

Second Integrated Household Survey

2005

An extract of findings

By

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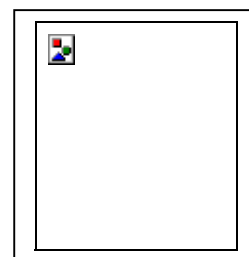
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1.0 Introduction

The Second Malawi Integrated Household Survey is a nationally representative sample survey designed to provide information on various aspects of welfare for the population of Malawi. The survey was conducted by the National Statistical Office (NSO) during the period March 2004-April 2005 and collected information from a nationally representative sample of 11,280 households. In addition to the household survey, the IHS2 collected information from the 564 communities in which these households reside.

This is the third survey conducted under the Integrated Household Surveys Programme. The other surveys conducted under this Programme include the Household Expenditure and Small Scale Economic Activities (HESSEA) conducted in 1990 and the first Integrated Household Survey (IHS1) conducted in 1997/8. To provide interim statistics on well-being for a subset of indicators, the NSO also fielded the Core Welfare Indicator Questionnaire (CWIQ) in 2002 and the Welfare Monitoring Survey (WMS) in 2005.

1.1 Objective of the survey

The survey covers a wide array of subject matter, with the primary objective to provide comprehensive information on the socio-economic status of the population in Malawi. As such, the survey can be used to derive a profile of the poor and to monitor indicators related to the Malawi Poverty Reduction Strategy and the Millennium Development Goals (MDGs).

1.2 Poverty in Malawi

In order to compute a poverty indicator for each individual in the IHS2, it is necessary to: 1) choose a welfare indicator, and 2) compute a threshold for this welfare indicator, below which a person is deemed “poor”. The measure of welfare used in the poverty analysis of the IHS2 is the total annual per capita consumption expenditure reported by a household. In the analysis, this measure is expressed in Malawi Kwacha deflated to February/March 2004 prices.

The threshold level of welfare that distinguishes poor households from non-poor households is the poverty line. The poverty line is a subsistence minimum expressed in Malawi Kwacha based on the cost-of-basic-needs methodology. It is comprised of two parts: minimum food expenditure based on the food requirements of an individual, and critical non-food consumption. Food needs are tied to the recommended daily calorie requirement. Non-food needs are estimated based on the expenditure patterns of households whose total expenditure is close to the minimum food expenditure. Using this method, a poverty line is developed for the country. Individuals who reside in households with consumption lower than the poverty line are then labeled “poor”. Using the minimum food expenditure as an additional measure, we

can identify the “ultra poor”, households whose *total* consumption per capita on food and non-food items is lower than the minimum food expenditure.

1.3 Poverty Lines

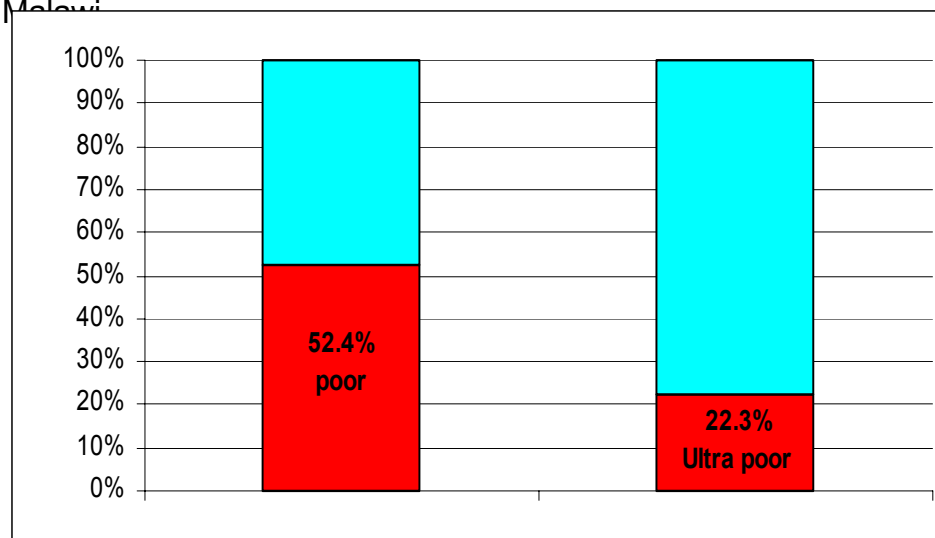
Using the methodology outlined above, the poverty lines for identifying the poor and ultra poor in Malawi are presented in Table 1.

Table 1: Poverty line in Malawi Kwacha per person per year

	Poverty line (MK per person per year)
Poor	MK16,165
Ultra Poor	MK10,029

Based on the poverty lines in Table 1, it has been found that 52.4 percent of the population in Malawi is poor. More to this, 22 percent of the population is ultra poor. That is, about one in every five people lives in dire poverty such that they cannot even afford to meet the minimum standard for daily-recommended food requirement.

Figure SEQ Figure * ARABIC 1: Proportion of poor and ultra-poor persons in Malawi



1.4 Poverty and Location

While the national poverty rate is 52 percent, there is variation across regions in terms of poverty rates. The Southern region has the largest poverty rate (60%) implying that three out of five people live in poverty in the rural areas of the Southern region. The Northern region has the second highest proportion of poor people (54%). The Central region has the lowest proportion (44%) of poor.

The regional rates above mask a striking difference in poverty rates between urban and rural areas. About 25 percent of the population in urban areas is living in poverty, compared to 56 percent of the rural population. That is, a person in a rural area is more than twice as likely to be poor.

A similar pattern is observed for ultra-poor people. The proportion of ultra-poor people is high in the Southern region, followed by the Northern region and then finally the Central region.

In Figure 2 below, four areas are defined: urban, North rural, Southern rural and Central rural. The solid line indicates the national poverty line and as can be seen, excluding the urban centers, only the Central region has a poverty rate that is below the national level, likewise for ultra poverty in the Central rural areas.

