food poverty line (column VI).

Table 4-2: Comparison of alternative measures of price inflation.

	All items			Food items		
	CPI (I)	CPI-adj (II)	Surveys (III)	CPI (IV)	CPI-adj (V)	Surveys (VI)
Nampula	1.89	2.19	2.51	2.06	2.38	2.58
Beira	1.76	1.93	2.17	1.90	2.09	2.08
Maputo	1.67	1.76	1.78	1.79	1.85	1.60
Overall	1.74	1.88	2.02	1.87	2.01	1.91

Notes: for all columns the measure of overall price inflation is a weighted sum of the preceding cells; the weights are those used by INE to produce its national CPI series—namely, Maputo = 0.55, Beira = 0.26, Nampula = 0.19; CPI-adj. refers to INE's CPI series with weights adjusted to correspond to household survey consumption bundles.

Sources: MPD/DNEAP using data from INE (CPI series), IAF02 & IOF08.

The results show a high degree of comparability between the various price estimates. As expected, comparability improves where there is greater correspondence between the basket of goods used to construct the CPI measure and the basket used to yield the survey-based measures. Both the CPI and the household survey-based price measures point to more rapid rates of inflation in basic items consumed by the poor, particularly food. The aggregate measure for food items, which is the most comparable measure, is almost identical between the IAF02 and IOF08 surveys and the re-weighted CPI inflation measures. The regional measures differ somewhat, though this is to be expected as the measures do not contain exactly the same products nor do they refer to exactly the same geographic area. Overall, the correspondence between the household survey-based measures of price inflation and the CPI is very good. This lends confidence to the price information reflected in the IAF02 and IOF08 surveys, particularly in urban zones.

4.4 Agricultural price data

An additional source of information concerning trends in prices is contained in the Agricultural Markets Information System (*Sistema de Informação de Mercados Agrícolas*, SIMA). The SIMA data provide price information for a range of core agricultural products in 25 urban markets (cities and towns) covering all provinces in Mozambique. Consequently, it

importance of the item in the poverty line basket from IAF02. Finally, weights are rescaled such that the food and non-food consumption shares match the food and non-food shares from IAF02.

has a much wider geographical coverage than the price database used for the construction of the CPI. While the spatial coverage is better, the SIMA data cover a relatively small number of agricultural goods (see Appendix 10.4). Nevertheless, these products tend to be important elements in the consumption baskets of poor people. In addition, SIMA remains focused principally on central markets, often classified as urban, rather than rural or farm-gate price trends.

Table 4-3 compares provincial measures of price inflation constructed from the SIMA series with survey-based measures of food price inflation (the ratio of the provincial food poverty lines in the first column).[14] Two price series are calculated from the SIMA, from which inflation is then derived. The first is based on a simple average of prices across all relevant SIMA products for each of the 12-month periods covered by the IAF (July 2002 to June 2003) and IOF (September 2008 to August 2009) household surveys. The ratio of these two averages measures cumulative food price inflation between the two periods. The second SIMA price series is a weighted measure, where the weights are estimated so as to correspond to the weights of the same items in the food poverty baskets estimated from the household surveys (see Appendix 10.4 for details).

Again, the poverty line-based price indices and the SIMA-derived price indices are not perfect comparators. Discrepancies exist due to the more restricted number of products in the SIMA dataset as well as differences in geographical coverage. Nevertheless, the trends in the SIMA-derived measures of inflation are highly consistent with those derived from the household surveys. At the national level, the SIMA dataset suggests cumulative food price inflation has been in the order of 134% between 2002/03 and 2008/09 (weighted price series), which is almost exactly the same as that estimated from the household survey data.[15] At the provincial level the trends are also very consistent—e.g., the correlation between these sets of provincial inflation measures is 0.82.

Continuing with the SIMA price series, Table 4-4 presents the distribution of prices across provinces in 2002/03 (IAF) and 2008/09 (IOF) relative to the national average. A score above (below) one indicates a price premium (discount) relative to the national average for a province in a given period. Of interest are changes in relative prices over time. Taking the preferred weighted price series, one notes a fall in the relative price premium of the Northern

[14] Note that the survey-based measures of price change are aggregated across rural and urban areas to produce provincial price change estimates. The method of aggregation is presented in Appendix 10.4.
[15] When one compares with the CPI results, these results imply that price inflation in basic food items has been considerably more rapid outside of the major urban centers of Maputo, Beira, and Nampula.

and Southern provinces (e.g., Niassa from 1.50 to 1.19) and a rise in the relative prices of Central provinces (e.g., Zambézia from 0.68 to 0.88). This is indicative of more acute price increases in the Central provinces relative to the rest of the country.

Table 4-3: Comparison of SIMA and survey-based measures of food price trends.

	Food poverty line ratio	SIMA prices (unweighted)			SIMA prices (weighted)			Ratio difference (%)	
		2002-03	2008-09	ratio	2002-03	2008-09	ratio	Unwtd.	Wtd.
Niassa	1.98	15.3	30.2	1.98	16.2	30.0	1.85	0.00	-0.13
Cabo Delgado	1.98	14.4	25.6	1.77	13.1	26.2	2.00	-0.20	0.02
Nampula	2.29	11.9	25.0	2.11	10.2	23.0	2.24	-0.18	-0.04
Zambezia	2.68	11.4	24.6	2.15	7.3	22.3	3.05	-0.54	0.36
Tete	2.69	12.8	27.4	2.14	11.4	27.0	2.37	-0.56	-0.32
Manica	2.54	12.4	28.0	2.26	10.9	28.7	2.63	-0.29	0.09
Sofala	2.52	12.9	27.6	2.14	10.1	27.2	2.70	-0.38	0.18
Inhambane	2.37	13.6	28.0	2.06	12.3	27.4	2.23	-0.31	-0.13
Gaza	2.37	13.7	28.0	2.05	12.8	26.4	2.05	-0.32	-0.32
Maputo City	1.97	12.4	25.5	2.05	11.9	24.2	2.03	0.09	0.07
Overall	2.35	12.7	26.4	2.08	10.8	25.3	2.34	-0.27	0.00

Notes: given the SIMA prices are calculated as 12 month averages (corresponding to the full periods of the household surveys), the food poverty lines do not include a temporal price adjustment (in contrast to Table 3-5); weighted SIMA prices are based on weights of food items in food poverty baskets; final two columns give the % difference between the survey-based inflation estimate and the weighted and unweighted inflation estimates from the SIMA database; Maputo province is not included as this is not covered by the SIMA series; overall prices are calculated as weighted averages, with weights based on corresponding survey-based provincial population shares (also excluding Maputo province).

Sources: MPD/DNEAP estimates using IOF, IAF and SIMA databases.

A strikingly strong relationship exists between these changes in relative prices and changes in the survey-based poverty headcount rates. The correlation coefficient between these two series (shown in the final row of the table) is 0.825 for the weighted SIMA price series and 0.654 for the unweighted series. The largest changes (positive and negative) in poverty rates correspond to the largest changes in relative prices. In the case of the two most Northern provinces, a slower rate of price increase (from a higher base) has been associated with substantial poverty reduction. In contrast, many of the Central provinces have seen the most rapid rate of price increases (from a lower base), and an increase in the poverty headcount. These relative price trends very likely reflect shifts in supply conditions by province. Relatively more rapid growth in supply is expected to induce a decline in relative prices.

Table 4-4: Comparison of SIMA relative prices versus poverty headcount changes (2002/03 versus 2008/09).

	Headcount change	SIMA relative prices (unweighted)			SIMA relative prices (weighted)		
	IOF-IAF	2002-03	2008-09	% change	2002-03	2008-09	% change
Niassa	-20.16	1.20	1.15	-4.82	1.50	1.19	-21.17
Cabo Delgado	-25.80	1.14	0.97	-14.75	1.22	1.04	-14.80
Nampula	2.08	0.94	0.95	1.31	0.95	0.91	-4.30
Zambezia	25.94	0.90	0.93	3.35	0.68	0.88	30.07
Tete	-17.77	1.01	1.04	2.91	1.05	1.07	1.20
Manica	11.49	0.98	1.06	8.60	1.01	1.13	12.23
Sofala	21.93	1.01	1.05	3.11	0.93	1.07	15.25
Inhambane	-22.75	1.07	1.06	-0.88	1.13	1.08	-4.67
Gaza	2.38	1.08	1.06	-1.40	1.19	1.04	-12.35
Maputo City	-17.45	0.98	0.96	-1.25	1.10	0.96	-13.24
Overall	0.97	1	1	0	1	1	0
Correl. w. headc. change	1.000			0.654			0.825

Notes: relative prices are simply the ratio of the provincial row entries in Table 12-2 to the corresponding overall price level; see Appendix 10.4 for methodology used to estimate SIMA prices. The overall change in the headcount is different from Table 3-5 because Maputo Province is not included.

Sources: MPD/DNEAP estimates using IOF08, IAF02 and SIMA databases.

Using the weighted SIMA price indices, Figure 4-1, Figure 4-2, and Figure 4-3 show trends in prices over time for the North, Central and Southern regions respectively, distinguishing between towns and cities. The story of more acute price increases in the Central regions, as well as a slower pace of price increases in the North (towns), remains clear. One also notes that food prices are generally volatile (especially in the North and Centre), with price spikes often being associated with food shortages. For example, all three graphs depict a substantial price spike in the hungry season period (January - February 2006) following the notably poor harvest of 2005.

As a final exercise, we use the SIMA calculated rates of growth in prices depicted in Table 4-3 to inflate the 2002/03 poverty lines to 2008/09 values. We then recalculate poverty rates in 2008/09. On this basis, Figure 4-4 gives a scatter plot of the actual and predicted poverty levels for 2008/09 as well as the changes relative to 2002/03.

Figure 4-1: IOF-weighted SIMA price index, Northern region.

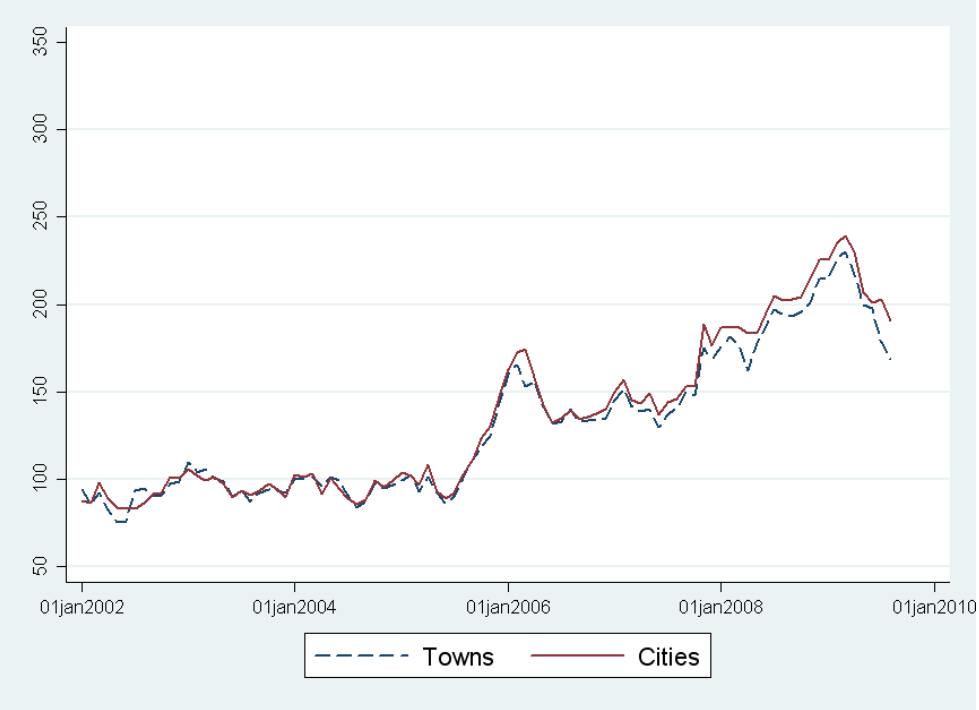
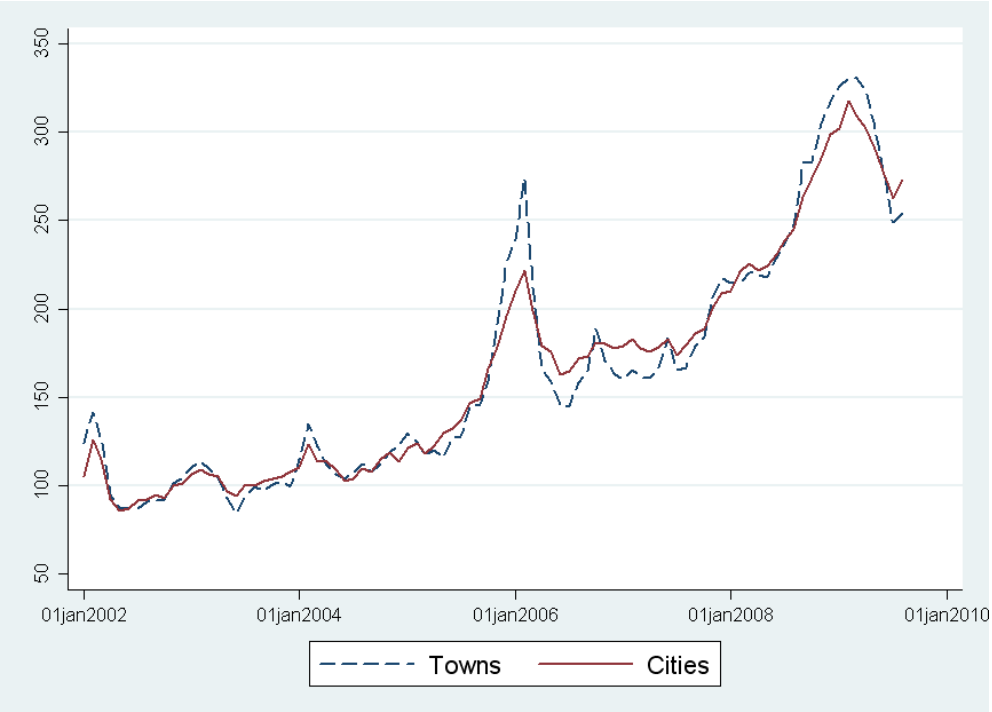
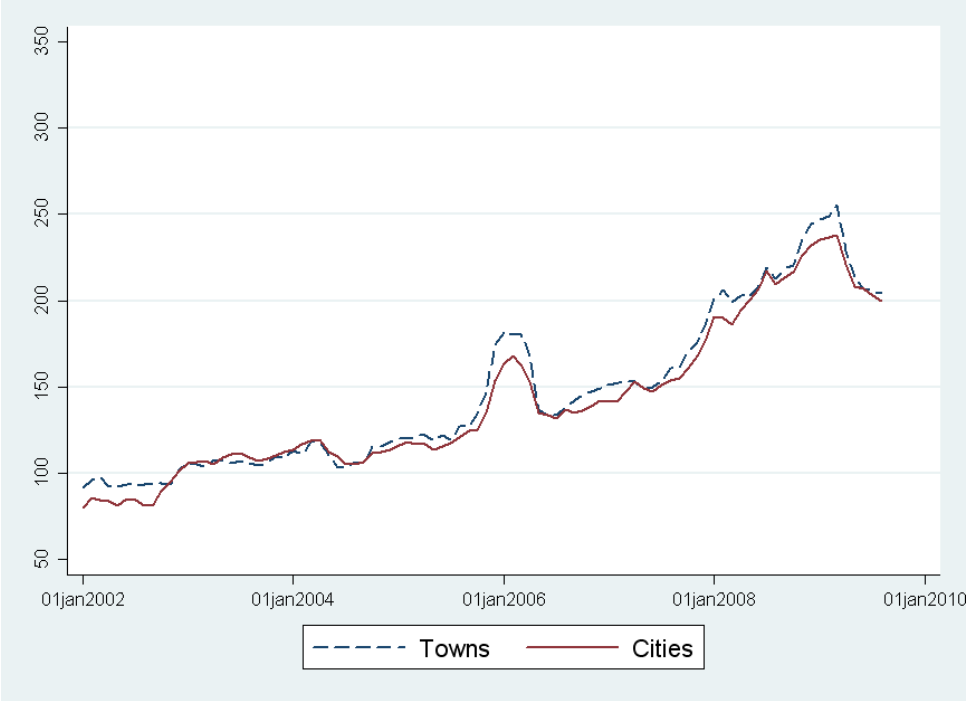


Figure 4-2: IOF-weighted SIMA price index, Central region.



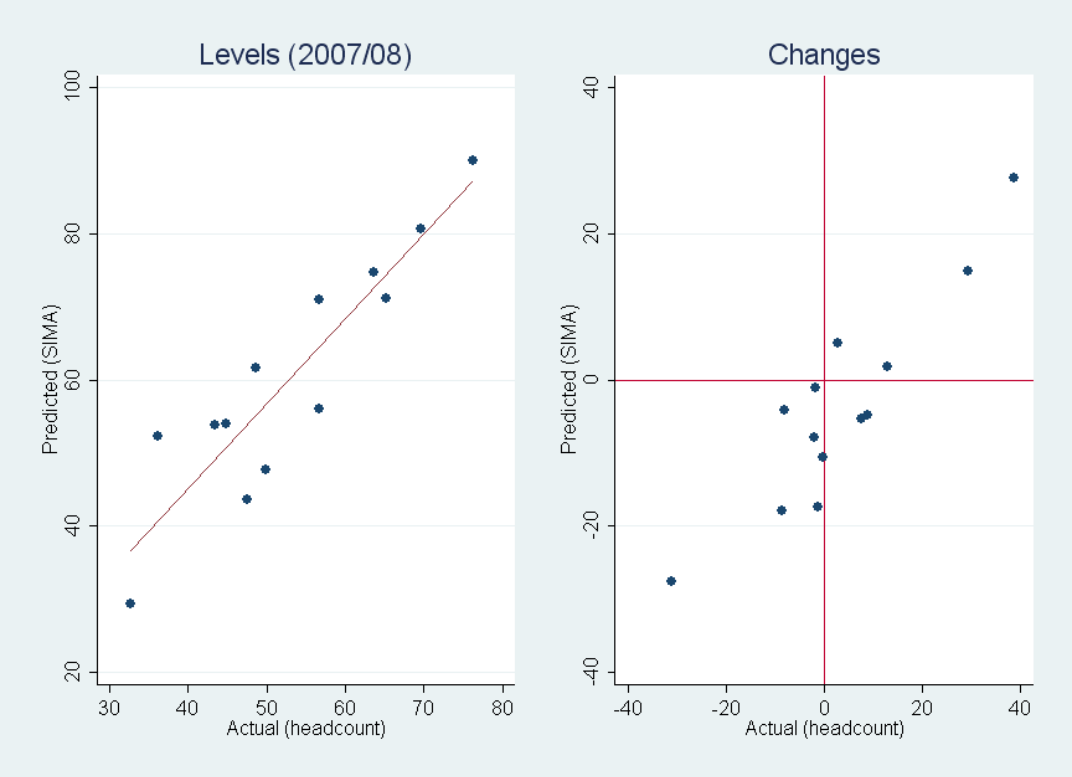
Source: IOF08 and SIMA.

Figure 4-3: IOF-weighted SIMA price index, Southern region.



Sources: MPD/DNEAP using SIMA databases.

Figure 4-4: Scatter plot of poverty rate levels in 2008/09 and changes (2002/03 to 2008/09) using actual results and predicted IAF poverty lines inflated using SIMA price indices, by spatial domain.



Note: IOF poverty changes are depicted on the horizontal axis while IAF/SIMA changes are depicted on the vertical axis.

The results are very consistent. The correlation between the two sets of poverty *levels* is 0.912 and between the two sets of poverty *changes* is 0.907. Furthermore, the standard deviation of the changes in poverty across the 13 spatial domains is 17.3 for the SIMA predictions compared with 14.2 in IOF. In sum, evidence from the SIMA series provides substantial comfort with regard to the quality of the price data taken from IOF08 and subsequently used to construct the poverty lines.

4.5 Food-based poverty indicators

We consider two additional indicators of well-being in 2002/03 and 2008/09, both of which are food based. They are: (i) the average daily number of meals per person; and (ii) the share of food in total consumption, where households with a food share higher than a pre-determined threshold are classified as poor. Data for these alternative measures are presented in Table 12-3. The last two rows of the table give the correlation between changes in monetary poverty at the regional level (not shown in the Table) and changes in the corresponding alternative measure.

With respect to the change in the reported average number of meals per capita consumed between the two surveys, it is important to highlight that the number of meals per day is a separate question posed to the household head in the QUIBB (Core Welfare Indicators Survey) section of the questionnaire. It is not obtained from the commodity-by-commodity consumption information used to estimate the consumption aggregate, and in that sense it is an independent indicator of the short-term consumption level. The changes in the number of meals declared per day exhibits a negative correlation of 0.60 with the change in poverty. Hence, provinces with increases (decreases) in poverty are those provinces with fewer (more) meals consumed per day. For example, rural Niassa and Cabo Delgado record an 11.3% increase in the average number of meals consumed and a 27.7 percentage point fall in headcount poverty. In contrast, rural Sofala and Zambézia record a large increase in headcount poverty, which corresponds to a fall in the average of the declared number of meals consumed.

Second, following from Engel's Law,[16] the share of food in household consumption is a useful proxy for well-being. Thus, a decline in the food share over time is likely to be indicative of improvements in living standards. This insight informs the "food share" poverty measure shown in the table. Specifically, for each region, we find the food share threshold

[16] Engel's Law holds that as incomes rise, the proportion of income spent on food falls.

that replicates the 2002/03 poverty rates. These thresholds are held fixed and then applied to the food shares observed in the 2008/09 survey. Households with food shares above this threshold (in either round) are deemed to be poor. Once again, the correlation between changes in this measure and the headcount poverty rate are good, at 0.58 (or 0.71 excluding Maputo City), thereby confirming the broad pattern of changes in monetary poverty over time.

In sum, these two food-based measures of well-being correlate closely with the (changes in) monetary poverty at the regional level.

4.6 Agricultural survey data

Agricultural production is critical for the well-being of the majority of Mozambican households. According to IOF08, for example, 70% of households are located in rural areas and virtually all of these (96%) are engaged in agriculture in some way. Additionally, consumption of food items accounts for around three fourths of the total consumption of poor households. These figures are essentially unchanged compared to IAF02 and suggest there is likely to be a strong relationship between trends in agriculture and aggregate trends in poverty reduction.

On this basis, the series of Agricultural Surveys (*Trabalhos de Inquérito Agricola*, TIAs) provides an important complement to the household budget surveys. Official estimates from the series of TIAs have recently been published by the Ministry of Agriculture (Economics Directorate, 2010) and are used in this subsection. In contrast to agricultural early warning systems, which until recently were used to estimate national agricultural production by INE, the TIAs are based on outcomes as reported by large, representative samples of households. As such, they represent the most consistent and rigorous database regarding production by agricultural households over time. Full TIAs were conducted in 1996, 2002, 2005, and 2008. They attempt to estimate total household income for the production year. For example, for TIA 2008, this would be the period from October 2007 to May 2008 with agricultural income coming from the harvest of 2008 and non-farm income coming from the period June 2007 to May 2008. Limited TIAs, which focus mainly on agricultural production, were conducted focusing on the harvests of 2003, 2006, and 2007.

Table 12-4 summarises key trends in agriculture based on the TIA series. Four main findings can be highlighted. First, the TIAs confirm the continued importance of agriculture for households' well-being. From 2002 to 2008 the number of small- and medium-sized farms

grew by 19%, consistent with population growth, and the area under cultivation grew by 34%. Importantly, however, the vast majority of farms are small—the *average* size is around 1.5 hectares, with many farms operating on one hectare or less.

Second, all indicators concerning access to and use of productivity-enhancing inputs, such as pesticides and fertilizers, show no unambiguously positive trends. From 2002 to 2008 the share of farming households receiving extension information appears to have declined from 13.5% to 8.3%. Similarly, use of pesticides fell from 6.8% to 3.8%. Even ignoring these trends, the absolute levels of these indicators are very low and point out that the vast majority of farming households continue to use almost no modern inputs or irrigation technologies to support production. Consequently these households are extremely exposed to the vagaries of climatic variation. On the positive side, however, the education level of heads of farming households shows a clear positive trend, which is consistent with the findings from the household surveys (see section 3.1).

Third, turning to Table 4-5, agricultural production shows only weak growth on aggregate. Thus, when adjusted to take into account either the expansion of cultivated area or rural population growth, the conclusion is that agricultural productivity has remained stagnant over time. This can be seen in a number of ways. For starters, the total production figures for 2008 year are broadly in line with past levels (panel A) even though planted area and total rural population with engagement in agriculture have been growing. Panel B of the table shows that, with population growth, per capita production of all the principal staple crops (e.g., maize, sorghum, cassava, rice) was lower in 2008 compared to 2002. Panel C of the table provides aggregated figures, calculated using caloric values of the individual crops as weights.[17] These caloric values remain constant over time and can be used to derive a total production index. When calculated on a per capita basis, the total calorie-value of agricultural production has been at best stagnant and possibly falling. For example, total calorie availability per person per day was 2,000 calories in 2008 compared to 2,135 in 2002 (based on national agricultural production alone). This means that if the total volume of agricultural production were distributed equally across all rural households (without wastage), it would not be sufficient to meet the basic calorie needs defined by the food baskets. These mild declines in per capita food production are highly consistent with the national picture of stagnant rural poverty over the same period.

[17] The caloric values are the same as those used in the household survey analysis and are based on internationally recognised benchmarks.

Table 4-5: Production trends for food crops.

