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ESSP 2 Discussion Paper 005

A Sub-National Hunger Index for Ethiopia: Assessing Progress in Region-Level Outcomes

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THE ETHIOPIA STRATEGY SUPPORT PROGRAM 2 (ESSP2)

DISCUSSION PAPERS

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ABSTRACT

Access to sufficient food and nutrients is essential for household welfare, as well as for accomplishing other development objectives. Households with insufficient access to food often face other challenges related to food insecurity including poor health and declines in productivity. In order to better target food aid assistance, evaluate progress, and design efficient intervention strategies, a transparent and reliable database on food insecurity is necessary. With the goal of providing a more straight-forward and standardized approach for calculating food insecurity, IFPRI developed a Global Hunger Index (GHI) in 2006 that allowed for easy comparison across countries. Recognizing the various dimensions of food insecurity, the GHI equally weights the proportion of people who are food energy deficient, the prevalence of underweight children under the age of five, and the mortality rate among children less than five years of age.

Because national averages can mask important regional differences, we calculate a Sub-National Hunger Index for Ethiopia using data from 1999-2000 and 2004-05 (the latter year being the latest for which nationally representative household surveys are available). Our findings indicate that between 1999-2000 and 2004-05, there were substantial improvements in all components of the Hunger Index in all analyzed administrative regions of Ethiopia. There were also major improvements in both urban and rural areas, with a decline in the index from 47.6 to 29.9 in small urban areas (areas defined urban in the household survey with exception to Addis Ababa, Dire Dawa, and Harari) and from 43.6 to 32.6 in rural areas. Given rapid agriculture-led economic growth between 2004-05 and 2008-09, it is expected that when new household survey data is available, these indices will show continued improvement.

Keywords: food insecurity, hunger index, undernourishment, PSNP, Ethiopia

INTRODUCTION

Access to sufficient food and nutrients is essential for household welfare, as well as for accomplishing other development objectives. Households with insufficient access to food often face other challenges related to food insecurity including poor health and a decline in productivity. These challenges can often create a vicious circle whereby households are unable to produce enough food, even in good years, because they are battling chronic health issues and are unable to work to their full potential. The gravity of food insecurity, and its many rippling effects, has led much of the development agenda to search for specific areas for intervention given limited resources and growing populations in many developing countries.

In order to better target food aid assistance, evaluate progress, and design efficient intervention strategies, a transparent and reliable database on food insecurity is necessary. With the goal of providing a more straight-forward and standardized approach for calculating food insecurity, IFPRI developed a Global Hunger Index (GHI) in 2006. The Global Hunger Index (GHI) – a tool adapted and further developed by IFPRI for regularly describing the state of global hunger shows that although hunger varies dramatically by region, overall global progress in reducing hunger remains slow.¹ The 2009 global GHI fell by only one quarter since 1990. Since 2006, IFPRI has built a national level hunger index for over 80 countries each year, and last year developed a sub-national index which calculated the proportion of food insecurity by 17 major states in India.

Although food insecurity is primarily related to inadequate access to food, other variables play a large role in defining the severity and extent of hunger. Over time, inadequate intake of key nutrients and sufficient calories result in low birth weights and underweight children. Perpetual low intake of calories in underweight children can lead to childhood stunting and / or wasting, which is associated with irreparable damage to cognitive function and increased susceptibility to disease. (Ferro-Luzzi 2001; Chandra and Kumari 1994; Grantham-McGregor and Fernald 1997). In the direst of circumstances, food insecurity leads to mortality.

Recognizing the various dimensions of food insecurity, the GHI equally weights: the proportion of people who are food energy deficient, the prevalence of underweight children under the age of five, and the mortality rate among children less than five years of age. Countries are then ranked on a scale from 0 to 100. Those countries that fall under a score of 10 are rated as low to moderately food insecure, whereas countries with values exceeding 30 have an extremely alarming food insecurity condition. Although a country-level index is important in understanding regional differences and challenges world-wide, providing a more in depth analysis at a sub-national level is required in order to understand investment opportunities and policy priorities, as well as target and tailor food aid programs to specific geographic, economic, and demographic landscapes within the country.

¹ For background information on the concept, see Wiesmann (2004), and Wiesmann, von Braun, and Feldbrügge (2000).

UNDERSTANDING FOOD SECURITY AT THE REGIONAL LEVEL WITHIN ETHIOPIA

Given that national averages can mask important regional differences, we calculate a sub-national, region level Hunger Index for Ethiopia. This index measures food insecurity in a manner that is consistent and can be compared to the national and global figures calculated in the GHI. We evaluate regional differences in food insecurity in order to understand how Ethiopia's index has improved over time, and identify gaps that require further research and potential intervention. Ideally, one would calculate these hunger indices at the zone or even woreda level, but unfortunately the underlying data used in the calculations are not statistically representative below the level of administrative region.

Although this index is calculated for 2009, it is important to note that this report evaluates past trends, and not the present situation. The calculation of the Ethiopia Regional Hunger Index (ERHI) uses the most recent data from the Household Income Consumption Expenditure Survey, and the Demographic and Health Survey from 2000 and 2005. In 2010, Ethiopia will conduct another round of surveys, at which point, it will be interesting to see how the government's investments in key infrastructure and food security programs during the past five years have transformed socio-economic indicators within the country.

The impetus behind creating a sub national index for Ethiopia is clear. Ethiopia is the second most populous country in Sub Saharan Africa (after Nigeria) with approximately 74 million people². Out of 74 million people, 84 percent of the population lives in rural areas, while 16 percent live in urban centers (defined by the Ethiopia Central Statistical Agency as population living in towns greater than 2,000 people). In 1999/2000 as many as eight million people received food security assistance from the Ethiopian government, international donors and non-governmental organizations (Kaluski, Ophir, and Tilahun Amede, 2001).

The Household Income Consumption and Expenditure Survey of 1999/2000 found that 44 percent (45 percent of rural inhabitants and 37 percent urban) of the total population was below the national poverty line (CSA, 2007). Given the severity of national poverty, a sub national index that takes into account some of the geographic and demographic particularities of the country will help to better identify risk prone areas and target intervention programs and investments.

Location matters in Ethiopia. Livelihood strategies are characteristic of place, and Ethiopia's geography is very unique. Ethiopia's landscape comprises: agricultural highlands and pastoralist lowlands; rural remote farmlands and densely populated urban areas; high-producing agricultural areas, as well as locations prone to drought with variable rainfall. Food insecurity in Ethiopia cannot be attributed to a homogeneous environment that affects all individuals equally and at the same pace. This report attempts to unpack some of these

² According to the Summary and Statistical Report of the 2007 Population and Housing Census (2009). Central Statistical Agency of Ethiopia.

geographic distinctions regarding food insecurity and is organized as such: the following section discusses the data and methods of calculating the Ethiopia Regional Hunger Index; we then provide further details on the results and analysis of food insecurity trends in Ethiopia over time; next, we discuss other factors beyond the index variables that may contribute to food insecurity in Ethiopia. Finally we provide a summary of ongoing programs aimed at targeting food insecure areas, as well as policy recommendations that could be further researched.

