Measuring food and nutrition security based on health outcomes

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What is food security?

Rome Declaration on World Food Security:
“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.”
Why is food security important?

- Availability of food
- Access to food
- Dietary needs
- Food utilization

People

Hunger

- Chronic hunger
- Hidden hunger

Access

Dietary needs

U5 mortality

Stunting

Underweight

Anemia

Etc., etc., etc.

How is food security measured?

Current measures:
- Prevalence of undernourishment (FAO/MDG1)
- Anthropometric indicators (stunting, etc.)
- Global Hunger Index (IFPRI/DWHH/Concern)
- Global Food Security Index (EIU/DuPont)
- Many others for different dimensions & scopes ("index inflation" through re-packaging of data)
How is food security measured?

Current measures:
- FAO’s indicator captures mainly changes in food availability at the household level
- Anthropometrics capture only single outcomes (not comparable, ignore “depth” of problem)
- GHI adds data on underweight and mortality to FAO figures to create an abstract index score
- GFSI covers various aspects of food affordability, availability, quality and safety at national level

Many things are looked at…

Dietary needs → Access to food → Availability of food → Determinants or Inputs

Hunger

Chronic hunger → Hidden hunger

People

Food utilization

U5 mortality → Underweight → Stunting → Anemia → Etc., etc., etc.
... why not at the overall outcome?

- WHO data on health outcomes at country level: “disability-adjusted life years” (DALYs) lost
- DALYs are weighted person-years lost due to shortened life and disability:
  - $\text{DALYs}_{\text{lost}} = \text{YLL} + \text{YLD}_{\text{weighted}}$
- Attribution to undernutrition:
  - Data on protein-energy malnutrition, vitamin A, iron & iodine deficiency, maternal conditions, measles, diarrhoeal diseases, and lower respiratory infections
- 65 million DALYs lost due to undernutrition in 2011 (4% of the global burden of disease), of which two thirds due to “hidden hunger”
### Rankings for selected countries

<table>
<thead>
<tr>
<th>Country</th>
<th>DALYs</th>
<th>Stunting</th>
<th>FAO</th>
<th>GHI</th>
<th>GFSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>2</td>
<td>54</td>
<td>29</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Niger</td>
<td>3</td>
<td>5</td>
<td><strong>60</strong></td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>Malawi</td>
<td>11</td>
<td>10</td>
<td>37</td>
<td>32</td>
<td>8</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>12</td>
<td>35</td>
<td>31</td>
<td>32</td>
<td>18</td>
</tr>
<tr>
<td>Nigeria</td>
<td>17</td>
<td>24</td>
<td><strong>76</strong></td>
<td>37</td>
<td>26</td>
</tr>
<tr>
<td>Tanzania</td>
<td>23</td>
<td>21</td>
<td>9</td>
<td>25</td>
<td>7</td>
</tr>
<tr>
<td>Uganda</td>
<td>24</td>
<td>33</td>
<td>12</td>
<td>37</td>
<td>35</td>
</tr>
<tr>
<td>Benin</td>
<td>25</td>
<td>17</td>
<td><strong>80</strong></td>
<td>42</td>
<td>24</td>
</tr>
<tr>
<td>Sudan</td>
<td>45</td>
<td>35</td>
<td>7</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>50</td>
<td>30</td>
<td>19</td>
<td>37</td>
<td>22</td>
</tr>
<tr>
<td>India</td>
<td>54</td>
<td>7</td>
<td>47</td>
<td><strong>13</strong></td>
<td>40</td>
</tr>
<tr>
<td>Guatemala</td>
<td>56</td>
<td>7</td>
<td>23</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>Botswana</td>
<td>63</td>
<td>48</td>
<td>27</td>
<td>43</td>
<td>59</td>
</tr>
<tr>
<td>Paraguay</td>
<td>64</td>
<td>83</td>
<td>32</td>
<td>73</td>
<td>57</td>
</tr>
<tr>
<td>Ecuador</td>
<td>98</td>
<td>n/a</td>
<td>44</td>
<td>62</td>
<td>48</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>108</td>
<td>86</td>
<td>36</td>
<td>43</td>
<td>44</td>
</tr>
</tbody>
</table>

