The Status of Hunger and Malnutrition in Zambia: A Review of Methods and Indicators

By

Rhoda Mofya Mukuka and Musonda Mofu

Technical Paper No. 5

June, 2016.

Indaba Agricultural Policy Research Institute (IAPRI)
Lusaka, Zambia
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The Indaba Agricultural Policy Research Institute (IAPRI) is a non-profit company limited by guarantee and collaboratively works with public and private stakeholders. IAPRI exists to carry out agricultural policy research and outreach, serving the agricultural sector in Zambia so as to contribute to sustainable pro-poor agricultural development.

This technical report was carried out in partnership with the National Food and Nutrition Commission (NFNC) in consultation with the Civil Society Organisation for Scaling up Nutrition (CSO-SUN), the Central Statistical Office (CSO) and the Food and Agriculture Organisation (FAO) office in Zambia. The authors are grateful to the Ministry of Agriculture (MoA) through the Permanent Secretary's office for requesting IAPRI and NFNC to carry out this study.
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Any views expressed or remaining errors are solely the responsibility of the authors.

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EXECUTIVE SUMMARY

Hunger, undernourishment, and malnutrition rates for Zambia have been reported in different publications as being extremely high and among highest rates in the world. The most recent statistics on undernourishment by Food and Agriculture Organisation (FAO), International Fund for Agricultural Development (IFAD) and World Food Programme (WFP) (2014) ranked Zambia as having the highest levels in Africa and second from the bottom in world at 48%, a figure which is projected for 2014 to 2016. The MoA, is among key stakeholders, which have queried these statistics given that Zambia recently experienced back to back surpluses in maize production which provides 70 percent energy supply requirement. This technical paper reviews the status of undernourishment, hunger and malnutrition in Zambia, examining how the rates have been calculated. It also explains the likely causes of the high rates of hunger and malnutrition in Zambia.

Secondary data and published survey reports were used to examine the data and methods used to calculate Undernourishment, Hunger index, Food provisions and Malnutrition. To assess the levels and track trends in nutritional status for Zambia, the study also used results generated from the Zambia Demographic Health Survey (ZDHS) and the Living Conditions Monitoring Survey (LCMS). ZDHS and LCMS are the only national level surveys which provide data on nutrition and since they are not conducted in the same years, each one of them is an important alternative data source.

The paper found some methodological issues in the calculation of undernourishment by FAO, which is also a component in the calculation of the hunger index. For example, the level of undernourishment calculated by FAO was reported as a population estimate, and hence ignores the variation that may exist in the country.

However, the undernourishment rates are similar with those generated from IAPRI/MAL/CSO survey, IFPRI Hunger Index and the figures from ZDHS. All the rates range between 40% and 48%, an indication that hunger and malnutrition are likely to be at alarmingly high rates, particularly at lean times of the year around September to February.

For Zambia to improve food security and reduce hunger, it should ensure that children and their families have access to enough diverse and good-quality foods, clean water and safe

sanitation. In addition, there is need child care capacity building programs at community and household level through different Government and non-government interventions. On the other hand, one reason Zambia may have ranked poorly in the State of Food Insecurity (SOFI) report compared to other similar countries is lack of good information on food consumption at household level. There is need to update the data on household food consumption levels.

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1. INTRODUCTION

This report outlines the findings and recommendations of a team of experts constituted by MoA to investigate the state of food security and undernutrition in Zambia and provide a detailed and accurate account of the situation as it is. The team was set up to primarily probe questionable statistics used as the basis of a presentation made during the IFPRI/IAPRI/CSO-SUN dialogue meeting on Food and Nutrition Security held in Lusaka on the 8th of December 2015. Drawing statistics from the 2014 FAO/IFAD/WFP SOFI report, the presentation showed that Zambia had the worst food security status in Africa and ranked second in the world, with 48 per cent of the population being malnourished or food insecure. These citations were contrary to the fact that Zambia had produced food surpluses for most of years in the past decade, meeting 70 percent energy supply requirement from staples. According to the MoA this paradox required independent verification by a broad-based team of experts.

The team, which was coordinated by IAPRI and drew expertise from NFNC, CSO-SUN, Food and FAO and the CSO was also mandated to examine the claim in the 2014 DHS report that about 40 per cent of children under the age of five in Zambia were stunted. This report outlines the findings and recommendations of the team.

Various published survey reports and research articles were used as a basis for discussion and for assessing the methods for measuring undernourishment, hunger and malnutrition as reported in the SOFI report, the Global Hunger Index and the 2013/14 ZDHS report on nutrition. It also uses results from other ZDHS and the LCMS reports over the years to assess the trends and the current status.

The rest of the paper is organized as follows: Section two discusses the measures and indicators of undernourishment/hunger and malnutrition; section three reviews the ranking for Zambia and; the conclusions are presented in section four.

2. STATUS, MEASURES AND INDICATORS OF UNDERNOURISHMENT, HUNGER AND MALNUTRITION

In this section, we discuss in detail the undernourishment/hunger and nutrition status in Zambia and how the indicators are calculated. The sections first defines what undernourishment is and its definition differs with that of malnutrition.

2.1 Definitions of Undernourishment/Hunger and Malnutrition

Undernourishment and malnutrition represent two different but interrelated human outcomes. The former is a term used to denote lack of sufficient calories (energy) in the diet, and is therefore synonymous with hunger (FAO, IFAD and WFP, 2014). According to FAO, it is the deprivation of food with calorie consumption of less than 1,800[1] kilocalories per day, which is the minimum that most people require to live a healthy and productive life (FAO, IFAD and EFP, 2014). On the other hand, malnutrition is defined as the state that develops when the body does not get the right amount of the vitamins, minerals and other nutrients it needs to maintain a healthy body.[2]