Crop	2002	2003	2005	2006	2007	2008	Change 2008-'02	Coeff. of variation
(A) Prodution Total (million KGs)								
Maize	1,115	1,181	942	1,396	1,134	1,214	8.9	12.7
Rice	93	118	65	98	103	88	-5.9	18.7
Sorghum	138	191	115	202	167	126	-8.6	22.8
Millet	12	22	15	22	25	15	19.7	27.5
Large groundnuts	38	44	27	25	31	31	-17.5	21.4
Small groundnuts	64	44	58	60	70	71	10.9	16.5
Butter bean	36	41	50	50	55	53	47.1	15.5
Cowpea	54	64	49	71	62	62	15.5	13.1
Bambara groundnut	23	18	9	12	20	13	-44.0	34.3
Pigeon pea	32	43	36	62	72	64	101.6	32.2
Cassava	3,446	4,782	4,782	5,481	4,959	4,055	17.7	15.7
Sweet potato	456	610	509	678	862	610	33.7	22.9
(B) Prodution per person (KGs)								
Maize	90.0	92.9	67.3	101.7	80.7	80.7	-10.4	14.0
Rice	7.5	9.2	4.6	7.1	7.3	5.8	-22.5	22.7
Sorghum	11.2	15.0	8.2	14.7	11.9	8.4	-24.8	25.5
Millet	1.0	1.7	1.1	1.6	1.8	1.0	-1.5	27.9
Large groundnuts	3.0	3.4	2.0	1.8	2.2	2.1	-32.1	27.3
Small groundnuts	5.2	3.4	4.2	4.4	5.0	4.7	-8.7	14.2
Butter bean	2.9	3.2	3.6	3.6	3.9	3.5	21.0	10.1
Cowpea	4.3	5.0	3.5	5.2	4.4	4.1	-5.0	13.9
Bambara groundnut	1.8	1.4	0.6	0.8	1.4	0.8	-53.9	39.3
Chickpea	2.6	3.4	2.6	4.5	5.1	4.3	65.9	28.2
Cassava	278.2	376.1	341.7	399.5	353.0	269.4	-3.2	15.6
Sweet potato	36.8	48.0	36.4	49.4	61.4	40.5	10.0	21.0
(C) Aggregate measures (using calories)								
Total production index	100.0	124.2	111.3	140.9	128.6	113.8	13.8	12.1
Productivity (kcal / ha)	2,307	2,643	1,935	2,424	2,189	1,961	-15.0	12.2
Productivity index	100.0	114.6	83.9	105.1	94.9	85.0	-15.0	12.2
Calories per person / day	2,135	2,583	2,103	2,717	2,422	2,000	-6.3	12.5

Sources: TIA and MPD/DNEAP.

The final point is one of production volatility. The last column of Table 4-5 reports the coefficient of variation, which is the standard deviation of the annual row values divided by their mean. It indicates the expected change per year as a percentage of the average value. For individual crops the level of volatility appears large on this measure—ranging from a minimum of 12.7% to a maximum of 34.3% (panel A). This is repeated with the aggregate production indices in panel C, where total production and total calorie-availability (per person / day) can be expected to vary by 12% from one year to the next. Production volatility is likely to be much larger at the regional level given that differential regional performances are expected to offset each other to some extent, leading to smoother national trends. Large variability in agricultural production is indicative of a high level of vulnerability of rural

populations, a point which supports the evidence of Table 12-4 concerning limited access to modern technologies, especially irrigation. More broadly, the evidence of production volatility supports some of the large regional changes in poverty rates observed in section 3.4.

4.7 Summary

In this section, we showed that the household surveys and national accounts (an external source) both point to nominal consumption growth (Table 4-1). In addition, we found that changes in median per capita nominal consumption between the surveys explained a substantial share of the variation in poverty rates (correlation coefficient of -0.74 from Table 12-2). Hence, the declared consumption levels of households, prior to any calculation of poverty lines, are substantial drivers of results.

Nevertheless, prices are important for determining real living standards. Thus, we showed that price evolution between the IAF02 and IOF08 surveys are strongly consistent with the CPI when the geographic coverage, commodity coverage, and weighting schemes are made comparable (Table 4-2). Next, we compared changes in prices for key food commodities derived from the SIMA database with price indices derived by taking ratios of the food poverty lines (Table 4-3). These were shown to be highly comparable. This provides substantial confidence in the price information obtained from the household surveys.

Importantly, we then showed that changes in the prices of food relative to the national average as measured by SIMA between 2002/03 and 2008/09 correspond strikingly closely to the changes in poverty rates estimated by the household surveys. The preferred measure of price change, the weighted relative price index, exhibits a correlation coefficient with observed changes in poverty rates of 0.78 (Table 4-4). Not too surprisingly in a context where food comprises about 75% of the consumption basket of the poor, fundamental food supply and demand conditions, as reflected in prices, appear to have strong implications for poverty.

Finally, we derived poverty lines for 2008/09 by using the SIMA-derived price indices to inflate the IAF02 poverty lines (Table 4-4). Note that these poverty lines are derived entirely from sources external to IOF08-09. Nevertheless, the poverty rate changes estimated using this approach are very similar to those obtained when using poverty lines derived from IOF08. The correlation in changes between the official estimates and the SIMA/IAF estimates is very strong at 0.92. In addition, the standard deviations of the changes in the two poverty measures are very close. The two indicators are very similar both in terms of direction and magnitude.

We then shifted to other indicators. Indicators such as meals consumed and food shares (derived from IAF02 and IOF08) provide similar indications to the poverty rates obtained (Table 12-3). Finally, we considered agriculture and agricultural production with a focus on aggregate (national) production of food crops using all available TIA surveys (Table 12-4 and Table 4-5). At best, these point to stagnant agricultural productivity in food production for small- and medium-sized farms. Two partial measures of productivity, production per hectare and production per capita, both exhibited declines between 2002 and 2008. In fact, the levels for these indicators in 2008 are the lowest for any of the TIA surveys considered, pointing to the likelihood of weather and other shocks depressing production on top of the stagnation in food productivity growth.

Recall that there are three potential sources driving changes in poverty rates: actual changes in poverty, sample error, and non-sample error. The results summarised above point strongly to a substantial "actual change" component to the estimated poverty rates and poverty rate changes obtained from the IAF02 and IOF08 surveys. More formally, the CPI, SIMA prices, IAF02 poverty lines and TIA results are *uncorrelated* with IOF sample error and IOF non-sample error. The fact that changes in poverty rates correlate strongly with, for example, changes in relative prices derived from SIMA (Table 4-4) and changes in poverty rates derived from IAF baskets inflated using SIMA prices (Figure 4-4) points strongly towards the third and remaining potential source: actual changes in poverty. Thus, while the other two sources driving changes in poverty rates should not be ignored (particularly with respect to provincial results), the overall set of results appears to be robust.

5 Poverty Correlates

5.1 Method

As a complement to the previous sections, it is helpful to undertake a multivariate analysis of the relationships between observed household characteristics and real consumption. Undertaken at different points in time (i.e., for different household surveys), this analysis provides information regarding the importance of variables such as education, ownership of assets or access to employment in explaining differences in consumption across households. The advantage of multivariate analysis is that we obtain estimates of the unique relationships between real consumption and various explanatory variables despite the fact that these variables may be correlated with one another. For example, poor households typically lack both education and assets. Multivariate analysis allows one to consider the implications of

increased education on consumption while holding asset measures constant (and vice versa). It is worth highlighting, however, that this analysis does not indicate what *causes* households to be poor or non-poor. The methodology only paints a broad picture of the magnitude and direction of the relationship between a single dependent variable, in this case real consumption, and a number of explanatory variables.

In what follows, we provide a simple multivariate analysis of the available data in the IAF02 and IOF08 household surveys. The method used is ordinary least squares (OLS) regression, adjusted to take account of population expansion factors and survey design. More sophisticated methods could be applied, but these are not suitable for the present report. The dependent variable is the natural logarithm of real consumption, where real consumption is defined as the ratio of nominal consumption to the poverty line (y / z). More simply it can be interpreted as the number of poverty-threshold 'bundles' that each household member is able to consume. Taking the log of this ratio ensures that any positive value of the dependent variable represents a level of consumption that is greater than the poverty line. Use of the logarithm also generates an approximately normally distributed variable, which is advantageous with respect to the properties of the estimates of the model, including calculation of standard errors (SEs). The model is described in further detail in Appendix 10.3.

5.2 Results

Regressions are estimated separately for the two survey rounds (2002/03 and 2008/09) and at different levels of geographic aggregation. Table 12-5 provides results at the national level, denoted as model 1; Table 12-6 disaggregates by rural and urban areas, denoted as model 2; and Table 12-7 and Table 12-8 further disaggregate by major regions (North, Centre and South), denoted as model 3. For each estimated coefficient (beta) in Table 12-5, we provide a simple hypothesis test of whether there is any significant change in the coefficient estimates between the two surveys. This indicates the extent to which the relationship between a given variable and real consumption appears to have changed in a meaningful way. Furthermore, and in keeping with the equation described in Appendix 10.3, we do not include a common intercept term in any of the models. Effectively, therefore, we allow the rural and urban zones of each province to have their own intercept term (via the fixed effects), but impose the assumption of common slope parameters for the specific level of aggregation chosen.

A number of variables, such as asset ownership and area of household agricultural activity, are represented as dummy variables, which only take values of zero or one.[18] For this reason it is useful to omit a 'baseline' category or household type. For all models, the omitted category refers to households who have no formal education, are exclusively active in the agricultural sector, do not consume any own-produced food, and are asset-poor. Estimated coefficients from the models therefore can be understood as the approximate percentage point change in expected real consumption associated with a one unit increase in the variable of interest.

Focussing first on the national aggregate estimates in Table 12-5, five main findings stand out. First, many of the coefficient estimates (betas) are remarkably stable over time, confirmed by small and insignificant differences indicated by the last two columns of the table. This is particularly the case with respect to the demographic and habitation characteristics of households—i.e., these have a fairly stable relation with observed patterns of real consumption.

Secondly, although also relatively stable, one notes substantial differences in the returns to different economic sectors. Transport and service sectors, including public services, are persistently associated with relatively higher real consumption, and therefore less poverty, compared to other activities. Nevertheless, the relative returns to these latter sectors appear to have declined moderately. One also notes an increase in returns to engagement in extractive industries; however this is not significant, in part owing to the small numbers of individuals involved.

Thirdly, returns to education appear to have fallen across all education levels from 2002/03 to 2008/09 (but there are, of course, still higher returns the higher the educational level), of which the declines in returns to primary and secondary education are highly significant. For example, in 2002/03 the expected average increase in real consumption relative to an uneducated household was 0.35 log points (or 42%) if all adults in the household had completed at least some cycle of primary education. In 2008/09 this expected increment had fallen to 0.15 log points (16%) on average.

[18] Formally, the use value of durable assets forms a part of the consumption aggregate on the left hand side of the regression equation. Hence, there will be, by definition, a correlation between ownership of assets included in the use value calculation and their presence in the household. We retain this specification because it compares with previous analyses. In addition, use value of durable goods represents only a small share of total consumption (a median of less than two percent). Hence, the degree of bias introduced is not likely to be large.

Fourthly, there are mixed tendencies in the relation between ownership of durables and real consumption. While, as expected, all coefficients are positive and significant, the coefficient on basic durables such as telephones and bicycles has declined; in contrast, returns to car ownership have increased. A possible reason for these changes relates to the trends observed in section 3.1, which indicate significant increases in ownership of basic durables. As ownership of these items becomes more widespread, these asset indicators may become less informative as to the real consumption status of each household.

Finally, one of the most important findings from Table 12-5 relates to the location effects (or intercept terms). The absolute levels of these estimated coefficients indicate that the baseline household in virtually every province (rural or urban) is expected to be classified as poor.[19] The unique exception (although statistically insignificant) here is rural Sofala for the 2002/03 survey round, where the expected consumption of the 'average' agricultural uneducated household is 103% of the local poverty line. The location effects, which capture all unobserved variables (including systematic measurement error), are very important as they explain a large share of the observed variation in real consumption—about 10% in both survey rounds (based on a reduced form of model 1). More critically, these location effects are unstable over time, especially in rural areas. For example, in 2008/09 the expected consumption of the 'average' agricultural uneducated household in rural Sofala had fallen to only 69% of the poverty line, a decline of 72 percentage points. Comparing these coefficients over time, one notes that the average change for rural areas between 2002/03 and 2008/09 is -0.13 log points (-12%), compared to -3% for urban areas. In both rural and urban areas, the Central regions (especially Sofala and Zambézia) show the largest declines. While it is difficult to give a precise interpretation of these changes, they may reflect temporal shocks to household consumption that are correlated among households in the region. For example, a poor agricultural season leading to low harvests across a specific geographical area would be expected to put downward pressure on the estimated location effect, particularly where households have few means to smooth consumption over time. An alternative source of changes in these location effects is systematic geographic variation in the degree of underreporting of food consumption, and in this light, it is notable that the location effects are somewhat larger in magnitude in urban areas.

[19] This is correct based on the assumption that the predicted consumption effect associated with household demographic factors is approximately zero, which is a reasonable approximation for an 'average' household containing 3 or more young children and two adults (i.e., with reference to the equation in Appendix 10.3, we assume).

Results for the other models, which allow the slope coefficients to vary at more disaggregated geographic levels, broadly confirm the above story. Nevertheless, a few nuances stand out. With respect to model 2 (Table 12-6), one notes substantial urban/rural differences in returns to different economic activities, as well as changes in these returns over time. Specifically, on average, urban areas witnessed an *increase* in returns across most sectors (although these are not always statistically significant), especially in primary and secondary production sectors such as construction. In contrast, a fall in returns to certain sectors is evident in rural areas such as in the transport sector. Further disaggregating by geographic zone (model 3), it appears that the increase in returns to economic sectors found on average in urban areas in Table 12-6 is largely driven by changes in the South of the country (e.g., Maputo City) and to a lesser extent in the North (e.g., construction sector). Also, urban areas in the Central zone of the country show the most marked declines in coefficients, particularly in variables pertaining to human capital and sector of economic activity. In other words, we see very different regional patterns of urban growth, marked by much more positive tendencies in the South of the country in particular.

The disaggregated estimates for rural areas found in Table 12-8 further confirm the general finding of declining returns to education as well as insignificant returns to activities in non-agricultural sectors (except private retail and services). Moreover, large changes in the location effects are apparent with positive changes in the North and South compared to negative changes in the Centre. Again, a diverse regional picture is evident.

As a final exercise, we use the regression models to predict expected poverty rates at the regional levels (based on household-level predictions in all cases). Although we expect to see a substantial correspondence between observed and expected poverty rates on aggregate, of interest are any systematic discrepancies at the regional levels. This would indicate that the model(s) are less informative in specific regions. The results are shown in Table 12-9, where predictions are given based on models 1 and 3. Overall, the fit of both models is strong. Even the regional poverty rates from model 1, estimated at the national level, gives a 0.94 correlation with the observed regional poverty rate changes. At the regional level, the weakest fit of the two models is found in rural Niassa and Cabo Delgado and urban Gaza and Inhambane. In both cases, the models underestimate the extent of decline in poverty. Nevertheless, the overall pattern of changes predicted from the models is very consistent with the principal monetary poverty results.

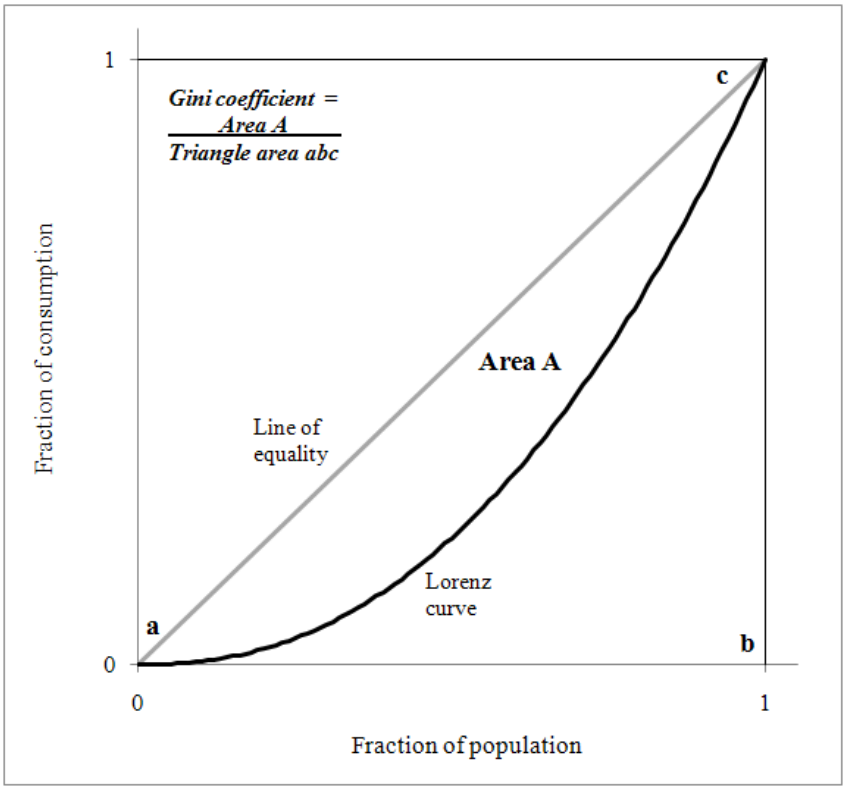
6 Inequality

In addition to measures of poverty, the household surveys can also be used to provide information on inequality and the distribution of consumption. The distribution of the benefits of production and growth is clearly relevant for economic and social development. Also, private consumption growth, inequality, and poverty are linked (Bourguignon, 2004). This section presents measures of inequality in real consumption. These measures and the approaches used for deriving them are comparable with previous poverty assessments. The first subsection introduces alternative measures of inequality, while the second subsection considers results. A final section interprets the results, including an assessment of the weaknesses of these measures in the Mozambican context.

6.1 Measures of inequality

The best-known measure of inequality is the Gini coefficient. The Gini coefficient, by construction, remains in the [0,1) interval, where zero represents no inequality and the measure approaches one as inequality increases. An intuitive presentation of the Gini is accomplished graphically. Figure 6-1 illustrates how the Gini coefficient is calculated for the case of consumption inequality.

Figure 6-1: The Lorenz curve and the Gini coefficient.



In the figure, the population is ordered from poorest to richest in terms of consumption level. The horizontal axis tracks the share of the population while the vertical axis tracks the share of consumption. If consumption were equally distributed, then consumption shares and population shares would be equal. This is reflected by the 45 degree line of equality. However, in reality, some households have higher consumption than others. As a result, the line tracking the relationship between the consumption share and the population share (called the Lorenz curve) curve bows below the line of equality. The more pronounced the bow of the Lorenz curve, the greater the degree of inequality. The Gini coefficient captures this relationship by considering the area above the Lorenz curve but below the line of equality (the area labeled A) divided by the total area below the line of equality.

The generalised entropy measures of inequality are more complex but have desirable properties. These measures are expressed by the following equations:

$$GE(\beta) = \begin{cases} \frac{1}{\beta(1-\beta)} \cdot \frac{1}{n} \cdot \sum_{i=1}^{n} \left[1 - \left(\frac{y_i}{\mu}\right)^{\beta} \right], \beta \neq \{0,1\} \\ \frac{1}{n} \sum_{i=1}^{n} \frac{y_i}{\mu} \ln\left(\frac{y_i}{\mu}\right), \beta = 1 \\ \frac{1}{n} \sum_{i=1}^{n} \ln\left(\frac{\mu}{y_i}\right), \beta = 0 \end{cases}$$

In the generalised entropy equations, higher values of β are associated with greater sensitivity to extremes at the upper end of the income distribution, while lower values are associated with greater sensitivity at the lower end of the income distribution. The most commonly used values of β are 0, 1 and 2, which we will refer to as GE(0), GE(1) and GE(2). As with the Gini coefficient, larger values of the GE(β) functions indicate higher levels of inequality.

6.2 Inequality results

Table 6-1 indicates effectively no change in the Gini coefficient from 2002/3 to 2008/9 at the national level and within urban and rural zones. As in 2002/03, all measures point to significantly lower levels of inequality in rural as opposed to urban areas. The other measures presented in Table 6-1 lead to similar conclusions. For nearly all GE(β) measures, changes between 2002/03 and 2008/09 are small. Standard errors are provided for the Gini coefficient and for the GE(1) measure. None of the changes in these measures are statistically significant. The breadth of the confidence intervals, at, for example, about +/-0.03 for the

Gini coefficient, bears emphasizing. In other words, the Gini coefficient would have to change by more than 0.03 in absolute value before we would be reasonably confident that the change is due to changes in inequality in the population and not just a relic of choosing more or less equal samples of the population.

Table 6-1: National Inequality Evolution Estimates and by Urban/Rural, 2002/3 and 2008/9.

	National		Rural		Urban	
	2002-03	2008-09	2002-03	2008-09	2002-03	2008-09
Gini coefficient	0.415	0.414	0.371	0.367	0.479	0.481
Gini coefficient standard error	(0.013)	(0.009)	(0.011)	(0.008)	(0.025)	(0.016)
Generalized entropy index, α=1	0.367	0.366	0.267	0.260	0.502	0.500
GE(1) standard error	(0.041)	(0.025)	(0.026)	(0.021)	(0.080)	(0.043)
Generalized entropy index, α=0	0.296	0.302	0.240	0.241	0.387	0.397
Generalized entropy index, α=2	0.987	0.882	0.552	0.499	1.447	1.234

Notes: Standard errors derived using the bootstrap procedure described in Simler and Arndt (2007).

Sources: MPD/DNEAP estimates using IOF08 and IAF02 databases.

Table 6-2 shows the changes in inequality measures by region between 2002/3 and 2008/9. Provincial level inequality measures are provided in Table 12-10. Focusing on Table 6-2, larger changes in absolute value are observed for the Gini coefficient and for the GE(1) measure by region; however, the accompanying standard errors are also larger. Consequently, none of the changes in these measures are statistically significant, either. Overall, there is no evidence of large-scale movement in inequality; however, from a statistical confidence point of view, the measures are rather blunt. For example, the measured Gini in 2008/09 would have to increase to about 0.445 (from 0.415) before we could conclude with about 95% statistical confidence that the Gini is increasing. We consider these and other issues with inequality measures below.

Table 6-2: Inequality Evolution Estimates by Region, 2002/3 and 2008/9.

	North		Center		South	
	2002-03	2008-09	2002-03	2008-09	2002-03	2008-09
Gini coefficient	0.385	0.411	0.393	0.381	0.475	0.456
Gini coefficient standard error	(0.037)	(0.020)	(0.015)	(0.012)	(0.016)	(0.012)
Generalized entropy index, α=1	0.346	0.379	0.309	0.279	0.495	0.444
GE(1) standard error	(0.105)	(0.054)	(0.037)	(0.027)	(0.051)	(0.027)
Generalized entropy index, α=0	0.250	0.292	0.269	0.261	0.385	0.357
Generalized entropy index, α=2	1.132	1.001	0.651	0.501	1.540	1.074

Notes: Standard errors derived using the bootstrap procedure described in Simler and Arndt (2007).

Sources: MPD/DNEAP estimates using IOF08 and IAF02 databases.

6.3 Interpretation in light of weaknesses of the measures

The relatively high standard errors on inequality measures reflect the tendency of these measures as a class to be sensitive to the extremes of the income distribution. For most inequality measures, it can matter a lot whether, in particular, the very wealthy are properly included in the sample or not. The number of extremely poor households also matters.

These characteristics do not play to the strengths of household budget surveys in general, and the IAF/IOF surveys in particular, for at least four reasons. First, even though very wealthy Mozambicans represent a tiny fraction of the population, they could easily represent a very noticeable share of total private consumption. Despite this, there is no particular effort dedicated to ensure that the wealthy are properly represented in the sample. The sample could fairly easily not contain a single 'elite' Mozambican.[20] Second, the questionnaire, as previously indicated, is designed to estimate the consumption of lower-income households, especially those living in rural areas. The consumption levels of the highest consumers could easily be poorly estimated.

Third, the number of extremely poor households is also relevant. In both the IAF02 and IOF08 (as well as every other large-scale household survey undertaken in poor countries), a fraction of households in the sample consume very small amounts. For example, about 6.5% of the population in 2008/09 consumed at less than one third of the poverty line. If these consumption levels persist, all household members would likely perish or the household would fracture as a unit. Doubtless, this happens—but there are other possibilities. Given that the reference period for IAF02 and IOF08 is one week, it is possible that some households are suffering through a short-term period of greatly reduced consumption. Hence, the actual annual consumption of the household is improperly measured. It is also possible that very low-consuming households reflect poor data collection or highly uncooperative households (leading to greatly reduced measured consumption).

Finally, as is well known, the consumption bundles of very poor and very wealthy households differ drastically. Nevertheless, to date, inequality analyses of all surveys have converted the consumption of all households from nominal to real using the price indices implicitly provided by the poverty lines. This is, at a minimum, a consistent approach. However, earlier analysis of the CPI indicated that the prices of products consumed by the poor tended to increase substantially more rapidly than the prices of other goods. The measures of inequality

[20] The largest consumption estimated across all households in IOF08 is about $200 per day for the household.

provided indicate that, measured in terms of poverty bundles, the wealthy have not become significantly better off relative to the poor. However, if the consumption of the wealthy were measured with respect to a bundle of goods that they actually consume, then their consumption might have increased while we have already seen that the consumption of the poor, appropriately measured, has remained essentially stagnant.

In summary, our ability to draw conclusions with respect to the evolution of inequality based on the household surveys is fairly circumscribed. It is, at this point, useful to consider the links between real private consumption growth, inequality and poverty as defined by Bourguignon (2004). If poverty rates have remained constant and inequality has not increased, then one expects essentially zero growth in real private consumption per capita.[21] If real per capita private consumption has grown and poverty rates have remained constant, then one expects an increase in inequality. This issue of consistency across aggregate measures is explored in the next section.

7 Macroeconomic Analysis

This section employs a macroeconomic modelling approach to consider and decompose the principal causes of the stagnation in the national-level consumption poverty rates identified in this report over the period 2002/03 to 2008/09. A series of potential causes have already been highlighted, and we use a dynamic computable general equilibrum (CGE) model to evaluate the importance of possible causal factors.

As identified earlier in this report, a potential cause of poverty rate stagnation is weak growth in agricultural productivity combined with region-specific weather shocks to agricultural production in 2008. These factors led to a decline in per capita production of food crops between 2002 and 2008 (see Table 4-5). We also showed in Table 4-3 that, in regions where food prices relative to the national average increased the most, increases in poverty tended to be the most severe. These changes in price conditions relative to the national average were linked to internal supply and demand dynamics.