DATA AND METHODS

The Ethiopia Regional Hunger Index is derived using the same variables that are used in the GHI which is produced annually by IFPRI. These variables are: 1) the proportion of population that does not consume an adequate level of calories; 2) the proportion of underweight children less than five years of age; and 3) the mortality rate among children less than five years of age, expressed as the percentage of children born alive who die before they reach the age of five. Equally averaging the above variables offers simplicity and transparency. Additionally, other weighting approaches did not offer any empirical advantages over the simpler approach (Wiesmann 2006).

In order to understand how food insecurity in Ethiopia has changed over time, we calculated a sub-national index at the region administrative level for the two most recent household surveys conducted in 2000 and 2005. We use two data sources to calculate the index for each survey year: the Household Income, Consumption and Expenditure Survey (HICE) for 1999-2000, and 2004-05; and the Ethiopia Demographic and Health Survey (DHS) for 1999-2000, and 2004-2005.

The Ethiopia Regional Hunger Index is calculated for 6 of the 9 regions (data were not collected for Gambella region during the 2004-05 HICE, and data were only collected for the non-sedentary population of three zones of Afar and six zones of Somali regions), and the two city administration areas (Addis Ababa and Dire Dawa). Both the HICE and the DHS surveys are representative at the regional level, and are disaggregated by rural and urban areas within each Region. Thus, we were able to analyze differences between rural and urban areas within the country, as well as variation among administrative regions.

Undernourished Population based on Calorie Consumption:

The proportion of the population that is undernourished based on calorie consumption was estimated using household-level food consumption data from the 2000-01 and 2004-05 HICE. The HICE obtained household consumption data on 362 individual foods; these consumption data were converted to calories using food-to-calorie conversion factors reported by the FAO and compared against the Ethiopia food composition tables produced by the Ethiopian Health and Nutrition Research Institute (EHNRI). We found little variation

among calorie conversion used in EHNRI composition tables and the FAO conversion factors. It is important to note, however, that the HICE data are at the household level.

Thus, for this analysis we assume that all members in a household with a per capita calorie consumption less than the calorie intake cut-off are undernourished. Conversely, all household members within a household with a per capita calorie consumption above the cut-off are considered to be consuming sufficient calories. Various studies of Ethiopia household livelihood and coping strategies have found that household members may not fully share risk factors for undernutrition, and an individual in a household that is defined as not being undernourished, may be in fact undernourished (Dercon and Krishnan 2000). Given data constraints, we are unable to calculate calorie intake variations within the household.

The GHI for 2009 calculated calorie-based undernutrition for Ethiopia to be 46 percent, based on the undernourishment cutoff of 1,820 kilocalories (kcal) per person of the Food and Agriculture Organization of the United Nations (FAO). FAO estimates calorie undernutrition using data on food availability collected from national food balance sheets because annual household survey data is unavailable for most years in most countries (See Annex 1), FAO estimates thus differ from calculations such as the Ethiopia index that are based on consumption data obtained from national level household surveys (Smith and Wiesmann 2007). As a first estimate, we calculated a national undernourishment rate using the FAO recommended 1,820 calorie cutoff which yielded a 38 percent undernutrition rate (see Annex 2). This is considerably less than the 46 percent estimation reported by the FAO. In order to ensure comparability of the Ethiopia Index with the GHI 2009, we adjusted the calorie intake cutoff to 1,990 kilocalories per day, which yields a national calorie undernutrition rate of 46 percent. We use a 1,990 kilocalories per person per day cut-off for both rural and urban areas to calculate regional undernutrition rates in the following section.

There is much debate on how to determine a calorie intake cut-off to establish rates of undernourishment. Some, reasonably, argue that urban and rural cut-offs should differ because of increased physical activity expended in rural areas. However, in order to maintain comparability across regions within Ethiopia and with the Global Hunger Index, we use the same cut-off of 1,990 kilocalories per capita per day for both rural and urban areas.

Underweight Children and Child Mortality:

The first Demographic and Health Survey (DHS) in Ethiopia was conducted in 2000, which provided regional estimates of the proportion of underweight children less than five years of age (calculated as the proportion of children in each region whose weight-for-age was less than two standard deviations). The DHS also provided the mortality rate among children less than five years of age, expressed as the percentage of children born alive who die before they reach the age of five. These estimates are also disaggregated by rural and urban areas within each region. Another round of the DHS was conducted in 2005, which

provided the same series of estimates with a similar sample design that allowed the key indicators to be calculated for each of the 9 regions, and the two city administration areas (Addis Ababa and Dire Dawa).

Results from the Ethiopian HICE, as well as the Demographic and Health Survey and Welfare Monitoring Survey from 1999-2000, calculated that approximately 44 percent of the total population was below the national poverty line. With these results in hand, the Ethiopian government and other development partners sought to streamline poverty reduction strategies and increase available information on living conditions within the country. A system of data collection and monitoring and evaluation was designed and implemented, and due to this type of investment in data collection, we are able to produce a time-series, sub-national hunger index for Ethiopia.

RESULTS

Analyzing the Ethiopia Regional Hunger Index (ERHI) for two time periods provides a greater understanding of the progress that Ethiopia has accomplished over five years (Table 1). Eight of the eleven regions are included in this study; no data were collected for Gambella region during the 2005 HICE survey and insufficient data were collected for Afar and Somali regions given their high share of non-sedentary population. All of the underlying variables that comprise the index show improvement with the exception Benishangul Gumuz region which show a slight increase in the percentage of children underweight between 2000 and 2005 of two percentage points. Nonetheless, the overall hunger index for Benishangul Gumuz still shows progress given improvement in the other two components (percentage with inadequate calorie consumption and infant mortality), (See Figure 1).

This analysis indicates substantial improvements in the Hunger Index by at 10 percentage points or more in each region over the five year period. Addis Ababa, Harari, Oromia, and SNNP decreased undernourishment prevalence by at least 17 percentage points; SNNP showed the most improvement with a 32 percentage point difference between 2000 and 2005. It is important to note, however, that the high rates of calorie undernourishment in comparison to the other indicators are very alarming and weigh heavily on the total ERHI scores (See Figure 2). The prevalence of undernourishment in all of the regions is over 40 percent of the population, and four of the eight regions analyzed have an undernourishment rate than half of the population for each area. While the prevalence of calorie undernourishment does contribute substantially to the overall index, the child underweight prevalence is also quite high. Greater than a third of children in five of the eight regions analyzed suffers from serious underweight measurements. Twenty-five percent of children in all of the regions (with the exception of Addis Ababa at 11 percent) are considered underweight (by two standard deviations from the mean).

The high prevalence of child underweight is very concerning; especially in rural areas where prevalence rates remain at 40 percent (See Table 3). Although rates remain high, 2005 figures show improvement over 2000 rates in underweight children and under five mortality rates. SNNP region experienced the most improvement in underweight prevalence, falling 19 percentage points from 2000 to 2005; the second most improved region was Oromia with an 8 percent fall in prevalence of underweight children (See Table 1). Rural and small urban areas improved 9 and 14 percentage points respectively (See Table 3).