### Newer data & approach, new result

- Same approach using more detailed health data from Inst. for Health Metrics & Evaluation (IHME)
  - Disadvantage: only available as global aggregate
  - Different: no discounting, new set of weights
  - Advantage: available for 1990, 2005 and 2010
- 160 million DALYs lost due to undernutrition in 2010 (6% of the global burden of disease), of which more than half due to hidden hunger
- 320 million DALYs lost due to undernutrition in 1990
- Burden of hunger in 2010 half the burden of 1990!
- Very different if compared to FAO/MDG1 measure
Prevalence vs. burden of hunger

Why this discrepancy?

Food availability but one factor for food security:
- Dietary needs (mechanisation, motorisation, ICTs)
- Food waste (storage, pest control, preservation, retail)
- Food utilization (nutrition education, infant feeding, water, parasites, health status, dietary change)
- Depth of undernourishment below given threshold

DALYs measure outcome of all these factors:
- More comprehensive, catch-all picture of “hunger”
- Incl. impaired cognitive and physical development
- Link to human capital development & econ. growth
Implications for economic growth

- WHO’s Commission on Macroeconomics & Health: DALYs valued at three times per capita income as improved health spurs economic growth
- Global cost of hunger amounts to \textbf{Int\$ 0.8 trillion} (1\% of world income) if based on WHO’s DALYs
- Global cost of hunger even \textbf{Int\$ 1.9 trillion} (2.4\% of world income) if approximated using IHME
- FAO’s State of Food and Agriculture 2013: global cost of undernutrition is \textbf{US\$ 1.4-2.1 trillion}
  - Based on World Bank country estimate for loss in productivity due to undernutrition of 2-3\% of GDP

Conclusions

- Experts and stakeholders in the field of agriculture and nutrition need to be aware of outcomes-based indicators, such as DALYs, which better capture the results of food insecurity
- Data is available but needs to be updated more frequently – and made accessible; more attention should be paid to nutrition details
- Further discussion and agreement on details of methodology needed, but it seems food security (MDG1) improved more than commonly thought...
- ... although the remaining burden and cost of hunger is still unacceptably high!
### Absolute and relative burden of undernutrition

<table>
<thead>
<tr>
<th>Outcomes of undernutrition</th>
<th>DALYs</th>
<th>Stunting</th>
<th>FAO</th>
<th>GHI</th>
<th>GFSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Several (expandable)</td>
<td></td>
<td>One (stunting)</td>
<td>No</td>
<td>Mortality, underweight</td>
<td>No</td>
</tr>
<tr>
<td>Individual</td>
<td></td>
<td>One (food availability)</td>
<td>No</td>
<td>One (food availability)</td>
<td>Several</td>
</tr>
<tr>
<td>DA-weight, diff. outcomes</td>
<td>Individual</td>
<td>Household</td>
<td>Household</td>
<td>Partially (index)</td>
<td>Partially (index)</td>
</tr>
<tr>
<td>Yes (years)</td>
<td></td>
<td>Yes (capita)</td>
<td>Yes (capita)</td>
<td>No (index score)</td>
<td>No (index score)</td>
</tr>
<tr>
<td>Summable and comparable units of measurement</td>
<td>Many uses of DALYs</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>192/187 countries</td>
<td>118 countries</td>
<td>185 countries</td>
<td>120 countries</td>
<td>105 countries</td>
<td></td>
</tr>
<tr>
<td>Planned annually</td>
<td>Annually</td>
<td>Annually</td>
<td>Annually</td>
<td>Annually</td>
<td></td>
</tr>
</tbody>
</table>
Thank you very much for your attention!

Forthcoming IFPRI Discussion Paper:
“Rethinking the Measurement of Undernutrition in a Broader Health Context”
→ www.ifpri.org/publications

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