At the same time, a great deal was happening in international commodity markets. World food prices spiked significantly in real terms with the peak attained in mid-2008. During the IOF survey period, world food prices declined to levels significantly below their peak levels

[21] This is true under fairly mild assumptions about the distribution of income.

of mid-2008 but still well above levels registered in 2002 and 2003.[22] In addition, fuel prices rose almost continuously from 2002 to a peak in mid-2008 that was nearly five times the average level observed in 2002/03. Like food, oil prices declined in the second half of 2008 but remained at levels well above those observed in 2002/03. Hence, the observed decline in per capita production of food crops in 2008 occurred essentially simultaneously with a very strong spike in international food prices. Increases in fuel prices raised the costs of delivering food to Mozambique (even after the international food price had been paid), distributing imports within the country, and distributing whatever surplus domestic production that might have existed.

While all the factors listed above are likely to increase poverty in the Mozambican context, it is not clear which factors are the most important. In order to consider the implications of these and other factors on the economy of Mozambique, we use a dynamic CGE model of the Mozambican economy, which is linked to a poverty module (described in greater detail below). Using the model as a simulation laboratory, we are able to estimate the strength of various factors in determining the national poverty rate as well as poverty rates by urban and rural zone. This modelling is also useful as a validation exercise at the national level. In other words, the CGE model can help determine whether the observed evolution of poverty over the 2002/03 to 2008/09 period can be plausibly reconciled with observed rates of economic growth and other macroeconomic trends.

The remainder of this section is structured as follows. First, the recursive dynamic CGE model employed is presented and explained. Second, the model simulations employed to examine growth and poverty impacts are explained. Finally, model results are presented and discussed.

7.1 Model description

Dynamic CGE models are often applied to issues of trade strategy, income distribution, and structural change in developing countries. They have features that make them suitable for such analyses. First, they simulate the functioning of a market economy, including markets for labour, capital and commodities, and provide a useful perspective on how changes in economic conditions are mediated through prices and markets. Second, they ensure that all economy-wide constraints are respected. This is critical discipline when substantial shocks

[22] For example, the International Monetary Fund (IMF) food commodity price index registered a level during the IOF survey period of 53% in nominal terms (or about 40% in real USD terms) above the level observed during the IAF survey period (July 2002 to June 2003).

are imposed. As will be shown below, shocks such as rises in world fuel prices have macroeconomic consequences in terms of, for example, the supply and demand for foreign exchange. CGE models track the balance of payments and require that a sufficient quantity of foreign exchange be available to finance imports. Finally, CGE models contain detailed sector breakdowns and provide a "simulation laboratory" for quantitatively examining how various impact channels influence the performance and structure of the economy.

In CGE models, economic decision-making is the outcome of decentralized optimization by producers and consumers within a coherent economy-wide framework. A variety of substitution mechanisms occur in response to variations in relative prices including substitution between: labour types, capital and labour, imports and domestic goods, and exports and domestic sales. The Mozambique CGE model is rather detailed and contains 56 activities/commodities, including 24 agricultural and 7 food-processing sectors. Five factors of production are identified: three types of labour (unskilled, semi-skilled and skilled), agricultural land, and capital. This detail captures Mozambique's macroeconomic structure and influences model results.

Economic development and poverty reduction is in many ways about the accumulation of factors of production such as physical capital, human capital, and technology. These factors, combined with the necessary institutional frameworks to make them productive, determine the material well-being of both households and countries. The dynamic CGE model captures these accumulation processes. For the purposes of this analysis, growth rates of labour and land were exogenously imposed using data from other sources. Capital is accumulated by the conversion of savings into investment, with the destination of investment determined by relative rates of profitability across sectors.

The model is calibrated to a 2003 social accounting matrix (Thurlow, 2008), which provides a complete snapshot of the Mozambican macro-economy in 2003. In addition, a poverty module, based on the IAF02 data, permits one to consider how changes in economic conditions translate into changes in the rates of poverty. The poverty module functions by using the data from IAF02 and applying changes in commodity prices and factor returns, as reflected in household commodity consumption, derived from the CGE model. So, if, in the CGE model, commodity prices rise and factor returns decline or remain stagnant, households are forced to reduce consumption (assuming a budget constraint). These changes are imposed on the households in the IAF02 database. Once these changes are imposed, it is

straightforward to calculate real consumption and projected poverty levels. A complete description of the model, including the poverty module, can be found in Arndt et al., 2010.

7.2 Scenarios

This section describes the various scenarios that are employed to consider poverty evolution. We present six successive scenarios labelled: 2003 Baseline, Education, Agriculture, Food, Fuel, and Weather. The scenarios are cumulative with each new scenario adding a particular set of changes to the earlier one. The 2003 Baseline presents a projection of economic growth and poverty rates in 2008/09 using assumptions that would have reasonably pertained had the projection been made in early 2004. The subsequent scenarios progressively add differences to this baseline with all previously imposed differences maintained. Thus, the Food scenario contains the new differences from the Baseline that comprise the food scenario as well as the differences imposed in the Education and Agriculture scenarios. The final scenario Weather represents the total cumulative effect of all changes from the Baseline. In the following subsections, we present the shocks from each scenario.

7.2.1 2003 Baseline

In the 2003 Baseline scenario, the model is run from 2003 - 2009. The following principal assumptions related to factor accumulation, technical change, and world prices are imposed on the growth process.

- *Factors***:** Skilled, semi-skilled, and unskilled labour stocks are projected to grow at rates of 3.5, 2.75, and 2.25% per annum respectively. The stock of arable land, cleared and ready for planting, grows at 2% per annum.
- *Technology:* Agricultural productivity improves at a relatively rapid rate of approximately 5% per year for food crops.
- *World prices:* Prices for all imports and all exports are assumed to remain constant at the levels observed in 2002/03.

These three sets of assumptions are the most important for this analysis because they are changed in the five later scenarios. All other assumptions remain constant across all scenarios.

We are interested principally in the differences between scenarios. For example, what is the difference between the 2003 Baseline scenario presented here and the Weather scenario that contains all differences from the 2003 Baseline? Or, what are the implications of reduced

agricultural productivity growth over the 2002/03 to 2008/09 period for poverty rates? Because we are focused mainly (but not exclusively) on differences across scenarios, the assumptions that remain constant are typically of lesser importance and typically have relatively minor implications for the differences across scenarios.

Nevertheless, some modelling choices are relevant. In all scenarios, the following closure rules apply. A balanced closure is applied to the macroeconomic aggregates. Specifically, consumption (C), government (G), and investment (I) remain at constant shares of total absorption (defined as C+I+G). Tax rates are fixed and the government deficit is variable. Saving rates of institutions (households and enterprises) adjust proportionately to equate savings with investment each year. Labour is fully employed and mobile across all activities. The capital stock is modelled in the putty-clay tradition meaning that allocated capital is sector-specific (i.e., immobile) but new investment can be directed to any sector. This new investment is allocated on the basis of factor returns in the previous year. The exchange rate is flexible and adjusts to equilibrate the supply and demand for foreign currency. Productivity growth for cash crops is set at about six percent per year. Non-agricultural productivity growth varies by sector and is chosen in order to reflect the sectoral growth rates recorded by national accounts between 2003 and 2008. Finally, for agriculture, because planting occurs in period *t* and harvest in period *t*+1, land allocation decisions are made on the basis of world prices that prevailed in period *t*. Similarly, farmers are not able to anticipate droughts.

7.2.2 Education

As discussed in section 3.1, the share of children enrolled in school has increased markedly in all provinces. In addition, separate analysis by Arndt and Nhate (2009) shows that the efficiency with which students move through the education system has continued to improve rapidly. These changes have two effects. First, because children represent a large share of the population (the 7-17 age group represents more than a quarter of the population), a more pronounced tendency to remain in school has labour market effects (see section 3.1.3). In particular, using data from IAF02 and IOF08, the supply of unskilled labour[23] has been declining since 2002/03 at a rate of slightly less than 2.5% per year. This contrasts with the baseline assumption of growth in the unskilled labour stock at a rate of 2.25% per year. Second, the profile of those who are working is rapidly becoming more skilled, albeit from a

[23] Unskilled labour is defined as those without a complete primary school education, semi-skilled labour refers to those who completed primary school but did not complete secondary school, and skilled labour refers to those with complete secondary school or better.

low base. The stock of semi-skilled labour more than doubled while the stock of skilled labour somewhat less than doubled.[24] Compared with the rates of growth assumed in the baseline scenario, the growth in the stocks of semi-skilled and skilled labour has in reality been more rapid.

Even though the skilled labour stock is growing rapidly, the net effect of the tendency to remain in school over the period 2002/03 to 2008/09 was a relatively slow rate of growth in the total labour force. According to the IOF/IAF surveys, the labour force as a whole grew at about 0.4% per annum. This rate is significantly less than the rate of population growth and the assumed rate of growth of the labour force in the baseline scenario (both of which are about 2.5% per annum).

7.2.3 Agriculture and Weather

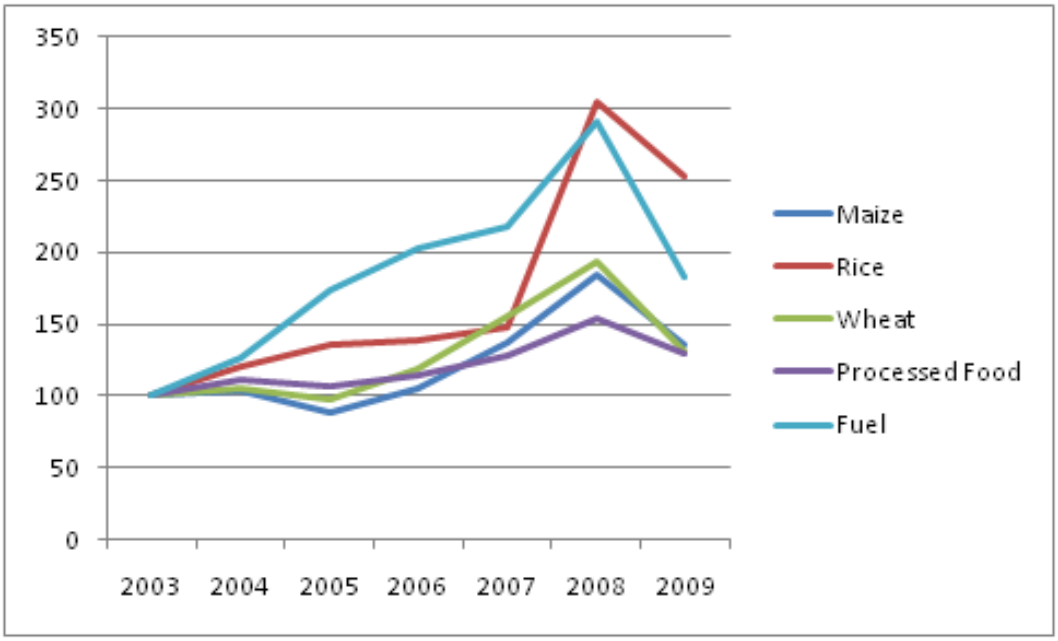
As shown in Table 4-5, production of food crops was highly variable over the 2002-08 period. This volatility is taken to be due principally to weather. In addition, there was very little evidence of technical advance. In the Agriculture scenario, we reduce the rate of underlying technical advance to zero. Separately, in the Weather scenario, we introduce weather shocks that reduce or increase per capita food production in accordance with TIA data. TIA Data are available for the years 2005, 2006, and 2008 and are not available for 2004, 2007, or 2009. For the years where data is lacking, no weather shock is assumed.

7.2.4 Food and Fuel Prices

Figure 7-1 provides indices of real international prices for selected import commodities. Real values are calculated by deflating prices by the United States GDP deflator. As can be seen in the figure, prices for crucial imports rise dramatically. In the Food and Fuel scenarios, import and export prices for food and fuel commodities, with a published international price, are changed in line with changes in world markets. This is done for each year from 2004-2009. In order to separate the effects, only food prices are changed in the Food scenario. Changes in fuel prices are added in the Fuel scenario.

[24] This rapid growth in the supply of skilled and semi-skilled labour is consistent with the declines in the wage premiums associated with educational attainment presented in section 0.

Figure 7-1: International price indices.



Source: International Monetary Fund (2010) and Council of Economic Advisors (2009).

7.3 Main results

Table 7-1 illustrates the growth in the components of GDP from both a production and an expenditure perspective by sector between 2003 and 2009 as (i) published in national accounts and (ii) projected by the dynamic CGE model for the final cumulative scenario Weather. This last scenario is designed to be the one that most closely simulates actual evolution of the Mozambican economy. The table also illustrates the shares of each sector in value added as well as expenditure shares in 2003. Sectors are divided between the broad categories of agriculture, industry, and services.

We note that, for industry and services, actual growth in value added is reasonably close to the growth in value added projected by the CGE model; however, for reasons discussed in more detail below, the projected rate of growth of agriculture is substantially lower than the rate estimated by national accounts. Overall GDP growth differs between the estimations of national accounts (7.6% per annum) and the projections of the model (6.5% per annum). About 90% of the difference in the overall GDP growth rate is due to the difference in the growth rate of agriculture, particularly food crops, which represented more than two thirds of agricultural value added in 2003.

Table 7-1: Growth in components of GDP 2003-2009 for national accounts and for model.

	2003 Share	National Accounts	Model
GDP	100	7.6	6.5
Production Optic:			
Agriculture	26	7.9	3.4
Industry	23	6.3	7.8
Services	51	8.3	7.4
Expenditure Optic:			
Consumption	89	5.9	4.5
Investment	22	4.5	5.8
Government	13	7.7	8.5
Exports	26	11.0	10.2
Imports	-50	4.7	5.2

Source: MPD/DNEAP & Thurlow (2008).

As mentioned in section 4.6, the Ministry of Agriculture has for a considerable time maintained two sources of information on agricultural production. The first relies principally on the Early Warning System, while the second relies on the TIA. As emphasised in Kiregyera et al. (2008), these two sources of information provide very different perspectives on the evolution of the agricultural sector. Kiregyera et al. also make it clear that the TIA provides a more reliable source of information. Recently, these and other observations led INE to switch the principal official source of information on agriculture published in the Statistical Yearbook from the Early Warning System to the TIA. This switch results in a very considerable revision of the performance of the agricultural sector both in terms of levels and trends.[25] Overall, the Early Warning System data indicated both larger production levels and more rapid growth in agriculture than TIA.

While the Statistical Yearbook has switched from the Early Warning System to TIA as the principal (but not only) source of information on agricultural production levels, the same is not true of national accounts. National accounts through 2009 still reflect agricultural production levels as provided by the Early Warning System. As a result, the growth rate of the agricultural sector, as estimated by national accounts, is overstated. The final column of Table 4-5 illustrates the estimated growth rate of agriculture using data from TIA as inputs into the CGE model. The growth rate of agriculture in this scenario is considerably slower

[25] For example, the 2005 Statistical Yearbook estimates that 1.38 million metric tonnes of maize were produced in 2005. This figure came from the Early Warning System. The 2008 Statistical Yearbook indicates that only 0.94 million metric tonnes of maize were produced in 2005. This figure came from TIA. In other words, relative to TIA, the Early Warning System overestimated maize production in 2005 by nearly 50 percent.

(3.4% per annum versus 7.9%). This decline in the rate of growth of agriculture reduces overall GDP growth by about one percentage point per annum over the period 2003 to 2009.

Even with this correction to the estimated overall GDP growth rate, per capita GDP is still estimated to have grown by about 4% per annum (6.5% GDP growth rate minus about 2.5% annual population growth rate) over the period 2003 to 2009. Table 7-1 illustrates that the rate of private consumption growth is lower than GDP growth in both the model and in national accounts. Real consumption is growing in the model at about 4.5% per annum in total or about 2% per annum per capita. This value, about two percent per annum per capita, represents our current best estimate of real private consumption growth.[26] Can this real growth in personal consumption be reconciled with stagnation in consumption poverty rates?

Table 7-2 illustrates that it can. The table compares poverty rates derived from IOF08 with projected poverty rates using the CGE model. Before comparing the rates, it is helpful to note that the CGE model is annual while IOF survey spans 2008 and 2009. To deal with this issue, we assume that the first semester of IOF results correspond to the model year 2008 while the second semester of IOF results corresponds to the model year 2009. When comparing the full IOF database with the model results, we take the simple average of results for 2008 and 2009.

Table 7-2: Actual and projected poverty rates.

	National		Rural		Urban	
	Actual	Model	Actual	Model	Actual	Model
Aggregate	54.7	54.3	56.6	55.3	49.6	52.3
Semester 1	57.3	57.4	60.1	57.8	50.5	56.5
Semester 2	52.3	51.3	53.8	52.8	48.6	48.0

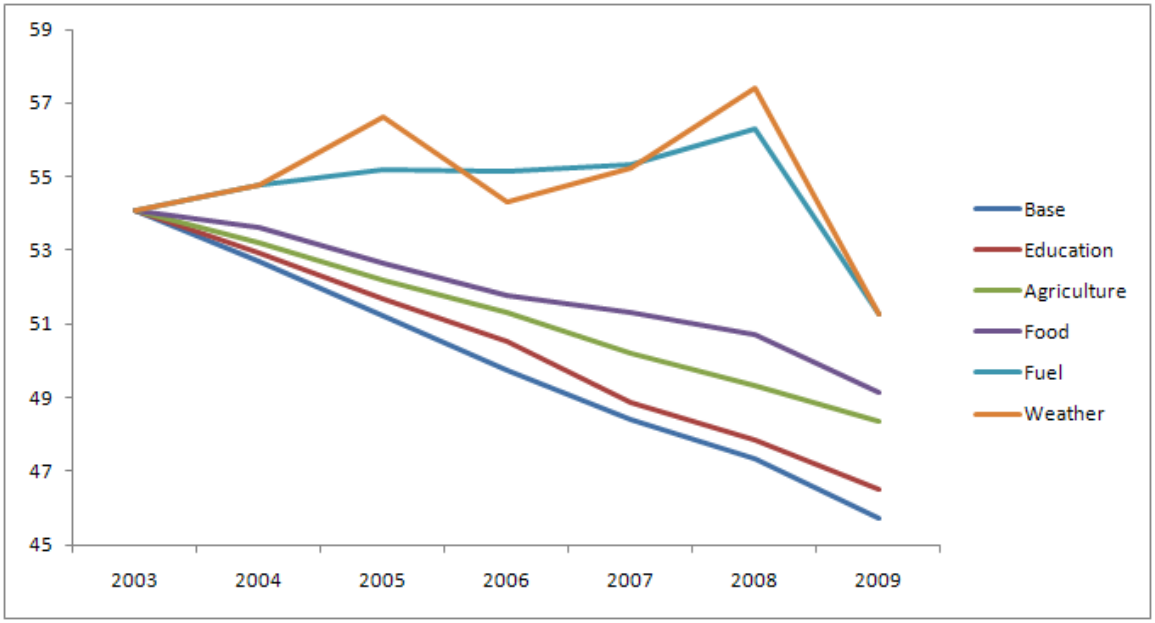
Source: MPD/DNEAP & Thurlow (2008).

Model results are strikingly close to the estimates from IOF08. At the national level and for the full survey period, the IOF survey estimates 54.7% of the population consumes below the poverty line. The corresponding model estimate is 54.3% of the population. Model results are also very close to IOF estimated rates in rural zones both for the full survey period and by semester. The only rates that do not lie very close to one another between the model projection (based off of IAF02 and the CGE model) and IOF08 are the first semester in urban zones. The difference between these two rates is about six percentage points. Overall, the IOF08 results appear to be fully consistent with the evolution of macroeconomic variables.

[26] An improved estimate would clearly be desirable.

A significant advantage of CGE models is they allow one to decompose complex phenomena, such as evolution of poverty rates through time, in order to provide insights on the driving forces behind results. So far, we have considered only results from the final scenario, Weather, which includes all of the effects discussed in the preceding subsection. Figure 7-2 shows the evolution of poverty rates through time for each of the scenarios: 2003 Baseline, Education, Agriculture, Food, Fuel, and Weather. Recall that the scenarios are cumulative. Hence, the scenario Agriculture differs from the 2003 Baseline both in terms of rates of productivity growth in agriculture and the rate of growth of the labour force by skill class.

Figure 7-2: Evolution of poverty rates by scenario.



Source: MPD/DNEAP.

A number of useful observations emerge from Figure 7-2. First, the goal of a 45% poverty rate by 2009 appears to have been a reasonable one. As discussed above, the 2003 Baseline scenario provides a projection of poverty rates based on information available in 2004. In this scenario, the labour force grows at plausible rates, agricultural productivity growth is relatively rapid, world prices are held constant, and no weather events occur. Under this scenario, a poverty rate of 45.7% is attained in 2009. This is essentially the same as the level targeted by PARPAII.

The principal impacts on poverty derive from: (i) the combination of low productivity growth in agriculture, particularly food crops, substantial increases in world food prices, and a weather shock in 2008; and (ii) the nearly continuous increase in fuel prices over the 2003 -

2009 period.[27] In 2008, when fuel prices were at their peak, they contributed most to the increases in poverty above the 2003 Baseline scenario. In 2009, with the decline in fuel prices but relative firmness of food prices, the combination of low agricultural productivity growth and food price increases contributed the most to the increase in poverty.

The strength of the fuel price effect merits further mention. This effect is consistent with earlier analysis (Arndt et al., 2008; Arndt et al., 2005).[28] Net imports of fuel and derived products represent a substantial share of total imports—about 18% in 2003. Because fuel use is difficult to economise on, particularly over relatively short time periods, fuel price increases imply a need to either increase exports or reduce imports for any given level of foreign exchange availability from external sources. This terms of trade loss amounts to a reduction in the quantity of goods available to the economy.

Earlier analysis by Arndt et al. (2008) illustrates that policy choices have some impact on poverty. For example, fuel subsidies can reduce the poverty impact of fuel shocks. However, fuel subsidies only partially offset the impact and come at the cost of reducing investment (and increasing future poverty rates assuming the investment is effective). In addition, fuel subsidies increase the burden of macroeconomic adjustment. Fuel subsidies imply (by definition) lower fuel prices and hence greater fuel consumption. This means that exports must increase more or imports of other items must decline by more than in the no-subsidy case. For these reasons, Mozambican authorities have largely, though not completely, allowed international fuel prices to pass through to higher domestic fuel prices. In the model simulations, the international fuel price increases are assumed to be passed through to the economy.

Changes in fuel prices then influence relative prices throughout the economy. In Mozambique, the existence of large differences between farm-gate agricultural prices and

[27] The scenario Education shows a very slight increase in poverty. Two factors are pushing in opposite directions in this scenario. The accumulation of more productive human capital tends strongly to reduce poverty. At the same time, education is an investment. Children greater than age 15 who are enrolled in school are presumed to be not working or not working as much as they would be if they would be if they were not enrolled in school. Hence, the size of the labor force is smaller and production levels lower.

[28] Arndt et al. (2008) report relatively mild impacts from the food price increases of 2008 with these negative effects concentrated in urban zones. Two factors contribute to making the world food price increases more powerful than the previous analysis suggested. First, the Arndt et al. (2008) analysis is static and based on a 2003 social accounting matrix for Mozambique while the current analysis is dynamic and runs from 2003 to 2009. Second, as shown in Table 4-5, per capita production of food crops declined substantially between 2003 and 2008. Information on 2008 food production was not available at the time of the analysis conducted by Arndt et al. (2008); hence food production levels were left at base values. In the current analysis, the reduced agricultural production levels in 2008 imply much less marketable surplus in rural areas. As a result, many more rural households are net food purchasers and experience first order welfare declines as a result of food price increases.

consumer prices is well established. Transport costs, of which fuel is a substantial component, account for a large share of this difference. Other things being equal, higher fuel prices simultaneously lower farm-gate prices and increase consumer prices because they expand the marketing wedge between producers and consumers (Tarp et al., 2002a). The costs of distributing imported products, especially food, which is bulky and relatively low value, increases. Finally, direct transport costs, which are often particularly important for urban residents, also tend to rise.

To conclude this section, we return to the links between consumption growth, poverty, and inequality set forth by Bourguignon (2004). In the model, consumption is growing and poverty is essentially static (up in 2008 and down in 2009). Therefore, one expects inequality to rise, though not dramatically, as the rate of consumption growth is not particularly rapid. This is indeed the case. The Gini coefficient, looking across results for 2008 and 2009, rises to about 43.5, or about two points higher than the estimate from 2002-03. As discussed in Section 6 and shown in Table 6-1, this change falls well within the estimated confidence interval for the change in the Gini coefficient between 2002/03 and 2008/09. Hence, while the point estimate for inequality from the IOF08 survey points to no change relative to 2002/03, cross references with other sources point to an increase in inequality of about two points.[29]

8 Changes in poverty at the sub-national level

The preceding analysis focused at the national level; however, there are large regional differences in poverty, both in levels and trends, as emphasised in Section 3.4. This section synthesizes results from previous sections of the report to provide an overview of the poverty situation in each of the three regions. Before proceeding to the regional analysis, we consider non-monetary poverty indicators at the provincial level. In addition, we consider the limits of analysis at lower levels of aggregation.

8.1 Housing and asset ownership

As discussed, the quality of housing improved significantly over the period of analysis as shown in Table 8-1. At the national level, the share of houses with solid roofs increased by

[29] The conversion from nominal to real expenditure also has an impact. As emphasised in section 6.3, the cost of living for poor households rose more rapidly than for wealthier households. In the CGE model and associated poverty module, real consumption is calculated by income quintile for rural and urban households. Preliminary attempts at deflating nominal consumption from IOF08 by consumption level specific deflators yield increases in inequality.

five percentage points between 2002-03 and 2008-09. The City of Maputo shows the greatest share with nearly all households living under a solid roof. At the other end of the spectrum, Niassa province has the smallest share of the population living under a solid roof despite a fairly rapid advance in the share of households with solid roofs with the figure passing from 4.4% to 8.1%. The share of households with solid walls increased from about 14% to about 18% at the national level. The largest gains for this indicator were registered in Maputo Province (13.5 percentage points) and in Tete (8.9 percentage points). The provinces of Nampula and Cabo Delgado registered declines in the share of houses with solid walls (3.8 and 1.5 percentage points respectively).

Table 8-1: Quality of housing by province.