Although Ethiopia's performance in reducing child mortality is admirable, prevalence still remains high in comparison to Sub Saharan Africa on a whole. According to recent estimates by the World Bank, approximately 28 percent of deaths among children less than five years old in Ethiopia can be attributed to pneumonia. Twenty-four percent of deaths are related to diarrhea and dehydration, which is also one of the primary causes of underweight estimates among children. Most children in Ethiopia suffer from severe diarrhea twice a year on average, and the use of oral rehydration therapy is much lower than in other developing countries (World Bank, 2004). Not only symptoms related with diarrhea affect underweight estimates, but also infant and young child feeding practices, knowledge, and care are all significant contributors to child underweight rates in Ethiopia. Given these figures, clean water and sanitation programs, as well as healthcare opportunities for children and training for young mothers and families may need to be re-evaluated and/or designed to address the higher rates of underweight children and child mortality throughout Ethiopia.

At the national level, Ethiopia's Hunger Index score fell steeply, from 43.9 in 2000 to 32.5 in 2005. This figure for 2005, is two percentage points more than reported for Ethiopia in the 2009 Global Hunger Index report³ (30.8) given differences in methodology and dataset used. Although this report adjusts the undernourished calorie cut-off to 1,990 kcal per day in order to match the figure used in the Global Hunger Index report, it uses different (national) data sources for the other components of the Hunger Index. In particular, this report uses national figures from the Ethiopian DHS survey for percentage of children underweight (38.4 percent) and child mortality (13.2 percent). In contrast, the Global Hunger Index uses a lower figure of 34.6 percent of children underweight, though the child mortality rate used (11.9 percent) is similar to that in the DHS.

³ The Global Hunger Index uses global datasets which calculates undernourishment rates utilizing the FAO methodology which uses national food balance sheets to calculate percent undernourished, the WHO Global Database on Child Growth and Malnutrition: NCHS/WHO reference data to calculate percent underweight, and UNICEF's The state of the world's children 2009 database to calculate child mortality

Table 1: Ethiopia Regional Hunger Index and Underlying Components

Region	Prevalence of Calorie Undernourishment (%)		Prevalence of Underweight among Children < 5 years (%)		Under 5 Mortality Rate (%)		Regional Hunger Index	
	2000	2005	2000	2005	2000	2005	2000	2005
Addis Ababa	72.9	53.3	14.1	11.0	11.4	7.2	32.8	23.8
Harari	65.2	47.6	27.1	26.7	19.1	10.3	37.1	28.2
Oromia	61.1	42.3	42.4	34.4	19.4	12.2	41.0	29.6
SNNP	77.6	45.5	53.7	34.7	19.2	14.2	50.1	31.5
Dire Dawa	68.5	51.3	30.8	29.6	17.6	13.6	39.0	31.5
Amhara	60.3	47.1	51.8	48.9	18.3	15.4	43.5	37.1
Tigray	72.6	59.3	47.9	41.9	16.9	10.6	45.8	37.3
Benishangul Gumuz	60.1	53.6	42.3	44.6	19.8	15.7	40.7	38.0
Ethiopia	65.9	46.0	47.2	38.4	18.8	13.2	43.9	32.5

Note: The Ethiopia Hunger Index represents the index calculated using a calorie undernourishment cutoff of 1,990 kcals per person per day to allow for comparison of the Ethiopia Regional Hunger Index with the Global Hunger Index 2009.
 Source: Author's calculations; Ethiopia Household Income Consumption and Expenditure Survey 1999/00 and 2004/05; Ethiopia Demographic and Health Survey 1999/00 and 2004/05.

Figure 1: Ethiopia Regional Hunger Index: 2000 and 2005

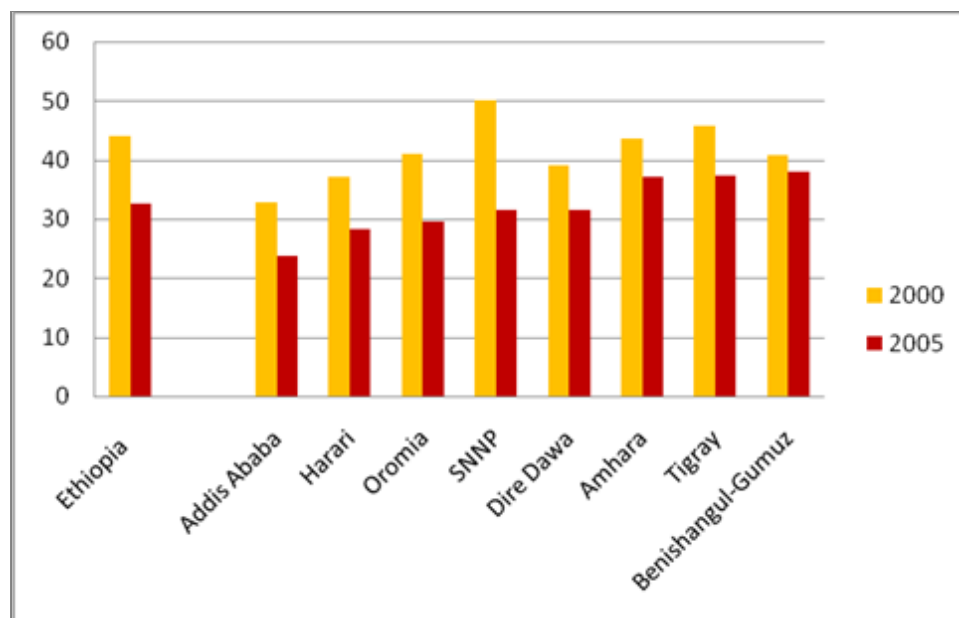
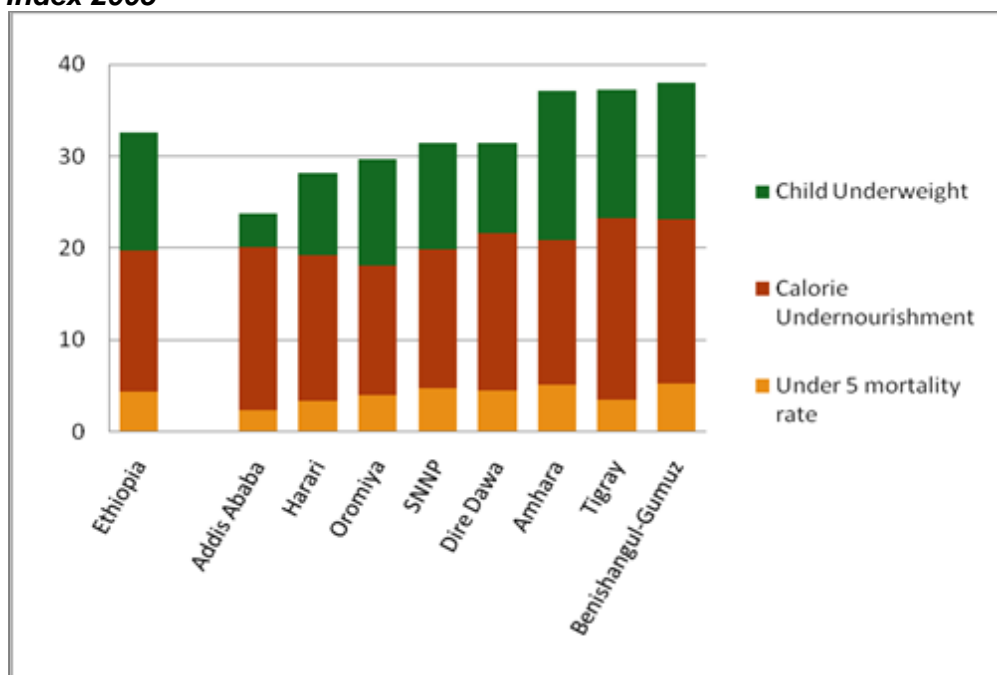


Figure 2: Contribution of Underlying Components of the Ethiopia Regional Hunger Index 2005



Note: The Ethiopia Hunger Index represents the index calculated using a calorie undernourishment cutoff of 1,990 kcals per person per day to allow for comparison of the Ethiopia Regional Hunger Index with the Global Hunger Index 2009. Source: Author's calculations; Ethiopia Household Income Consumption and Expenditure Survey 1999/00 and 2004/05; Ethiopia Demographic and Health Survey 1999/00 and 2004/05.