Figure SEQ Figure * ARABIC 2: Proportion of poor and ultra-poor persons

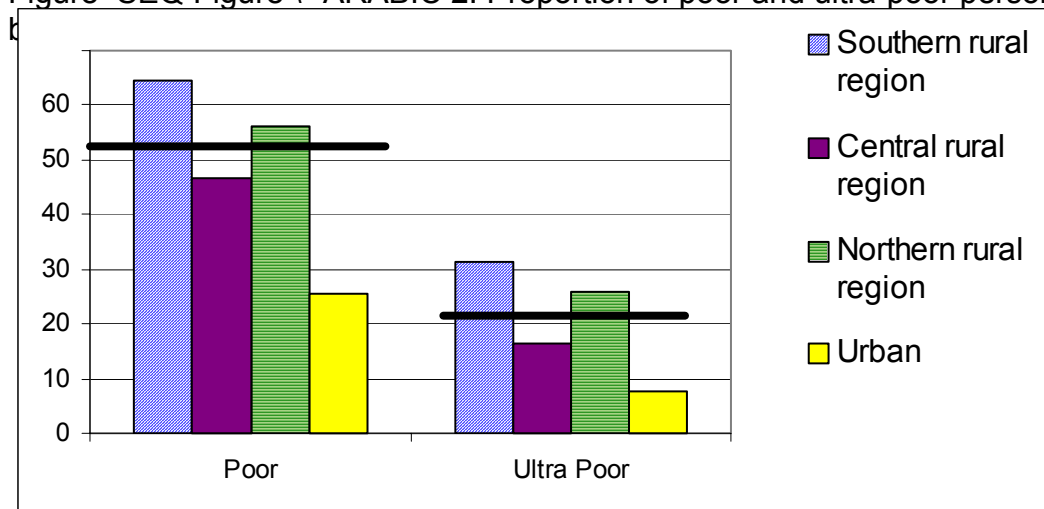


Table 2: Poverty headcount and percentage distribution of Malawi's poor by place of residence.

	Poverty headcount	Ultra Poor	Percent of Malawi's poor	Percent of Malawi's population
Malawi	52.4	22.4	100	100
Rural northern region	56.3	25.9	10.9	10.2
Rural central region	46.7	16.2	33.9	38.1
Rural southern region	64.4	31.5	49.7	40.4
Urban	25.4	7.5	5.5	11.3

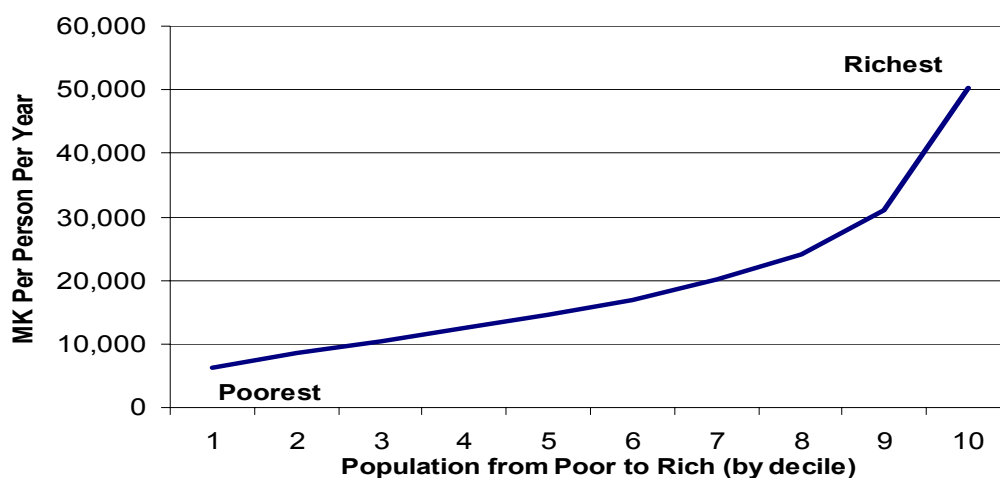
While the poverty rates are informative, they don't necessary tell us where most of the poor actually reside. In order to understand where the poor live, we need to take into account the population shares in the different regions. As shown in Table 2, almost half of the poor population in the country lives in the rural areas of the Southern region. About one in every three poor people comes from the rural areas of the Central region while one in every ten poor people comes from the Northern region rural areas. The urban areas are contributing only 6 percent of all the poor people in the country.

It is important to note that distribution of the population is slightly different from that of the poor. In terms of population distribution, the Southern rural area has 40 percent, the Central rural has 38 percent, the Northern rural has 10 percent while the urban areas contribute 11 percent. That is, the Southern rural areas have a disproportionate share of the poor, reflecting the higher poverty rate in this region.

1.5 Income Inequality in Malawi

Poverty rates indicate the share of the population below a minimum income level (the poverty line), but they don't reveal any information about the distribution of income above the threshold. Inequality measures, instead, consider the entire distribution, although they don't reveal anything regarding the level of absolute poverty. Certainly, income inequality persists in the country. Figure 3 uses expenditure as a proxy for income, and plots the median expenditure per capita for each of the deciles of the population. As shown in the figure the richest 10 percent of the population has a median per capita income that is eight times higher (MK50,373 per person per annum) than the median per capita income of the poorest 10% (K6,370 per person per annum). Moreover, the richest 10 percent of the population has a median income that is three times higher than the overall median income in the country.

Figure SEQ Figure * ARABIC 3: Per capita consumption expenditure by decile



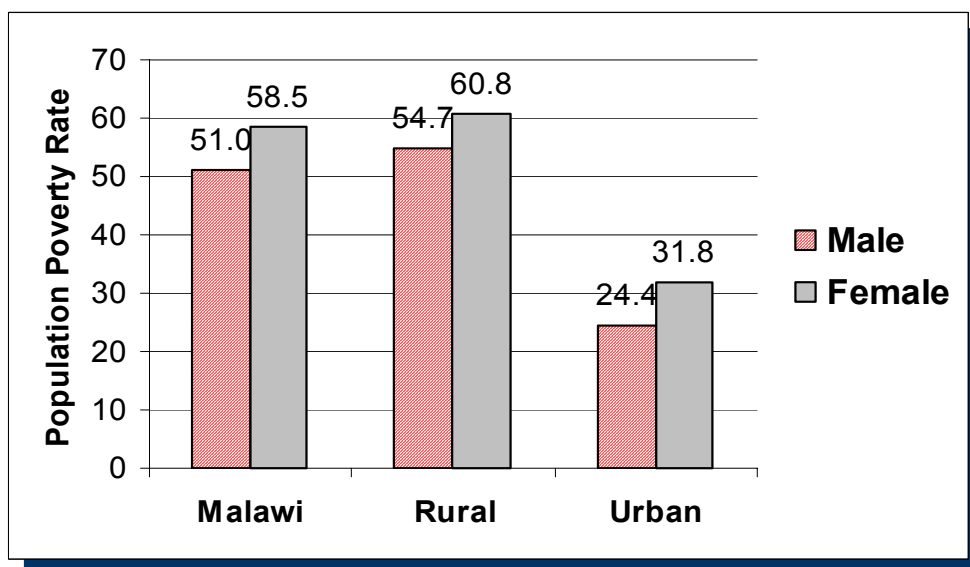
1.6 Poverty and household characteristics

Moving beyond these basic indicators of poverty for the population of Malawi, it is interesting to explore the differential poverty observed across households. To what extent are some household characteristics highly correlated with poverty? Are some types of households significantly more likely to be poor? We address these issues in this section, focusing on the characteristics of the household head (gender, age and education) as well as the demographic composition of the household membership.