	Solid roofing (%)		Solid walls (%)		Electric lighting	
	2002	2008	2002	2008	2002	2008
Niassa	4.4	8.1	4.4	6.6	4.4	5.8
Cabo Delgado	6.8	11.2	3.6	2.3	3.0	4.0
Nampula	8.1	11.8	8.9	5.1	4.9	8.9
Zambezia	4.2	11.5	2.0	9.4	2.7	4.1
Tete	11.8	15.1	8.0	16.9	3.5	5.9
Manica	23.4	25.4	13.2	14.0	6.0	8.8
Sofala	37.3	39.0	19.6	21.2	6.7	16.8
Inhambane	37.8	45.6	12.6	13.4	3.1	4.8
Gaza	63.6	67.1	17.7	17.9	7.3	12.5
Map Province	93.6	94.0	53.1	66.6	18.1	45.2
Map City	99.5	99.8	81.3	86.9	45.9	73.6
Rural	11.4	15.3	4.5	7.5	0.6	1.5
Urban	56.2	64.6	36.9	43.4	21.7	42.0
National	24.8	29.5	14.2	17.8	6.9	13.2

Sources: IAF02 and IOF08.

Asset ownership also increased in the majority of provinces though with considerable variation across provinces. As shown in Table 8-2, ownership of bicycles and televisions increased by six percentage points while ownership of a radio remained approximately stable. With the exception of Maputo City, all zones registered increases in bicycle ownership. With respect to cell phones and televisions, increases were registered in all provinces.

Table 8-2: Durable asset ownership

	Bicycle (%)		Radio (%)		TV (%)		Cell phone (%)	
	2002	2008	2002	2008	2002	2008	2002	2008
Niassa	56.9	65.4	43.0	59.7	2.1	5.1	0.5	12.6
Cabo Delgado	24.1	42.6	43.0	45.4	2.6	4.3	0.2	11.4
Nampula	26.7	35.3	48.3	38.4	3.0	6.1	1.0	10.2
Zambezia	38.7	48.6	39.4	41.1	1.7	3.7	0.1	7.9
Tete	27.9	41.6	45.1	47.2	1.7	3.5	0.8	11.0
Manica	38.5	54.7	63.6	72.1	4.9	7.0	2.2	19.3
Sofala	35.5	44.1	52.3	53.2	7.0	14.6	3.1	29.5
Inhambane	11.7	24.0	32.9	42.6	3.9	11.0	0.9	36.4
Gaza	16.7	19.2	34.1	40.1	4.6	19.3	5.9	44.8
Map Province	10.2	10.3	53.4	42.8	18.3	42.7	13.8	67.3
Map City	7.8	5.7	61.8	40.8	56.0	65.4	37.9	84.2
Rural	31.8	43.8	41.5	44.9	0.7	2.8	0.5	13.1
Urban	19.4	24.1	54.9	47.7	19.5	35.9	11.4	53.7
National	28.1	38.1	45.5	45.8	6.3	12.4	4.3	23.7

Sources: IAF02 and IOF08.

8.2 Limits to analysis at lower levels of aggregation

To recap the consumption poverty results, we find large increases in poverty in both the urban and rural areas of Sofala and Zambézia, as well as an increase of 18 percentage points in rural Manica and a slight increase in poverty in urban Nampula (5 percentage points). In contrast, we find substantial reductions in poverty in Niassa, Cabo Delgado, Tete, Inhamabane and Maputo City.

While these provincial changes merit explanation, it is important to highlight that results at these lower levels of geographical aggregation are more prone to error and should not be taken as precise. Aside from the usual and not immaterial error introduced by having information from a sample rather than the entire population, the existence of non-sample error associated with underreporting of food consumption weakens our ability to make precise inferences about changes in poverty over time at the provincial level (see Section 10.6). One way of thinking about this problem is that the standard errors (reported in Table 3-6) may well be under-estimated, which would have material consequences for interpretation of results. For example, according to the point estimates and standard errors reported in Table 3-6, the 95% confidence interval around the estimated change in poverty from 2002/03 to 2008/09 in Niassa is +/- 14.7 percentage points. The effect of sample error alone is that we that we can only state, with 95% confidence, that the change in poverty lies between -5.5 and -34.9 percentage points. Thus, if these reported standard errors are biased

downward due to non-sample error, we have even weaker grounds on which to assess the magnitude of poverty trends at the provincial level.

With the above caveats in mind, it is nevertheless the case that a number of factors help to account for the broad spatial pattern of changes in poverty observed. These are described below for each of the three broad geographical zones (North, Centre, South). However, this section does not constitute a complete or final explanation of poverty dynamics at the provincial level. Rather, backed by improvements in poverty monitoring and data quality, they constitute important lines of enquiry for future research.

8.3 Poverty dynamics in the North

The better performance of the Northern provinces compared to those of the Centre is related to at least two main factors: (i) a comparatively better agricultural performance in 2008/09 and (ii) larger gains in access to public services and infrastructure. Evidence for the first of these factors comes indirectly from the SIMA price data, which show substantially slower rates of price increase in Niassa and Cabo Delgado relative to the Centre (see Section 4.4). In the IOF08, Northern households also self-report fewer numbers of months with inadequate food. For example, 30% of rural households in the North report they have had insufficient food for more than two of the past 12 months, or an average of 1.9 months of insufficient food per household. In contrast, 58% of rural households in the Centre report they have had insufficient food for more than two of the past 12 months, averaging 2.9 months of insufficient food. These findings are further supported by rainfall data, which suggest that the more Northerly provinces have enjoyed more stable and higher rainfall over recent years, at least in comparison to the Central provinces.

Households in the North also report faster rates of change across a number of non-monetary poverty indicators, also attesting to relatively more positive performances. For example, according to Figure 3-4, the proportion of households in the rural North living within 45 walking minutes of a primary health facility increased by a factor of more than two (from 31.5% to 69.7%), while in the rural South the increase was only 12.6 percentage points (from 35.0% to 47.6%). More broadly, a study by McCoy and Cunamizana (2008) documents large and persistent provincial differences in the allocation and execution of both investment and recurrent government spending in core social sectors. They find that due to bureaucratic allocation rules, as well as differences in spending capacity, the more populous provinces of Nampula and Zambézia frequently lose out on a per capita basis to smaller provinces such as

Niassa in the North.[30] Thus, the spatial incidence of government spending in social sectors appears to favour the North (and the South, see below), which in turn has some correlation with estimated changes in poverty. A causal relation remains to be established.

8.4 Poverty dynamics in the Centre

Two factors appear to be of special relevance in the Central zone. First, agricultural performance appears to have been particularly weak. According to data from the TIA surveys, per capita production of food crops was 32% lower in Sofala and 19% lower in Zambézia in 2008 compared to 2003 (measured by calorie values). In turn, this is likely to be associated with more severe climatic shocks as well as lack of access to technology. For instance, the TIA surveys indicate that these regions show some of the lowest rates of access to modern agricultural technologies, such as fertilizers.

The Central regions of the country also have been most exposed to climatic variation over recent years—i.e., floods, droughts and cyclones—which is likely to have increased household vulnerability and weakened coping mechanisms, such as food stocks. In late 2007 and early 2008, for example, intense rains in the Central region of the country led the Mozambican government to declare a "red alert" due to flooding in the Zambezi river basin and rising water levels on the Búzi, Púngue, Save and Licungo rivers. In March of 2008, cyclone "Jokwe" created extensive damage in Nampula province. More precise data on the economic effects of these climatic shocks are not available. Nevertheless, the TIA surveys show a particularly high annual volatility of food production in these regions (annually production varies by around 20% more compared to the average level).

Rainfall data support the conclusion of more difficult weather conditions in the Centre relative to the North over recent years. Based on satellite data, Table 8-3 provides estimates of total accumulated rainfall during the first four months of each year in selected provinces in the North and Centre since 1997.[31] Not only do the figures indicate that Central provinces receive both lower levels and less reliable rainfall than the Northern provinces (especially

[30] For example, data on total education spending per school student from 2003 to 2006 shows that Zambézia spent US$ 30.4 per year on average compared to US$ 53.5 in Niassa. Similarly, of total water spending by province over the same period, Niassa and Cabo Delgado spent 46.5% of the overall budget compared to 11.2% by Zambézia and Sofala (combined).

[31] These data were obtained from the NASA Langley Research Centre POWER Project funded through the NASA Earth Science Directorate Applied Science Program. The data contain daily observations on 204 geographical coordinates (latitude, longitude) in Mozambique from January 1, 1997 to April 30, 2009. These coordinates are mapped to individual provinces (with potential error close to boundary points), and a daily average for each province is calculated. This average of daily precipitation across the relevant coordinates of a given province is then used as the basis to calculate accumulated provincial rainfall.

Niassa and Cabo Delgado), but we also note that 2008 was a particularly bad year for Sofala and Manica. For these provinces, accumulated rainfall in the first months of 2008 was lower than in 2005, itself a bad drought year across the country.

Table 8-3: Estimated accumulated precipitation (in mm), first 4 months of each year.

	Niassa	Cabo Delgado	Nampula	Zambezia	Tete	Manica	Sofala
1997	832.8	736.1	884.9	742.8	795.8	745.4	844.7
1998	712.8	785.0	662.7	486.3	579.3	366.8	533.6
1999	915.6	844.1	770.9	725.7	759.7	683.5	945.8
2000	681.1	629.4	637.6	597.3	651.9	828.1	870.4
2001	851.4	702.0	649.9	706.0	833.3	664.3	870.3
2002	927.3	1037.1	659.0	445.9	546.0	218.9	313.9
2003	956.3	809.2	910.9	633.6	701.5	454.5	605.2
2004	723.6	853.2	795.5	519.9	621.4	579.6	546.5
2005	583.0	555.1	484.9	356.1	440.1	284.9	334.3
2006	795.4	759.0	577.0	538.6	669.0	495.5	563.7
2007	912.3	998.8	953.1	582.1	698.2	466.1	616.6
2008	805.5	896.6	791.0	446.5	549.5	300.1	306.7
2009	775.4	629.9	636.2	589.9	646.7	372.7	492.4
Mean	805.6	787.3	724.1	567.0	653.3	497.0	603.4
Coef. Var.	14%	18%	19%	21%	17%	38%	37%
2008/2005	38%	62%	63%	25%	25%	5%	-8%

Notes: "coef var." gives the coefficient of variation, calculated as the standard deviation divided by the mean.

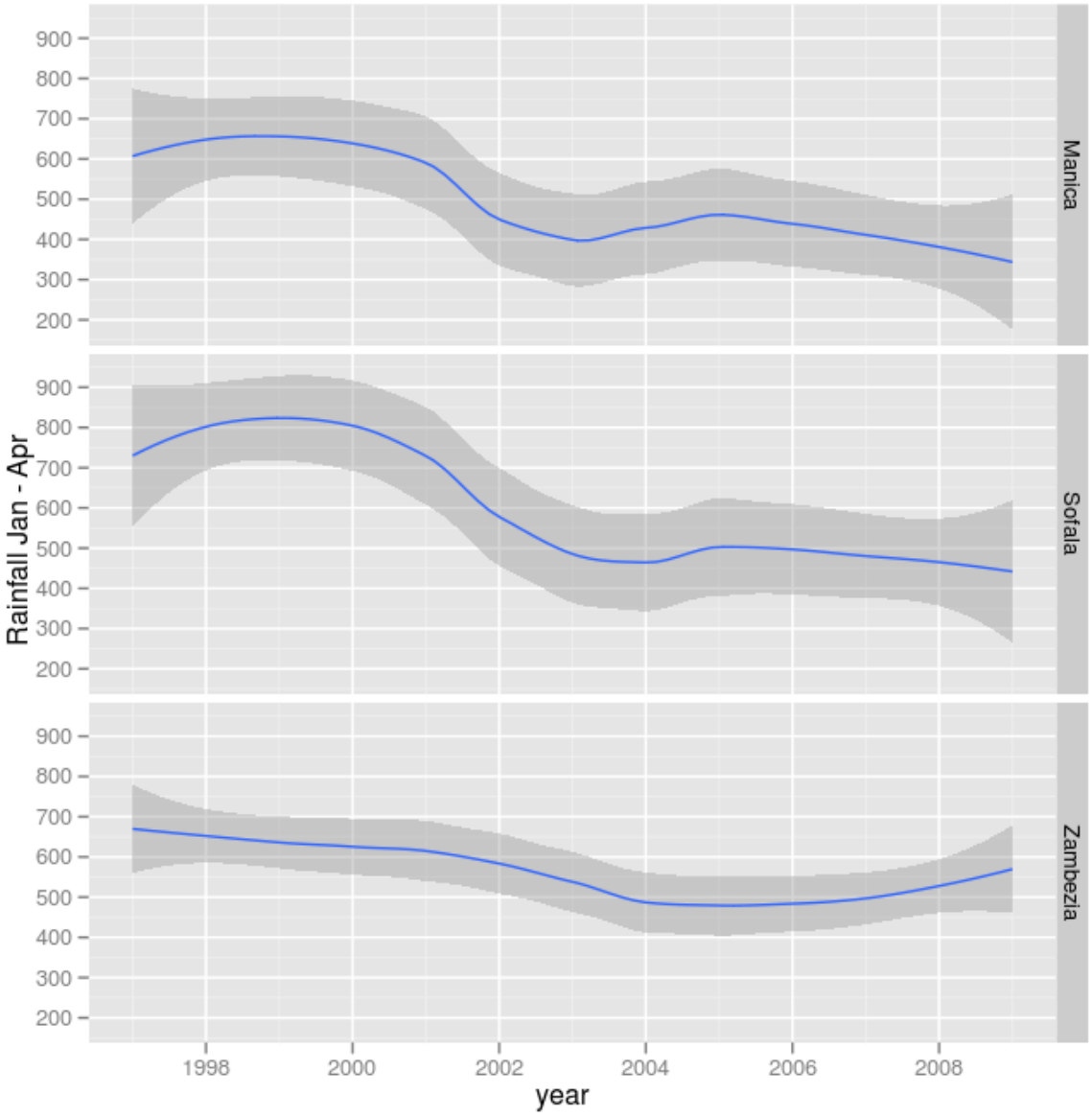
Source: MDP/DNEAP and NASA.

Figure 8-1 plots the long-run trend in precipitation for selected Central provinces (by applying a Loess smoother to the data in the previous table). The plot shows that Central provinces have suffered consistently poorer accumulated rainfall over the most recent years, especially in relation to the 1999-2001 period. To the extent that this affected agricultural production, it would weaken reserve food stocks and, in turn, the ability of households to cope with additional external shocks.

Closely related to weak agricultural performance and rainfall patterns, prices increased far more quickly in the Central regions relative to the North and South. For example, the SIMA series presented in Section 4.4 suggests that the price of agricultural products sold in urban areas of Zambézia increased by over 200% from 2002/03 to 2008/09 compared to only 85% in Niassa. This reflects at least in part a comparative deterioration of local agricultural supply conditions, potentially associated with climatic shocks, which undermine both production and transport access and thereby aggravate general price increases caused by international trends in fuel and food prices. Thus, in the Central regions during 2008/09, there appears to have

been a particularly unfortunate and acute interaction between agricultural performance, climatic shocks, and price trends, which resulted in a large number of households moving into poverty.[32]

Figure 8-1: Smoothed annual trends in accumulated precipitation (in mm), first 4 months of each year.



Source: MPD/DNEAP and NASA.

A specific factor that has affected Central provinces, and Zambézia in particular, is the spread of Coconut Lethal Yellowing-type Diseases.[33] While precise estimates of the extent and impact of these diseases are not available, an evaluation in 2006 (Eden-Green, 2006)

[32] Further analysis of the association between trends in climatic factors, prices and poverty would be valuable in order to understand the nature and extent of climatic vulnerability across the country.
[33] Thanks to the Millennium Challenge Account, Mozambique, for providing this additional information.

indicated that at least 5% of economically-useful coconut trees had already been destroyed. A rapid appraisal undertaken in 2008 (Donovan et al., 2010) suggests that these problems have worsened, increasing in intensity in specific zones. Survey evidence presented in the same report also suggests that households in the most affected zones have been substantially economically disadvantaged by this phenomenon. This is a major concern for the future, as the rapid spread of the disease means that up to 50% of coconut production could be lost by 2015 (Donovan et al., 2010).

Lastly, an additional contributing factor behind the increase in poverty in the Centre may be the cumulative effect of the HIV/AIDS epidemic. The epidemic is most mature in the Central region of the country, and current estimates are that nearly 630,000 deaths from AIDS occurred in the Central region (current population 9.3 million) over the period 1998 to 2009 alone (INE et al., 2008). In contrast, Northern provinces (population 7.1 million) have been much less affected by the epidemic, registering less than 120,000 AIDS-related deaths over the same period. Southern provinces (population 5.2 million) registered slightly more than 200,000 AIDS-related deaths over the same period. While AIDS is clearly a large and growing problem in the South, the South has been suffering from strongly elevated rates of adult death due to AIDS for a considerably shorter period of time than the Centre. Also, due to the long lags between infection and the onset of AIDS, death rates from AIDS in the Centre remain high. In 2008, the share of the population estimated to have perished from AIDS in the Centre was still 40% above the corresponding share for the South (and 140% above the share for the North). Hence, measured in terms of estimated AIDS deaths, the AIDS pandemic has been and remains much more severe in the Centre than in any other region of the country.

8.5 Poverty dynamics in the South

The Southern zone of the country presents an economic structure quite different from that of the Central and Northern zones. Proximity to South Africa and to Maputo—the commercial capital and centre of government—provides for a substantially more diverse set of economic opportunities and possibilities for both income and consumption smoothing. Public spending and infrastructure is most developed in the South, especially around Maputo, compared to other zones (McCoy and Cunamizana, 2008). Recently, liberalization of restrictions on movement of people and goods within the Southern African Development Community (SADC), as well as ongoing rehabilitation of the Maputo Corridor, have bolstered economic

linkages between Mozambique and South Africa. In addition, the Maputo region benefits disproportionately from positive spillover effects on the demand for goods and services associated with central government, foreign investment and foreign aid. It is notable that all these elements have grown strongly since 2002/03 and are likely to have generated substantial economic benefits for the Southern zone of the country.

9 Conclusions

This report has provided an in-depth quantitative assessment of the 2008/09 poverty situation in Mozambique. The new information that made this analysis possible is the 2008/09 household survey (IOF08). This database provides a wealth of information, including key characteristics of households, their consumption, and their asset holdings. The IOF08 is strictly comparable to previous household budget surveys undertaken in Mozambique. The National Institute of Statistics (INE) held responsibility for the arduous task of collecting the data in the field throughout Mozambique; the present report was elaborated by the National Directorate of Studies and Policy Analysis (DNEAP) of the Ministry of Planning and Development (MPD) with technical support from the University of Copenhagen.

A key underlying theme of this report is that poverty is a multi-dimensional concept. Consequently, in analyzing poverty, we have considered a number of dimensions. These include consumption poverty, indicators of non-monetary well-being and anthropometric indicators. We have also paid close attention to ensuring that the underlying definitional relationships between growth, inequality and poverty have been accounted for.

We conclude that:

- Significant progress has been realised across a range of non-monetary poverty indicators at both the national and regional levels. These include large improvements in access to education (at both primary and secondary levels); improved access to health services, particularly in rural areas; increases in asset ownership by households and improvements in housing quality. These advances are not captured well by the consumption-based measures.
- While consumption poverty decreased substantially from 1996/97, it did not fall between 2002/03 and 2008/09. Some 55% of the Mozambican people remain poor according to this indicator. Trends were positive from 2002/03 to 2008/09 in Northern Mozambique, which registered important advances in combating poverty; the same goes for the Southern region to a slightly lesser extent. In contrast, Central Mozambique saw increases

in consumption poverty. Also, nutrition indicators for children under five years show little progress at the national level.

In sum, the present assessment points to both successes and future challenges. Successes have been realised in expanding access to government-provided social services, particularly education and health, and private accumulation of durable goods. These are key factors for long-term growth and development. The challenges highlighted include low levels of consumption, high levels of vulnerability and the persistently high levels of child malnutrition.

Three basic sets of reasons were identified as the main drivers of the disappointing performance in the consumption-based measure of poverty. These are:

- Very slow or zero growth rates in agricultural productivity, reflected in weak growth in the production of food crops;
- Weather shocks that impacted the harvest of 2008, particularly in the Central provinces; and
- Declining terms of trade due to large increases in international food and fuel prices. Fuel prices, in particular, rose substantially over the period 2002/03 to 2008/09.

An important policy message to draw from this analysis is that a principal missing element in the current development process in Mozambique is sustained productivity growth in the family agriculture sector. Getting agriculture moving is a serious challenge in the struggle against absolute poverty. Without stimulating the agricultural sector, particularly but not exclusively the family sector, poverty among the large numbers of food-producing small and medium-sized farmers simply will not go away within the foreseeable future. Improved levels of agricultural production will also benefit urban households through lower prices.

As a complement to actions in agriculture, there is also a need to promote growth in employment opportunities through the creation and expansion of small and medium enterprises, promotion of agro-processing, development of the financial system, and through the implementation of the Strategic Plan to Reduce Urban Poverty (PERPU). More success in stimulating the agricultural sector and the overall economy should help to improve the the problem of child malnutrition; however, numerous factors determine the nutritional status of children. For example, chronic malnutrition could be related to food consumption traditions or due to simple lack of information.

As regards the implications for the attainment of the Millennium Development Goals (MDGs) by 2015, we note that poverty rates in the second semester of the survey are substantially less than poverty rates in the first semester. If, as Appendix 10.6 indicates, proper accounting for consumption in Maputo and in other urban areas reduces measured poverty rates by about three percentage points, then poverty rates in 2010 could easily be less than 50%. With favourable international conditions and increases in agricultural productivity, the MDG poverty target remains very much within reach.

Finally, it is abundantly clear that national household budget surveys occur with insufficient frequency. The current six-year gap creates a substantial information deficit in the latter half of the period, fits poorly with the government planning and electoral cycle, and effectively precludes the development of panel data sets. In addition, the six-year gap renders capacity building for data collection and analysis far more difficult. DNEAP/MPD therefore concludes that the piloting of alternative questionnaires immediately and launching of a new survey in mid-2011 is desirable.

10 Appendices

10.1 Methodology for monetary poverty measurement

The methodology employed to measure monetary (consumption) poverty in Mozambique broadly follows the Cost of Basic Needs (CBN) approach. In the following subsections we only briefly describe this methodology as it is essentially similar to that applied in the First and Second National Poverty Assessments. The CBN approach is widely recognised and follows international standards in poverty measurement. It is laid out in more detail in Deaton and Zaidi (1999) and Deaton and Grosh (2000). Further details on the methodology as applied to Mozambique can be found in Tarp et al. (2002b), Arndt and Simler (2010), and DNEAP (2004).

Application of the CBN approach proceeds in the following steps, which are described in more detail below. First, we use the survey data to calculate total consumption per household (per day). Per capita consumption is simply total household consumption divided by household size. Second, these consumption measures are adjusted to take into account temporal changes in prices over the entire survey period (one year). Third, poverty lines are constructed at a regional level taking into account observed patterns of food consumption, local prices and non-food consumption. Fourth, an iterative procedure is used to ensure that the poverty lines are based on the actual consumption patterns of the "poor." Finally,

adjustments are made to these poverty lines in order to ensure consistency across space and over time. Individuals are then defined as poor if their total consumption falls below the defined poverty line for their region—in other words, they are deemed poor if the value of their consumption is unable to meet the costs of basic needs.

10.1.1 Consumption measure

Drawing from several modules of the IOF, we measure the total value of consumption of food and non-food items, including purchases, home-produced items, and received gifts. We also impute use values for owner-occupied housing (using a hedonic regression) and household durable goods. In contrast to IAF 2002/03, receipts-in-kind in IOF 2008/09 only relates to payment from work. Imputation methodology for these three items are described in greater detail in section 10.5. Omissions from this consumption measure include consumption of commodities supplied by the public sector and consumption of home-produced services.

10.1.2 Temporal price adjustment

Food prices tend to follow a seasonal pattern, which implies that the purchasing power of a given amount of money varies during the year. A temporal food price index is therefore developed for the survey period, and all nominal values of food consumption are adjusted by the index to take these price fluctuations into account. The temporal price index is on a quarterly basis, with the last quarter's price index set to one, for six regions of the country.

10.1.3 Definition of poverty lines

In the CBN approach (see Ravallion 1994, 1998), the aggregate poverty line is constructed as the sum of a food and a non-food poverty line. The former line is critical as a large share of consumption in developing countries is devoted to food; without adequate food, individuals cannot lead healthy and fulfilling lives. Nevertheless, a minimum level of non-food consumption is also unavoidable, for example to ensure clothing and shelter. Thus both aspects of expenditure must be taken into account.

As prices of basic goods vary across space and time, price differences must be accounted for to permit consistent poverty comparisons. Spatial differences in prices are accommodated by defining region-specific poverty lines. These are based on region-specific food consumption bundles, reflecting consumption patterns of the poor in that region, and the cost of the bundle calculated using region-specific prices. The IOF survey separates the urban and rural zones of each of the ten provinces, thereby producing twenty regions. In addition, the capital,

Maputo City, is treated as a separate region, which gives us twenty-one regions initially. For the purposes of drawing poverty lines, the first poverty assessment aggregated these 21 regions into 13 spatial domains in order to ensure enough observations in each region to produce reliable poverty estimates. These same spatial domains have remained the same in all subsequent poverty assessments. A separate poverty line is calculated for each spatial domain.

For each of the 13 poverty line regions, a 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 Meticais per person per day, is the region-specific cost of meeting the minimum caloric/energy requirements when consuming a food bundle comprised of goods that the poor in the region actually consume.

Individual caloric requirements are estimated using age and sex as well as empirical probabilities of pregnancy/breastfeeding for moderately active persons. In all three surveys used for poverty assessment (1996–97 and 2002/03 IAF and 2008/09 IOF), the average daily caloric requirement per person per day varied around an average of about 2,150 kilocalories in each of the thirteen poverty line regions. More specifically, the average is 2,144 kilocalories daily per capita in 2008/09 IOF. The households' consumption of food items measured in grams are converted into kilocalories by using information on the typical calorie content of a gram of a given food item.

In each of the 13 regions, food items are identified that account for 90% of food expenditure among the poorest 60% of the population. These bundles represent about 95% of the calorie requirement. The values of these region-specific food bundles are then scaled up to equal 100% of calorie requirements, taking into account the fact that the remaining food items tend to be more expensive per calorie. The prices used are the "trimmed" average value-weighted unit values (amount spent divided by quantity in grams) observed among relatively poor households in the expenditure data. Here, "trimmed" means that the top and bottom 5% of food item prices are excluded, thereby limiting the influence of extreme prices. This trimming is only applied for food bundle cost calculation purposes, and do not exclude any households or any expenditures from the final estimation of poverty rates.