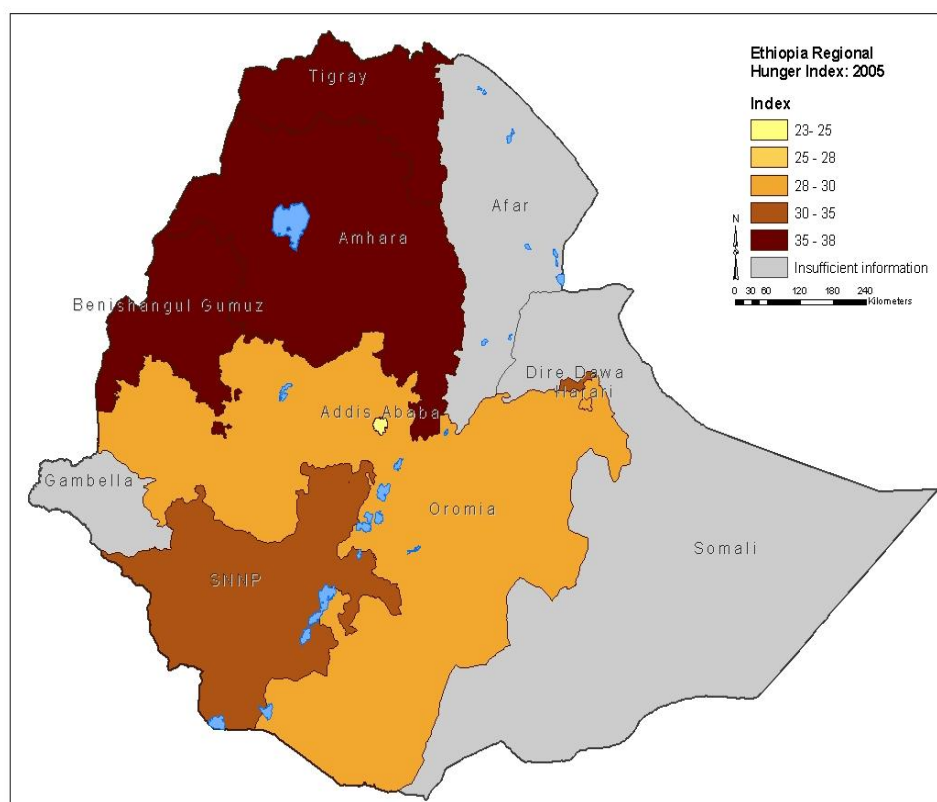
Although considerable improvement occurred across all regions on the underlying components of the Ethiopia Regional Hunger Index, as well as the index ranking itself, all regions remain within the alarming, or extremely alarming hunger category (see Table 2). The ERHI ranks regions on the following (international) scale: under 10 on the index is equivalent to low or moderate food insecurity; 10-20 is a serious threat of food insecurity; 20-30 is alarming; and over 30 corresponds to an extremely alarming threat of food insecurity. In 2000, all regions fell in the category of extremely alarming, but several regions moved out of this category by 2005. Addis Ababa and Harari remain the top performers in the ERHI ranking and have progressed out of the extremely alarming category. SNNPR dramatically improved its score from 2000 to 2005, and is currently 4th in the ERHI ranking. The map in figure 3 shows that the majority of regions are in extremely alarming conditions, although some regions are in a less severe situation; the map in figure 4 displays the percentage point change improvement of the ERHI over 5 years. SNNP and Oromia regions show the most improvement over time, progressing 18.7 and 11.3 percentage points respectively, while Benishangul Gumuz improved the least with a 2.8 percentage point improvement.

Table 2: Ethiopia Regional Hunger Index and Index Ranking

Region	Regional Hunger Index		Regional Hunger Index Rank		Improvement between 2000 and 2005
	2000	2005	2000	2005	
Addis Ababa	32.8	23.8	1	1	9.0
Harari	37.1	28.2	2	2	8.9
Oromia	41.0	29.6	5	3	11.3
SNNP	50.1	31.5	8	4	18.7
Dire Dawa	39.0	31.5	3	5	7.5
Amhara	43.5	37.1	6	6	6.4
Tigray	45.8	37.3	7	7	8.5
Benishangul-Gumuz	40.7	38.0	4	8	2.8
All Ethiopia	65.9	24.0	-	-	11.4

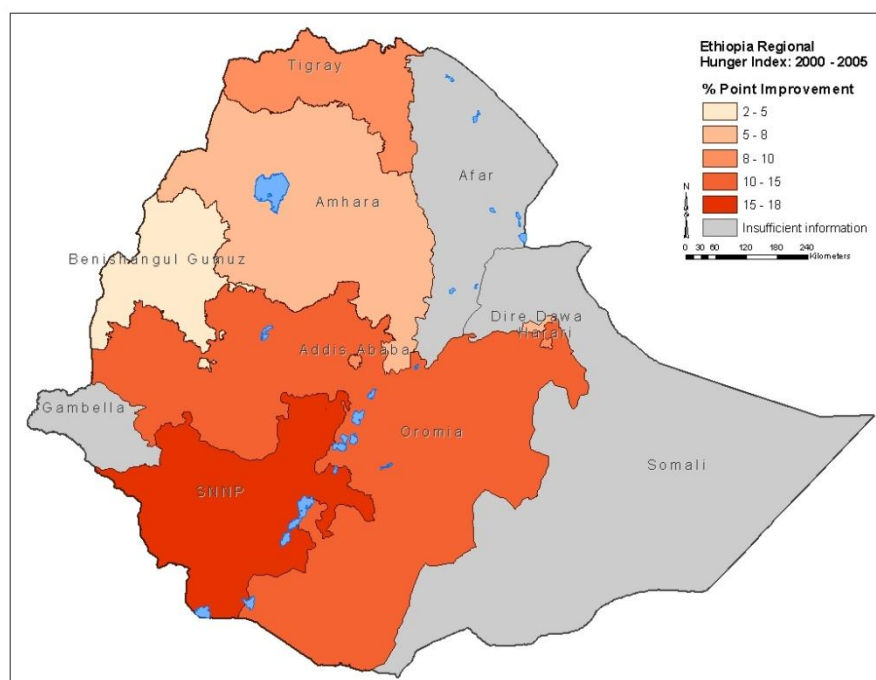
Note: The Ethiopia Hunger Index represents the index calculated using a calorie undernourishment cutoff of 1,990 kcals per person per day to allow for comparison of the Ethiopia Sub-national Hunger Index with the Global Hunger Index 2009. Source: Author's calculations; Ethiopia Household Income Consumption and Expenditure Survey 1999/00 and 2004/05; Ethiopia Demographic and Health Survey 1999/00 and 2004/05.