1.6.1 Poverty and gender of the household head

Figure 4 shows that 51 percent of the people in male-headed households are poor. On the other hand, 59 percent of people in female-headed households are poor. By place of residence, it may be noted that the poverty rates by male and female headship are slightly higher in rural areas than at national level. About 55 percent of people in male-headed households in the rural areas are poor compared to 60 percent those who reside in female-headed. The rates are seen to be lower in the urban areas where nearly one in four people in male-headed households are poor compared to about a third of those in female-headed households.

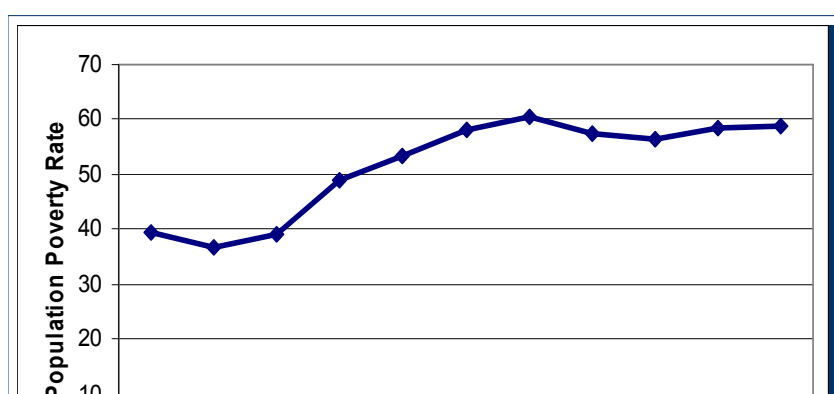
Figure SEQ Figure * ARABIC 4: Population poverty rates by sex of household head by place of residence



1.6.2 Poverty and age of household head

People in households headed by older members consume less per capita per day than those in younger households. Figure 5 shows that as the age of the household head increases, the poverty rate of the population increases. By about the late 40s, the age profile is fairly flat indicating that the relationship between poverty and age of the head is concentrated among the younger ages.

Figure SEQ Figure * ARABIC 5: Population poverty rates by age group of household head



1.6.3 Poverty, household size and dependency ratio

The size of the household is highly correlated with the poverty rate of the household. As the household gets larger, household members share the same amount of resources, thereby reducing their per capita expenditure. This is shown in Table 3. The poor households have larger mean household size of 5.4, compared to non-poor households with a mean household size of 3.8

A second indicator of household demographics is the dependency ratio, defined in the standard way as the ratio of prime-age adults to the total number of persons in the household outside the economic active population (children under the age of 15 and adults above 65 years of age). The table shows that poor households tend to have a larger dependency ratio of 1.4, compared to non-poor households with a dependency ratio of 0.8. That is, poor households have fewer working-age adults per dependent (child and elderly).

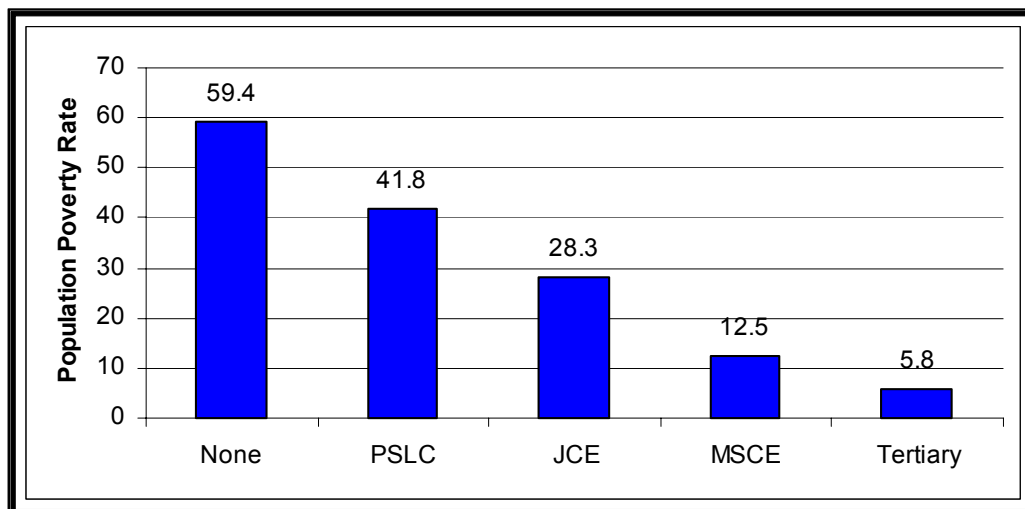
Table SEQ Table * ARABIC 3: Household size and dependency ratio by wealth groups

	Non-poor households	Poor households
Household size	3.8	5.4
Dependency ratio	0.8	1.4

1.6.4 Poverty and education of head

Education of the household head is also highly correlated with poverty status. As expected, poverty is more severe among people who live in households whose heads have no formal education qualification. Figure 6 shows that the poverty rate for people in households whose head do not have any formal education qualification was 59%, whilst as the education qualification of the household head increases the poverty rate drops. The population in households whose head has more than JCE level of education is significantly less likely to live in poverty.

Figure SEQ Figure * ARABIC 6: Proportion of population in poverty by education qualification of household head



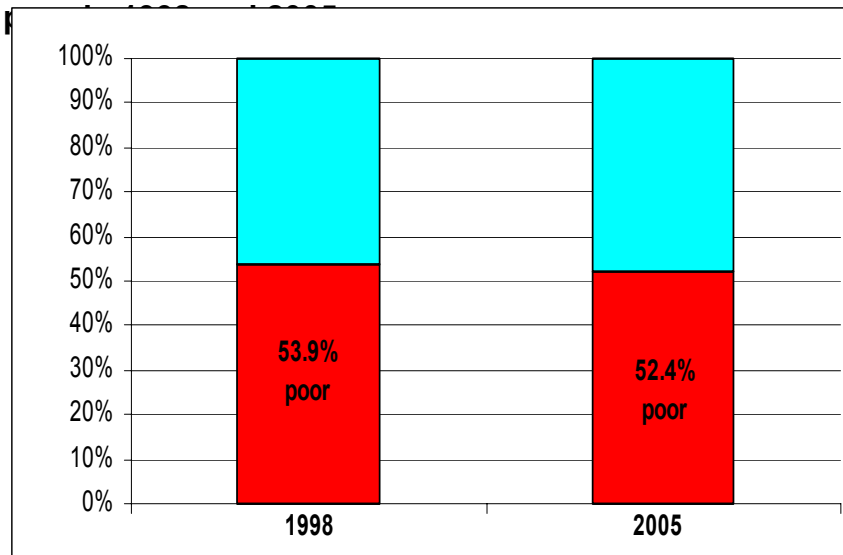
1.7 Poverty Comparisons: IHS1 & IHS2

As earlier highlighted, the IHS2 estimate of the poverty rate is 52.4%. However, this rate *should not* be directly compared to the 65.3% estimate from the 1997/8 IHS1. This is because the survey instruments & methods of calculating the poverty rates have been revised and improved to meet local and international standards.

