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Internally displaced people at Camp Bentiu in South Sudan collect aid, including sorghum, salt, vegetable oil, and baby food. Many South Sudanese have left their villages seeking not only refuge from armed conflict, but also food.

# THE CONCEPT OF THE GLOBAL HUNGER INDEX

The Global Hunger Index (GHI) is a tool designed to comprehensively measure and track hunger globally, regionally, and by country.[1] Each year, the International Food Policy Research Institute (IFPRI) calculates GHI scores in order to assess progress, or the lack thereof, in decreasing hunger. The GHI is designed to raise awareness and understanding of regional and country differences in the struggle against hunger. By calling attention to the issue, we hope that this report will trigger action to reduce hunger around the world.

Hunger is a multidimensional problem, and a variety of terms are used to describe its different aspects (Box 1.1). To reflect the multidimensional nature of hunger, the GHI combines the following four component indicators into one index:

1. **UNDERNOURISHMENT:** the proportion of undernourished people as a percentage of the population (reflecting the share of the population with insufficient caloric intake);

2. **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);

3. **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

4. **CHILD MORTALITY:** the mortality rate of children under the age of five (partially reflecting the fatal synergy of inadequate nutrition and unhealthy environments).[2]

There are several advantages to measuring hunger using this multidimensional approach (Figure 1.1). It reflects the nutrition situation of not only the population as a whole, but also of children—a vulnerable subset of the population for whom a lack of dietary energy, protein, or micronutrients (essential vitamins and minerals) leads to a high risk of illness, poor physical and cognitive development, or death. It also combines independently measured indicators to reduce the effects of random measurement errors.[3]

This year, GHI scores have been calculated using a revised and improved formula (Box 1.2). The revision replaces child underweight, previously the sole indicator of child undernutrition, with two indicators of child undernutrition—child wasting and child stunting—which are equally weighted in the GHI calculation. The revised formula also standardizes each of the component indicators to balance their contribution to the overall index and to changes in GHI scores over time (Box 1.3).

The 2015 GHI has been calculated for 117 countries for which data on the four component indicators are available and where measuring hunger is considered most relevant. GHI scores are not calculated for some higher-income countries where the prevalence of hunger is very low. The GHI is only as current as the data for its four

BOX 1.1 **CONCEPTS OF HUNGER**

**Hunger** is usually understood to refer to the distress associated with lack of food. The Food and Agriculture Organization of the United Nations (FAO) defines food deprivation, or undernourishment, as the consumption of fewer than about 1,800 kilocalories a day—the minimum that most people require to live a healthy and productive life.[1]

**Undernutrition** goes beyond calories and signifies deficiencies in any or all of the following: energy, protein, or essential vitamins and minerals. Undernutrition is the result of inadequate intake of food in terms of either quantity or quality, poor utilization of nutrients due to infections or other illnesses, or a combination of these factors. These, in turn, are caused by a range of factors including household food insecurity; inadequate maternal health or childcare practices; or inadequate access to health services, safe water, and sanitation.

**Malnutrition** refers more broadly to both undernutrition (problems of deficiencies) and overnutrition (problems of unbalanced diets, which includes consuming too many calories in relation to energy requirements, with or without low intake of micronutrient-rich foods).

In this report, "hunger" refers to the index based on the four component indicators. Taken together, the component indicators reflect deficiencies in calories as well as in micronutrients. Thus, the GHI reflects both aspects of hunger.

[1] FAO considers the composition of a population by age and sex to calculate its average minimum energy requirement for an individual engaged in low physical activity. This requirement varies by country—from about 1,650 to more than 1,900 kilocalories per person per day for developing countries in 2014–2016 (FAO 2015). Each country's average minimum energy requirement for low physical activity is used to estimate undernourishment (FAO, IFAD, and WFP 2015).

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

[2] According to recent estimates, undernutrition is responsible for 45 percent of deaths among children younger than five years old (Black et al. 2013).

[3] For a multidimensional measure of poverty, see the index developed by the Oxford Poverty and Human Development Initiative for the United Nations Development Programme (Alkire and Santos 2010).

FIGURE 1.1 **FEATURES OF THE GLOBAL HUNGER INDEX**

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

Source: Wiesmann et al. (2015).
Notes: Each indicator is standardized. The child undernutrition indicators include data from additional sources where available. See pp. 10–11 for a list of all child undernutrition data sources used in this report.

component indicators. This year's GHI reflects the most recent country-level data and projections available between 2010 and 2016. It therefore reflects hunger levels during this period rather than solely capturing the conditions in 2015.[4] For some countries, such as Burundi, Comoros, the Democratic Republic of the Congo, Eritrea, Papua New Guinea, South Sudan, Sudan, and Syria, lack of data on undernourishment prevents the calculation of GHI scores.[5]

The scores are based on source data that are continuously revised by the United Nations (UN) agencies that compile them, and each year's GHI report reflects these revisions. While these revisions result in improvements in the data, they also mean that the GHI scores from different years' reports are not comparable with one another. Also, with the use of the revised formula in this year's report, direct comparisons between this report's findings and the scores from previous GHI reports are not possible. This year's report contains GHI scores for 2015 and four reference periods—1990, 1995, 2000, and 2005. All scores were calculated using the revised formula. This allows for valid comparisons of hunger levels over time.