Figure 3: Ethiopia Regional Hunger Index 2005



Note: To display a greater range of the index, the 'Alarming' category has been broken down into low (20-24.9), medium (25-27.9), and high (28-30). The 'Extremely Alarming' category has been disaggregated by low (30-34.9) and high (35-38).

Figure 4: Percentage Point Change Improvement of the ERHI from 2000 to 2005

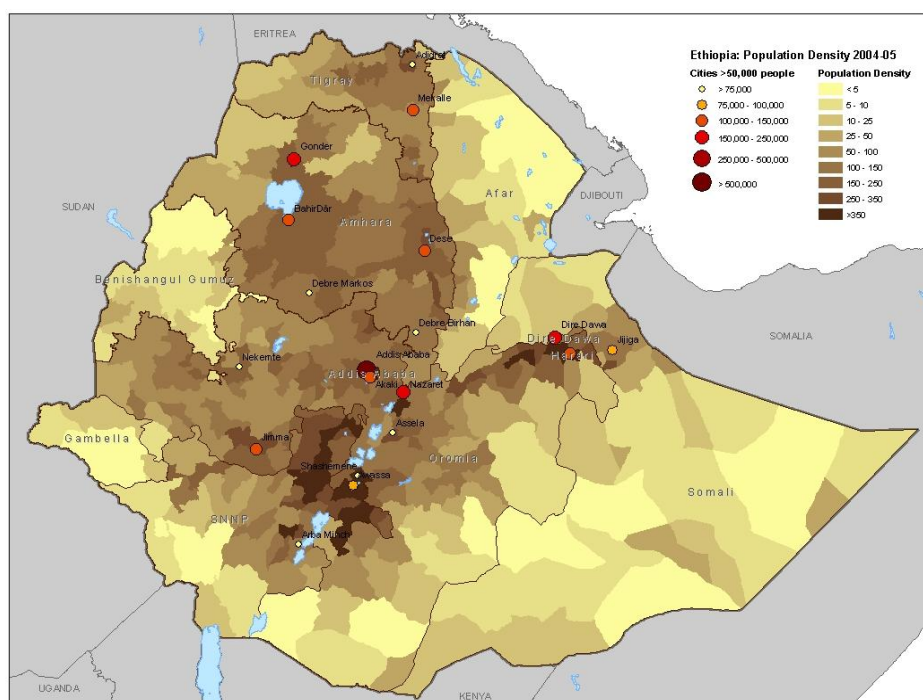


On the whole, the improvement of all regions in the Ethiopia Regional Hunger Index and its underlying variables is quite encouraging, though much remains to be done. Investments in key rural infrastructures and agricultural extension, social protection, health, and nutrition services to ensure progress on poverty and hunger alleviation remain critically important. Despite Ethiopia's progress in reducing the ERHI, most regions remain within the severely alarming food insecure ranking. As we will discuss further in the paper, developing countries that depend primarily on rain-fed agriculture technologies are at risk of repeated seasonal undernourishment, which can lead to extremely dire situations very quickly. Continued monitoring of trends using indicators such as these is essential to maintain progress and to quickly target key areas for intervention when necessary.

RURAL - URBAN DYNAMICS IN FOOD SECURITY

Understanding food insecurity in a rural - urban context is essential for a country such as Ethiopia. Approximately 84 percent of Ethiopians live in rural areas; the other 16 percent live in the urban, highland areas which comprise 35 percent of Ethiopia's territory (see Figure 5). The primary market centers and transportation routes are also in the highlands. People living in rural areas are further from transportation routes and are less connected to important healthcare and nutrition facilities. A challenge, therefore, is to create more tailored support systems in which rural populations are able to access critical goods and services. By analyzing the Ethiopia Regional Hunger Index at a rural / urban disaggregation, we are better able to understand how the country and donors have progressed in addressing the varying needs within these dynamic environments, and hypothesize further areas for investment.

Figure 5: Large Cities and Population Density in Ethiopia



Source: EASE 2000/01, Central Statistical Agency

On a national scale, the rural and urban indicators of the Ethiopia Regional Hunger Index have drastically improved. In large urban areas, defined as Addis Ababa, Dire Dawa and Harari (the main market centers in the country), the undernourishment rate fell 20 percentage points, while the rural areas decreased from 63 percent to 45 percent undernourished. In 2000, the undernourishment rate among small towns (all areas defined as urban in the HICE except Addis Ababa, Dire Dawa and Harari) was 85 percent; this rate fell an impressive 34 percentage points between 2000 and 2005. Similar to the regional indices, all of the underlying variables disaggregated by large urban, small urban and rural areas also improved over time (see Figure 6). Large and small urban areas moved out of the extremely alarming food hunger ranking into the current rate of 24.6 and 29.9 respectively. The rural areas also experienced a notable improvement; progressing 11 percentage points on the ERHI (see Table 3).

An interesting trend that we see when comparing urban to rural areas is the high degree of undernourishment in urban centers relative to rural areas. A closer look at the types of food that each area is eating gives insight as to why urban dwellers are performing poorer on this index. In 2005, the major foodstuff was cereals which comprised 62 percent of total national caloric intake (52 percent in urban centers, and 63 percent in rural areas), followed by potatoes and tubers which encompassed roughly 14 percent of national caloric intake. Rural areas consumed 11 percent greater quantity of potatoes and tubers, while urban areas consumed more than 7 percent greater quantity of oils and fats and 9 percent more breads (injera) than rural inhabitants. Although urban areas may have greater access to markets and nutritional variety, they are eating less calorie-rich foods, whereas rural inhabitants have

less access to diverse foods, but are able to grow and supplement their diets with calorie-rich grains and tubers.

Although urban areas have a higher prevalence of undernourishment, rural areas have a higher proportion of underweight children and child mortality. This may be attributable to the limited access of clean water and healthcare facilities in rural areas. As stated earlier, the major contributing factor to child underweight and mortality rates is pneumonia and diarrhea. Several studies of food insecurity coping strategies in rural Ethiopia found that parents usually protect their children from serious calorie undernourishment in rural areas, but underweight measures persist due to continual contraction of diarrheal diseases and limited access to healthcare centers (Ramakrishna and Demeke 2002; Anna Ferro-Luzzi 2001).