Despite this change in survey instruments and methodology, an effort was put in place to compute the poverty rates for the previous IHS using the current methodology. In this exercise, poverty estimates from IHS1 were estimated using regression models to impute expenditure per capita based on comparably measured household characteristics. See the Appendix for more details on the methodology applied.

From the Figure 7, it may be noted that poverty has not changed significantly over the period. About 54 percent of the population was deemed poor in 1998 while the rate is at 52 percent in 2005.

Figure SEQ Figure * ARABIC 7: Proportion of the population deemed



2.0 Non-Monetary Welfare Measures

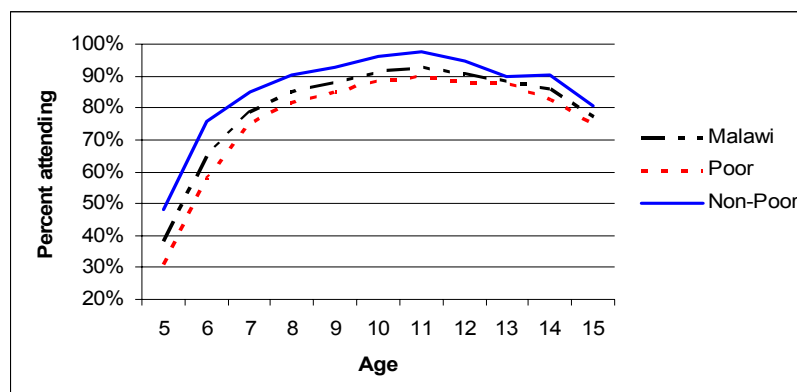
Poverty is truly a multi-dimensional concept. In addition to the monetary welfare measures of poverty, it is important also to understand poverty using the non-monetary welfare measures. This section will attempt to describe some of the characteristics of the poor using non-income indicators. Specifically, the section will cover some issues in education, health, employment, nutrition, water and sanitation, crime and safety nets.

2.1 Education

2.1.1 School Attendance

As shown in Figure 8, at all ages, poor children are less likely to be attending school than their non-poor peers. This gap is largest at young ages. For example, for children ages 5-6, those from non-poor households are 40 percent more likely to be attending school than poor children. School attendance for both poor and non-poor children increases by age up to about age 12. From age 12, attendance rates start to decline.

Figure SEQ Figure * ARABIC 8: School attendance by expenditure quintiles



2.1.2 Primary School Gross Enrolment Ratio

The Primary School Gross Enrolment Ratio (GER) is defined as the total enrolment in primary education regardless of age, expressed as a percentage of the official school age population (6 to 13 years). The GER provides an indicators of the capacity of the primary education system, but a high ratio does not necessarily indicate a successful education system.

Consistent with previous estimates, the GER in Malawi is quite high (Table 4). The primary gross enrolment ratio is 137 percent. The rate is significantly higher for boys at 144 percent as compared to girls at 130 percent. These high numbers mean that there are that a large proportion of primary school pupils that are over age (by official standards) for their grade. This could partly be explained by delayed enrolment and high drop-out, as well as high repetition rates. Repetition rates now stand at 27.1 percent, with higher rates for boys at 27.7 percent than for girls at 26.4 percent.

It is interesting that there is almost no difference in gross enrolment ratios in primary across children in poor and non-poor households. Likewise, the GER levels are similar for children in urban and rural areas. We do, however, observe a gap among boys by poverty status, where poor boys have lower GER than their non-poor peers (142 to 146, respectively).

Table SEQ Table * ARABIC 4: Primary Gross Enrolment Ratios 2004

	Malawi	Poor	Non-Poor	Urban	Rural
Boys	144	142	146	142	144
Girls	130	130	131	127	131
Total	137	136	138	134	137

2.1.3 Primary School Net Enrolment Ratio

Net Enrolment Ratio (NER) is the percentage of the enrolment of primary school children of the official age group to the corresponding population of children. The NER excludes overage students in an attempt to capture accurately the system's cover and internal efficiency. It does not solve the problem completely since some children fall outside the official age simply because of late or early entry rather than grade repetition. Simply put, the NER reflects the percent of children of official primary school age who actually attend primary school.

The difference between the gross and net enrolment ratios shows the incidence of overage and underage enrolments.. The NER is quite similar across poor and non-poor children, as well as those in urban and in rural areas.

Table SEQ Table * ARABIC 5: Primary Net Enrolment Ratios 2004

	Malawi	Poor	Non-Poor	Urban	Rural
Boys	78.5	74.9	83.3	86.2	77.8
Girls	81.4	78.6	85.0	87.3	80.8
Total	80.0	76.9	84.2	86.8	79.3

The findings indicate that the NER is higher for children from non-poor households (84%) than their peers in poor households (77%). Further, girls have slightly higher net enrolment ratios than boys (81.4% and 78.5%, respectively). While this reflects the fact that girls are enrolling at younger ages than boys, they also leave school earlier, resulting in less completed years of schooling.

2.1.4 Ratio of Girls to Boys in Primary and Secondary Education

The ratio was calculated by looking at the proportion of girls to boys in primary and secondary education. The ratio of girls to boys in primary school is almost 1:1 across wealth group and in rural and urban areas. However, as the years of schooling increases, the ratio declines to 0.87.

Table SEQ Table * ARABIC 6: Ratio of girls to boys enrolment

	Malawi	Poor	Non-Poor	Urban	Rural
Primary	1.07	1.10	1.03	1.20	1.06
Secondary	0.87	0.64	0.95	0.99	0.81

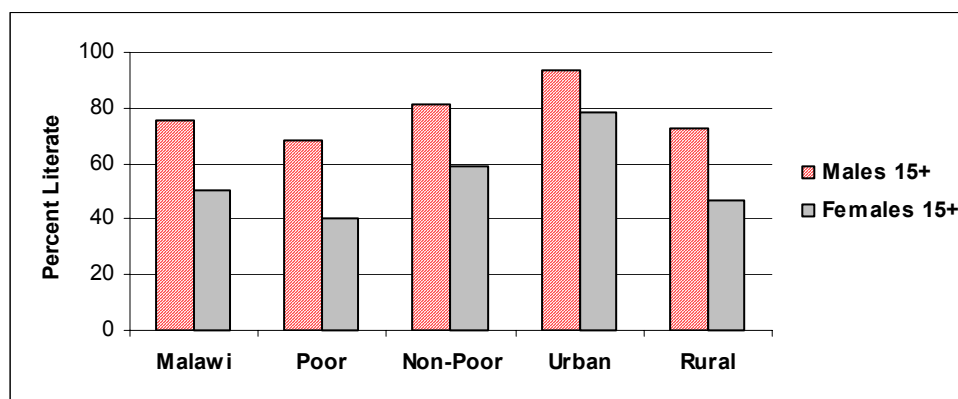
This implies that for every 100-boy student in secondary education, 87 are girls. In addition, the table above depicts that the ratios for boys to girls in

secondary are higher in urban than rural and also between non-poor and poor households. This clearly shows that there is less gender gap for secondary education in urban and non-poor households.