Finally, the non-food poverty line is taken as a simple weighted average of non-food expenditure for people with expenditure at between 80 and 120% of the food poverty line. A

triangular weighting scheme is used where weights are higher the closer a household's expenditure is to the poverty line. Added together with the food poverty line, this provides an aggregate poverty line, which is the basis for calculating initial poverty rates.

10.1.4 Iterative procedure

Prices and quantities are based on the poorest people, but in the above exercise the poor are somewhat arbitrarily assumed to be the bottom 60% of the population. In order to focus on the poor, the relevant food bundles and associated prices are estimated for relatively poor households using an iterative procedure as described by Ravallion (1998). Households are ranked by nominal consumption per capita, with the bottom x_1=60% identified as the relatively poor. The value for x_1 may be considered as a preliminary estimate of the poverty headcount. Preliminary poverty line calculations[34] are made, and the nominal consumption values are converted to real terms by taking into account region-specific differences in the cost of acquiring the basic needs bundle. This gives us a preliminary poverty headcount x_2. Households are then re-ranked using this first approximation of consumption per capita in real terms, and the bottom x_2 percent of this ranking identified as the relatively poor. Observed consumption patterns and prices in this sub-sample are calculated, producing a second estimate of poverty lines. This gives us another preliminary poverty headcount x_3. And we again re-rank households according to real expenditure. The iterative process continues until it converges, meaning that the same, or nearly the same, sub-sample of households appears as the poorest. For Mozambique, about five iterations are sufficient, giving a poverty rate of 53.6% in 2008/09.

10.1.5 Adjusted food bundles

Although the iterative procedure should reduce poverty rate bias, there is no guarantee that poverty lines are consistent across time and space. Therefore a last adjustment is made. Quantities in the iterative flexible bundle are adjusted so that they fulfill the revealed preference conditions across time and space. Basically, these conditions say that the costs associated with buying the 2008/09 bundle should be no more than the costs associated with buying the 2002/03 bundle with 2008/09 prices. Similarly, the cost of the 2002/03 bundle should be no more than the costs of buying the 2008/09 bundle when using 2002/03 prices. These are the intertemporal conditions. Spatially, the condition is that the cost of buying domain *i*'s bundle is no more than the cost associated with buying domain *j*'s bundle, both

[34] Food poverty line and non-food poverty line with the previously mentioned triangular weighting.

evaluated at prices in domain *i*; i , j = {1, 2, …, 13}, $i \neq j$. Thus, a given food basket should be *more* expensive when prices from another time period or spatial domain are used. These conditions are based on microeconomic theory, which suggests that with existing prices, a utility maximizing combination of quantities will be chosen. Thus, any other set of (relative) prices will make the chosen bundle (yielding the same quality or utility) more expensive.

The cost of the adjusted food basket is the food poverty line. Average non-food expenditure of poor people near the poverty is defined as the non-food poverty line. This is calculated using a triangular weighting scheme (kernel) for persons with consumption +/- 20% of the food poverty line, where greater weight is given to persons the closer they are to the food poverty line. The sum of the food poverty line and the non-food poverty line is the total poverty line, which is applied to calculate final poverty rates.

As opposed to earlier poverty assessments, Maputo Province and City poverty lines are now also adjusted by including a temporal dimension in the coherency requirement.

10.2 Standard errors

The level of the poverty rate is seldom interesting in itself. Rather, the measure is usually only interesting relative to poverty rates in other years, relative to other countries' poverty rates, or poverty rates in one region compared to another region, or one population subgroup compared to another population subgroup. When we compare poverty rates, the important question is whether any observed difference is meaningful or could potentially be due to sampling variability. Thus, statistical tests using the standard error (SE) are necessary to distinguish whether any difference in poverty rates is genuine. A general rule of thumb is that a difference in poverty rates that is greater than twice the corresponding SE is statistically significant.

Statistical software easily produces SEs for poverty estimates. However, a problem is that these *only* take into account uncertainty with respect to the welfare measure and do not allow for any uncertainty regarding the estimation of the poverty lines (Simler and Arndt, 2007). This tends to produce bias in the SEs, typically making them too low. Previous estimates for Mozambique based on IAF02 suggest that the SE for the national poverty rate would be underestimated by about 27% using conventional measures (Simler and Arndt, 2007).

To get an unbiased estimate for the SE for IOF08 we apply essentially the same methodology as used in IAF02, which relies on "bootstrapping." The advantage of this approach is that the estimation procedure can have any degree of complexity and there is no explicit formula we

can use to calculate SEs for our case. Bootstrapping basically implies that we create multiple random samples (by replication) from the same underlying IOF08 dataset. Based on these repeated samples we calculate the poverty rate. The number of replications (*k*) is decided by the analyst, but the final unbiased SEs are more reliable the higher the number of replications. On the other hand, as the poverty software is time intensive, we employ *k* = 200 replications. For each of these *k* replications of the poverty rate, we directly calculate the SE using conventional measures.

10.3 Poverty correlates

The methodology applied is a straightforward OLS (ordinary least squares) regression, estimated separately for the two survey periods at different levels of geographic aggregation. Appropriate adjustments are made for the survey design and standard errors are based on a Taylor-linearised variance estimation. As is typical in the poverty analysis literature, numerous explanatory variables are employed in the model. For ease of exposition, these are classified into the following categories: characteristics of the household head (*head*), household demographics (*demo*), household human capital (*hcap*), sector of economic activity (*sector*), areas of household agricultural activity (*agric*), habitation (*habit*), ownership of durable goods (*assets*) and fixed location effects. As the model is estimated at the household level, certain variables—such as those relating to education or sector of employment—are adjusted to take into account household composition. Specifically, such variables are adjusted so as to represent the share of household members with a given characteristic. Qualitative variables, such as location, are represented by dummy variables.

A summary form of the regression model is given by the following equation:

$$\begin{aligned}\log\left(y_{ijt}/z_{jt}\right) &= head_{it}^{'}\beta_{1t} + demo_{it}^{'}\beta_{2t} + hcap_{it}^{'}\beta_{3t} + sector_{it}^{'}\beta_{4t} \\ &+ agric_{it}^{'}\beta_{5t} + habit_{it}^{'}\beta_{6t} + assets_{it}^{'}\beta_{7t} + location_{jt}^{'}\beta_{8t} + \varepsilon_{ijt} \\ &= X_{ijt}^{'}\beta_{t} + \varepsilon_{ijt}\end{aligned}$$

where *y* refers to per capita household consumption, *z* the poverty line, subscript *i* denotes households, subscript *j* denotes locations, and subscript *t* denotes the survey period. The last term in the model (ε) represents a residual error term that is assumed to be identically distributed and independent of the explanatory variables.

Fitted values from the above model are used to give predicted poverty measures in each period. Thus, for the case of the Foster, Greer and Thorbecke poverty measure with $\alpha = 0$, the predicted average poverty headcount for region j containing J households at time t is estimated as follows, using an indicator function:

$$\hat{\mathrm{H}}_{\mathrm{jt}} = \frac{1}{\mathrm{J}} \sum_{\mathrm{i}=1}^{\mathrm{J}} 1\left(X_{ijt}^{'} \hat{\beta}_t + \hat{\varepsilon}_{ijt} < 0\right)$$

where the estimated beta (β) coefficients are taken directly from the estimated OLS regression model and the predicted residual terms are drawn (pseudo-)randomly from a mean zero normal distribution with standard deviation equal to that of the regression residuals for the relevant location (and model).

10.4 Analysis of SIMA price data

Average monthly price information from the SIMA dataset is analysed for the period from January 2002 to August 2009. In terms of the quality of the SIMA data, the range and distribution of prices is uneven across space and time. Similar products such as maize flour (*farinha de milho*) often fall into different categories due to differences in product quality and/or availability in different markets and periods. Moreover, missing observations lead to gaps in the data for specific market and product combinations.

Given the structure of the information, a number of adjustments are necessary in order to be able to use the SIMA data to make meaningful comparisons with alternative price data. The steps taken are as follows:

a. To match the products in the IOF with the products in the SIMA data, the more detailed SIMA product classification is aggregated to produce a simpler set of nine product categories. The price for each aggregate category (in each of the 25 markets) in a given month is calculated as the average price (per kg) of its constituent products. Outliers and products with few price observations are also eliminated.

b. A set of food product weights is calculated for each of the urban areas of the North, Central and Southern regions. To do so, the average food poverty basket for a given location is calculated, taking the mean of the shares of different products (by value) in the 2002/03 IAF and 2008/09 IOF surveys. Then, for a given product and location, its weight is simply its average share in the relevant average basket.

c. These region-specific weights are applied directly to the raw price information in the SIMA dataset to produce a set of weighted prices. In effect, these can be understood as representing the costs of food products contained in the basket typically eaten by the poor in that region. While these can be calculated for each of the 25 SIMA markets separately, both gaps and noise in the data mean that it is more appropriate to calculate the weighted prices at the provincial level, distinguishing between towns and cities in each province. Consequently, 18 separate price series are calculated. (Note that all weights are appropriately normalised to ensure they sum to one in each location and time period).

d. To assist comparison across space and time, these weighted series are transformed into indices. In all cases, the base period, given a value of 100, is the average of the weighted price series in each location observed during the 12 months of the IAF 2002/03 survey period.

For presentational simplicity, these weighted prices and indices are analysed in the text at a more aggregate provincial level. Where this is the case, and unless otherwise stated, simple averages are taken over the relevant spatial domain.

10.5 Imputation of receipts-in-kind

Due to a difference in the questionnaires between IOF 2008/09 and IAF 2002/03, the value of receipts-in-kind need to be imputed for IOF 2008/09 to ensure consistency between the two surveys. The latter survey only recorded receipts-in-kind for work, thus neglecting receipts-in-kind from other sources such as friends and family outside the household. In contrast, all receipts-in-kind were included in the IAF 2002/03 survey. The imputation procedure described here applies parameters estimated from the IAF 2002/03 data to observed household data from IOF 2008/09.

10.5.1 Estimation

The objective is to impute receipts-in-kind (RIKs) in 2008/09 based on the pattern of RIKs observed in 2002/03. To do so, we construct a model to predict the value of RIKs for each household in the IAF 2002/03 survey. The response variable is taken as the nominal value RIK as a share of total non-RIK household consumption. The use of a fraction is convenient as it avoids problems of deflation (spatial and inter-temporal). As the dependent variable is a number between 0 and 1, with substantial censoring at zero, the appropriate econometric approach is a Tobit model that takes into account the selective nature of the data.

The explanatory variables used in the model are:

- demographic background variables for the household (head): age, household size, whether there is a mother in the household, ability to read and write, whether student, educational level, dependency ratio, employment industry, illness, disability, salaried worker, and economically active
- possession of durable goods: bed, fridge, bicycle, radio, tv, watch
- housing quality: access to safe water and sanitation, solid roof, durable walls
- vintiles (groups at every 5^{th} percentile) with respect to temporally (TPI) and spatially (SPI) deflated per capita expenditure excluding actual RIK
- survey month; and
- the stratas: urban/rural by provinces

Implementing the model on the 2002/03 data (including population weights) produces a set of estimated parameters. From these we predict the fraction of RIK out of non-RIK total expenditure. Multiplying this fraction with non-RIK expenditure gives us an estimate of nominal (total) RIK for each household. A final adjustment is necessary because some RIKs were already recorded in the 2008/09 consumption data. Specifically, for 2008-09 we calculate the imputed non-work related RIK as the imputed total RIK value minus the work-related RIK value in the survey. If the result is negative then only the work-related RIK value is used, thereby giving a small upward bias to the estimates. This is taken into account by a proportional downsizing. The sum of actual work-related RIK and (adjusted) imputed non-work RIK then gives the final imputed nominal value for receipts-in-kind for 2008-09. Finally, for each household, this consumption is attributed to a randomly chosen food product item out of the ten most important products.

10.5.2 Performance

For the IAF02 we can evaluate how well this methodology performs because we have the actual RIKs from the survey. The official published poverty rate, based on IAF 2002/03, was 54.1 %. When we employ the fitted RIKs procedure (as opposed to actual RIK) for 2002/03 the poverty rate is 54.3 %, meaning a very slight over-estimation of 0.2 percentage points. At the provincial level the biggest differences occurs for Manica (2.9 percentage points above published poverty rate) and Sofala (1.1 percentage points below). However, none of the differences at the provincial or national levels are statistically significant. Furthermore, the

correlation coefficient between the actual and fitted poverty rates at the provincial level is 0.996. Thus, we conclude that this is a reasonable and robust imputation procedure.

10.6 Assessment of data on calorie consumption

Based on the cumulative experience of the three household surveys now completed in Mozambique (IAF96, IAF02, IOF08), there is mounting evidence of systematic underreporting of calorie consumption for (specific) households in certain locations. This section provides a brief review of the nature of the concerns regarding calorie underreporting, the available evidence from the surveys (focusing on the most recent) and its implications for the poverty analysis.

We conclude that evidence of underreporting of calorie consumption is most severe in the urban South. This is likely to be due to the existence of more diversified diets in these areas and higher food consumption outside the home, which in turn are associated with higher disposable incomes as well as the greater variety of foodstuffs available in the marketplace. These factors increase the likelihood of non-sampling error in self-reported food consumption. Due to the close connection between food consumption and poverty measures, such underreporting has material consequences for the levels of poverty estimated at a given time. Based on reasonable (and data-driven) assumptions regarding the pattern of this underreporting, we estimate that the poverty headcount rate may be overestimated by around 3 percentage points at the national level. However, as the design of the household survey questionnaires employed in Mozambique has been broadly consistent over time, the evidence also indicates that the pattern and extent of underreporting has been relatively stable. Consequently, estimates of *changes* in poverty over time continue to be reasonably reliable, despite concerns over the precise poverty *levels* in certain areas. Finally, we argue that although this problem is frequently encountered in household surveys across the globe, improvements to the survey design should be adopted in future.

10.6.1 Background

A core component of the Mozambican household budget surveys involves collection of detailed data on food consumption for each household over a period of a week. Based on reports by household members rather than direct observation, daily information is collected regarding the quantity of individual food items either purchased for future consumption (e.g., rice, tomatoes etc.) or consumed from own production. In the case of purchased items, information is collected from the households regarding their purchase price value; for own-

produced foods, the prices are imputed. From this, estimates of the monetary value of (daily) household food consumption are made.

Under the analytical methods employed in this assessment (following the Cost of Basic Needs approach, see Section 2.3), households are identified as poor when the total monetary value of their consumption of food and non-food goods falls below a set threshold. Calorie-based measures play only an indirect role in this procedure via the construction of food poverty lines. As explained in Section 10.1, the food poverty lines are constructed such that they represent the monetary value required to reach a target level of calories (approximately 2150 calories per person, per day) in accordance with local dietary preferences and prices.

No specific references to or estimates of calorie intake are made at the household level for the purposes of estimating poverty. The limited emphasis placed on measures of calories is now an established practice in poverty analysis (Ravallion 1994, 1998 and Ravallion and Bidani 1994). The focus on monetary consumption values is strongly preferred as they are considered to be less error-prone relative to possible alternatives. With respect to calories, for example, numerous unobserved factors such as differences in food quality, food preparation methods and wastage can have a huge impact on actual calories consumed. In addition, calorie consumption does not map directly to welfare. Just because one individual consumes fewer calories than another does not mean that the former individual has lower welfare than the latter.

In light of these points, the concept of caloric underreporting should be clarified. On the one hand, calories are not reported directly in the surveys but are estimated from reported food consumption quantities. This estimation is prone to error, meaning that the calorie estimates cannot be considered to be particularly robust. Nevertheless, given the definition of the (food) poverty line, we should expect to find a correspondence between calories consumed and measures of poverty. To put it differently, we expect the non-poor to be consuming at least a reasonable minimum number of calories. Consequently, estimates of calorie intake can provide a useful consistency check on the estimated poverty rates. A large disconnect between the two can be caused by either: (a) an error in the mapping from food quantities to calories; or (b) a failure to fully capture the actual food consumption of the household. In either case the finding, for a given household, of relatively high real consumption (of non-food) alongside low calorie intake may be taken as an indication of calorie underreporting. In case (b), if consumption items have been omitted from the household survey, rather than

misclassified, then the total value of consumption may be underestimated, thereby increasing the risk of incorrectly classifying the household as poor.

10.6.2 Evidence for Mozambique

Following these considerations, we review the evidence on calorie underreporting in the Mozambican household surveys. We do so by investigating the relationship between estimates of (real) consumption and calorie intake. To start, Table 10-1 reports the mean and median calorie intake per person by spatial domain.

Table 10-1: Mean and median estimated calorie intake, per person per day.

	Mean			Median		
	2002/03	2008/09	Diff.	2002/03	2008/09	Diff.
Niassa & Cabo Delgado - rural	2,181	2,362	181	1,880	2,152	273
Niassa & Cabo Delgado - urban	2,010	1,936	-74	1,458	1,722	264
Nampula - rural	3,383	2,114	-1,269	2,160	1,919	-241
Nampula - urban	1,842	2,043	201	1,412	1,691	278
Sofala & Zambezia - rural	2,767	1,857	-910	1,989	1,574	-415
Sofala & Zambezia - urban	1,966	1,621	-345	1,720	1,332	-388
Manica & Tete - rural	1,877	1,837	-40	1,696	1,769	73
Manica & Tete - urban	1,945	1,764	-181	1,299	1,607	308
Gaza & Inhambane - rural	1,497	1,757	260	1,295	1,439	144
Gaza & Inhambane - urban	1,566	1,689	123	1,018	1,388	371
Maputo Province - rural	1,083	1,257	174	863	1,082	220
Maputo Province - urban	1,019	1,108	89	827	960	133
Maputo City	1,041	1,469	428	830	1,194	363
National	2,138	1,860	-277	1,620	1,620	0
Correl. with headcount	-0.441	-0.489	-0.577	-0.495	-0.493	-0.795

Sources: MPD/DNEAP estimates using IOF08 and IAF02 databases.

Table 10-2 then provides proxy indicators of poverty based on three alternative thresholds of calorie sufficiency: 2150 per person, 1800 per person, and a household-specific threshold that is sensitive to household composition (gender and age).[35]

[35] Women and young children typically require fewer calories than adult males. As the poor population is composed of more women and, in particular, more children, the poor, as a group, require fewer calories per day on average.

Table 10-2: Proxy poverty measures based on calorie-insufficiency.

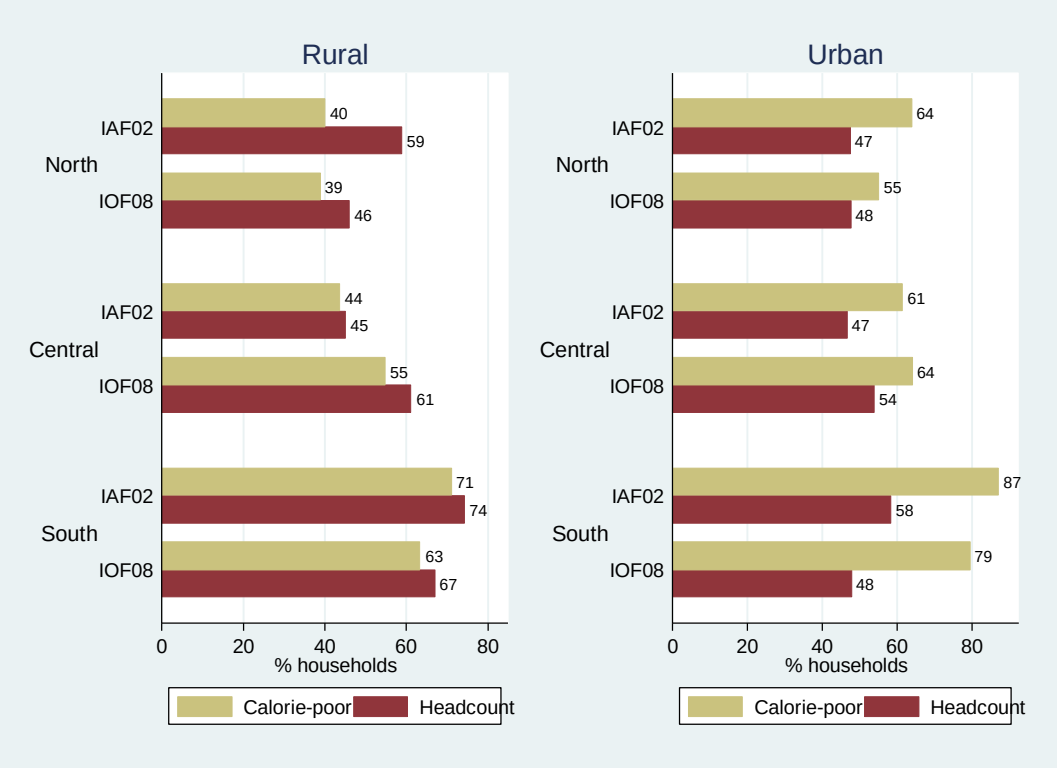
	2150 threshold		1800 threshold		Household-specific threshold	
	2002/03	2008/09	2002/03	2008/09	2002/03	2008/09
Niassa & Cabo Delgado - rural	62.6	49.7	47.3	35.4	46.0	32.6
Niassa & Cabo Delgado - urban	73.8	67.9	63.4	55.6	66.0	55.8
Nampula - rural	49.9	59.5	36.5	45.9	34.5	43.8
Nampula - urban	75.2	65.3	65.3	54.2	63.0	54.8
Sofala & Zambezia - rural	57.3	72.9	42.5	61.0	39.9	58.0
Sofala & Zambezia - urban	69.9	78.3	53.2	68.4	56.1	68.2
Manica & Tete - rural	67.6	67.0	53.7	50.7	51.6	49.7
Manica & Tete - urban	78.2	68.0	66.5	56.5	69.4	55.9
Gaza & Inhambane - rural	82.8	70.6	73.3	62.0	69.5	60.8
Gaza & Inhambane - urban	85.6	75.6	78.2	66.8	78.3	65.8
Maputo Province - rural	89.3	85.7	82.3	77.6	79.7	76.6
Maputo Province - urban	94.9	93.3	89.4	87.7	90.5	88.3
Maputo City	93.4	84.8	88.4	76.2	90.2	79.6
National	69.2	69.0	57.0	57.2	55.7	55.9
Correl. with headcount	0.461	0.462	0.486	0.464	0.421	0.401
Correl. (ex. urban South)	0.539	0.792	0.592	0.808	0.512	0.765

Notes: individuals are classified as calorie-poor if their estimated calorie intake falls below a specified threshold; chosen calorie thresholds are described in the text.

Source: MPD/DNEAP based on IAF02 & IOF08.

These thresholds are all meaningful. The 2150 threshold is an approximate average for Mozambique based on the WHO's recommended calorie intakes for different demographic groups (WHO 1985). However, while the 2150 threshold is commonly used as a reference point, it is not necessarily a level below which people are undernourished. Recently, the Food and Agriculture Organization (FAO) published minimum dietary energy requirement estimates for different countries. According to these, the minimum level in Mozambique is 1800 calories per person per day on average (FAO, 2010). Thus, for each of the three thresholds, Table 10-2 classifies all members of the household as 'calorie-poor' if its estimated calorie intake per person falls below the specified level. Finally, Figure 10-1 plots the poverty rates estimated according to the household-specific calorie-threshold and the (preferred) headcount measure across rural/urban and broad geographic regions.

Figure 10-1: Comparison of calorie-poverty vs. actual headcount poverty measures.



Notes: individuals are classified as calorie-poor if their estimated calorie intake falls below the household-specific threshold employed in Table 10-2 and described in the text.

Source: MPD/DNEAP based on IAF02 & IOF08.

The largest disconnect between the *levels* of estimated calorie intake and monetary consumption (e.g., headcount poverty rate) appears to occur in the urban South of the country, and Maputo City in particular. Taking the latter domain as an example, median estimated calorie consumption in 2002/03 was less than 1000 calories per person (per day), rising to around 1200 in 2008/09. Although this represents a large increase (of around 44%) this level is very low and, in turn, suggests a 'calorie-poverty' rate of over 75% in 2008/09 compared to an estimated actual headcount rate of 36%. This would indicate that calorie availability presents a substantial problem in Maputo City, which simply does not square with other available data such as data on child malnutrition. In other urban domains, some disconnect between the calorie- and monetary-based poverty measures are found, but these are much less severe. In rural areas, one finds a generally close link between the two (see Figure 10-1). Thus, while the correlation coefficient between the calorie- and monetary-based poverty levels is less than 0.50 when all domains are considered, it increases to about 0.80 in 2008/09 when the urban South is excluded from the calculation (see bottom two rows of Table 10-2).

10.6.3 Implications for headcount poverty estimates

To the extent that calorie underreporting genuinely reflects consumption items that have been omitted, the corresponding total level of household consumption will be biased downwards, thereby increasing the risk of incorrectly classifying some households as poor. To get a sense of the extent to which the Mozambican poverty estimates (in levels) may be affected by this source of non-sample error, we perform a simple simulation whereby, in essence, consumption values are inflated in accordance with a measure of the disconnect between observed (food) consumption and calorie intake.

More specifically, the method proceeds as follows. We start with the assumption that individuals with a value of consumption close to that of the poverty line should be consuming at least the minimum level of calories defined by FAO (1800 calories). Thus, the first step is to find the average calorie intake of individuals close to the poverty line. This is calculated using a triangular weighting scheme (kernel) for individuals with consumption +/- 20% of the poverty line, thereby giving greater weight to individuals the closer they are to the poverty line. These calorie-intake averages are set out in Table 10-3, based on separate calculations for each of the 13 spatial domains.

Table 10-3: Estimated calorie intake versus threshold for the near-poor.