Figure 6: Ethiopia Regional Hunger Index and Underlying Components: Rural and Urban Areas

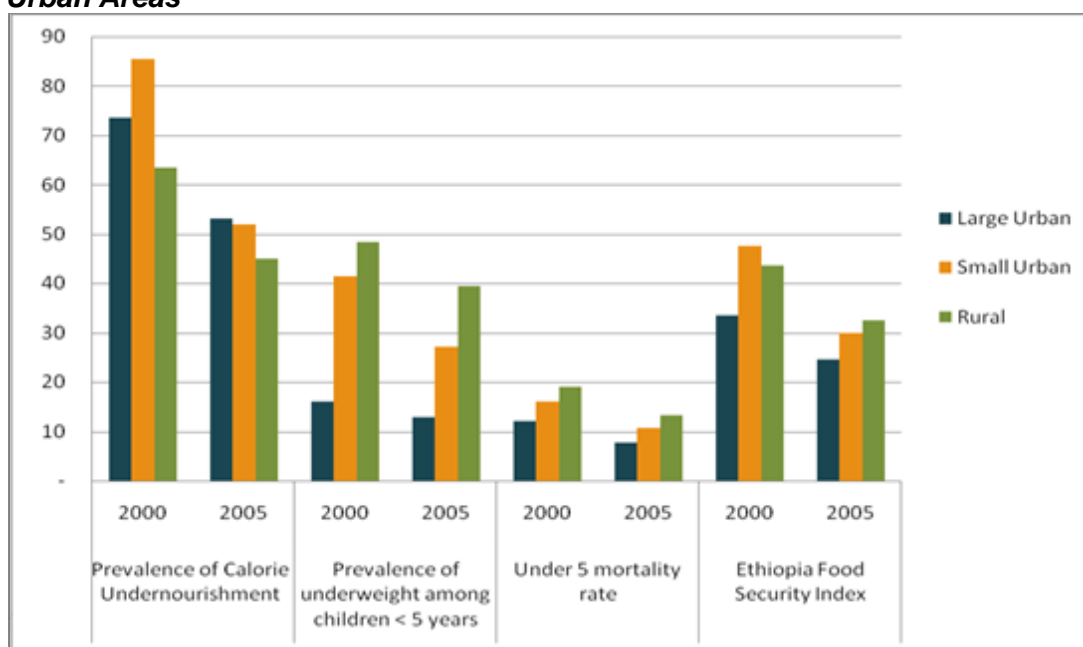


Table 3: Ethiopia Regional Hunger Index - Rural Urban

Residence	Prevalence of Calorie Undernourishment		Prevalence of underweight among children < 5 years		Under 5 mortality rate		Regional Hunger Index	
	2000	2005	2000	2005	2000	2005	2000	2005
Large Urban	73.5	53.1	16.0	12.8	12.1	7.8	33.5	24.6
Small Urban	85.4	51.9	41.4	27.1	16.1	10.6	47.6	29.9
Rural	63.4	45.0	48.5	39.5	19.0	13.3	43.6	32.6
All Ethiopia	65.9	46.0	47.2	38.4	18.8	13.2	43.9	32.5

Note: The Ethiopia Hunger Index represents the index calculated using a calorie undernourishment cutoff of 1,990 kcals per person per day to allow for comparison of the Ethiopia Sub-national Hunger Index with the Global Hunger Index 2009. Source: Author's calculations; Ethiopia Household Income Consumption and Expenditure Survey 1999/00 and 2004/05; Ethiopia Demographic and Health Survey 1999/00 and 2004/05.

Although considerable improvement occurred across all urban and rural areas, it cannot be stressed enough that the rural areas are still within the extremely alarming food insecure category. Rural population comprises more than $\frac{3}{4}$ of the total population. Upcoming poverty alleviation and food security programs may need to place priority on rural areas and target specific areas for intervention. While the Ethiopia Regional Hunger Index is built to provide comparability and transparency across regions and among countries (when contrasted with the GHI), the conditions that determine and dictate the successes or shortfalls of the underlying components may reflect very localized conditions. It is important to understand not only regional disparities in food insecurity, but also the local conditions driving an individual's success at obtaining the basic goods and services needed to thrive and survive.

FOOD INSECURITY AND SEASONALITY IN ETHIOPIA

Food insecurity isn't static within Ethiopia. Inter-annual variability of both production and consumption is a distinguishing factor of many Sub Saharan African countries that depend primarily on rain-fed agriculture production systems. Seasonal variation in rainfall and sunlight are the basic determinants of production levels, and consequently food availability. Variations in food availability are often associated with market price fluctuations as well, especially in areas with limited storage capacity. Households that engage in agricultural production as a primary activity may have difficulty accessing other non-farm sources of income to tide the household over during low production, and high market price periods. Webb and Von Braun (1994) ascribe seasonal undernourishment to a series of factors including: production fluctuations, lack of employment opportunities, limited household assets, isolation from major markets, low levels of farm technology, constraints to improvements in human capital, and poor health and sanitation environments. Given the degree to which Ethiopia remains primarily a rural, agrarian society, many of these attributes are characteristic to the current agricultural and economic landscape within the country.

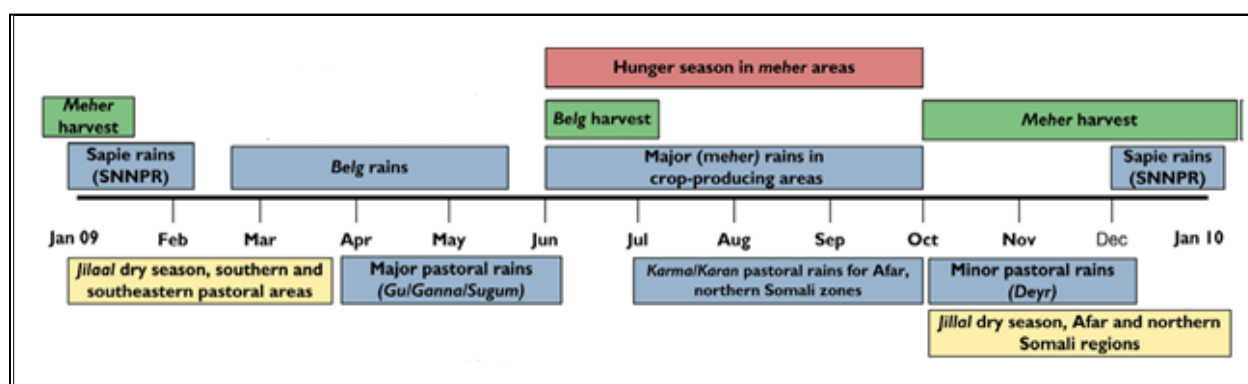
Many case studies show that seasonal undernourishment has lasting consequences on the effected population. Individuals that already lack fat stores prior to experiencing a seasonal drop in consumption tend to lose weight from lean tissue such as muscle mass and internal organs because they have minimal fat deposits to sacrifice. Adults with very low bodyweight are more prone to disease, which can decrease income-generating capacity due to prolonged weakness and delayed recovery from illness. (Ferro-Luzzi et al. 2001; Dasgupta 1997; Longhurst 1986). Children also suffer from seasonal undernourishment. Severe and/or repetitive periods of undernourishment at a young age leads to the process of child stunting, which is associated with permanent damage to cognitive function and increased propensity of disease. (Chandra and Kumari 1994; Grantham-McGregor and Fernald 1997) In the most basic interpretation, the effects of seasonal undernourishment lead to decreased production capacity. Given that in 2006/07, agricultural production generated approximately 46 percent of Ethiopia's gross domestic product and employed 80 percent of the working

population, it is imperative that seasonal fluctuations in food availability are tackled in order to maintain healthy living conditions as well as economic stability. (Arndt et al. 2009)

Seasonal undernourishment is experienced in different ways and at different times depending on the geographic location of the community. The FEWSNET calendar of Ethiopian harvests (see Figure 7) underpins the variation in harvest calendars throughout the country and the importance of a reliable rainy season in providing a sufficient amount of food in order to sustain household energy expenditure. The two most important harvests (and rains) in terms of food security are the belg and meher harvest. The belg rains extend from February to May across the northeastern highlands of Amhara and Tigray. The belg rains, known as the gu rains in the lowlands, constitute the main seasonal rains for pastoral and agro pastoral populations in the South Omo zone of SNNP, Southern Somali Region, and the lowlands in Oromia. Failure of the belg rains in the Amhara and Tigray regions implies a longer hunger season (where production is low and food prices are high) between the belg harvest in early June and the meher harvest in mid-October. Poor belg rains in the lowlands signifies water shortages and unsuitable grazing land for livestock. Pastoral communities are forced to migrate in the hopes of finding water in order to preserve livestock and livelihood.