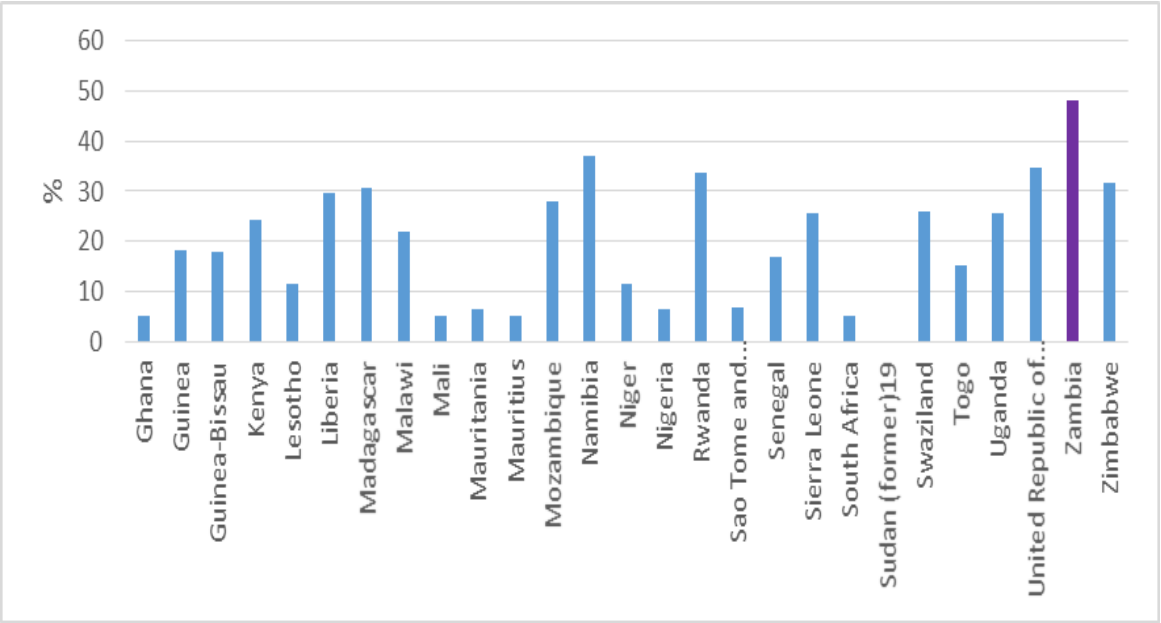
2.2 Status of Undernourishment

In the FAO, IFAD and WFP (2014) SOFI report, Zambia was reported as having around 48% of its population undernourished (hungry) as shown in Figure 1. Currently, the global average of undernourishment is 11.3% and 23.8% in Africa. With an estimated undernutrition rate of 48%, Zambia is far worse than most countries and as ranks as the worst in Africa and second from the bottom worldwide (FAO, IFAD and WFP, 2014). The 2014 report has SOFI projects for a period of three year 2014-2016. Figure 2 shows the regional averages clearly indicating that Africa rates have been and continue to be the worst in the world.

[1] This value can range from 1,650 to more than 1,900 kilocalories per person per day for developing countries in 2014–2016. Each country's average minimum energy requirement for low physical activity is used to estimate undernourishment (FAO/IFAD/WFP 2014).

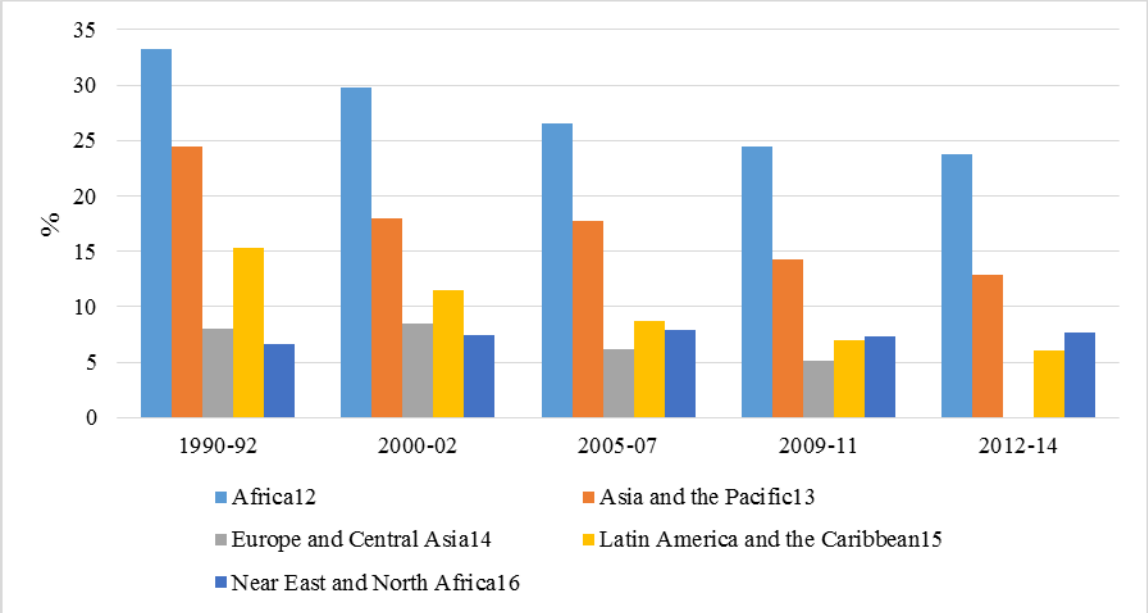
[2] http://medical-dictionary.thefreedictionary.com/malnutrition

Figure 1: Level of Undernourishment by Country in Africa



Source: FAO**,** IFAD & WFP, 2014

Figure 2: Level of Undernourished Population by Continent



Source: FAO, IFAD & WFP, 2014

2.2.1 Measures and Indicators of Undernourishment

According to the FAO, IFAD and WFP (2014), undernourishment is calculated using the dietary energy consumption (DEC) and dietary energy requirement (DER) as random variables to estimate undernourishment. Both the DEC and the DER are expressed as kilocalorie intake per person per day. When DEC is equal to DER, then this would be regarded as a state of adequate nourishment. However when the dietary energy consumption is less than the dietary energy requirement (DER>DEC), then this is classified as a state of undernourishment.