	Calorie intake		Threshold		Deficit	
	2002/03	2008/09	2002/03	2008/09	2002/03	2008/09
Niassa & Cabo Delgado - rural	2,051	2,005	1,781	1,730	-270	-274
Niassa & Cabo Delgado - urban	1,637	1,769	1,846	1,787	209	18
Nampula - rural	2,447	2,147	1,795	1,778	-652	-369
Nampula - urban	2,287	1,955	1,840	1,831	-447	-124
Sofala & Zambezia - rural	1,912	2,051	1,767	1,760	-145	-292
Sofala & Zambezia - urban	1,834	1,614	1,824	1,803	-10	189
Manica & Tete - rural	1,885	1,833	1,772	1,765	-113	-68
Manica & Tete - urban	1,520	1,835	1,836	1,784	316	-51
Gaza & Inhambane - rural	1,712	1,964	1,741	1,740	29	-225
Gaza & Inhambane - urban	1,309	1,693	1,802	1,793	494	100
Maputo Province - rural	1,740	1,561	1,883	1,815	144	254
Maputo Province - urban	1,032	1,163	1,903	1,827	872	663
Maputo City	1,207	1,307	1,895	1,843	688	536
National	1,869	1,878	1,798	1,776	-71	-102

Note: calorie deficit is calculated as threshold level minus estimated calorie intake, thus a negative value indicates a surplus; threshold is based on averages for each spatial domain.

Source: MPD/DNEAP based on IAF02 & IOF08.

The table also provides a threshold calorie level based on the FAO's 1800 recommendation, subsequently adjusted for average demographic characteristics in the spatial domain and also calculated only for those located near the poverty line. The table shows that the 'near-poor' consume around 1900 calories per day on average, meaning they are not generally undernourished according to the FAO minimum dietary requirements. Nevertheless, we find differences at the regional level that confirm the analysis of the previous subsection: the near-poor people in rural areas consume around 2000 calories, while the urban near-poor consume 1600 calories on average. More specifically, in urban Maputo Province and Maputo City we find that the average intake is 1300 calories per day or less.

Based on these estimates, we can calculate the average calorie deficit for households near the poverty line. This is just the raw difference between the chosen calorie threshold and the average calorie intake of the near-poor; this is also shown in Table 10-3. Finally, selecting only those domains with a calorie deficit, we inflate the food value of consumption for all households in the region according to the estimated ratio of the calorie deficit to the actual calorie intake of the near-poor. Thus, if the calorie deficit is equal to 10% of the estimated actual intake (as in urban Sofala and Zambézia in 2008/09), we inflate the monetary value of food consumption by 10% for *all* households in that region. In turn, this gives an adjusted total consumption value, from which it is straightforward to calculate adjusted poverty rates, based on existing poverty lines.

Table 10-4 summarises the results of this exercise for both 2002/03 and 2008/09. As expected, where the calorie-deficit is largest (i.e., in the urban South), we find the largest downward adjustments in poverty rates. For example, the adjusted headcount rate is 33 percentage points lower in urban Maputo Province and 15 points in Maputo City (2008-09). These regions end up with 31% and 22% adjusted poverty rates, respectively. Even the rural areas of Maputo Province receive a large downward adjustment in 2008/09. These estimates dovetail with the non-monetary measures, which show lower levels of deprivation in the South as well as generally positive trends. For other domains, the estimates of bias are generally much lower. Consequently, the aggregate impact is a reduction of around 3 percentage points in the national poverty rate in 2008/09 and 2 percentage points in 2002/03, yielding an adjusted rate of 51.9% in 2008/09.

Table 10-4: Poverty headcount simulations to address calorie underreporting.

	Simulated headcount rate			Simulation vs. Actual estimate		
	2002/03	2008/09	change	2002/03	2008/09	change
Niassa & Cabo Delgado - rural	60.4	32.7	-27.7	0.0	0.0	0.0
Niassa & Cabo Delgado - urban	48.9	42.5	-6.4	-5.1	-0.9	4.2
Nampula - rural	57.8	56.7	-1.1	0.0	0.0	0.0
Nampula - urban	44.9	49.9	5.0	0.0	0.0	0.0
Sofala & Zambezia - rural	42.1	69.7	27.6	0.0	0.0	0.0
Sofala & Zambezia - urban	41.7	52.6	10.9	0.0	-4.1	-4.1
Manica & Tete - rural	51.6	47.5	-4.1	0.0	0.0	0.0
Manica & Tete - urban	45.4	48.7	3.3	-8.7	0.0	8.7
Gaza & Inhambane - rural	72.6	65.2	-7.4	-0.6	0.0	0.6
Gaza & Inhambane - urban	53.8	42.4	-11.5	-8.9	-2.5	6.4
Maputo Province - rural	80.5	65.7	-14.8	-0.7	-10.6	-9.9
Maputo Province - urban	43.5	30.5	-13.0	-18.3	-33.2	-14.9
Maputo City	44.0	21.5	-22.5	-9.6	-14.6	-5.0
National	52.1	51.9	-0.1	-2.0	-2.8	-0.8

Note: simulations are based on adjusted household consumption values, where consumption is inflated in calorie deficit regions; final three columns show the difference (in percentage points) between simulation and actual estimated poverty rates in levels and trends; actual poverty rates taken from Table 3-5.

Source: MPD/DNEAP based on IAF02 & IOF08.

A further observation from Table 10-4 is that the degree of underreporting in IOF08 is broadly similar, in magnitude and distribution, to that found in IAF02. This is expected due to the large degree of consistency between the consumption modules of the questionnaires used in both surveys. As a result, although poverty *levels* change for some regions when we correct for calorie underreporting, the estimated *changes* in poverty from 2002/03 to 2008/09 are very stable. These are plotted in Figure 10-2 and indicate that the correlation between the unadjusted and adjusted (simulated) changes in poverty rates across the spatial domains is 0.91.

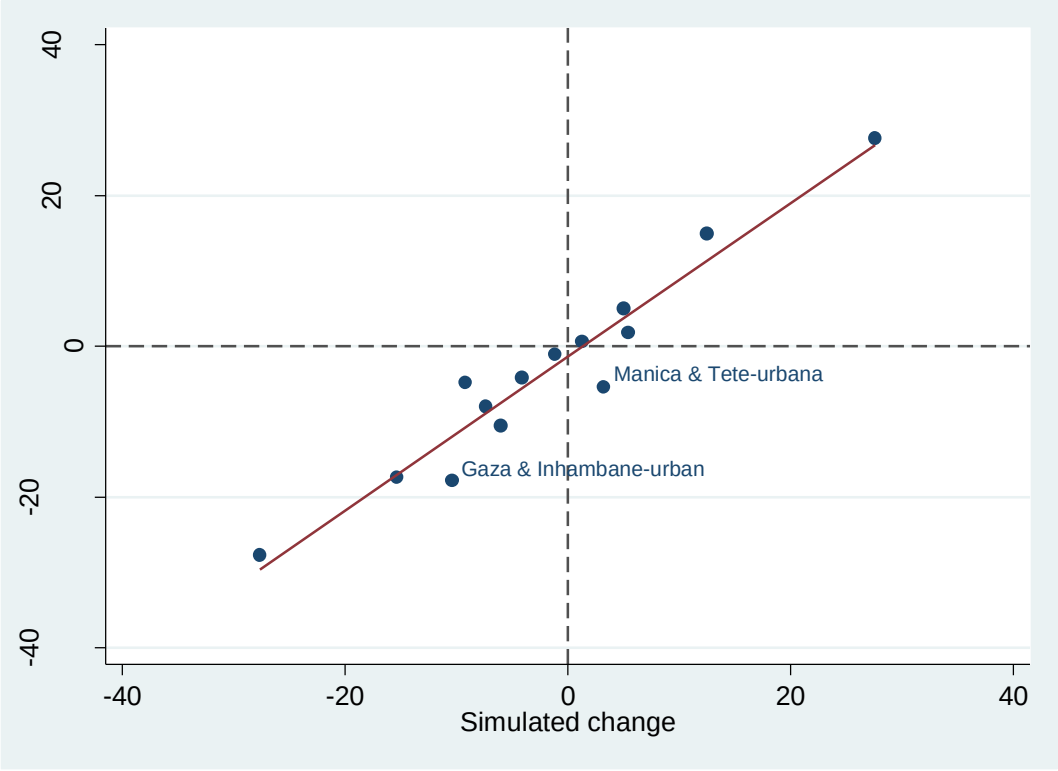
10.6.4 Alternative simulation approach

The estimates presented in the previous subsection depend on certain assumptions about the nature and extent of underreporting of food consumption. Alternative approaches can be employed, and it is useful to examine whether we attain similar results using a different method. This is pursued in this subsection.[36] Specifically, we classify households as being underreporters of consumption if they are estimated to consume less than 800 calories per capita per day. This is a nutritional level well below any common definition of adult undernourishment. Next, excluding these suspected "underreporters," we estimate a consumption regression similar to those pursued in Section 5. Specifically, we regress the

[36] This approach follows the very helpful comments on calorie underreporting received from the World Bank.

logarithm of per capita consumption on the following explanatory variables (number of variables, types or levels in parenthesis): household demographic characteristics (8), educational level (4), own produced food items (5), assets (7), housing quality (5), sector of employment (6), and regional dummies (21, provinces by rural/urban and Maputo City). Separate regressions are estimated for IAF 2002/03 and IOF 2008/09 and the adjusted R-squared is 0.46 for both samples. These regression results are used to predict the 'expected' consumption values for underreporting households and, in turn, are used to re-estimate poverty rates. For all households not categorised as underreporters, we simply maintain their reported level of consumption in these adjusted calculations.

Figure 10-2: Comparison of changes in poverty headcount for actual vs. simulated measures (IAF02 and IOF08).



Note: simulations are based on adjusted household consumption values, where consumption is inflated in calorie deficit regions; slope is a based on a simple linear regression fit.

Source: MPD/DNEAP based on IAF02 & IOF08.

A disadvantage to this approach is that all households that consumed less than the 800 calories threshold are dropped from the regressions whether the data are correct or not. While 800 calories per person per day is a very low level of consumption, it is certainly possible within the reference period of one week. Hence, it is likely that at least some households are erroneously dropped. Perhaps more importantly, a reading below the 800 calories threshold could easily be an indicator of severe household stress. The recorded consumption may be

below the actual level, but the actual level remains very low. As a result the procedure is likely to be discarding households that are experiencing negative shocks to consumption while retaining households that are experiencing positive shocks to consumption with concomitant bias to the parameter estimates and predicted levels of consumption.

With these caveats in mind, the impact of replacing reported consumption with a regression-based prediction for households with consumption below 800 calories per day is shown in Table 10-5.

Table 10-5: Alternative poverty headcount simulations to address calorie underreporting

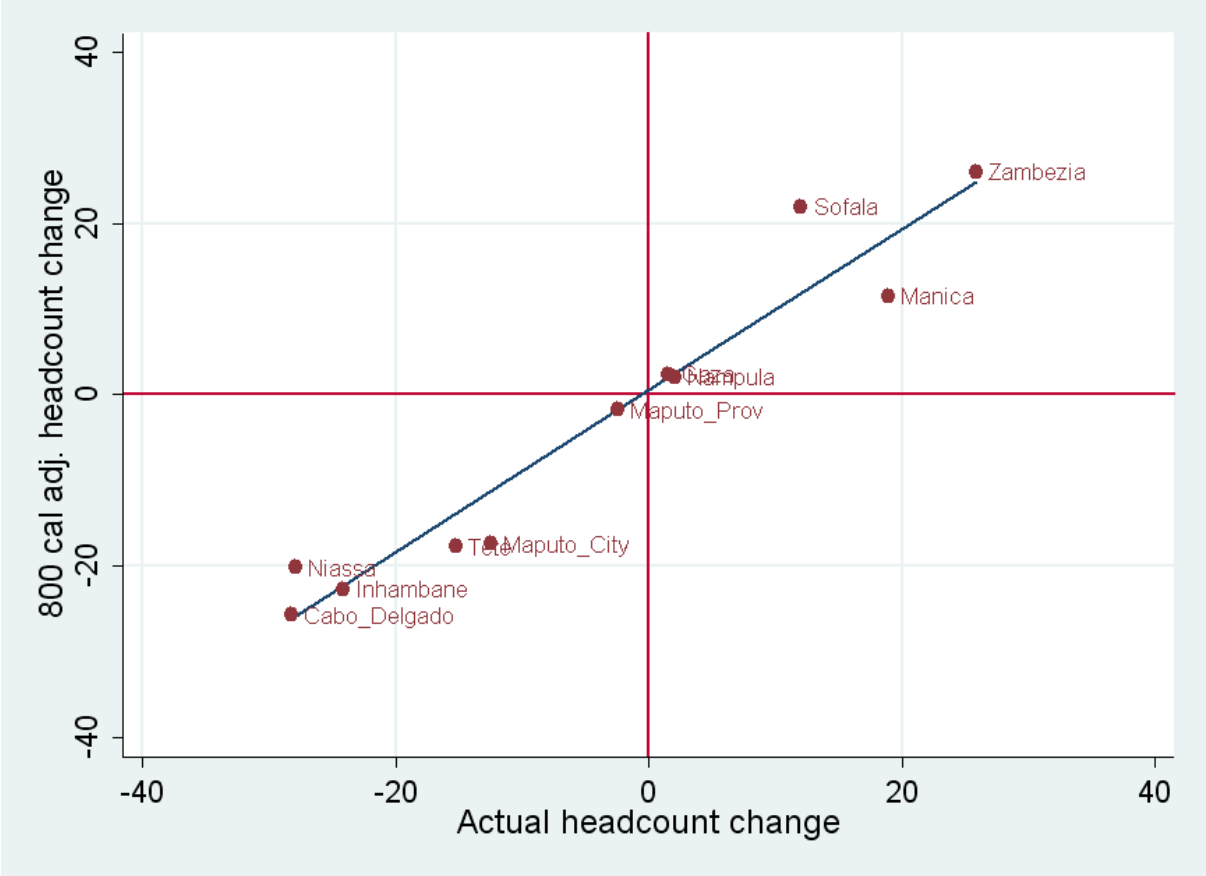
	Simulated headcount rate			Simulated minus actual rates		
	2002/03	2008/09	Change	2002/03	2008/09	Change
Niassa	49.2	21.4	-27.9	-2.9	-10.6	-7.7
Cabo Delgado	62.9	34.6	-28.3	-0.3	-2.8	-2.5
Nampula	50.1	52.1	2.0	-2.5	-2.6	0.0
Zambezia	43.1	68.9	25.8	-1.5	-1.6	-0.1
Tete	46.8	31.5	-15.2	-13.0	-10.5	2.5
Manica	30.5	49.4	18.9	-13.1	-5.7	7.4
Sofala	28.7	40.7	12.0	-7.4	-17.3	-9.9
Inhambane	79.1	54.9	-24.2	-1.6	-3.0	-1.4
Gaza	50.8	52.4	1.6	-9.3	-10.1	-0.8
Maputo Province	60.6	58.2	-2.5	-8.7	-9.3	-0.6
Maputo City	42.0	29.5	-12.5	-11.6	-6.7	4.9
National	48.7	48.6	-0.2	-5.4	-6.1	-0.8
Correlation with actual	0.943	0.944	0.964			

Note: simulations are based on adjusted household consumption values for households with calorie consumption per capita below 800 daily.

Source: MPD/DNEAP based on IAF02 & IOF08.

In 2008/09 the adjusted national poverty rate is 6 percentage points lower than the unadjusted results, and 5.4 percentage points lower in 2002/03. The provincial difference varies between 2 and 17 percentage points in 2008/09 and up to 13 percentage points in 2002/03. Nevertheless, the impact of these adjustments on changes in poverty over time is much smaller. At the national level, the impact is only -0.8 percentage points. Thus, even adjusting for calorie underreporting using an alternative approach, we find that the national poverty rate is virtually constant from 2002/03 to 2008/09. Also, and as illustrated in Figure 10-3, trends at the provincial level are almost unaffected by the adjustment. It remains the case that poverty appears to have worsened in the Centre but has improved in the other zones over the 2002/03 to 2008/09 period. Indeed, the correlation between actual and simulated provincial poverty trends is 0.96.

Figure 10-3: Comparison of changes in poverty headcount for actual vs. regression-based simulated measures
(IAF02 and IOF08).



Finally, these results are not sensitive to the choice of the 800 calorie threshold. For instance, when assuming that underreporting is present at less than 1,200 calories per person per day, we find the correlation between actual and simulated provincial poverty trends remains high, at 0.93. Similarly, the correlation coefficient is even higher when the calorie limit is reduced to below 800 calories per person per day.

10.6.5 Some international comparisons

Before concluding this section, it is helpful to consider calorie consumption estimates from nationally representative household surveys in other countries. The full data set for Uganda was made available; as a result, a more complete comparison is possible. Table 10-6 below provides a comparison of evidence for Mozambique and Uganda. For reference, estimated consumption poverty rates in Uganda are shown, although one should bear in mind that the poverty rates between Uganda and Mozambique are not strictly comparable due to differences in approach. The main point to note is that average and median calorie consumption are not substantially different in Uganda than in Mozambique at the national

level and in rural areas. The comparisons for urban areas, which would be dominated by the South in Mozambique, support concerns with respect to undercounting.

Table 10-6: Comparison of recent calorie and poverty data for Mozambique and Uganda.

	Rural	Urban	Total
Poverty, %			
Mozambique	56.9	49.6	54.7
Uganda	34.2	13.7	31.1
Daily calories PC, mean			
Mozambique	1,951	1,651	1,860
Uganda	1,859	1,930	1,870
Daily calories PC, median			
Mozambique	1,736	1,355	1,620
Uganda	1,653	1,710	1,664

Source: MPD/DNEAP using IOF08 (for Mozambique) and UNHS 2005/06 (for Uganda).

Other information was obtained from published reports or journal articles. Estimates from Malawi are much higher: 2332 and 2630 per person per day in rural and urban areas respectively in 2007. The reported national average is 2366 (Republic of Malawi and the World Bank, 2008, p. 82). Other estimates are considerably lower. For example, Dercon (1999) reports calorie consumption *per adult equivalent* for Ethiopia on a national basis and by rural and urban zone. This is not directly comparable to the per capita measure employed in Mozambique. However, for rural areas, Dercon provides a per person per day estimate of 1600 calories. This is well below the level of 1951 observed in Mozambique. Dercon concludes that "these figures suggest low average living standards, especially in rural areas" (p. 22).

Ranging beyond Africa, Skoufias (2003) presents evidence from Indonesia for the years 1996 and 1999. Results from the SUSENAS survey show per capita consumption in rural areas at 1988 and 1840 calories per person per day in the years 1996 and 1999 respectively. For urban areas, the corresponding numbers are 1942 and 1762 in the years 1996 and 1999 respectively. These SUSENAS surveys are noteworthy because they bracket the Asian financial crisis, which drastically increased the relative price of food. Calorie consumption is estimated to have declined substantially in Indonesia due to the crisis and resulting relative price shifts. Skoufias also noted an increase in the income elasticity of demand for cereals. Finally, Deaton (2010) reports calorie data for India. In 2004/05, rural Indians consumed about 2047 calories per person per day while urban Indians consumed about 2000.

It is pertinent to note that Angus Deaton, Stefan Dercon, and Emmanuel Skoufias are all highly respected analysts of consumer behaviour and poverty. For rural areas, these authors present estimates of average calorie consumption that are slightly above (India), are well below (Ethiopia), and bracket (Indonesia) the levels obtained by IOF for rural Mozambique. Overall, the evidence in Mozambique points to the probability of systematic underreporting of food consumption, particularly in the urban South. This affects the levels of poverty in these areas but does not affect the estimated trends. However, as a clear understanding of poverty levels is important *per se*, future household surveys should be modified to attempt to address this deficiency. Our recommendation is to pilot different food consumption survey designs (particularly in the urban South) in order to identify the precise sources of non-sample error that may be behind the underreporting.

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12 Additional Tables

Table 12-1: Poverty lines for 2002/03 and 2008/09.

	Poverty lines 2002/03			Poverty lines 2008/09			Food shares		Ratio of lines 08/02	
	Food	Non-food	Total	Food	Non-food	Total	2002/03	2008/09	Food	Total
Niassa and Cabo Delgado, rural	5.4	1.7	7.1	12.5	3.4	15.9	76.5	78.5	2.30	2.25
Niassa and Cabo Delgado, urban	7.5	2.7	10.2	14.0	5.0	18.9	73.7	73.8	1.85	1.85
Nampula, rural	4.5	1.5	6.0	11.1	3.2	14.3	74.9	77.8	2.49	2.40
Nampula, urban	4.9	1.8	6.7	12.5	4.2	16.7	72.9	74.9	2.58	2.51
Sofala and Zambezia, rural	4.2	1.3	5.5	11.4	3.0	14.4	75.9	79.1	2.73	2.62
Sofala and Zambezia, urban	6.6	2.2	8.8	13.7	5.4	19.1	75.1	71.8	2.08	2.17
Manica and Tete, rural	5.6	1.3	6.9	15.2	4.2	19.4	81.2	78.1	2.69	2.80
Manica and Tete, urban	7.1	2.5	9.7	15.6	5.9	21.5	73.7	72.6	2.18	2.22
Gaza and Inhambane, rural	6.6	2.4	9.0	13.1	5.3	18.4	73.4	71.2	1.98	2.04
Gaza and Inhambane, urban	7.3	3.5	10.7	14.1	6.3	20.3	67.7	69.2	1.93	1.89
Maputo Province, rural	11.8	5.0	16.8	17.9	7.0	24.8	70.4	72.0	1.52	1.48
Maputo Province, urban	11.9	6.4	18.3	20.7	10.2	30.9	65.0	67.0	1.74	1.69
Maputo City	12.2	7.3	19.5	20.9	12.3	33.1	62.6	63.0	1.71	1.70
Average (population weighted)	6.1	2.3	8.5	13.6	4.8	18.4	74.2	75.1	2.33	2.32

Source: MPD/DNEAP based on IOF08 and IAF02.

Table 12-2: Nominal consumption and poverty rates (2002/03 and 2008/09).

	Nominal consumption (total)			Nominal consumption (mean pc)			Nominal consumption (median pc)		
	2002-03	2008-09	% change	2002-03	2008-09	% change	2002-03	2008-09	% change
Niassa & Cabo Delgado – rural	5,852	21,500	267.4	3,009	9,300	209.1	2,447	7,304	198.5
Niassa & Cabo Delgado – urban	4,099	7,115	73.6	7,800	10,935	40.2	3,635	7,476	105.7
Nampula – rural	4,902	16,200	230.5	2,382	5,576	134.1	2,105	4,763	126.3
Nampula – urban	4,909	13,300	170.9	3,532	10,884	208.1	2,681	6,115	128.1
Sofala & Zambezia – rural	11,500	22,900	99.1	2,827	5,039	78.2	2,223	3,944	77.4
Sofala & Zambezia – urban	5,717	12,300	115.1	5,755	9,486	64.8	3,599	6,152	70.9
Manica & Tete – rural	5,915	22,800	285.4	2,992	8,202	174.1	2,541	7,438	192.7
Manica & Tete – urbana	2,967	6,737	127.0	4,532	10,315	127.6	3,226	7,847	143.2
Gaza & Inhambane – rural	5,554	13,800	148.5	2,774	6,810	145.5	1,997	5,542	177.5
Gaza & Inhambane – urban	2,843	7,283	156.2	4,538	11,194	146.7	2,853	8,091	183.6
Maputo Province – rural	1,592	3,533	121.8	4,056	8,679	114.0	2,809	6,491	131.0
Maputo Province – urban	4,741	11,800	148.9	7,538	12,447	65.1	5,125	9,003	75.7
Maputo City	12,200	29,600	142.6	11,612	26,289	126.4	6,277	14,773	135.3
National	72,792	188,867	159.5	3,976	8,773	120.6	2,582	5,996	132.2
Correlation with headcount change			-0.376			-0.439			-0.739

Notes: All values stated in millions of New Mozambican Meticais.

Sources: MPD/DNEAP using IAF02 & IOF08.

Table 12-3: Food-based indicators of poverty and well-being.

	Number of meals			"Food share" poverty (%, pp)		
	2002/03	2008/09	change, %	2002/03	2008/09	change
Niassa & Cabo Delgado – rural	2.05	2.28	11.3	60.4	57.5	-2.9
Niassa & Cabo Delgado – urban	2.31	2.29	-0.9	53.9	52.0	-1.9
Nampula – rural	2.24	2.16	-3.6	57.8	62.3	4.5
Nampula – urban	2.24	2.29	1.9	44.9	57.2	12.3
Sofala & Zambezia – rural	2.47	2.28	-7.7	42.1	59.5	17.5
Sofala & Zambezia – urban	2.59	2.41	-6.7	41.7	46.7	5.0
Manica & Tete – rural	2.41	2.30	-4.8	51.6	45.6	-6.0
Manica & Tete – urbana	2.60	2.53	-2.8	54.1	58.0	3.9
Gaza & Inhambane – rural	2.04	2.11	3.7	73.1	72.0	-1.2
Gaza & Inhambane – urban	2.44	2.31	-5.2	62.7	66.6	3.9
Maputo Province – rural	2.31	2.42	4.6	81.2	81.2	0.0
Maputo Province – urban	2.38	2.46	3.5	61.8	75.3	13.5
Maputo City	2.45	2.47	1.0	53.6	64.4	10.8
National	2.33	2.29	-1.6	54.1	59.5	5.3
Correl. with headcount (all)			-0.597	1.000	0.516	0.579
Correl. with headcount (ex. Maputo)			-0.602	1.000	0.600	0.709

Notes: food share poverty is calibrated to replicate IAF02 results based on food shares, these are held fixed and applied to IOF08 survey data (see text for further details).

Sources: MPD/DNEAP estimates using IOF and IAF databases.

Table 12-4: Agriculture and agricultural technology.

	2002	2003	2005	2006	2007	2008	Change 2002 - '08
Cultivated area ('000 hectares)	4,185	4,535	5,552	5,612	5,672	5,602	33.9
No. small and medium sized farms ('000)	3,127	3,210	3,333	3,396	3,619	3,725	19.1
Average farm size (ha.)	1.3	1.4	1.7	1.7	1.6	1.5	12.4
Household size (average)	5.0	5.0	5.3	5.1	4.9	5.1	2.0
Rural population (millions) [adjusted]	12.4	12.7	14.0	13.7	14.0	15.1	21.5
Household heads with 4th grade education (%)	31.1	32.9	36.4	36.2	36.6	42.3	36.0
Receipt of extension info. (% farms)	13.5	13.3	14.8	12.0	10.1	8.3	-38.5
Use of chemical fertilizer (% farms)	3.8	2.6	3.9	4.7	4.1	4.1	7.9
Use of pesticides (% farms)	6.8	5.3	5.6	5.5	4.2	3.8	-44.1
Use of irrigation (% farms)	10.9	6.1	6.0	8.4	9.9	8.8	-19.3
Receipt of credit (% farms)	-	2.9	3.5	2.9	4.7	2.6	-10.3

Note: Cultivated area in 2006 is not available. It is estimated as the average of area in 2005 and 2007.