2.1.5 Adult Literacy Rate

Adult literacy rate, defined as the percentage of individuals aged 15 years and older who can, with understanding, both read and write a short, simple statement about their everyday life. The national adult literacy rate is still low at 62.8 percent. Adult literacy rate is higher among males (75.7 percent) than females (50.5 percent).

Figure SEQ Figure * ARABIC 9: Adult literacy rate by wealthy groups by place of residence



Also as expected, the proportion of individuals who can read and write is higher among individuals, both males and females, residing in urban areas than their rural peers. Further, the likelihood of being literate is also high in non-poor households than their counterparts.

2.1.6 Youth Literacy Rate

This was calculated on individuals aged between 15 and 24 years. The overall youth literacy rate is 74.9 percent and is significantly higher than the adult literacy rate. The pattern is similar to the adult literacy rate where the rate is higher for males and urban dwellers.

In addition, the ratio of literate female youth to male youth is 95 percent. This shows that there is not much disparity between young females and males. However, the variation is greater when comparing the youth from different wealth groups. The youth from non-poor households are more likely to be literate (100 percent) than from poor households (85 percent).

2.2 Health and Poverty

2.2.1 Births Attended by Skilled Health Personnel

Births by skilled health personnel, defined as births that were attended by doctor, clinical officer and nurse or mid-wife. There has been slow progress made towards achieving complete births attended by skilled personnel. More births by individuals from non-poor households are likely to be attended by skilled health personnel than their peers.

Table SEQ Table * ARABIC 7: Proportion of births attended by skilled health personnel

	Non-Poor	Poor	All
Malawi	62.2	54.0	57.9
Southern Region	68.5	58.3	62.3
Central Region	55.3	44.7	50.7
North Region	71.5	61.4	66.2
Rural	55.3	53.0	55.3
Urban	84.6	75.2	84.6

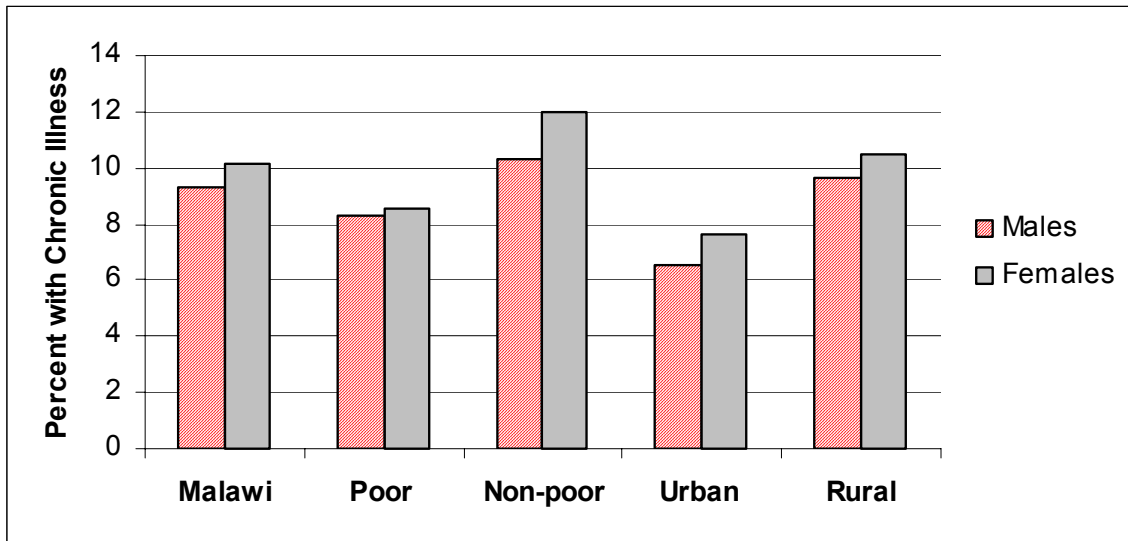
The results of the survey indicate that there is a significant difference between births in urban (84.6 percent) and rural (55.3) being attended by skilled health personnel. However, the difference might be due to a higher rate of births attended by traditional births attendants in rural areas. Regional comparison has shown that more births in the north are attended by skilled personnel than the other regions and central region is the lowest.

2.2.2 Chronic Health problems

The results of the survey indicate that the proportion of individuals suffering from chronic illnesses is highest among non-poor. As chronic illness is self-reported, and not necessarily assessed objectively by a medical practitioner, it may not only capture a person's health status. For example, reporting of chronic conditions may be higher among those who access health services (and have a heightened perception of their health status). On the other hand, low income people may not be financially able to stop working or seek treatment in response to poor health, in which case they may under-report health conditions that would result in days off from work for the non-poor.

The results also show that for both poor and non-poor, more women report having a chronic illness than men and that there are more chronically ill individuals in the rural areas than in the urban areas.

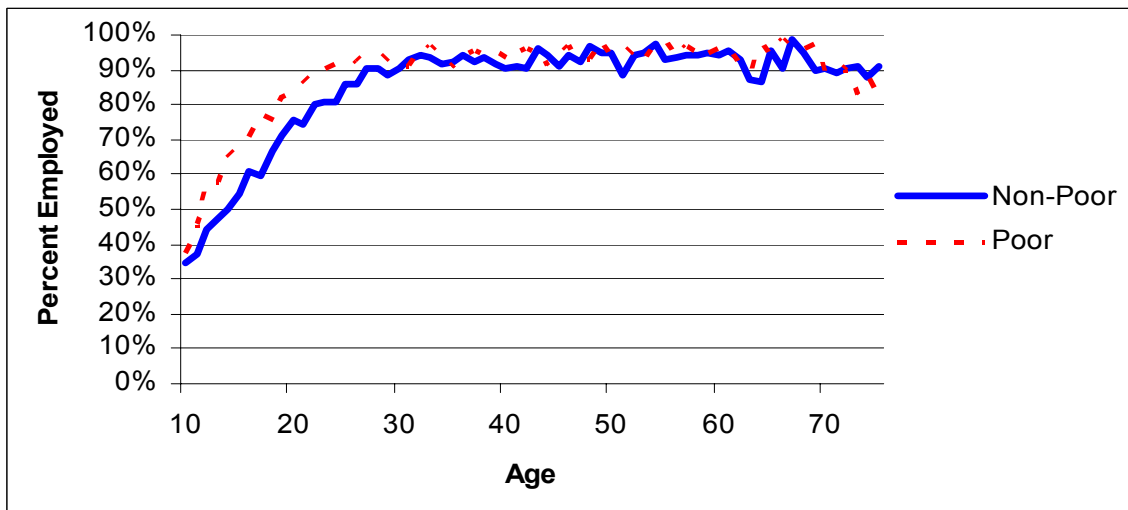
Figure 10: Proportion of persons reporting having a chronic illness-Malawi 2005