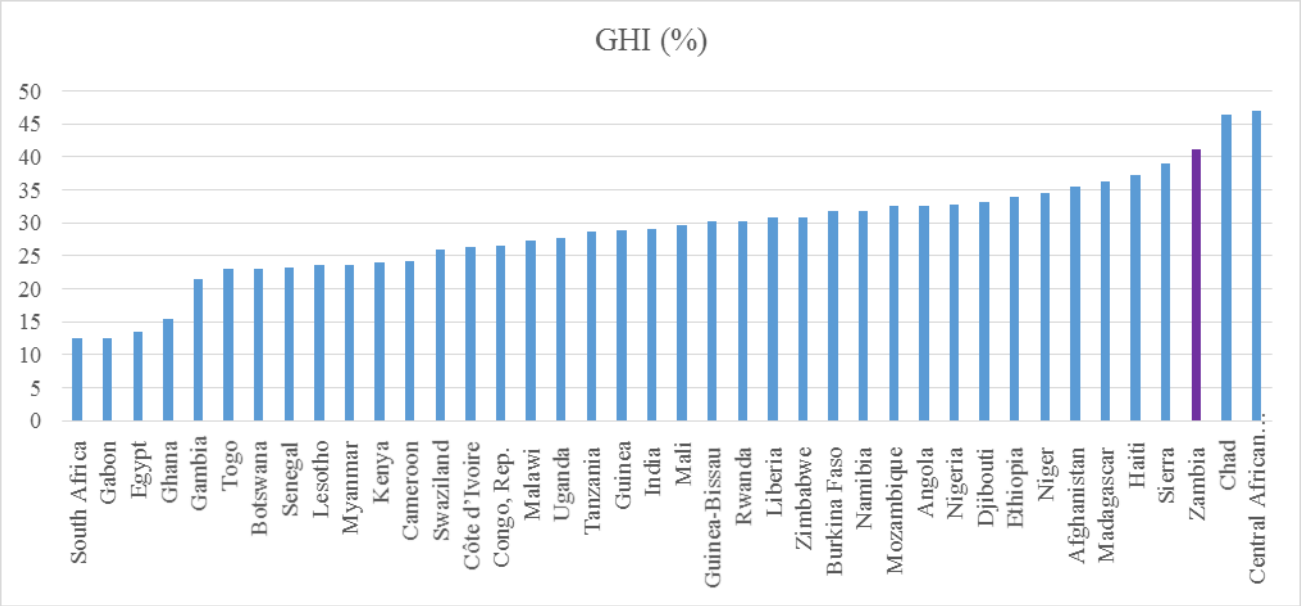
Therefore, the prevalence of undernourishment is measured as the proportion of individuals in a population with DEC below the individuals' respective DERs (Naiken, 2014). FAO collects DEC information from individual countries based on food consumption data collected in national consumption/expenditure surveys. However, DER is not an observed variable but a normatively derived measure that is subject to random variation (Naiken, 2014).

2.3 The Global Hunger Index – Zambia Status

The International Food Policy Research Institute (IFPRI) calculates the Global Hunger Index (GHI) every year in order to keep track on the progress or regression of hunger in the world. According to the 2015 Global Hunger Report, the GHI for Zambia is 41.1% and it is among the three highest rates of Hunger in Africa and in the world (Figure 3). [3]

[3] The GHI for Burundi, Comoros, the Democratic Republic of the Congo, Eritrea, Papua New Guinea, South Sudan, Sudan, and Syria, has not been calculated due to lack of data on undernourishment (IFPRI, WHH, Concern World Wide, 2015).

Figure 3: Global Hunger Index by Country in Africa



Source: IFPRI, Welthungerhilfe & Concern Worldwide, 2015

2.3.1 Global Hunger Index - Measures and Indicators

Unlike the SOFI report, the GHI takes cognisance of the fact that hunger is a multidimensional problem and therefore combines the following components in the calculation of the index:

- undernourishment which is as measured in the SOFI report discussed above. It is basically a share of the population with insufficient caloric intake;
- child wasting: the proportion of children under the age of five who suffer from wasting (that is, low weight for their height, reflecting acute undernutrition);
- child stunting: the proportion of children under the age of five who suffer from stunting (that is, low height for their age, reflecting chronic undernutrition); and
- child mortality: the mortality rate of children under the age of five. (partially reflecting the fatal synergy of inadequate nutrition and unhealthy environments)

Previously, underweight was included instead of wasting and stunting, but this has since been revised. In part this is because a child may have a normal weight, or even be overweight for its age, but may be stunted (IFPRI, Welthungerhilfe, Concern Worldwide, 2015).

To arrive at the GHI, each of the four components is first given standardised score based on the thresholds which are set slightly higher than the country-level highest value observed world-wide for that indicator between 1988 and 2013 (IFPRI, Welthungerhilfe, Concern Worldwide, 2015). The standardised scores are then aggregated to calculate the GHI score for each country. Each indicator is given a weighted such that undernourishment and child mortality each contribute one-third of the GHI score, while the child undernutrition indicators (child wasting and child stunting) each contribute one-sixth of the score. Table 3 shows the components, the weighting of each component and what each component measures.

Table 1: Dimensions and Indicators for Measuring GHI

Dimensions	Indicator	Weight	Reasons for inclusion
Inadequate food supply (FAO)	Undernourishment	1/6	▪ Measures insufficient food supply, an important indicator of hunger ▪ Refers to the entire population, both children and adults ▪ Used as a lead indicator for international hunger targets
Child undernutrition (UNICEF, WHO, World Bank)	Wasting	1/3	Goes beyond calorie availability, considers aspects of diet quality and utilisation ▪ Children are particularly vulnerable to nutritional deficiencies Is sensitive to uneven distribution of food within the household ▪ Stunting and wasting are the suggested nutrition indicators for the Sustainable Development Goals (SDGs)
	Stunting	1/3	
Child mortality (Inter-agency Group for Child Mortality Estimation (IGME))	Under-five mortality rate	1/3	Death is the most serious consequence of hunger, and children are most vulnerable Improves the GHI's ability to reflect micronutrient deficiencies Wasting and stunting only partially capture the mortality risk of undernutrition

Source: IFPRI, Welthungerhilfe & Concern Worldwide, 2015

This calculation results in GHI scores on a 100-point scale where 0 is the best score (no hunger) and 100 the worst. Table 2 shows the severity of hunger from low to extremely alarming levels. Zambia, with a rate of 41.1% falls in the category of alarming rates.