Source: TIA data.

Table 12-5: Regression analysis of real consumption (log.), by survey rounds [model 1].

	IAF 2002/03		IOF 2008/09		Change	
	Estimate	*SE*	Estimate	*SE*	Diff.	Prob.
Household head						
Age	-0.01***	*0.00*	-0.00***	*0.00*	0.00	0.23
Female	0.03	*0.03*	0.00	*0.02*	-0.03	0.33
Household demograhphics						
Average age	0.01***	*0.00*	0.01***	*0.00*	0.00	0.01
Household size	-0.07***	*0.01*	-0.07***	*0.01*	-0.01	0.40
Dependency rate (%)	0.03	*0.06*	0.09	*0.05*	0.06	0.49
Adult males (%)	0.21***	*0.07*	0.31***	*0.06*	0.10	0.27
Adult females (%)	0.33***	*0.06*	0.27***	*0.07*	-0.06	0.54
Human capital						
Ill (last 2 weeks)	0.13***	*0.04*	0.07*	*0.04*	-0.06	0.37
Receive wages / salary	0.14	*0.09*	0.14**	*0.07*	0.00	0.98
Literate	0.18***	*0.05*	0.03	*0.15*	-0.15	0.37
Primary education	0.35***	*0.06*	0.15***	*0.05*	-0.20	0.01
Secondary education	0.99***	*0.11*	0.55***	*0.07*	-0.43	0.00
Higher education	1.83***	*0.37*	1.43***	*0.19*	-0.39	0.35
Economic sector						
Extractive industries	0.15	*0.15*	0.28	*0.19*	0.14	0.58
Manufacturing	0.26*	*0.15*	0.15	*0.09*	-0.11	0.55
Construction / real estate	0.17	*0.11*	0.17	*0.10*	0.00	0.98
Transport & comm.s	0.42***	*0.13*	0.29***	*0.10*	-0.13	0.43
Services & retail	0.44***	*0.05*	0.32***	*0.05*	-0.12	0.12
Public service	0.39***	*0.11*	0.17**	*0.07*	-0.22	0.10
Agricultural assets						
Cereals	0.35***	*0.04*	0.43***	*0.04*	0.08	0.13
Live animals	0.26***	*0.06*	0.25***	*0.03*	-0.01	0.91
Fish	0.02	*0.04*	0.10**	*0.05*	0.08	0.19
Fruits	0.01	*0.03*	0.07*	*0.04*	0.05	0.26
Vegetables	-0.13***	*0.04*	-0.01	*0.06*	0.12	0.10
Habitation						
Access to safe water	0.02	*0.03*	0.06**	*0.03*	0.04	0.34
Concrete roof	0.08**	*0.04*	0.14***	*0.04*	0.06	0.22
Durable walls	0.09**	*0.04*	0.15***	*0.03*	0.05	0.30
Number of rooms	0.05***	*0.01*	0.01**	*0.01*	-0.03	0.00
Access to electricity	0.25***	*0.05*	0.21***	*0.04*	-0.04	0.47
Durable goods						
Bed	0.14***	*0.03*	0.06**	*0.03*	-0.08	0.06

	IAF 2002/03		IOF 2008/09			
	Estimate	*SE*	Estimate	*SE*	Diff.	Prob.
Bicycle	0.14***	*0.02*	0.06***	*0.02*	-0.08	0.01
Motorbike	0.23***	*0.06*	0.32***	*0.04*	0.08	0.26
Car	0.70***	*0.06*	0.90***	*0.05*	0.19	0.02
Radio	0.11***	*0.02*	0.11***	*0.02*	0.00	0.93
TV	0.19***	*0.05*	0.20***	*0.03*	0.01	0.82
Telephone (fixed / mobile)	0.28***	*0.04*	0.21***	*0.03*	-0.07	0.21
Location dummies						
Niassa - urban	-0.71***	*0.08*	-0.53***	*0.10*	0.18	0.17
Cabo Delgado - urban	-0.64***	*0.16*	-0.68***	*0.12*	-0.05	0.81
Nampula - urban	-0.53***	*0.08*	-0.62***	*0.11*	-0.09	0.51
Zambezia - urban	-0.65***	*0.09*	-0.92***	*0.11*	-0.27	0.06
Tete - urban	-0.94***	*0.10*	-0.91***	*0.11*	0.03	0.82
Manica - urban	-0.69***	*0.09*	-0.80***	*0.10*	-0.11	0.40
Sofala - urban	-0.51***	*0.08*	-0.78***	*0.10*	-0.27	0.04
Inhambane - urban	-0.88***	*0.11*	-0.57***	*0.10*	0.31	0.03
Gaza - urban	-0.66***	*0.09*	-0.70***	*0.16*	-0.04	0.82
Maputo Prov - urban	-1.05***	*0.10*	-1.26***	*0.10*	-0.21	0.13
Maputo City	-1.06***	*0.09*	-0.92***	*0.10*	0.14	0.29
Niassa - rural	-0.32***	*0.09*	-0.27**	*0.11*	0.05	0.74
Cabo Delgado - rural	-0.62***	*0.08*	-0.43***	*0.10*	0.20	0.13
Nampula - rural	-0.56***	*0.08*	-0.60***	*0.10*	-0.04	0.76
Zambezia - rural	-0.34***	*0.08*	-0.76***	*0.10*	-0.43	0.00
Tete - rural	-0.50***	*0.09*	-0.42***	*0.11*	0.08	0.58
Manica - rural	-0.26**	*0.12*	-0.62***	*0.11*	-0.35	0.03
Sofala - rural	0.03	*0.09*	-0.69***	*0.20*	-0.72	0.00
Inhambane - rural	-0.88***	*0.10*	-0.53***	*0.13*	0.35	0.03
Gaza - rural	-0.41***	*0.08*	-0.78***	*0.11*	-0.37	0.01
Maputo Prov - rural	-1.03***	*0.08*	-1.10***	*0.13*	-0.06	0.68
No. of observations	8,700		10,832			
R-squared	0.50		0.49			

Notes: Probability only shown where this is less than or equal to 15%; no common intercept term estimated. Due to absence of consistent data on agricultural assets for the two surveys, these are constructed as dummy variables, which take a value of one if the household produces and consumes at home at least some of the foods in the respective agricultural category. For example, if cereals is set to one then the household produces and consumes some cereal crops.

Sources: MPD/DNEAP estimates using IOF08 and IAF02 databases.

Table 12-6: Regression analysis of real consumption (log.), by survey rounds and rural/urban areas [model 2].

	Urban				Rural			
	IAF 2002/03		IOF 2008/09		IAF 2002/03		IOF 2008/09	
	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Household head								
Age	-0.01***	*0.00*	-0.00***	*0.00*	-0.00***	*0.00*	-0.00**	*0.00*
Female	0.00	*0.03*	-0.01	*0.03*	0.04	*0.04*	-0.01	*0.03*
Household demograhphics								
Average age	0.01***	*0.00*	0.01***	*0.00*	0.01***	*0.00*	0.01***	*0.00*
Household size	-0.07***	*0.01*	-0.06***	*0.01*	-0.07***	*0.01*	-0.09***	*0.01*
Dependency rate (%)	-0.03	*0.13*	0.14*	*0.08*	0.05	*0.06*	0.05	*0.07*
Adult males (%)	0.33***	*0.10*	0.39***	*0.07*	0.15	*0.09*	0.26***	*0.08*
Adult females (%)	0.29***	*0.10*	0.39***	*0.09*	0.37***	*0.08*	0.19**	*0.08*
Human capital								
Ill (last 2 weeks)	0.14**	*0.07*	0.01	*0.07*	0.12**	*0.05*	0.10*	*0.05*
Receive wages / salary	0.22**	*0.10*	-0.09	*0.07*	0.05	*0.16*	0.56***	*0.13*
Literate	0.23**	*0.10*	0.04	*0.20*	0.18***	*0.06*	0.00	*0.23*
Primary education	0.32***	*0.08*	0.19***	*0.06*	0.36***	*0.09*	0.14***	*0.06*
Secondary education	0.94***	*0.12*	0.66***	*0.09*	1.24**	*0.50*	0.33***	*0.12*
Higher education	2.23***	*0.31*	1.67***	*0.16*	0.63	*0.75*	0.59	*0.64*
Economic sector								
Extractive industries	-0.05	*0.20*	0.35**	*0.18*	0.30	*0.23*	0.04	*0.48*
Manufacturing	0.14	*0.17*	0.24***	*0.07*	0.26	*0.27*	0.10	*0.24*
Construction / real estate	0.07	*0.10*	0.25**	*0.10*	0.19	*0.22*	-0.05	*0.20*
Transport & comm.s	0.19	*0.12*	0.36***	*0.10*	1.28***	*0.37*	0.01	*0.26*
Services & retail	0.36***	*0.06*	0.33***	*0.05*	0.42***	*0.11*	0.26**	*0.11*
Public service	0.11	*0.15*	0.28***	*0.07*	0.63***	*0.16*	0.07	*0.16*
Household agricultural activity								
Cereals	0.20***	*0.04*	0.36***	*0.05*	0.43***	*0.05*	0.45***	*0.04*
Live animals	0.33***	*0.10*	0.20***	*0.06*	0.25***	*0.06*	0.24***	*0.03*
Fish	0.06	*0.07*	0.07	*0.06*	0.03	*0.04*	0.12**	*0.06*
Fruits	0.08**	*0.04*	0.04	*0.03*	0.01	*0.03*	0.09**	*0.04*
Vegetables	-0.11***	*0.04*	-0.11***	*0.03*	-0.07	*0.07*	0.15	*0.11*
Habitation								
Access to safe water	0.04	*0.03*	0.06	*0.04*	0.01	*0.04*	0.05	*0.03*
Concrete roof	0.14***	*0.05*	0.12*	*0.07*	0.02	*0.05*	0.14***	*0.04*
Durable walls	0.11**	*0.05*	0.20***	*0.03*	0.05	*0.07*	0.10**	*0.04*
Number of rooms	0.03***	*0.01*	0.01	*0.01*	0.05***	*0.01*	0.02**	*0.01*
Access to electricity	0.27***	*0.05*	0.19***	*0.03*	0.07	*0.11*	0.05	*0.10*

	Urban				Rural			
	IAF 2002/03		IOF 2008/09		IAF 2002/03		IOF 2008/09	
	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Durable goods								
Bed	0.18***	*0.04*	0.05	*0.05*	0.11***	*0.04*	0.06**	*0.03*
Bicycle	0.08**	*0.03*	0.03	*0.03*	0.16***	*0.03*	0.07***	*0.03*
Motorbike	0.21***	*0.08*	0.18***	*0.05*	0.24***	*0.07*	0.43***	*0.06*
Car	0.58***	*0.05*	0.84***	*0.05*	1.01***	*0.15*	1.02***	*0.13*
Radio	0.09***	*0.03*	0.06**	*0.03*	0.11***	*0.02*	0.13***	*0.02*
TV	0.16***	*0.05*	0.19***	*0.03*	0.40**	*0.18*	0.17**	*0.07*
Telephone (fixed / mobile)	0.29***	*0.04*	0.21***	*0.03*	0.19	*0.13*	0.21***	*0.05*
Location dummies								
Niassa	-0.48***	*0.12*	-0.55***	*0.11*	-0.49***	*0.12*	-0.36**	*0.15*
Cabo Delgado	-0.40**	*0.18*	-0.69***	*0.14*	-0.80***	*0.12*	-0.53***	*0.14*
Nampula	-0.34***	*0.10*	-0.65***	*0.11*	-0.72***	*0.11*	-0.69***	*0.14*
Zambezia	-0.41***	*0.11*	-0.95***	*0.12*	-0.51***	*0.11*	-0.85***	*0.14*
Tete	-0.79***	*0.14*	-0.98***	*0.13*	-0.65***	*0.12*	-0.48***	*0.15*
Manica	-0.48***	*0.13*	-0.86***	*0.11*	-0.42***	*0.14*	-0.69***	*0.15*
Sofala	-0.35***	*0.12*	-0.88***	*0.11*	-0.14	*0.13*	-0.74***	*0.22*
Inhambane	-0.77***	*0.14*	-0.61***	*0.11*	-0.98***	*0.13*	-0.59***	*0.16*
Gaza	-0.54***	*0.13*	-0.77***	*0.15*	-0.51***	*0.12*	-0.82***	*0.15*
Maputo Prov	-0.94***	*0.15*	-1.38***	*0.11*	-1.07***	*0.11*	-1.09***	*0.16*
Maputo City	-0.95***	*0.14*	-1.08***	*0.11*				
No. of observations	4,005		5,223		4,695		5,609	
R-squared	0.60		0.58		0.46		0.46	

Notes: no common intercept term estimated.

Sources: MPD/DNEAP estimates using IOF08 and IAF02 databases.

Table 12-7: Regression analysis of real consumption (log.) in urban areas, by survey rounds and geographic zones [model 3].

	Urban					
	North		Center		South	
	2002-03	2008-09	2002-03	2008-09	2002-03	2008-09
Household head						
Age	-0.01*	0.00	-0.01**	-0.01**	-0.00**	-0.00***
Female	0.07	-0.06	-0.02	0.06	-0.04	-0.02
Household demograhphics						
Average age	0.00	0.01**	0.01**	0.01***	0.01***	0.01***
Household size	-0.09***	-0.07***	-0.06***	-0.05***	-0.07***	-0.07***
Dependency rate (%)	-0.26	0.00	0.15	0.05	-0.07	0.36***
Adult males (%)	0.62**	0.44***	0.08	0.32**	0.14	0.42***
Adult females (%)	0.08	0.38**	0.40**	0.17	0.20*	0.54***
Human capital						
Ill (last 2 weeks)	0.14	-0.02	0.11	0.03	0.22***	0.02
Receive wages / salary	0.82***	-0.04	0.23	0.26**	0.07	-0.22***
Literate	0.21	0.04	0.21	0.89**	0.21**	0.14
Primary education	0.22	0.22**	0.37***	-0.02	0.34***	0.32***
Secondary education	0.77*	0.67***	0.85***	0.37**	1.01***	0.80***
Higher education	1.31***	2.08***	-0.14	1.05***	2.47***	1.93***
Economic sector						
Extractive industries	-0.99**	0.06	0.68*	0.12	-0.08	0.74**
Manufacturing	-0.02	0.15	0.17	-0.02	0.05	0.35***
Construction / real estate	-0.49**	0.44**	0.07	-0.13	0.16	0.23**
Transport & comm.s	-0.14	0.13	0.40**	0.29*	0.11	0.41***
Services & retail	0.47***	0.40***	0.39***	0.20***	0.21***	0.33***
Public service	-0.49	0.39***	0.32**	0.11	0.12	0.27***
Agricultural assets						
Cereals	0.15**	0.31***	0.33***	0.41***	0.18	0.40***
Live animals	0.23*	0.16	0.40**	0.15**	0.73***	0.33***
Fish	0.10	0.16*	-0.03	0.02	0.02	-0.07
Fruits	0.08	0.04	-0.04	0.01	0.15**	0.02
Vegetables	-0.14*	-0.12*	-0.06	-0.09**	-0.13***	-0.05
Habitation						
Access to safe water	-0.05	0.05	0.12**	0.16***	0.06*	-0.01
Concrete roof	0.23***	0.28***	0.04	0.04	0.15***	-0.26
Durable walls	0.05	0.17*	0.17***	0.19***	0.11***	0.24***
Number of rooms	-0.02	-0.01	0.03	0.02	0.06***	0.03**
Access to electricity	0.30*	0.13*	0.24***	0.24***	0.24***	0.17***

	North		Urban Center		South	
	2002-03	2008-09	2002-03	2008-09	2002-03	2008-09
Durable goods						
Bed	0.25***	-0.01	0.10**	0.09*	0.17***	0.15***
Bicycle	0.09	0.05	0.06*	0.06*	0.16***	0.01
Motorbike	0.02	0.19**	0.26**	0.12*	0.18*	0.05
Car	0.45	1.00***	0.70***	0.78***	0.55***	0.77***
Radio	0.17***	0.11	0.13***	0.03	0.02	0.02
TV	0.20	0.21***	0.42***	0.22***	0.06	0.16***
Telephone (fixed / mobile)	0.59***	0.30***	0.19**	0.17***	0.29***	0.12***
Location dummies						
Niassa	-0.04	-0.53**				
Cabo Delgado	0.05	-0.63***				
Nampula	0.07	-0.63***				
Zambezia			-0.59***	-0.75***		
Tete			-0.93***	-0.78***		
Manica			-0.66***	-0.62***		
Sofala			-0.46***	-0.62***		
Inhambane					-0.80***	-0.43***
Gaza					-0.58***	-0.52**
Maputo Prov					-0.90***	-1.06***
Maputo City					-0.87***	-0.73***
No. of observations	816	1,194	1,176	1,391	2,013	2,638
R-squared	0.67	0.62	0.64	0.60	0.62	0.60

Notes: Standard errors not shown; no common intercept term estimated.

Sources: MPD/DNEAP estimates using IOF08 and IAF02 databases.

Table 12-8: Regression analysis of real consumption (log.) in rural areas, by survey rounds and geographic zones [model 3].

	Rural					
	North		Center		South	
	2002/03	2008/09	2002/03	2008/09	2002/03	2008/09
Household head						
Age	-0.00**	-0.01***	-0.01**	0.00	-0.00**	-0.00**
Female	0.04	-0.04	0.00	0.01	0.13**	-0.09
Household demograhphics						
Average age	0.01***	0.00**	0.01***	0.00	0.01***	0.01**
Household size	-0.10***	-0.11***	-0.08***	-0.10***	-0.03**	-0.06***
Dependency rate (%)	0.03	-0.14	-0.10	0.06	0.22	0.11
Adult males (%)	0.18	0.11	0.02	0.24**	0.25	0.14
Adult females (%)	0.42***	0.12	0.20	0.19	0.32***	0.04
Human capital						
Ill (last 2 weeks)	0.14**	-0.05	0.11	0.09	0.23**	0.42***
Receive wages / salary	-0.12	0.62***	0.06	0.66***	0.34**	0.50***
Literate	0.16*	0.13	0.10	0.05	0.32***	0.00
Primary education	0.57***	0.08	0.16	0.17*	0.52***	0.16
Secondary education	1.52**	0.27	1.05	0.21	1.17***	0.53**
Higher education	-0.79	1.92**	2.67***	-0.85**	2.08	1.10*
Economic sector						
Extractive industries	-0.03	2.66***	0.15	-0.46	0.39	0.22
Manufacturing	0.24	-0.05	0.39	0.49*	-0.19	0.04
Construction / real estate	-0.09	-0.09	0.46	-0.07	0.12	-0.04
Transport & comm.s	1.31***	0.94	-0.29	0.31	1.56***	0.15
Services & retail	0.29*	0.17	0.53***	0.44***	0.27**	0.06
Public service	0.73***	-0.23	0.34	0.25	0.46	-0.31
Household agricultural activity						
Cereals	0.21***	0.32***	0.72***	0.67***	0.18***	0.20***
Live animals	0.09	0.20***	0.23***	0.27***	0.64***	0.12
Fish	-0.08	0.16***	0.09*	0.06	0.03	0.04
Fruits	0.05	0.16***	-0.03	0.04	0.06	0.22**
Vegetables	-0.01	-0.01	-0.15	0.24*	0.03	0.03
Habitation						
Access to safe water	0.10**	-0.05	0.04	0.08*	-0.09	0.14*
Concrete roof	0.07	0.19***	0.07	0.12*	-0.01	0.16***
Durable walls	-0.45***	0.09	0.22	0.11*	0.14**	0.10
Number of rooms	0.05***	0.02*	0.05***	0.01	0.02	0.03**

	Rural					
	North		Center		South	
	2002/03	2008/09	2002/03	2008/09	2002/03	2008/09
Access to electricity		0.25*	0.09	0.07	0.11	-0.08
Durable goods						
Bed	0.13**	0.14***	0.01	-0.03	0.18***	0.06
Bicycle	0.15***	0.11***	0.21***	0.07**	0.03	0.03
Motorbike	0.11	0.29***	0.33***	0.39***	0.32**	0.57***
Car	1.23***	0.84**	0.70***	1.05***	0.86***	0.88***
Radio	0.06**	0.12***	0.13***	0.14***	0.12***	0.09**
TV	-0.11	0.48***	0.81***	0.09	0.10	0.23***
Telephone (fixed / mobile)		0.35***	-0.23***	0.31***	0.34***	0.02
Location dummies						
Niassa	-0.15	0.22				
Cabo Delgado	-0.48**	0.01				
Nampula	-0.35	-0.12				
Zambezia			-0.53***	-1.09***		
Tete			-0.66***	-0.73***		
Manica			-0.39**	-0.92***		
Sofala			-0.14	-0.90***		
Inhambane					-1.41***	-0.63***
Gaza					-0.85***	-0.79***
Maputo Prov					-1.42***	-0.92***
No. of observations	1,494	1,975	1,924	2,555	1,277	1,079
R-squared	0.49	0.47	0.45	0.53	0.61	0.47

Notes: standard errors not shown; no common intercept term estimated.

Sources: MPD/DNEAP estimates using IOF08 and IAF02 databases.

Table 12-9: Actual vs predicted headcount poverty rates, by region

	Poverty headcount			Predicted headcount, model 1			Predicted headcount, model 3		
	2002-03	2008-09	Change	2002-03	2008-09	Change	2002-03	2008-09	Change
Niassa & Cabo Delgado – rural	60.4	32.7	-27.7	56.2	36.7	-19.5	57.5	36.5	-21.0
Niassa & Cabo Delgado – urban	53.9	43.4	-10.5	51.1	46.0	-5.1	58.5	48.0	-10.5
Nampula – rural	57.8	56.7	-1.1	59.3	52.4	-6.9	58.2	57.3	-0.9
Nampula – urban	44.9	49.9	5.0	53.3	50.5	-2.8	50.9	53.6	2.7
Sofala & Zambezia - rural	42.1	69.7	27.6	42.9	65.5	22.6	43.4	68.9	25.5
Sofala & Zambezia - urban	41.7	56.7	14.9	36.0	55.4	19.5	38.3	54.7	16.3
Manica & Tete - rural	51.6	47.5	-4.1	55.3	56.8	1.5	59.2	52.7	-6.5
Manica & Tete - urban	54.1	48.7	-5.4	55.7	53.4	-2.3	55.1	54.0	-1.1
Gaza & Inhambane - rural	73.1	65.2	-8.0	71.0	64.4	-6.6	70.4	66.1	-4.3
Gaza & Inhambane - urban	62.7	44.9	-17.9	60.0	49.5	-10.5	61.9	48.8	-13.1
Maputo Province - rural	81.2	76.3	-4.9	74.7	67.5	-7.1	80.9	71.8	-9.1
Maputo Province - urban	61.8	63.7	1.8	57.8	59.1	1.4	59.2	59.3	0.1
Maputo City	53.6	36.2	-17.4	51.3	34.2	-17.0	49.2	35.1	-14.1
National	54.1	54.7	0.6	53.9	54.6	0.7	54.7	56.0	1.3
Mean absolute change			11.3			9.4			9.6
Correlations			1.000			0.937			0.977

Notes: Predictions are based on regression models and include a simulated error term (models 1 and 3).

Sources: MPD/DNEAP estimates using IOF08 and IAF02 databases.

Table 12-10: Inequality estimates.

	2002-03						2008-09					
	Gini coefficient		Generalized entropy index				Gini coefficient		Generalized entropy index			
	Estimate	SE	Est., α=1	SE	Est., α=0	Est., α=2	Estimate	SE	Est., α=1	SE	Est., α=0	Est., α=2
National	0.415	0.013	0.367	0.039	0.296	0.987	0.414	0.011	0.366	0.031	0.302	0.882
Urban	0.479	0.024	0.502	0.075	0.387	1.447	0.481	0.018	0.500	0.050	0.397	1.234
Rural	0.371	0.011	0.267	0.027	0.240	0.552	0.367	0.011	0.260	0.028	0.241	0.499
North	0.385	0.037	0.346	0.111	0.250	1.132	0.411	0.024	0.379	0.066	0.292	1.001
Center	0.393	0.016	0.309	0.038	0.269	0.651	0.381	0.015	0.279	0.035	0.261	0.501
South	0.475	0.016	0.495	0.048	0.385	1.540	0.456	0.016	0.444	0.042	0.357	1.074
Niassa	0.357	0.033	0.265	0.060	0.216	0.482	0.427	0.042	0.428	0.136	0.330	1.309
Cabo Delgado	0.445	0.100	0.621	0.307	0.347	3.043	0.347	0.020	0.238	0.040	0.203	0.461
Nampula	0.361	0.028	0.235	0.040	0.214	0.334	0.419	0.042	0.409	0.109	0.304	1.057
Zambezia	0.351	0.022	0.226	0.030	0.206	0.321	0.365	0.028	0.296	0.074	0.228	0.733
Tete	0.399	0.021	0.296	0.039	0.291	0.471	0.323	0.021	0.184	0.026	0.202	0.226
Manica	0.400	0.031	0.300	0.047	0.287	0.453	0.345	0.019	0.210	0.025	0.208	0.284
Sofala	0.427	0.038	0.409	0.105	0.309	1.127	0.456	0.036	0.379	0.066	0.417	0.572
Inhambane	0.443	0.026	0.400	0.061	0.337	0.800	0.383	0.021	0.274	0.036	0.247	0.425
Gaza	0.406	0.029	0.381	0.083	0.275	1.110	0.427	0.024	0.348	0.048	0.327	0.601
Maputo Province	0.433	0.022	0.363	0.042	0.312	0.646	0.387	0.024	0.303	0.044	0.252	0.539
Maputo City	0.524	0.029	0.604	0.086	0.465	1.973	0.512	0.027	0.552	0.067	0.442	1.288

Notes: Standards errors calculated using an alternative approach to that employed in Table 6-1 and Table 6-2.

Sources: MPD/DNEAP estimates using IOF08 and IAF02 databases.