2.3 Employment

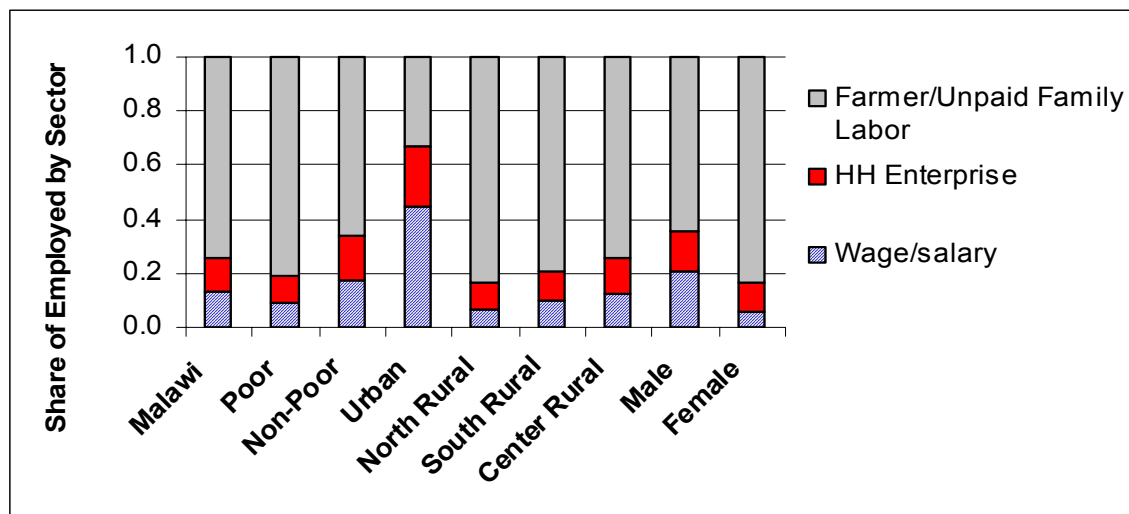
According to ILO, unemployment rate is the proportion of the economically active population who during the reference period was without work, was currently available for work and was seeking work.

Figure 11: Employment by Age and Poverty status



The results in Figure 11 show that there is no much difference in terms of those employed between the poor and the rich and that more poor youth tend to enter the labor market earlier than their non-poor peers.

Figure 12: Share of employed by sector



To get a more nuanced understanding of the employment situation, employment has been classified into three broad sectors: wage/salary employment, self-employment in the non-farm sector (most often small-scale household enterprises), and farming (which includes unpaid family labor). Note that the third category is not comparable to the agriculture sector since some wage employees could be working in that sector.

Among those who are employed, Figure 12 shows that the majority of individuals, especially in the rural areas, are engaged as farmers or unpaid family labor. A larger share of poor people are working as farmers or unpaid family labor than the non-poor. In contrast, wage employment is prevalent among non-poor individuals. Urban individuals have more wage employment opportunities than rural individuals; moreover, wage employment more likely among males.

2.4 Child Nutrition Status

The nutritional well-being of young children reflects households, community and national investments in family health and it directly and indirectly contributes to the country's development. Child nutrition status is calculated using the height and weight measurements for children aged 6 to 59 months in the sample households of the IHS. Using reference distributions, nutrition status is then determined i.e. whether the child is stunted, wasted or underweight.

- I. Stunted children are those children with a low ratio of height for age. This indicates long-term or chronic malnutrition.
- II. Wasting children are those with low weight for height resulting from acute malnutrition, as in a situation of famine
- III. Underweight children are those with low weight for age which is a combination effect of wasting and stunting.

Prevalence of underweight children is the percentage of children under five years of age who are classified as undernourished according to the anthropometric index of nutritional status called weight for age.

Table SEQ Table * ARABIC 8: Proportion of children underweight by sex by place of residence

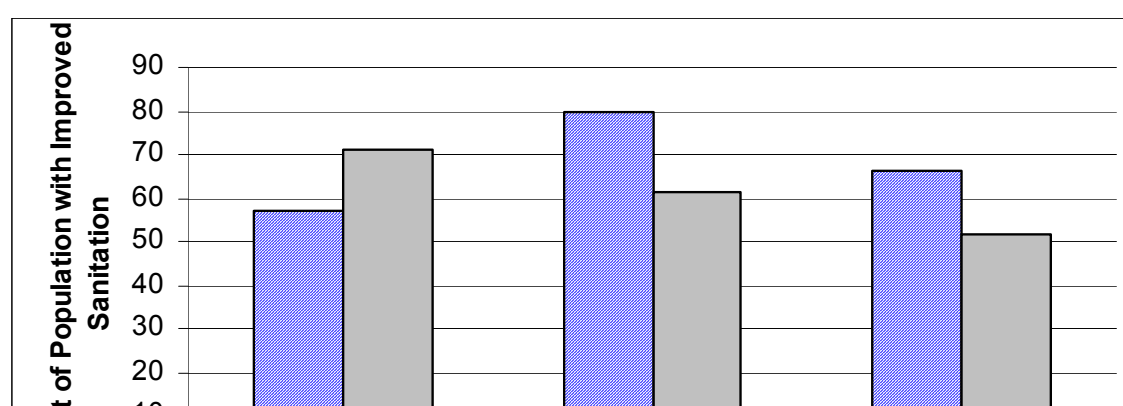
	Malawi	Poor	Non-poor	Urban	Rural
Boys	23.4	24.6	22.1	22.5	23.5
Girls	20.6	21.2	19.8	18.2	20.8
Total	22.0	22.9	20.9	20.4	22.2

The results in Table 8 show that 22.0 percent of children below five years of age are undernourished. The results indicate there is not much difference in the prevalence of malnutrition in urban and rural areas and even between the poor and non poor. This indicates that the problem of malnutrition is spread national wide. In 1998 (IHS1), the underweight prevalence rate was at 29.6 percent. This shows that there has been a slight decrease in the prevalence of underweight children.

2.5 Access to Improved Sanitation

Improved sanitation has been defined as households who reported having flush toilets, Ventilated Improved Pit Latrine (VIP) latrines or traditional latrines with a roof.