The 1990, 1995, 2000, 2005, and 2015 GHI scores presented in this year's report reflect the latest revised data for the four component

[4] The latest undernourishment estimates from the Food and Agriculture Organization of the United Nations (FAO) include projections for 2014–2016, which are used in the calculation of the 2015 GHI (FAO, IFAD, and WFP 2015).

[5] FAO stopped publishing country-level estimates of undernourishment for the Democratic Republic of the Congo in 2011 (FAO, IFAD, and WFP 2011). According to past GHI reports, the GHI score of the Democratic Republic of the Congo was in the extremely alarming category with the highest levels of hunger. For South Sudan, which became independent in 2011, and present-day Sudan, separate undernourishment estimates are not yet available from FAO (FAO, IFAD, and WFP 2015).

BOX 1.2 **HOW GHI SCORES ARE CALCULATED**

GHI scores are calculated using a three-step process.

First, values for each of the four component indicators are determined from the available data for each country. The four indicators are

- → the percentage of the population that is undernourished,
- → the percentage of children under five years old who suffer from wasting (low weight for height),
- → the percentage of children under five years old who suffer from stunting (low height for age), and
- → the percentage of children who die before the age of five (child mortality).

Second, each of the four component indicators is given a standardized score based on thresholds set slightly above the highest country-level values observed worldwide for that indicator between 1988 and 2013.[1] For example, the highest value for undernourishment estimated in this period is 76.5 percent, so the threshold for standardization was set a bit higher, at 80 percent.[2] In a given year, if a country has an undernourishment prevalence of 40 percent, its *standardized* undernourishment score for that year is 50. In other words, that country is approximately halfway between having no undernourishment and reaching the maximum observed levels.

Third, the standardized scores are aggregated to calculate the GHI score for each country. 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.

This calculation results in GHI scores on a 100-point scale where 0 is the best score (no hunger) and 100 the worst. In practice, neither of these extremes is reached. A value of 100 would signify that a country's undernourishment, child wasting, child stunting, and child mortality levels each exactly meet the thresholds set slightly above the highest levels observed worldwide in recent decades. A value of zero would mean that a country had no undernourished people in the population, no children younger than five who were wasted or stunted, and no children who died before their fifth birthday.

The scale below shows the severity of hunger—from low to extremely alarming—associated with the range of possible GHI scores using the revised formula.

**STEP 1 Determine values for the component indicators:**

| | |
|---|---|
| PUN | proportion of the population that is undernourished (in %) |
| CWA | prevalence of wasting in children under five years old (in %) |
| CST | prevalence of stunting in children under five years old (in %) |
| CM | proportion of children dying before the age of five (in %) |

**STEP 2 Standardize component indicators:**

$$\text{Standardized PUN} = \frac{\text{PUN}}{80} \times 100$$

$$\text{Standardized CWA} = \frac{\text{CWA}}{30} \times 100$$

$$\text{Standardized CST} = \frac{\text{CST}}{70} \times 100$$

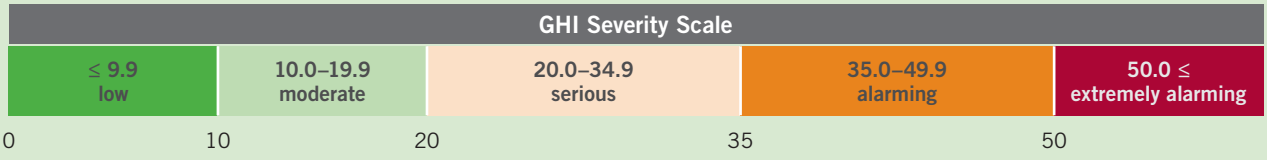
$$\text{Standardized CM} = \frac{\text{CM}}{35} \times 100$$

**STEP 3 Aggregate component indicators:**

$$\begin{aligned} &\tfrac{1}{3} \times \text{Standardized PUN} \\ +\ &\tfrac{1}{6} \times \text{Standardized CWA} \\ +\ &\tfrac{1}{6} \times \text{Standardized CST} \\ +\ &\tfrac{1}{3} \times \text{Standardized CM} \\ \hline =\ &\text{GHI Score} \end{aligned}$$

[1] The thresholds for standardization are set slightly above the highest observed values in order to allow for the possibility that these values could be exceeded in the future.

[2] The threshold for undernourishment is 80, based on the observed maximum of 76.5 percent; the threshold for child wasting is 30, based on the observed maximum of 26.0 percent; the threshold for child stunting is 70, based on the observed maximum of 68.2 percent; and the threshold for child mortality is 35, based on the observed maximum of 32.6 percent.