The longer cycle, meher harvest constitutes 90 to 95 percent of total annual crop production in Ethiopia. The meher rains usually begin in the southwest of the country between March and May and progressively move northwards through the end of August. Primarily maize, teff and sorghum is produced during this season and the main harvest occurs between October and November. During the first month of the meher rains, a feeling of overwhelming anxiety characterizes most conversations throughout Ethiopia, hypothesizing whether the meher rains will fail. Meher rain failure would lead to severe food insecurity conditions for most inhabitants within the failed region, as well as neighboring areas.

Figure 7: Seasonal Calendar and Critical Events



Source: FEWSNET Ethiopia (July, 2009 Report)

The majority of Ethiopians lives in rural areas and confronts similar challenges in securing sufficient food, but given the topographic and biophysical variation throughout Ethiopia, seasonal undernourishment varies across geographic space and time. A combination of factors determines the vulnerability to and severity of undernourishment and its effects (whether transitory or abiding) on a specific population. Not only does the success or failure of a harvest (or rainy season) determine seasonal fluctuations in food insecurity, but also the degree of poverty in a certain area, the possibility of securing a non-farm income in between harvests, and the possibility of accessing external assistance (Webb and Von Braun 1994).

Seasonal undernourishment in Ethiopia occurs even during the best harvest years. A recent study conducted by Anna Ferro-Luzzi et al. described the agricultural cycle in South Shewa (on the border of SNNP and Oromia regions) whereby inhabitants are forced to lower consumption during low production periods. The principal maize harvest in South Shewa begins in September following the meher rains. Green maize is harvested in September along with other lesser grown crops for the area such as teff and sorghum, but the peak harvest for Maize in South Shewa is in November. Given the limited storage capacity of households, peak consumption of maize is also highest in November and very few families buy maize during this time.

By March, three months after post harvest in South Shewa, adult weight loss is evident. While household food stocks are at their lowest and families are eating less; male family members are required to expend large amounts of energy to prepare for the next planting season. More affluent households that are connected to a market may have the opportunity to buy grain in order to maintain a minimal level of calorie intake, but food prices will be much higher (given the lack of grain throughout the area) than the earnings these same households received in November when they sold their overstock at low prices. Given the unstable condition of food security in agriculture based societies in Ethiopia (such as the South Shewa case), interventions and aid programs that address more geographically specific conditions may be able to better target precise needs during critical months when populations are most vulnerable.

SUMMARY AND POLICY RECOMMENDATIONS

Considerable progress has been made in tackling the prevalence of undernourishment, child underweight, and child mortality in Ethiopia. Disaggregating the index by region and by rural and urban areas provides greater insight into the unique socio-economic conditions and challenges that different households and communities confront in order to live a sustainable lifestyle. We find that undernourishment (measured in terms of calorie consumption) contributes more than the other underlying variables to the ERHI, but the prevalence of child underweight and mortality in Ethiopia is higher than many other Sub Saharan African countries. The government recognizes these issues and their relation to food insecurity in the region and has instituted key monitoring and evaluation mechanisms and institutions, as

well as safety net programs with the hope of identifying and targeting vulnerable populations at the right time and place in order to have the most efficient and effective impact. Moreover, given rapid agriculture-led economic growth between 2004-05 and 2008-09, it is expected that when new household survey data is available, measures of food security will show continued improvement.

Several of the key strategies and programs that have had a large impact on these indicators include the Poverty Strategy Plan that Ethiopia finalized in 2002 with regional governments and international donors, as well as the Plan for Accelerated and Sustained Development to End Poverty (PASDEP). Each of these programs outlines priorities, action steps, and monitoring and evaluation mechanisms in order to provide a continuous depiction of current food insecurity throughout the country.

In 2004, the government established the Food Security Coordination Bureau (FSCB) designed to improve the food security status of up to 15 million rural Ethiopians. An important component of this Bureau is the Productive Safety Net Program (PSNP). The PSNP provides food insecure households with cash and/or food transfers in order to prevent asset depletion during hunger periods. It consists of two components, a work for cash/food opportunity that supports public works, such as terracing or land rehabilitation in the local area, as well as direct support for labor-poor households (elderly or chronically ill). PSNP assistance areas were selected among the four major regions (Tigray, Oromia, Amhara, and SNNP) at the Kebele administrative level and identified using a set of criteria including agricultural lands that suffer from drought and experience dangerously low agricultural productivity. Currently, a total of 7.5 million chronically food insecure people receive assistance through employment in public works under the PSNP (see Annex 3 for woredas that receive PSNP).

Although remarkable progress has been made on securing food availability for some of the most vulnerable populations in Ethiopia, other interventions have been identified that may help to improve the overall condition of high risk households. A study completed in 2002 in North Wello⁴ modeled different development interventions and their effects on household food insecurity. Several interesting findings emerged from this study that may be applicable to other regions with similar socio-economic and agro ecological conditions. Ramakrishna and Demeke found that an increase in education of one person within the household would decrease the probability of food insecurity by 31.5 percent in the household. These results are similar to Christiaensen and Alderman (2003) which attribute parental education as a main determinant of child nutrition in Ethiopia. Livestock holdings (increased by one unit) also diminish food insecurity by 24.38 percent. Conversely, an increase in family size resulted in more vulnerability to food insecurity by 36.25 percent.

⁴ Ramakrishna, G. and Assefa Demeke (2002) An Empirical Analysis of Food Insecurity in Ethiopia: The Case of North Wello. *Africa Development*, Vol. XXVII; 1: 127-143.

Finally, as mentioned previously in this report, access to sanitation and healthcare services among rural households is vital to reducing child underweight and mortality rates. While malaria remains one of the leading causes of morbidity and mortality in Ethiopia, most deaths among children under five years in Ethiopia are attributed to pneumonia (28 percent) and diarrhea (24 percent); illnesses that are a disappearing cause of death in many other developing countries (World Bank, 2004). In part, the persistence of these illnesses is linked to lack of proper education and training of oral rehydration therapy (ORT). According to the World Bank Status Report on Health and Poverty, Ethiopia has one of the lowest ORT treatment rates for children in the world. In a recent World Bank survey, approximately 40 percent of women in the poorest quintile, and 13 percent of women in the wealthier quintile in Ethiopia had not heard about ORT. Oral Rehydration Therapy is inexpensive and highly effective, further education and training on this intervention may improve child underweight and mortality rates considerably. As well as diarrhea and pneumonia, lack of instruction regarding correct infant and young child feeding practices, knowledge, and care are also significant contributors to child underweight rates.