Figure 13: Proportion of population with improved sanitation

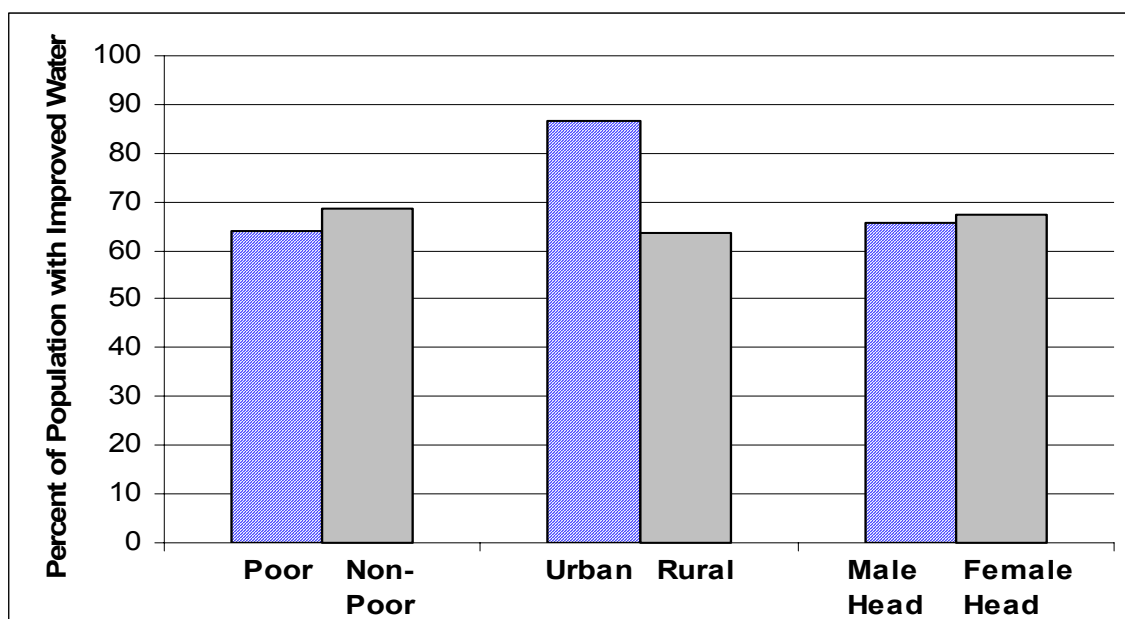


The results in Figure 13 show that 64 percent of the population has access to improved sanitation. The proportions are higher in urban households (79.6%) and households with a male head (66.5%).

2.6 Access to Improved Water

A household's source of drinking water is important because potentially, fatal diseases including typhoid, cholera and dysentery are prevalent in unprotected water sources. Improved water sources are defined as having the main source of water: water piped into dwelling, piped outside dwelling (personal), communal stand pipe, personal hand pump, or communal hand pump.

Figure 14: Proportion of population with Improved Water Source



The results in Figure 14 show that there is no significant difference between the poor and non-poor in accessing improved water. However the proportion is higher in urban than in rural areas, this implies that a person is more likely to have less access to improved water sources in rural areas than in urban areas.

2.7 Crime Victimization

The IHS2 survey also looked at crime victimization in the past year (2003/04). It collected information about personal crime victimization from individuals in the household (over 10 years), as well as information on incidence of crime for the household. Table 9 reports on four of these indicators occurring in the past year: the proportion of people over 10 years who were personally attacked, physically beaten or threatened with violence by someone; incidence of household burglary (whether someone entered the dwelling to steal, to try to steal something, or to commit another crime); and incidence of crop and livestock theft.

Table SEQ Table * ARABIC 9: Proportion of victims of crime by type

<i>In the past year:</i>	All	Urban	Rural	Non-Poor	Poor
Personally attacked, physically beaten, or threatened with violence by someone	4.0	3.3	4.0	4.9	3.0
Someone entered the hh dwelling to steal, to try to steal something, or to commit another crime	14.7	14.3	14.8	16.9	12.0
Animals stolen from household	14.4	4.1	15.8	14.7	14.0
Crops stolen from household	20.6	2.9	22.3	20.9	20.1

The results in Table 9 show that a very small fraction of people reported to have been assaulted. The most reported crime was burglary (equally prevalent in urban and rural areas) and theft of crops and livestock (most prevalent in rural areas).

2.8 Access to Social Safety Nets

The IHS2 included information on households that benefited from any of the three safety nets programs in 2003/04. These three programs are Targeted

Input Program (TIP), Public Works Program (PWP) and the Targeted Nutrition Program (TNP).

Table SEQ Table * ARABIC 10: Proportion of households receiving safety nets by type of safety nets

	Malawi	Poor	Non-poor	Urban	Rural	Male-headed	Female-headed
TIP	42.1	48.8	36.9	6.5	46.9	40.1	48.8
PWP	4.0	5.2	3.0	0.4	4.4	3.9	4.1
TNP	4.1	4.2	4.0	0.5	4.6	4.1	4.2

From the results shown in Table 10, we can see that 42.1 per cent of the households benefited from the TIP program, majority of which were the poor in the rural areas, and more female headed households received TIP than male headed households.

Furthermore, the results show that only 4 per cent of households benefited from either PWP or TNP. There is no significant difference between the poor and the non – poor household for the TNP.

Appendix 1: Comparable Poverty Estimates for 1998 and 2005

This note describes the methodology used to develop comparable poverty indicators for Malawi from the two rounds of the Integrated Household Surveys. The first survey (IHS1) was administered in 1997-98. The second (IHS2) was administered in 2004-05. The issue of comparing welfare or poverty across time and surveys is not new. There is a large and expanding literature on how best to compare welfare indicators from two non-similar surveys. Changes in data collection methods, questions asked, etc., make direct comparison of poverty statistics problematic. This is the dilemma facing the analysis of the IHS data. There were some key differences in the surveys which are detailed in the Basic Information Document. As the poverty statistics rely on consumption expenditure data, one of the most critical differences in the IHS data rounds is how these data are collected. The IHS1 used a diary method to record consumption expenditure for food and frequently purchased items. The IHS2 was redesigned in part to take into account the experiences from IHS1 (both in terms of the fieldwork and subsequent analysis). A major redesign was to collect consumption expenditure information by using recall periods for all food and nonfood consumption expenditure (for example, 7 day recall for food) rather than a diary. Diaries are expensive and difficult to collect accurately especially among rural and illiterate populations. Thirty-eight percent of the 10,698 households in the IHS1 did not complete the diary (or the diary of expenditure was not consistently maintained). On the other hand, the food-recall method is, internationally, a common substitute to the diary for consumption measures to assess poverty. However, the levels of consumption between the two surveys are not directly comparable.

Given these and other revisions to the survey methodology, **the previous poverty estimates produced from the IHS1 should not be compared to the new poverty estimates from the IHS2.** Rather, new poverty estimates

must be computed from the IHS1 following a comparable approach used with the IHS2 data.