Table 2: Severity of Hunger

< = 9.9	10 to 19.9	20.0 – 34.9	35 – 49.9	> = 50.0
Low	Moderate	Serious	Alarming	Extremely Alarming

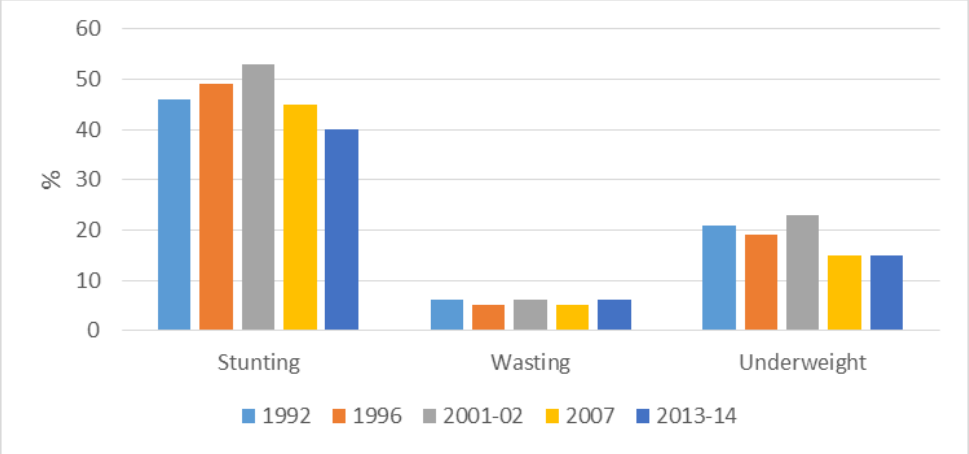
Source: IFPRI, Welthungerhilfe and Concern Worldwide, 2015

2.4 State of Malnutrition

In terms of malnutrition, the most recent Zambia Demographic and Health Survey (ZDHS), carried out in 2013/14, revealed that 40% of children under the age of five were stunted, 5% wasted, 15% underweight, and 9% of children were estimated to be overweight. At 40% stunting rates, Zambia's malnutrition levels are among the highest in the world. However, the rates have shown a reduction trend in the last 10 years has shown in Figure 4.

In the case of women, the situation exemplifies the double-burden of malnutrition, with 10% (8% urban and 11% rural) underweight (BMI <18.5 kg/m^2), and 19% (30% urban and 11% rural) overweight or obese (BMI ≥ 25.0 kg/m2) (CSO, 2015).

Figure 4: Trends in Stunting, Wasting and Underweight. 1992 to 2013-14

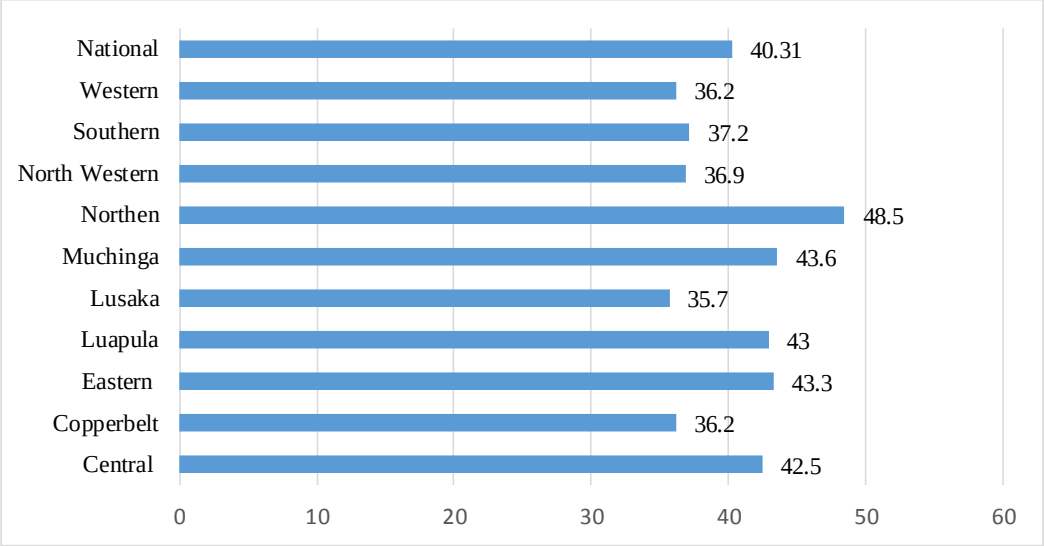


Source: LCMS and DHS Various years

Despite the agricultural growth that the country has experienced during in the last decade, levels of malnutrition in the form of stunting, underweight and wasting have barely changed in the population since 1992 and earlier. In 2013-14, five out of the ten provinces of Zambia (Northern, Eastern, Luapula, Muchinga and Central provinces) had stunting rates above the national average Lusaka, Western and Copper-belt provinces have the lowest rates as shown in Figure 5.

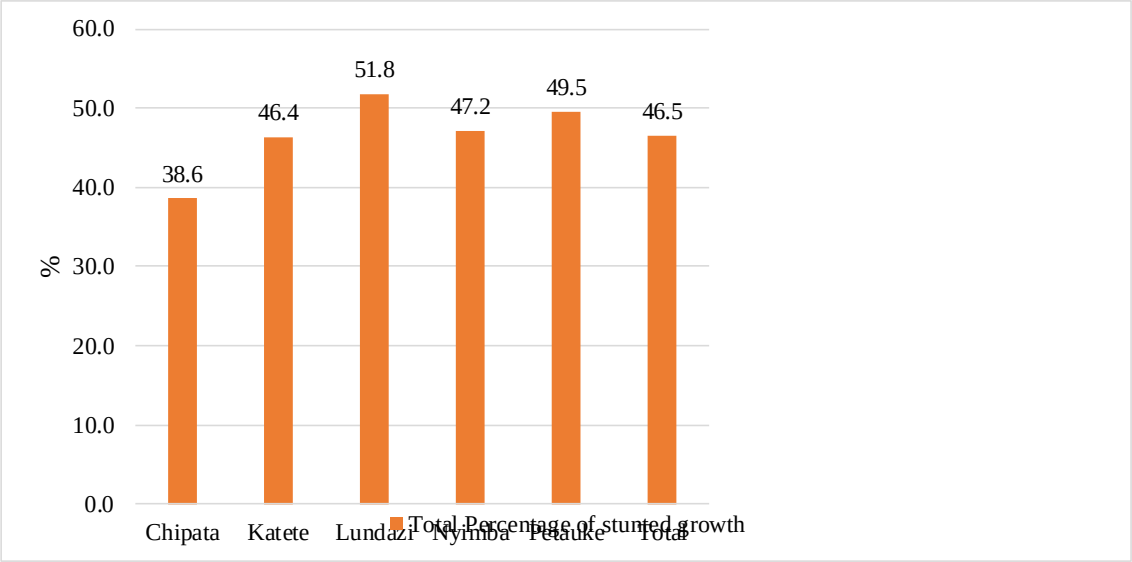
Another study on nutrition status in five districts in Eastern province that was carried out by USAID's Feed the Future project in 2012 found similar stunting rates. The average rate for the five districts was 46% as shown in Figure 6.