Given the continued rates of food insecurity throughout Sub Saharan Africa, a more targeted and tailored approach of addressing vulnerable communities is needed. By calculating a sub-national hunger index that follows the methodologies used in the GHI, we hope to provide a more disaggregated, standardized, and transparent mechanism for assessing vulnerability among countries, across regions, within rural and urban contexts. A better understanding of local conditions and challenges in regards to food insecurity and livelihood strategies, as well a clearer picture of the dynamics of the rural economy within Ethiopia will provide the necessary knowledge to design efficient and effective policy and development programs that target the most vulnerable populations at the most critical and appropriate time.

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ANNEX 1: FAO CALCULATION OF THE PROPORTION OF UNDERNOURISHED

<http://millenniumindicators.un.org/unsd/mdg/Metadata.aspx?IndicatorId=0&SeriesId=640>

FAO's estimates of the prevalence of undernourishment are essentially a measure of food deprivation based on the calculation of three key parameters: the average amount of food available for human consumption per person, the level of inequality in access to that food and the minimum number of calories required for an average person.

Average food available for human consumption comes from national "food balance sheets" compiled by FAO every year which estimate how much of each food commodity a country produces, imports and withdraws from stocks for other non-food purposes. FAO then divides the energy equivalent of all the food available for human consumption by the total population to come up with average daily energy consumption.

Data from household surveys are used to derive a coefficient of variation to account for the degree of inequality in access to food. Similarly, since a large adult needs almost twice as much dietary energy as a three-year-old child, the minimum energy requirement per person for each country takes into account its mix of age, gender and body sizes.

The minimum level of dietary energy requirement is derived from the FAO/WHO/UNU Expert Consultation in 2001, which established energy standards, published in 2004, for different sex and age groups performing sedentary physical activity and with a minimum acceptable body-weight for attained heights.

The average energy requirement is the amount of food energy needed to balance energy expenditure in order to maintain body-weight, body composition and a level of necessary and desirable physical activity consistent with long-term good health. This includes the energy needed for the optimal growth and development of children, for the deposition of tissues during pregnancy, and for the secretion of milk during lactation consistent with the good health of mother and child. The recommended level of dietary energy intake for a population group is the mean energy requirement of the healthy, well-nourished individuals who constitute that group.

FAO reports the proportion of the population whose daily food intake falls below that minimum energy requirement as undernourished. Trends in undernourishment are mainly driven by:

- Changes in food consumption as measured by country Food Balance Sheets;
- Changes in the variance of the distribution of dietary energy consumption in the population, induced by changes in both the distribution of dietary energy consumption due to income levels, and the distribution of dietary energy requirements based on weight for attained heights by sex and age; and

- Changes in the minimum level of dietary energy consumption, induced by changes attained heights and the sex-age population structure.

This indicator has been defined within a probability distribution framework as follows:

$$P(U) = P(x < r_L) = \int_{x < r_L} f(x) dx = F_x(r_L)$$

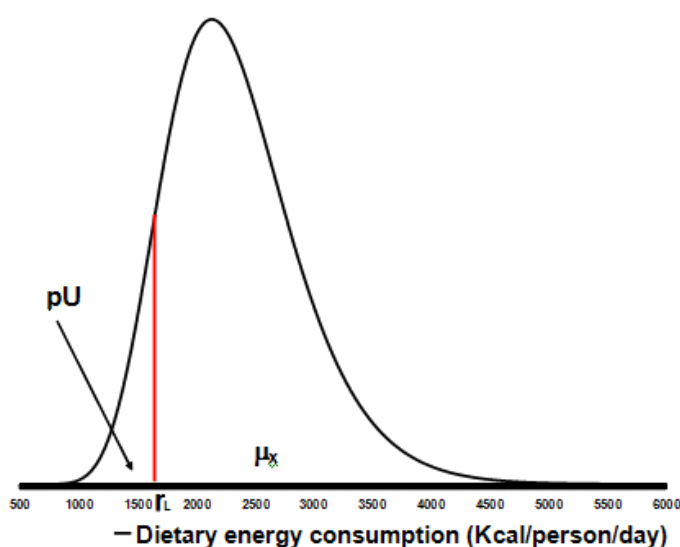
where:

- P(U) is the proportion of undernourished in total population;
- (x) refers to the dietary energy consumption or intake;
- rL is a cut-off point reflecting the minimum acceptable dietary energy consumption;
- f(x) is the density function of dietary energy intake; and,
- Fx is the cumulative distribution function.

In developing the methodology for estimating the prevalence of undernourishment, a basic problem concerns the use of energy requirement norms and energy consumption for individuals. Even after taking into account the most influential factors such as age, sex, body weight and activity, differences exist in the energy requirement of individuals. As it is not feasible to determine energy consumption of individuals, the estimate of the proportion of individuals with insufficient energy consumption is defined within a probability distribution framework.

The graph below illustrates the methodological framework for the estimation procedures of the proportion of population who are undernourished.

Distribution of dietary energy consumption



Source: FAO, posted at <http://unstats.un.org/unsd/mdg/Metadata.aspx>

In the graph above, the curve $f(x)$ depicts the proportion of the population corresponding to different per person dietary energy consumption levels (x) represented by the horizontal line. The area under the curve up to the minimum acceptable dietary energy consumption, rL , represents the proportion of the population below minimum level of dietary energy consumption or the proportion of the population undernourished, i.e. prevalence of undernourishment, pU

ANNEX 2: ETHIOPIA REGIONAL HUNGER INDEX USING THE FAO SUGGESTED CALORIE INTAKE CUT-OFF OF 1820 KILOCALORIES PER PERSON IN ORDER TO MEASURE THE PROPORTION OF UNDERNOURISHED BY REGION.

Table A: Ethiopia Regional Food Security Index using a 1820 calorie intake cut-off

Region	Proportion of undernourished in population (%)		Prevalence of underweight children under 5 years (%)		Under 5 mortality rate (%)		Regional Hunger Index	
	2000	2005	2000	2005	2000	2005	2000	2005
Addis Ababa	63.5	37.9	14.1	11.0	11.4	7.2	29.6	18.7
Harari	54.4	35.7	27.1	26.7	19.1	10.3	33.5	24.2
Oromia	47.3	44.7	42.4	34.4	19.8	15.7	36.5	31.6
Dire Dawa	58.6	39.5	30.8	29.6	17.6	13.6	35.7	27.6
SNNP	57.9	42.3	53.7	34.7	18.4	9.3	43.3	28.8
Tigray	63.5	50.2	47.9	41.9	16.9	10.6	42.8	34.2
Amhara	70.1	38.0	51.8	48.9	19.2	14.2	47.0	33.7
Benishangul-Gumuz	73.2	40.2	42.3	44.6	22.9	12.3	46.1	32.4
Ethiopia	56.7	38.3	47.2	38.4	18.8	13.2	43.9	32.5

Source: Author's calculations; Ethiopia Household Income Consumption and Expenditure Survey 1999/00 and 2004/05; Ethiopia Demographic and Health Survey 1999/00 and 2004/05.

ANNEX 3: CURRENT RECIPIENTS OF PRODUCTIVE SAFETY NET PROGRAM

Figure A: Woredas Receiving Productive Safety Net Program Assistance