13 Contents of food bundles

The food baskets (adjusted flexible bundles) for each of the thirteen spatial domains are presented in the following thirteen tables. These baskets satisfy the revealed preference conditions for each spatial domain over time and over space. The total values (daily Meticais per person) are listed at the bottom row in the respective quantity columns ("Daily consumption"), and are equal to the sum of food item prices multiplied by consumed quantities of each of these food items. The listed quantities cover 95% of required calories per person in each spatial domain. In the calculations, we assume that 90% of expenditure is necessary to cover 95% of the calorie requirement, which implies that the per calorie cost of the remaining 5% of calories is double the per calorie cost of the preceding 95%). Therefore the food poverty line is found by dividing the total costs of the basket by 0.9. Similarly the total calories presented in the bottom row equals the sum of the calories (food item consumption multiplied by calories per gram of a given food item) divided by 0.95—this is the spatial domain calorie requirement. The budget shares sum to 90%, which reflects that we have included the main food items consumed.

On expositional grounds, we have abbreviated the names of these six food item (groups) in the food bundles: "Aves vivas e outros animais vivos" is "Aves vivas e outros animais vivos comprados para consumo como alimentos," "Carne de caça comes., fresca, refr. ou cong." represent "Carne de caça comestível, fresca, refrigerada ou congelada, "Carne de cabrito, met. tr., fresca, refr. ou cong." represent "Carne de cabrito, metade traseira, fresca, refrigerada ou congelada," "Camarão e gambas, frescos, refr. ou cong." represent "Camarão e gambas, frescos, refrigerados ou congelados," "Carne de frango em peda., fresca, refr. ou cong." is "Carne de frango em pedaços, fresca, refrigerada ou congelada," and finally "Carne de frango inteiro com ou sem miudezas" represents "Carne de frango inteiro com ou sem miudezas, fresca, refrigerada ou congelada."

Niassa and Cabo Delgado, rural	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Farinha de milho	175.50	0.0146	3.54	20.43
Farinha de mandioca	159.96	0.0092	3.42	11.78
Peixe seco (excepto bacalhau)	10.27	0.0985	3.09	8.09
Serra fresca, refrigerada ou congelada	23.31	0.0303	0.51	5.65
Feijão nhemba em grão seco	33.31	0.0162	3.39	4.30
Abóbora e abobrinha	58.25	0.0085	0.25	3.94
Folhas de mandioqueira	55.87	0.0080	0.27	3.55
Arroz grão corrente	14.33	0.0273	3.63	3.13
Amendoim (casca e miolo)	13.18	0.0285	4.07	3.00
Folhas de aboboreira	35.25	0.0093	0.22	2.63
Óleo de girassol	3.87	0.0709	9.00	2.20
Aves vivas e outros animais vivos	3.73	0.0721	0.83	2.15
Mandioca fresca	48.06	0.0052	1.30	2.00
Milho fresco	66.21	0.0033	1.23	1.73
Feijão boer	18.04	0.0119	3.08	1.71
Outros produtos hortícolas de folha e talo	31.84	0.0062	0.22	1.57
Milho em grão branco	27.08	0.0065	2.41	1.40
Tomate	19.14	0.0091	0.18	1.40
Farinha de mapira	10.11	0.0137	3.55	1.11
Folha de feijão nhemba	9.32	0.0144	0.11	1.07
Manga	98.48	0.0013	0.41	1.05
Açúcar amarelo granulado	4.06	0.0278	3.89	0.90
Quiabo	7.48	0.0147	0.30	0.88
Ervilha	8.30	0.0125	1.04	0.83
Feijão jugo	6.38	0.0130	3.08	0.66
Mapira em grão	8.97	0.0084	2.49	0.60
Batata doce	17.36	0.0042	0.96	0.58
Feijão manteiga	2.60	0.0274	3.35	0.57
Cogumelos	7.36	0.0094	0.25	0.55
Mandioca seca	13.92	0.0049	3.42	0.55
Total cost, calorie requirement and exp. share	12.51		2,107	90

Niassa and Cabo Delgado, urban	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Farinha de milho	197.70	0.0163	3.54	23.05
Farinha de mandioca	174.54	0.0068	3.42	8.46
Folhas de mandioqueira	141.83	0.0057	0.27	5.84
Peixe seco (excepto bacalhau)	8.10	0.0968	3.09	5.62
Cebola	90.86	0.0082	0.40	5.31
Feijão manteiga	22.05	0.0283	3.35	4.47
Feijão nhemba em grão seco	36.97	0.0167	3.39	4.42
Outros produtos hortícolas de folha e talo	48.96	0.0114	0.22	4.02
Arroz grão corrente	18.70	0.0278	3.63	3.72
Amendoim (casca e miolo)	14.70	0.0324	4.07	3.41
Óleo de girassol	6.90	0.0622	9.00	3.08
Serra fresca, refrigerada ou congelada	7.40	0.0411	0.51	2.18
Açúcar amarelo granulado	12.19	0.0231	3.89	2.02
Tomate	14.13	0.0199	0.18	2.02
Mandioca fresca	54.80	0.0049	1.30	1.94
Folha de feijão nhemba	15.46	0.0157	0.11	1.74
Folhas de aboboreira	14.79	0.0125	0.22	1.32
Feijão boer	12.14	0.0144	3.08	1.25
Pão de trigo normal	19.58	0.0084	2.53	1.18
Couve tronchuda portuguesa	18.46	0.0088	0.22	1.17
Aves vivas e outros animais vivos	1.39	0.1109	0.83	1.11
Batata doce	24.29	0.0056	0.96	0.97
Carapaus , frescos, refrigerados ou congelados	2.33	0.0567	0.51	0.95
Abóbora e abobrinha	19.50	0.0057	0.25	0.79
Total cost, calorie requirement and exp. share	13.95		2,155	90

Nampula, rural	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Farinha de mandioca	187.25	0.0092	3.42	15.47
Farinha de milho	110.04	0.0125	3.54	12.33
Peixe seco (excepto bacalhau)	10.65	0.0677	3.09	6.47
Folhas de mandioqueira	116.68	0.0060	0.27	6.32
Serra fresca, refrigerada ou congelada	22.54	0.0279	0.51	5.64
Amendoim (casca e miolo)	28.84	0.0216	4.07	5.60
Abóbora e abobrinha	139.36	0.0039	0.25	4.90
Feijão nhemba em grão seco	41.05	0.0115	3.39	4.24
Folhas de aboboreira	29.83	0.0114	0.22	3.05
Mandioca fresca	57.23	0.0055	1.30	2.82
Tomate	38.18	0.0063	0.18	2.16
Aves vivas e outros animais vivos	3.27	0.0703	0.83	2.06
Mandioca seca	41.84	0.0055	3.42	2.05
Outras leguminosas secas	9.97	0.0178	3.08	1.60
Arroz grão corrente	6.30	0.0276	3.63	1.56
Carne de caça comes., fresca, refr. ou cong.	9.45	0.0174	0.89	1.48
Feijão boer	13.85	0.0117	3.08	1.46
Manga	56.65	0.0029	0.41	1.46
Milho fresco	36.37	0.0044	1.23	1.44
Favas	20.85	0.0052	3.08	0.98
Açúcar amarelo granulado	4.44	0.0230	3.89	0.92
Folha de feijão nhemba	10.04	0.0101	0.11	0.91
Feijão jugo	9.47	0.0100	3.08	0.85
Óleo de girassol	1.35	0.0632	9.00	0.77
Carne de cabrito, met. tr., fresca, refr. ou cong.	1.49	0.0530	1.07	0.71
Cogumelos	4.26	0.0163	0.25	0.62
Milho em grão branco	11.79	0.0055	2.41	0.59
Farinha de mapira	4.37	0.0147	3.55	0.58
Mapira em grão	9.24	0.0066	2.49	0.54
Coco	10.52	0.0044	1.95	0.41
Total cost, calorie requirement and exp. share	11.14		2,124	90

Nampula, urban	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Farinha de milho	167.14	0.0125	3.54	16.66
Serra fresca, refrigerada ou congelada	30.60	0.0357	0.51	8.72
Farinha de mandioca	110.49	0.0098	3.42	8.63
Peixe seco (excepto bacalhau)	13.98	0.0662	3.09	7.39
Amendoim (casca e miolo)	35.08	0.0219	4.07	6.13
Arroz grão corrente	23.30	0.0239	3.63	4.45
Feijão nhemba em grão seco	30.30	0.0135	3.39	3.28
Folhas de mandioqueira	52.19	0.0077	0.27	3.22
Açúcar amarelo granulado	17.95	0.0215	3.89	3.09
Milho fresco	52.78	0.0063	1.23	2.66
Óleo de girassol	5.63	0.0503	9.00	2.26
Mandioca fresca	38.45	0.0071	1.30	2.19
Mandioca seca	37.66	0.0070	3.42	2.11
Farinha de mapira	14.09	0.0182	3.55	2.05
Pão de trigo normal	27.79	0.0090	2.53	2.00
Aves vivas e outros animais vivos	3.49	0.0708	0.83	1.97
Carapaus , frescos, refrigerados ou congelados	5.31	0.0460	0.51	1.95
Tomate	16.09	0.0150	0.18	1.93
Folhas de aboboreira	22.98	0.0089	0.22	1.62
Feijão boer	12.98	0.0131	3.08	1.35
Milho em grão branco	31.39	0.0048	2.41	1.20
Manga	23.00	0.0053	0.41	0.98
Folha de feijão nhemba	11.51	0.0094	0.11	0.86
Coco	18.14	0.0060	1.95	0.86
Cebola	7.24	0.0142	0.40	0.82
Abóbora e abobrinha	18.29	0.0054	0.25	0.79
Feijão manteiga	3.64	0.0268	3.35	0.78
Total cost, calorie requirement and exp. share	12.53		2,160	90

Sofala and Zambezia, rural	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Farinha de milho	147.37	0.0144	3.54	18.65
Farinha de mandioca	160.55	0.0124	3.42	17.54
Arroz grão corrente	55.41	0.0171	3.63	8.36
Serra fresca, refrigerada ou congelada	38.21	0.0178	0.51	6.00
Peixe seco (excepto bacalhau)	9.72	0.0641	3.09	5.50
Aves vivas e outros animais vivos	5.23	0.0755	0.83	3.48
Folhas de mandioqueira	78.80	0.0036	0.27	2.53
Feijão nhemba em grão seco	14.78	0.0188	3.39	2.45
Batata doce	107.56	0.0026	0.96	2.44
Feijão boer	15.75	0.0165	3.08	2.29
Tomate	24.46	0.0104	0.18	2.24
Folhas de aboboreira	37.72	0.0066	0.22	2.18
Milho em grão branco	26.15	0.0083	2.41	1.91
Mandioca fresca	50.07	0.0042	1.30	1.87
Carne de caça comes., fresca, refr. ou cong.	17.61	0.0092	0.89	1.43
Coco	59.40	0.0026	1.95	1.35
Óleo de girassol	2.12	0.0662	9.00	1.24
Amendoim (casca e miolo)	6.75	0.0185	4.07	1.10
Abóbora e abobrinha	31.82	0.0039	0.25	1.09
Feijão manteiga	3.63	0.0304	3.35	0.97
Farinha de mapira	7.98	0.0136	3.55	0.96
Mandioca seca	15.33	0.0064	3.42	0.86
Quiabo	11.32	0.0083	0.30	0.83
Milho fresco	14.41	0.0062	1.23	0.78
Camarão e gambas, frescos, refr. ou cong.	2.18	0.0379	0.35	0.73
Camarão seco	1.08	0.0756	3.20	0.72
Ovos frescos de galinha	2.26	0.0262	1.39	0.52
Total cost, calorie requirement and exp. share	11.35		2,102	90

Sofala and Zambezia, urban	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Farinha de milho	183.38	0.0148	3.54	19.88
Arroz grão corrente	76.22	0.0202	3.63	11.27
Serra fresca, refrigerada ou congelada	37.48	0.0321	0.51	8.80
Farinha de mandioca	64.32	0.0150	3.42	7.05
Peixe seco (excepto bacalhau)	15.87	0.0460	3.09	5.34
Óleo de girassol	11.69	0.0473	9.00	4.04
Feijão manteiga	16.30	0.0299	3.35	3.56
Pão de trigo normal	33.88	0.0136	2.53	3.37
Tomate	26.48	0.0159	0.18	3.07
Coco	88.40	0.0041	1.95	2.66
Carapaus , frescos, refrigerados ou congelados	6.70	0.0435	0.51	2.13
Amendoim (casca e miolo)	6.75	0.0393	4.07	1.94
Batata doce	49.38	0.0053	0.96	1.93
Aves vivas e outros animais vivos	2.24	0.0899	0.83	1.47
Açúcar amarelo granulado	9.08	0.0219	3.89	1.46
Milho em grão branco	23.53	0.0080	2.41	1.37
Folhas de mandioqueira	29.70	0.0061	0.27	1.32
Mandioca seca	23.47	0.0076	3.42	1.31
Feijão nhemba em grão seco	8.96	0.0199	3.39	1.30
Camarão seco	2.45	0.0632	3.20	1.13
Cebola	5.40	0.0265	0.40	1.05
Feijão boer	24.66	0.0057	3.08	1.03
Farinha de mapira	10.55	0.0125	3.55	0.96
Folhas de aboboreira	15.47	0.0083	0.22	0.94
Mandioca fresca	13.94	0.0082	1.30	0.83
Couve tronchuda portuguesa	9.30	0.0116	0.22	0.79
Total cost, calorie requirement and exp. share	13.68		2,184	90

Manica and Tete, rural	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Farinha de milho	273.33	0.0223	3.54	40.23
Batata doce	306.59	0.0030	0.96	5.97
Peixe seco (excepto bacalhau)	13.04	0.0557	3.09	4.79
Milho fresco	124.29	0.0046	1.23	3.80
Óleo de girassol	9.55	0.0572	9.00	3.61
Folhas de aboboreira	55.25	0.0086	0.22	3.12
Milho em grão branco	37.30	0.0112	2.41	2.75
Feijão manteiga	12.72	0.0307	3.35	2.58
Farinha de mexoeira	8.53	0.0450	3.33	2.53
Manga	188.77	0.0017	0.41	2.17
Quiabo	26.05	0.0115	0.30	1.98
Feijão nhemba em grão seco	15.75	0.0170	3.39	1.77
Arroz grão corrente	11.07	0.0241	3.63	1.76
Tomate	20.51	0.0122	0.18	1.66
Farinha de mapira	7.33	0.0307	3.55	1.48
Aves vivas e outros animais vivos	3.47	0.0619	0.83	1.42
Açúcar amarelo granulado	8.34	0.0255	3.89	1.41
Abóbora e abobrinha	31.91	0.0067	0.25	1.41
Couve tronchuda portuguesa	29.12	0.0072	0.22	1.39
Folha de feijão nhemba	27.19	0.0071	0.11	1.27
Amendoim (casca e miolo)	4.73	0.0300	4.07	0.94
Serra fresca, refrigerada ou congelada	3.42	0.0377	0.51	0.85
Outros produtos hortícolas de folha e talo	17.67	0.0051	0.22	0.60
Melancia	13.80	0.0055	0.32	0.50
Total cost, calorie requirement and exp. share	15.15		2,110	90

Manica and Tete, urban	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Farinha de milho	166.80	0.0236	3.54	25.26
Óleo de girassol	34.23	0.0520	9.00	11.42
Pão de trigo normal	148.15	0.0105	2.53	9.96
Arroz grão corrente	48.97	0.0231	3.63	7.26
Milho em grão branco	80.13	0.0127	2.41	6.51
Peixe seco (excepto bacalhau)	17.03	0.0523	3.09	5.72
Feijão manteiga	25.18	0.0291	3.35	4.71
Açúcar amarelo granulado	20.78	0.0253	3.89	3.37
Batata doce	78.15	0.0057	0.96	2.87
Tomate	21.02	0.0141	0.18	1.91
Couve tronchuda portuguesa	29.91	0.0094	0.22	1.80
Farinha de mapira	5.95	0.0460	3.55	1.76
Esparguete	5.87	0.0338	3.30	1.27
Feijão nhemba em grão seco	9.46	0.0196	3.39	1.19
Amendoim (casca e miolo)	6.75	0.0274	4.07	1.19
Carapaus , frescos, refrigerados ou congelados	3.06	0.0481	0.51	0.94
Folha de feijão nhemba	12.43	0.0073	0.11	0.58
Cebola	3.99	0.0189	0.40	0.48
Folhas de aboboreira	7.97	0.0093	0.22	0.48
Quiabo	4.66	0.0155	0.30	0.46
Serra fresca, refrigerada ou congelada	1.66	0.0434	0.51	0.46
Aves vivas e outros animais vivos	0.78	0.0831	0.83	0.42
Total cost, calorie requirement and exp. share	15.58		2,165	90

Gaza and Inhambane, rural	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Mandioca fresca	194.62	0.0056	1.30	8.37
Arroz grão corrente	44.98	0.0199	3.63	6.83
Milho em grão branco	79.41	0.0107	2.41	6.49
Feijão nhemba em grão seco	39.01	0.0216	3.39	6.44
Cacana	57.36	0.0145	0.58	6.37
Amendoim (casca e miolo)	22.20	0.0362	4.07	6.13
Folhas de aboboreira	84.34	0.0085	0.22	5.46
Farinha de milho	41.93	0.0170	3.54	5.45
Coco	259.90	0.0026	1.95	5.24
Folha de feijão nhemba	61.29	0.0080	0.11	3.77
Folhas de mandioqueira	44.52	0.0083	0.27	2.83
Serra fresca, refrigerada ou congelada	14.08	0.0250	0.51	2.69
Castanhas	19.28	0.0170	5.89	2.50
Aves vivas e outros animais vivos	3.43	0.0920	0.83	2.41
Açúcar amarelo granulado	12.41	0.0204	3.89	1.93
Flocos de mandioca(tapioca)	13.35	0.0187	3.42	1.91
Tomate	21.97	0.0111	0.18	1.86
Folhas de batata doce	40.88	0.0056	0.37	1.75
Mafura	10.42	0.0168	2.69	1.34
Batata doce	17.30	0.0099	0.96	1.31
Peixe seco (excepto bacalhau)	4.49	0.0376	3.09	1.29
Pão de trigo normal	13.94	0.0117	2.53	1.24
Abóbora e abobrinha	40.04	0.0040	0.25	1.23
Melancia	17.33	0.0089	0.32	1.18
Couve tronchuda portuguesa	13.10	0.0107	0.22	1.07
Outros produtos hortícolas de folha e talo	18.70	0.0070	0.22	1.01
Milho fresco	23.79	0.0055	1.23	1.00
Amêndoas	7.61	0.0154	5.89	0.90
Total cost, calorie requirement and exp. share	13.09		2,088	90

Gaza and Inhambane, urban	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Arroz grão corrente	70.46	0.0196	3.63	9.82
Mandioca fresca	177.55	0.0060	1.30	7.59
Pão de trigo normal	68.95	0.0130	2.53	6.39
Amendoim (casca e miolo)	20.62	0.0428	4.07	6.29
Coco	290.35	0.0027	1.95	5.57
Serra fresca, refrigerada ou congelada	19.75	0.0331	0.51	4.65
Açúcar amarelo granulado	29.98	0.0203	3.89	4.34
Folhas de aboboreira	53.08	0.0106	0.22	4.00
Cacana	33.76	0.0165	0.58	3.96
Farinha de milho	31.39	0.0175	3.54	3.91
Tomate	30.48	0.0145	0.18	3.15
Milho em grão branco	32.49	0.0135	2.41	3.13
Feijão nhemba em grão seco	29.97	0.0135	3.39	2.87
Óleo de girassol	5.63	0.0621	9.00	2.49
Couve tronchuda portuguesa	31.80	0.0101	0.22	2.29
Folha de feijão nhemba	39.36	0.0081	0.11	2.27
Feijão manteiga	7.79	0.0394	3.35	2.19
Folhas de mandioqueira	39.81	0.0076	0.27	2.16
Folhas de batata doce	33.37	0.0079	0.37	1.87
Caldos	1.91	0.1290	3.25	1.75
Aves vivas e outros animais vivos	1.93	0.1041	0.83	1.43
Peixe seco (excepto bacalhau)	3.81	0.0453	3.09	1.23
Flocos de mandioca(tapioca)	8.25	0.0208	3.42	1.22
Castanhas	10.00	0.0149	5.89	1.06
Carapaus , frescos, refrigerados ou congelados	2.79	0.0494	0.51	0.98
Laranja	28.36	0.0048	0.41	0.96
Cebola	5.82	0.0224	0.40	0.93
Mafura	10.27	0.0121	2.69	0.88
Manga	5.54	0.0155	0.41	0.61
Total cost, calorie requirement and exp. share	14.05		2,135	90

Maputo Province, rural	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Milho em grão branco	396.71	0.0107	2.41	23.66
Folhas de aboboreira	109.61	0.0120	0.22	7.36
Amendoim (casca e miolo)	27.80	0.0455	4.07	7.08
Arroz grão corrente	56.44	0.0204	3.63	6.43
Cacana	87.57	0.0129	0.58	6.32
Pão de trigo normal	38.00	0.0250	2.53	5.32
Farinha de milho	50.43	0.0153	3.54	4.32
Serra fresca, refrigerada ou congelada	19.67	0.0289	0.51	3.18
Tomate	25.36	0.0166	0.18	2.36
Mandioca fresca	49.66	0.0081	1.30	2.26
Óleo de girassol	6.74	0.0583	9.00	2.20
Folhas de mandioqueira	50.05	0.0077	0.27	2.14
Aves vivas e outros animais vivos	3.94	0.0959	0.83	2.11
Batata doce	37.02	0.0100	0.96	2.06
Açúcar amarelo granulado	15.27	0.0216	3.89	1.85
Folha de feijão nhemba	20.61	0.0140	0.11	1.62
Carapaus , frescos, refrigerados ou congelados	5.49	0.0504	0.51	1.55
Folhas de batata doce	44.85	0.0061	0.37	1.53
Outros produtos hortícolas de folha e talo	40.16	0.0064	0.22	1.43
Feijão manteiga	6.34	0.0385	3.35	1.36
Coco	30.36	0.0072	1.95	1.22
Couve tronchuda portuguesa	17.51	0.0107	0.22	1.05
Feijão nhemba em grão seco	6.75	0.0268	3.39	1.01
Esparguete	1.96	0.0529	3.30	0.58
Total cost, calorie requirement and exp. share	17.89		2,127	90

Maputo Province, urban	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Pão de trigo normal	131.00	0.0256	2.53	16.23
Arroz grão corrente	112.53	0.0222	3.63	12.08
Amendoim (casca e miolo)	36.37	0.0471	4.07	8.28
Coco	236.66	0.0058	1.95	6.69
Carapaus , frescos, refrigerados ou congelados	25.93	0.0475	0.51	5.95
Tomate	44.02	0.0198	0.18	4.22
Farinha de milho	39.51	0.0205	3.54	3.91
Óleo de girassol	12.26	0.0635	9.00	3.76
Feijão manteiga	17.26	0.0417	3.35	3.48
Milho em grão branco	58.37	0.0108	2.41	3.03
Açúcar amarelo granulado	28.12	0.0222	3.89	3.01
Couve tronchuda portuguesa	47.55	0.0104	0.22	2.40
Aves vivas e outros animais vivos	3.79	0.1112	0.83	2.04
Feijão nhemba em grão seco	12.15	0.0257	3.39	1.51
Cacana	13.07	0.0232	0.58	1.46
Serra fresca, refrigerada ou congelada	7.42	0.0402	0.51	1.44
Cebola	10.98	0.0269	0.40	1.43
Caldos	2.28	0.1171	3.25	1.29
Alface	13.49	0.0193	0.12	1.26
Folha de feijão nhemba	24.89	0.0105	0.11	1.26
Mandioca fresca	31.40	0.0081	1.30	1.23
Folhas de aboboreira	19.30	0.0120	0.22	1.12
Esparguete	5.12	0.0453	3.30	1.12
Folhas de mandioqueira	15.40	0.0134	0.27	1.00
Repolho	13.39	0.0122	0.19	0.79
Total cost, calorie requirement and exp. share	20.69		2,189	90

Maputo City	Daily consumption (grams per person)	Price (Meticais per gram)	Calories per gram	Expenditure share, % of poverty line
Arroz grão corrente	152.43	0.0220	3.63	16.06
Pão de trigo normal	105.72	0.0251	2.53	12.73
Amendoim (casca e miolo)	44.47	0.0394	4.07	8.39
Carapaus , frescos, refrigerados ou congelados	30.91	0.0464	0.51	6.87
Coco	258.48	0.0050	1.95	6.16
Farinha de milho	42.92	0.0215	3.54	4.43
Tomate	50.82	0.0181	0.18	4.40
Óleo de girassol	14.62	0.0628	9.00	4.40
Açúcar amarelo granulado	30.65	0.0216	3.89	3.17
Feijão manteiga	16.14	0.0364	3.35	2.82
Cebola	18.63	0.0265	0.40	2.37
Couve tronchuda portuguesa	47.28	0.0104	0.22	2.36
Caldos	4.11	0.1170	3.25	2.30
Folhas de aboboreira	22.37	0.0128	0.22	1.37
Serra fresca, refrigerada ou congelada	6.97	0.0409	0.51	1.37
Alface	16.72	0.0139	0.12	1.12
Cacana	10.21	0.0214	0.58	1.04
Feijão nhemba em grão seco	8.53	0.0256	3.39	1.04
Esparguete	5.20	0.0393	3.30	0.98
Aves vivas e outros animais vivos	1.66	0.1142	0.83	0.91
Folha de feijão nhemba	29.76	0.0063	0.11	0.91
Repolho	14.16	0.0110	0.19	0.75
Carne de frango em peda., fresca, refr. ou cong.	2.45	0.0618	0.83	0.73
Mandioca fresca	12.08	0.0118	1.30	0.68
Chá preto simples	0.39	0.3596	2.93	0.67
Folhas de mandioqueira	10.86	0.0116	0.27	0.60
Batata reno fresca	5.88	0.0191	0.65	0.54
Alho	1.02	0.0847	1.21	0.41
Carne de frango inteiro com ou sem miudezas	1.10	0.0773	0.83	0.41
Total cost, calorie requirement and exp. share	20.87		2,227	90