Figure 5: Stunting Rates by Province



Source: DHS 2013-14

Figure 6: Stunting Rates for Eastern Province



Source: USAID Feed the Future Population Based Survey

2.4.1 Indicators for measuring Malnutrition

Anthropometric measurements, defined as body dimensions and composition, have become increasingly useful tools for examining an individual's body parameters to indicate nutritional status or even the extent and severity of malnutrition in a given population. The most widely used measurements are the weight and height which may be combined to examine nutritional status (WHO, 1995).

Growing children need adequate quality of nutrients from food as well as quantity of calories, they need clean water and adequate sanitation to avoid disease, and they and their mothers need to be well fed and cared for, particularly in the first 1000 days from conception to age of 2 and beyond. If all of these elements are in place, children anywhere in the world can grow healthily. In fact, children grow proportionally at remarkably similar rates to the age of five years old, even if their final attained height in adulthood varies due to other factors (Habicht et al, 1974). It is known that the socio-economic status of a child (and therefore their ability to access the elements described above) makes much more difference to their pattern of growth than their genetic background at this young age.

This pattern of growth is therefore used to measure a child's nutritional status. If a child's height is significantly below the average of healthy, well-fed children of the same age and sex, that child is known to suffer from chronic undernutrition due to a lack of one or more of the elements above, and is known to be stunted (a term used to denote chronic undernutrition. However, undernutrition is different to undernourishment, which is only about lack of energy from calories).

The use of weight and height as nutritional indicators are specific to age of individuals. While for adults, the idea is to explain the body composition, body-mass-index (BMI) is popularly used. However, for children below the age of 5, the idea is to explain the growth. In that case the core indicators used are weight-for-age (W/A), height-for-weight (H/W) and height-for-age (H/A). Growing children need adequate quality of nutrients from food as well as quantity of calories, they need clean water and adequate sanitation to avoid disease, and they and their mothers need to be well fed and cared for, particularly in the first 1000 days from conception to age 2 and beyond. Most Zambians cannot afford a diet that would be considered nutritious[4]

The W/A, W/H and H/A are used to compare a child or group of children with a reference population. This reference was initially based on a population of children in the United States of America (USA) which was defined by the National Centre for Health Statistics (NCHS) and accepted by the US Centre for Disease Control in the 1960s. More recently, WHO completed a new study (WHO Multicentre Growth Reference Study, WHO, 2006), which provides a new reference point. The study which was conducted among 8,440 children in six countries (USA, Norway, Brazil, Ghana, Oman, and India) is used on the understanding that young children of all population groups, regardless of the ethnic grouping or feeding practices, tend to follow very similar growth patterns under optimal conditions.

Anthropometry measures are constructed from indices and as such are referred to as 'indicators'. For example the proportion of children below a certain level of weight-for-age is widely used as an indicator of the community nutritional status. Each of these indices W/A, W/H and H/A are expressed in terms of Z-scores which is the deviation of the value for an

[4] Zambia cost of diet report 2013

individual from the median value of the reference population divided by the standard deviation (SD) for the population (WHO, 1995). The Z-score is expressed as:

$$\text{Z-score or SD score} = \frac{\text{Observed Value} - \text{Median reference value}}{\text{Standard deviation of the reference population}}$$

The indices are generated using the WHO "igrowup" software package. Other expressions of the anthropometry index are percentile and the percentage median. Studies show that the Z-score has more advantages than the percentile and the percentage median in that it is able to detect changes at the extremes of the distribution. In some cases, birth weight is used to assess nutritional status of new-borns as well as of the mother during pregnancy (See Chevassus-Agnès, 1999). Ideally, anthropometry measures analyses the response of the body dimensions, composition and growth to the quantity and composition of food intake. The measures provide insights into whether an individual or a population needs nutrition interventions.

Each of the indices, W/A, W/H and H/A provide different nutritional information. The Height-for-Age index explains the linear growth of a child. A Z-score of below minus two standard deviations (<-2 SD) from the median of the reference population indicates stunted. Children falling in this category are considered short for their height, an indication of chronically malnourished and recurrent illness. Below minus three (<-3 SD) from the median of the reference population is an indication of severely stunted. Therefore the Height-for-Age indicator does not only explain the current status but also the future risks as the effect is chronic. In that case policy interventions should be directed towards long-term solutions.

Weight-for-Height explains acute malnutrition and therefore requires speedy interventions. Similarly, a Z-score of <-2SD from the median of the reference population means the child is thin for the height, a condition referred to as being wasted. Children whose Z-score falls below minus three (<3SD) a considered severely wasted. Inadequate nutrition prior to the survey or acute illness leading to sudden loss of weight may be the cause of wasted children.

Studies show that height-for-age has greater sensitivity[5] than Height-for-Weight in identifying children that are likely to die in the next two years (WHO, 1995).

The Weight-for-Age indicates underweight, a condition resulting from both chronic and acute malnutrition. A Z-score of below minus two standard deviation (<-2 SD) from the reference population indicates underweight while <-3 SD indicates severe underweight.

[5] Sensitivity explains the anthropology indicator in relation to death.

3. REVIEW OF HUNGER AND MALNUTRITION RATINGS FOR ZAMBIA

The researchers found the calculation of undernourishment for Zambia problematic. Firstly, the level of undernourishment calculated by FAO is reported as a population estimate, hence ignores the variation that may exists in a country. Secondly, a major shortcoming in Zambia is that national consumption surveys, from which DEC can be derived have not been carried out consistently with the last survey carried out in 1971. Therefore, in the absence of consumption survey-derived DEC, the FAO estimated the country's undernutrition index based on 'food balance sheets' which in Zambia are based on the annual crop forecast survey results. The total amount of calories available in a country is then divided by the number of people in the population to derive an average number of calories available per person. The average number of calories available per person was then compared to the DER with all those falling below the DER classified as undernourished.

There are evident flaws with this method of calculation, as it is very difficult to get accurate data on exactly what is produced, particularly in a country like Zambia with many small-scale farmers who produce crops for their own consumption, and with a tradition of collecting wild foods if crops fail or during lean seasons. In addition, averaging available calories throughout the population ignores the fact that calorie availability is in fact unequally distributed between richer and poorer parts of the population.

Thirdly, Zambia has not had a national food consumption survey since 1971 to obtain updated information on the DEC. Many available micronutrient surveys are limited to few areas and only targeting specific geographical areas and limited in scope. In addition, over the last decade, there have been considerable social, economic and demographic changes in Zambia impacting the food consumption patterns of both rural and urban populations (Mason and Jayne 2009; Chapoto et al 2010) but the FAO estimate is static and is not able to capture population composition and changes. Thus, in the absence of a recent nationally representative food consumption data to base the DEC it may be difficult to believe the under nourishment ranking. Also, these surveys are critical to the planning and implementation of effective nutrition interventions.