BOX 1.3 **WHY THE GLOBAL HUNGER INDEX WAS REVISED**

The Global Hunger Index (GHI) was first released by the International Food Policy Research Institute and Welthungerhilfe in 2006.[1] Since then it has been published with updated data each year. Previously, the Index included the following three, equally weighted, nonstandardized indicators:

1. the proportion of the population that is undernourished;
2. the prevalence of underweight in children under five; and
3. the under-five mortality rate.

This year, in order to reflect the current thinking in nutrition measurement and common practice in index construction, the formula was revised to replace child underweight with child wasting and child stunting, and to standardize each of the component indicators (Wiesmann et al. 2015). Each of these changes is described here.

The prevalence of underweight in children under five was previously the preferred indicator of undernutrition in children. Yet, underweight has been questioned in recent years in terms of its effectiveness in monitoring child undernutrition. In part, this is because a child may be of normal weight, or even overweight, for his or her age, and yet be stunted (Martorell 2008). In this scenario, simply measuring underweight would give the false impression that this child is well-nourished, while failing to take into account evidence of stunting, an indicator of chronic undernutrition. To remedy this issue and to bring more nuance to the GHI, child underweight has been replaced with child wasting and child stunting. The other component indicators—undernourishment and child mortality—remain unchanged.

In previous editions of the index, the component indicators of the GHI were not standardized. However, the values for undernourishment and child stunting are typically higher than the values for child mortality and child wasting, and vary more greatly across countries. To understand why this is important, imagine that a country historically has had a child mortality rate of 10 percent and an undernourishment prevalence of 50 percent. If child mortality is reduced to 5 percent and the prevalence of undernourishment is reduced to 45 percent, this is an absolute change of 5 percentage points for each indicator. In the previous GHI formula, both changes would have had the same effect on the GHI score. However, because the undernourishment indicator has generally higher levels and tends to fluctuate more than the child mortality indicator, a reduction of 5 percentage points in the child mortality rate actually represents a more meaningful decline. By using standardized values in the new formula, a decline of 5 percentage points in the child mortality rate has a greater effect on the overall GHI score than a change of the same amount in the prevalence of undernourishment. Thus, by standardizing the values of the four component indicators, their effects on GHI scores can be balanced in any given year and over time.

[1] Concern Worldwide joined the partnership in 2007.

indicators of the GHI.[6] Where original source data were not available, the estimates for the GHI component indicators were based on the most recent data available. (See Appendix A for more detailed background information on the data sources for the 1990, 1995, 2000, 2005, and 2015 GHI scores.)

The four component indicators used to calculate the GHI scores in this report draw upon data from the following sources:

**UNDERNOURISHMENT:** Updated data from the Food and Agriculture Organization of the United Nations (FAO) were used for the 1990, 1995, 2000, 2005, and 2015 GHI scores. Undernourishment data and projections for the 2015 GHI are for 2014–2016 (FAO 2015; authors' estimates).

**CHILD WASTING AND CHILD STUNTING:** The child undernutrition indicators of the GHI—child wasting and child stunting—include data from the joint database of UNICEF, the World Health Organization (WHO), and the World Bank, and additional data from WHO's continuously updated Global Database on Child Growth and Malnutrition; the most recent Demographic and Health Survey (DHS) and Multiple Indicator Cluster Survey (MICS) reports; statistical tables from UNICEF; and the latest national survey data for India from UNICEF India.[7] For the 2015 GHI, data on child wasting and child stunting are for the latest year for which data are available in the period

[6] For previous GHI calculations, see von Grebmer et al. (2014, 2013, 2012, 2011, 2010, 2009, 2008); IFPRI/Welthungerhilfe/Concern (2007); Wiesmann (2006a, b); and Wiesmann, Weingärtner, and Schöninger (2006).

[7] Data on India's latest child stunting and wasting rates are provisional.

2010–2014 (UNICEF/WHO/World Bank 2015; WHO 2015; UNICEF 2015a; UNICEF 2013; UNICEF 2009a; MEASURE DHS 2015; India, Ministry of Women and Child Development, and UNICEF 2014; authors' estimates).

**CHILD MORTALITY:** Updated data from the UN Inter-agency Group for Child Mortality Estimation were used for the 1990, 1995, 2000, 2005, and 2015 GHI scores. For the 2015 GHI, data on child mortality are for 2013 (IGME 2014).

Despite the existence of advanced technology to collect and assess data almost instantaneously, time lags and data gaps persist in reporting vital statistics on hunger and undernutrition. While recent improvements have been made and projections of undernourishment are now available up to 2016, more reliable and extensive country data are still urgently needed. Further improvements in collecting high-quality data on hunger and undernutrition will allow for a more complete and current assessment of the state of global hunger, which can, in turn, better guide efforts to end hunger.