There are numerous non-income dimensions which are directly comparable between IHS1 and IHS2, such as child malnutrition, school attendance, asset ownership, and employment activities. Nevertheless, income poverty is often taken as a primary, singular measure of progress in fighting poverty. Therefore, it is necessary to develop a poverty measure for IHS1 which can, in fact, be compared to the IHS2 poverty measure.

The approach used in developing a revised 1998 poverty estimate, one which is comparable to the IHS2 estimate, follows recently-developed statistical techniques. We develop a comparable poverty measure in IHS1 by first imputing the consumption expenditures in IHS1 (described below). The methodology originated in Elbers et. al. (2002, 2003) and has since been widely applied in different countries, in particular for poverty maps, but also for survey-to-survey imputations (as used here). For example, this method is used to estimate population prevalence of HIV in Malawi, for lack of population-based data (Ivaschenko and Montana, 2005). An example closer to the situation in this note is from India where surveys were changed between rounds. Kijima and Lanjouw (2003) use the methodology to impute poverty at the regional level in India. Finally, recent work from Uganda is also very similar to the situation in Malawi in that the surveys changed over time drawing into question the comparability of the poverty estimates (Luoto, 2005). Examples of a more simplified approach to the one used in these papers is the estimate of poverty status for households in the NSO's Core Welfare Indicator Questionnaire (CWIQ) 2002. Likewise, the IHS1 itself actually *imputed* per capita expenditure and poverty status for 38% of the 10,698 households in the survey (noted above). The imputation approach in IHS1 for these missing households is a simplified version of the approach described below. It was based on one regression model of per capita expenditure, whereas the approach here uses 4 region-specific models, 100

simulations, and estimates of otherwise omitted disturbance terms, for an improved fit.

The steps involved in computing a comparable IHS1 poverty estimate are: 1) estimate per capita expenditure for IHS1 households based on a model of per capita expenditure developed from IHS2 using a set of household characteristics measured in both surveys, and 2) estimate poverty rates for households using the imputed per capita expenditure, applying the IHS2 poverty lines. The main assumption imbedded in this approach is that the correlation between poverty and the set of household characteristics has not changed significantly over time.

To model this we first run a Generalized Least Squares (GLS) regression of the observed log per capita expenditure for household h as:

$$(1) \quad \ln y_h = \mathbf{x}_h \boldsymbol{\beta} + u_h,$$

where $\mathbf{x}_h \boldsymbol{\beta}$ is a vector of k parameters and u_h is a disturbance term satisfying $E[u_h | \mathbf{x}_h] = 0$. The set of household characteristics is in vector \mathbf{x} (described in Table 1.1). The model in (1) is estimated separately for four regions (urban, north rural, central rural, south rural) using the IHS2 data. In a simple model of expenditure, we would impute values of per capita expenditure for IHS1 households, based on the set of \mathbf{x} covariates and the estimated $\boldsymbol{\beta}$ values. However, we can improve up on this estimate as follows. Because the disturbance term for households in the target population (IHS1 in this case) are always unknown, we estimate the expected value of the indicator given the IHS1 households' observable characteristics and the model of expenditure in (1). We denote this expectation as:

$$(2) \quad \mu_v^s = E[W | \mathbf{X}_v^s, \boldsymbol{\xi}],$$

where $\boldsymbol{\xi}$ is the vector of model parameters, including those which describe the distribution of the disturbances, and the superscript 's' indicates that the

expectation is conditional on the sample of IHS1 households from district v rather than a census of households.

In constructing an estimator of μ_v^s we replace the unknown vector ξ with consistent estimators, $\hat{\xi}$, from the IHS2 expenditure regression. This yields $\hat{\mu}_v^s$. This expectation is generally analytically intractable so simulation is used to obtain our estimator, $\tilde{\mu}_v^s$. One hundred simulated draws are performed to derive our estimator for $\hat{\mu}_v^s$ in each of the four models (urban, north rural, central rural, south rural). The four models use household weights and therefore serve as estimates for the *population* considered and not just the sample at hand. See Kijima and Lanjouw (2003) for more detail on the prediction error associated with our estimator $\tilde{\mu}_v^s$ of the expected value of per capita expenditure for a given region.

For the estimations we used the *povmap* program that builds on the methodology outlined. The *povmap* program is a program developed by the World Bank which is designed to make poverty maps based on a survey and a census. The program is still under development. As noted above, we estimate four models, which allows the estimated parameters β to vary across the four areas and give a better fit of the models. For the simulations, we ran 100 simulations and used non-parametric distributions for both cluster draws and household draws. The explanatory variables used can be seen in Table 1.1 below, in addition to district indicator variables.

After estimating per capita expenditure 100 times for every IHS1 household, the *povmap* program then computes the poverty indicator (poor or non-poor) for each household's simulated per capita expenditure. Thus, every household has 100 imputed values for being poor. The median value is assigned to that household for the final computation of the poverty rate in IHS1.

Table 1.2 shows the imputed poverty rates for IHS1 and compares them with the IHS2 poverty estimates.

Table 1.1: Descriptive statistics of variables to impute IHS1

	IHS1	IHS2
Demographic		
Household head is male*	0.75	0.77
Proportion of females in household	0.51	0.51
Spouse of household head is present*	0.66	0.72
Number of household members	4.31	4.55
Dependency ratio	0.39	0.43
Welfare		
Renting house*	0.15	0.10
Own water supply*	0.06	0.06
Collects firewood*	0.77	0.75
Household owns bed*	0.35	0.32
Household owns table*	0.35	0.36
Household owns chair*	0.44	0.45
Household owns refrigerator*	0.03	0.02
Household owns stove*	0.05	0.03
Household owns washing machine*	0.00	0.00
Household owns tv*	0.02	0.04
Household owns bicycle*	0.32	0.36
Household owns motorcycle*	0.01	0.00
Household owns boat*	0.01	0.01
Household owns axe*	0.55	0.63
Household owns sickle*	0.36	0.55
Household owns panga*	0.46	0.62
Household owns ox*	0.02	0.02
Education		
All kids 6-12 years old in school*	0.36	0.36
No kids in the household*	0.48	0.45
Adult females highest education: standard 5-8*	0.26	0.30
Adult females highest education: standard 8 *	0.07	0.13
Head education: standard 1-4*	0.23	0.24
Head education: standard 5-8*	0.34	0.41
Head education: higher than standard 8*	0.14	0.28
Labor market		
Household has enterprise*	0.22	0.31
Proportion of adults employed	0.64	0.60

Notes: Dummy variables for districts were also included. * indicates binary variables which are 1 if description is true for the household, else 0.

Table 1.2: Poverty Rates for 1998 and 2005

	1998 IHS1	2005 IHS2
Malawi	53.9	52.4
<i>by Region</i>		
Urban	19.6	25.4
North rural	55.9	56.3
Central rural	48.1	46.7
South Rural	67.2	64.4

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