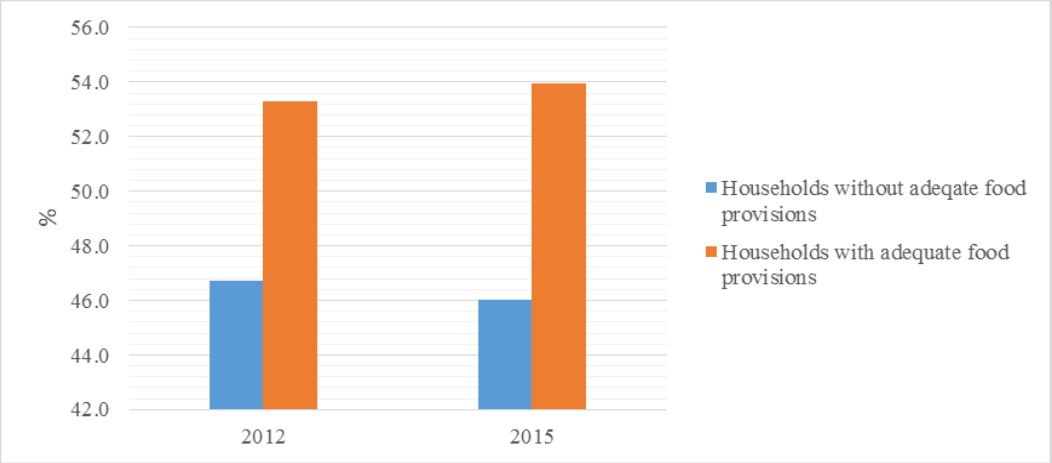
Third, Naiken (2014) also found methodological problems with FAO's estimation of undernourishment, stating that the method yields an underestimate of the magnitude of the prevalence undernourishment in a population. The Naiken (2014) study found that even after averaging the daily energy intakes of each individual in the reference group over a number of days to derive DEC, there remained significant differences between the usual DECs of the individuals in the reference group.

However, the study found that despite these flaws, the undernourishment indicator is a useful guide to the availability of dietary energy at a population level, and in particular to look at changes over time. In Zambia, the number of undernourished people by this measure has risen steadily since 1990, and the proportion of the population going hungry has remained almost at the same level since 2000.

3.2 What do alternative data sources say about undernutrition in Zambia

In order to triangulate the level of undernutrition in Zambia, the study considered household provision data from the Rural Agricultural Livelihood surveys (RALS). IAPRI working together with Ministries of Agriculture and Livestock and the CSO carried out the RALS a nationally representative survey with 8839 households and 7934 households in 2012 and 2015 respectively. The reference period for the 2012 survey was the 2011-12 agriculture marketing period while it was 2013-14 for the 2015 survey. To examine the rate of hunger among the households, the respondents were asked to indicate the number of months in which they experienced inadequate household food provisions. The results showed that in 2012, 46.7% of the households experienced hunger and this figure remained the same in 2012 as can be seen in Figures 7.

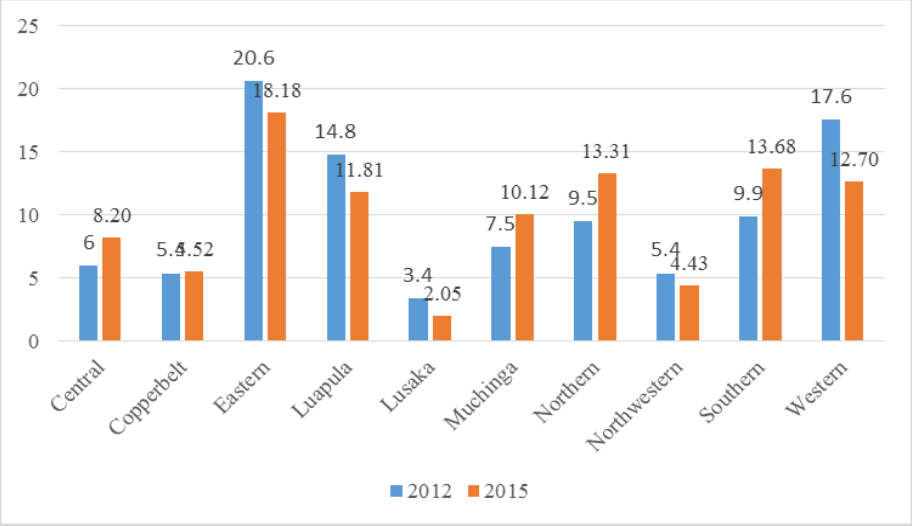
Figure 7: Percent of Households Experiencing hunger in 2012 and 2015



Source: IAPRI/CSO/MAL, 2012 and 2015

Similarly, the pattern of hunger rates across the provinces has not significantly changed between 2012 and 2015. In both cases the Eastern Province records the highest prevalence with 20.6% in 2012 and 18.2% in 2015. Lusaka Province remains the lowest with 3.4% in 2012and 2.0% in 2015 (Figure 8). These variations across the provinces are an indication that even the FAO food insecurity levels could be a result of effects in some provinces more than in others.

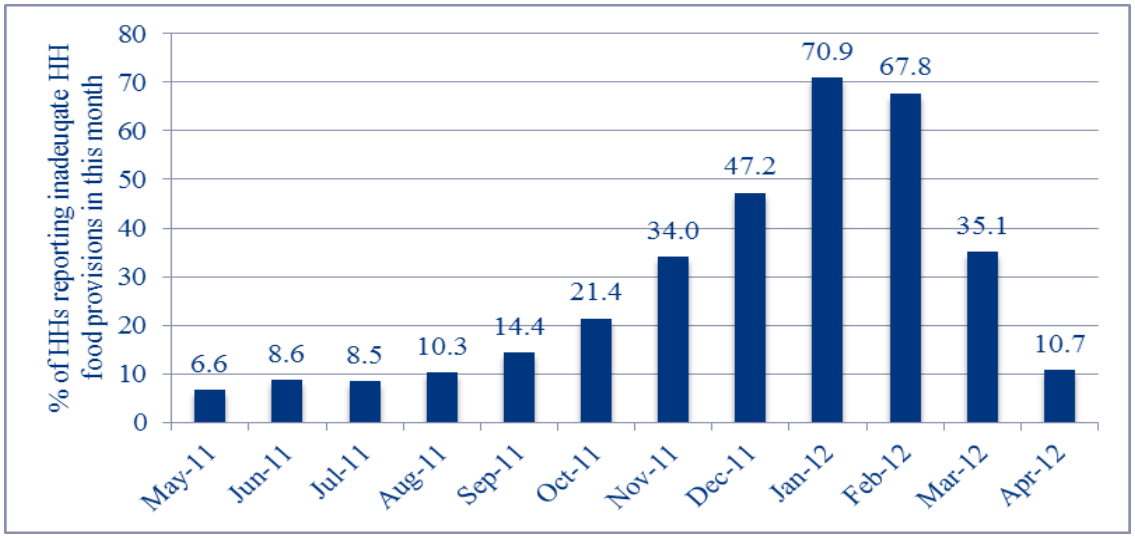
Figure 8: Hunger rates among Small Holder by Province in 2012 and 2015 (Among Households Experiencing Hunger in at Least one Month)



Source: IAPRI/CSO/MAL, 2012 and 2015

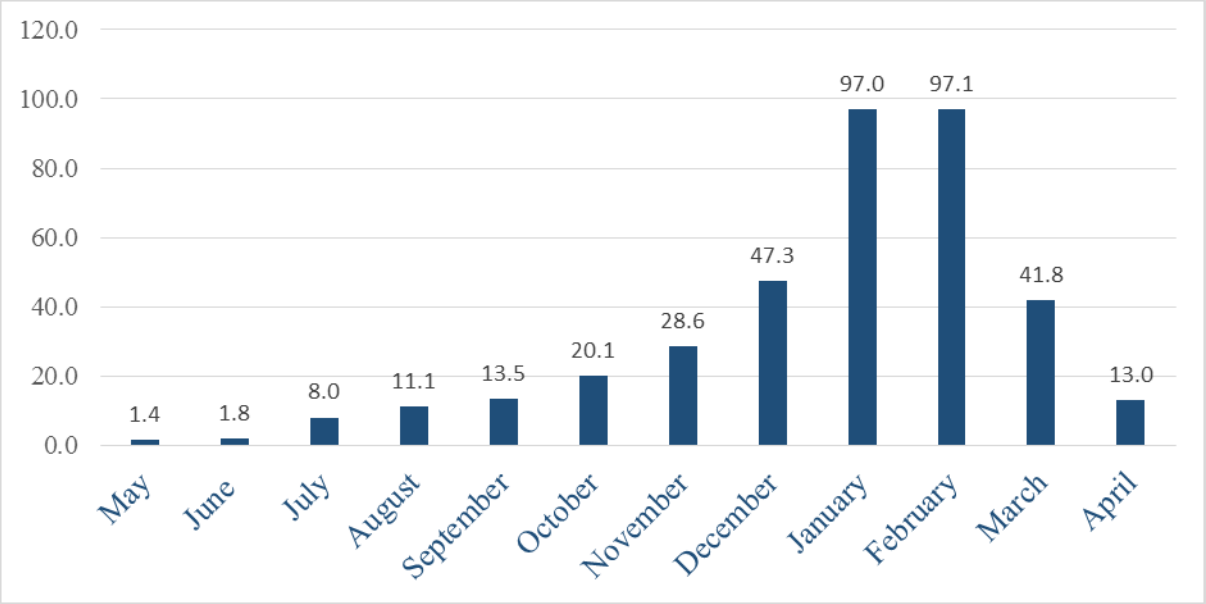
Figures 9 and 10 show the months and the percentage of households reporting inadequate food provisions in those months in 2012 and 2015 respectively. In both periods, hunger is at its highest in January and February, when household stocks dwindle and food prices rise. Hunger is at its lowest in April through August, the main harvest period when household stocks are relatively large and food prices are relatively low. Comparing the percentage of households reporting inadequate food provisions in 2011-12 to those reporting the same in 2014-15, there appears significant increase in 2014-15 in the months of January and February when food supplies are at the lowest levels. In 2012-13 about 70.9% and 67.8% of the households reported inadequate food provisions in December and January respectively, this figure increased to 97% for both months in 2013-14.

Figure 9: Percentage of Households Experiencing Hunger by Month 2012 (Among Households Experiencing Hunger in at least one Month)



Source: IAPRI/MAL/CSO 2012

Figure 10: Percentage of Households Experiencing Hunger by Month in 2015 (Among Households Experiencing Hunger in at least one month)



Source: IAPRI/MAL/CSO 2015

The measure of hunger used in this study as defined above may be subjective in the sense that it entirely depends on the household's perception of "enough" food. However, food insecurity measures, such as hunger, can be captured by assessing not only aspects of the availability, access and utilisation of food, but also how a person feels (e.g., anxiety, worry) and thinks about it (e.g., perceptions, social acceptability) (Wolfe and Frongillo, 2000). Previous studies have used number of months in which the household had adequate/inadequate food provisions to measure food access, hunger or food insecurity (e.g., Bilinsky and Swidale, 2010; Frayne et. al 2010). Such a method of assessing hunger or food insecurity is understood to be useful for policy analysis and for examining the causes (Mason, 2003).

Secondly, unlike the FAO, SOFI estimates which is based on the entire population, the RALS survey was rural based. This means that the estimates from the RALS survey maybe different in the urban areas.

However, there is consistency in the levels of hunger reported by all the three reports. The FAO, SOFI, the Hunger Index and the figures from the RALS survey show that in general households do experience undernourishment and inadequate food provisions respectively.

The rates (48% 41.1% and 46%) are very high, which gives an indication that hunger exists among rural households and the situation has remained at unacceptable levels and have not changed between 2011-12 and 2013-2014.

3.3 What the Nutrition Index Means for Zambia

The levels of malnutrition in Zambia are estimated using the LCMS and the ZDHS. Unlike the hunger estimates which are calculated using the food intake, malnutrition is estimated using outcomes of food intake, mainly through measuring the height and the weight of the individuals. We find this method less problematic compared to the measure of food intake. Over the years, the estimates from the LCMS have been consistent with the estimates from ZDHS and have proved to be reliable. Of the two surveys, the ZDHS is even more reliable because trained health workers are involved in collecting Anthropometric measurements unlike the LCMS.

Even if Zambian, children were not included in the studies that calculated the average height for healthy, well-fed children, it is highly unlikely that patterns of growth in young children are particularly different here than everywhere else in the world. It is highly likely that if the same study were carried out here, the same thing would be found. Children from wealthier families (and therefore better able to access the elements described above) would reach the same heights as healthy children elsewhere, irrespective of their ethnicity or background.

3.3.1 Determinants of Nutrition Status

The determinants of nutrition status are food intake and health status. The present nutrition situation has been attributed to poor food intake which explains inadequate nutrient intake. Nutrients can be classified as ether macro or micro nutrients. Evidence from elsewhere show that micronutrient deficiencies affects both women of child bearing age and children under the age of five in Zambia. The most common of these deficiencies are iron, vitamin A and zinc which manifests in anemia, night blindness and zinc deficiency. Inadequate intakes of several micronutrients Zambia are widespread because staple diets are predominantly maize-based, and intakes of plant based and animal products are low (Mason and Jayne 2009;

Chapoto et al 2010). As a result, the content and bioavailability of micronutrients such as iron, zinc and vitamin A are often low in these diets.

According to the 2012 Malaria Indicator survey, anemia affects 55 percent of children under the age of five and 30 percent of women in the child bearing age, (MoH, 2012). Although the etiological factors of anemia have not been determined, it is reasonable to assume that in Zambia, as in many African countries, the primary causes are nutritional deficiencies, malaria and intestinal worms (Shaw and Friedman 2011). Consequently, more than half (54 percent) of children under the age of five and 13 percent among women of child bearing age are vitamin A deficient (NFNC, 2003). According to an indirect method of estimating rates of zinc deficiency, 38 percent of the population in Zambia is at risk of low zinc intake (IZiNCG, 2004).

In addition, iron and folic acid supplements are very important nutrients that determine ideal foetal development and health of the child. In Zambia, iron and folic acid are distributed during antenatal visits, however, compliance has been low with only 59 percent of the women reporting to have had taken iron tablets for 90 or more days during their last pregnancy *(*CSO, 2015*).* This situation has a great contribution to the present nutrition situation in the country; folic acid and iron are critical in the very early months of pregnancy for foetal growth and for postnatal growth and development *(*Stoltzfus 2011*).* Folic acid and iron are vital for the brain function, and are part of the brain responsible for complex intellectual performance *(*Beard 2001, Ebadi, Elsayed, Aly 1994*).* Iron is a prerequisite in chemicals required for production of chemicals needed for sending messages to the brain *(*Beard 2001*).* It is also important for growth, development and normal functioning of body cells *(*Beard 2001). The consequence of poor iron and folic status are huge. Children with Iron Deficiency Anaemia (IDA) perform worse than children without IDA on developmental indices both mental *(*Lozoff, Wolf, Jimenez 1996) and motor (Harahap, Jahari, Husaini, Saco-Pollit, Pollitt 2000*).*

There are a number of factors that could explain the present nutrition situation in the country. Studies conducted elsewhere *(*Black, Quigg, Hurley, Pepper 2011*)* have shown that infants, children, teen-aged girls and pregnant women are in danger of getting insufficient quantities of iron from the diet alone. Food consumption still remains poor in Zambia as shown by recent results from the ZDHS. Results show that the majority of women and children have a dietary diversity lower than normal.

4. CONCLUSIONS AND RECOMMENDATIONS

This report has discussed the statistics on undernourishment, hunger and malnutrition in Zambia and the methods and indicators used to calculate them. The study found some methodological issues in the calculation of undernourishment by FAO although the rates calculated remain similar to the Hunger Index and the RALS findings. There are two conclusions researchers can make about the reported undernourishment (hunger) in Zambia.

i. There is hunger in Zambia, and given the figures in the SOFI report as well as the RALS report, it is likely to be at alarmingly high rates, particularly at lean times of the year, as seen from the monthly rates, when stores from the previous year are depleted. If the Zambian government would like to improve food security and reduce hunger in the country. The government also invest further in helping households to safely store the harvests, so that these hunger periods are not so severe. The government should further work towards a more equal economic growth that includes poorest parts of society in the long term.

ii. One reason Zambia may have ranked so very poorly in this report compared to other developing countries is lack of good information on food consumption at household level, thereby giving a low estimate of energy available. If the Zambian government would like to show progress in combatting hunger, it could support efforts to collect more regular and more accurate agricultural and food consumption data to improve these figures.

Going forward, ensuring that children and their families have access to enough diverse and good-quality foods, clean water and safe sanitation, and that families are taught and supported to care for their children, must be among the government's priority areas. Investing part of the rising tax revenue in ensuring these basic elements are provided would not only reduce the rates of chronic malnutrition and undernourishment in Zambia, but are important goals in and of themselves. Improving food security to ensure sufficient calories in the diet (and therefore avoid undernourishment) is a necessary measure to ensure good nutrition in Zambia's population- although it is not on its own sufficient. Sustained political commitment

at the highest level is a prerequisite for hunger eradication. It entails placing food security and nutrition at the top of the political agenda and creating an enabling environment for improving food security and nutrition (FAO, IFAD, and WFP (2014).

Finally, the poor nutritional situation in Zambia reinforces the urgent need of appropriate and efficient interventions to mitigate malnutrition in the country. However, to effectively formulate and evaluate such nutrition interventions, food consumption data and nutrition status information are urgently required to accelerate the combating of this nutritional problem.

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Annex 1: Nutrition Index and the Challenges that are measured.

Table 3: Anthropometry Index and Challenges Measures

Index	Nutritional challenges measured
Weight-for-height	Acute malnutrition (wasting)
Height-for-age	Chronic malnutrition(Stunting)
Weight-for-age	Any protein-energy malnutrition (Underweight)
BMI	Under or over nutrition
Birth weight	Maternal nutrition and baby survival chances at birth.

Source: WHO 1995

The severity of malnutrition is measured by prevalence rate and differs across the indicators. For stunting, a prevalence rate of 40% is considered very high while for underweight very high is anything above 30%. Wasting is considered very high if more than 15% of the children in a given population have a z-score of <2 SD. The classification for assessing the severity of malnutrition in a given population is presented in Table 6.

Table 4: Severity of Malnutrition per Indicator

	Indicator Severity of malnutrition by prevalence ranges (%)			
	Low	Medium	High	Very high
Stunting	<20	20-29	30-39	>=40
Underweight	<10	10-19	20-29	>=30
Wasting	< 5	5-9	10-14	>=15

Source: LCMS report 2010.