The FAO chronic hunger index

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“The FAO index [...] is unsatisfactory in a number of ways. Food availability is a rather poor predictor of failure to grow, mortality and economic productivity (Svedberg 2000). The index is not distribution-sensitive and an increase in food deficiency of the most deprived sector of the population would leave the index unchanged. Food availability data are averaged over a 3 year period and the effect of seasonal crises and droughts go unnoticed. [...] Svedberg (2002) and Dasgupta (1993) critically discuss the FAO cut-off points and maintain that their use results in a large underestimation of nutrition in the World. [...] The index is not robust as is very sensitive to the parameter values used for its calculation: energy cut-off points, food availability, and the distribution of calories across households (Baton, 1983; Naiken, 2003, Svedberg, 2000)[...]. Because the information generated by the index does not have value at the country level, the index cannot be used in causal model of for targeting purposes”

Popular view among analysts and academics: FAO estimate of the prevalence of undernourishment is of little value today. Criticism on:

a) appropriateness of the operational definition of hunger

b) soundness of the methodological approach on which the estimate is obtained

c) reliability of the elementary data used to compile the estimate.
Context

• New demands:
  a) Estimates **disaggregated geographically** (at sub-national level) and **by socio-economic groups**
  b) **Consistency between income growth (and poverty reduction) & hunger trends**
  c) **Real time monitoring** of food security trends in response to price spikes of food items
What do we do

- FAO hunger index is based on **two fundamental assumptions**:
  a) Nourishment refers to **food intake**, not to the consequences of metabolic food processing
  b) Food intake can be measured through the amount of **dietary energy**
- **Need of additional indicators** to measure the different dimensions of food security (availability, access, use, stability)
  - food supply, anthropometric measures, measures of diet quality, etc.
What do we do

• FAO index is an **indicator of chronic hunger** = captures the evolution of *fundamental, not contingent*, elements that drive long term nutritional status

• FAQ hunger index is not supposed to closely follow the series of total food production or aggregate food prices
  – Short term phenomena such as seasonal food shortages or temporary food price crises are not intended to be covered
  – Mechanisms exist for households to cope with temporary food price crises (food item substitution, savings, debt, food storage, etc.)
• FAO hunger index = Prevalence of Undernourishment - PU
  – % of the population in a Country with a level of Dietary Energy Consumption (DEC) lower than the Dietary Energy Requirements (DER).
• Key role in monitoring MDG 1 (progress towards global hunger reduction)
• Some criticisms are addressing more the inadequacy of the FAO indicator to respond to specific unintended analytic objectives
How do we do it

• Theoretical considerations
  – Parametric vs Nonparametric approach
    • Higher variability in surveys than in the population
    • DEC distribution can vary from survey to survey
  – Joint distribution for the individual DEC & DER in a country, $f(x,r)$: probabilistic model
  – Observations on individual DEC & DER are virtually impossible to obtain
  – Hypothesis on the marginal distributions and on a strong correlation between $x$ and $r$ (self regulating homeostatic energy balance, Sukhatme & Margen, 1982). PU can be expressed in terms of only the marginal distribution of DEC, $f_x(x)$
Svedberg’s criticism

- \( f_r(r) = \) distribution of **minimum** per capita calorie requirement (MPCCR)
- Joint normal density \( f(x,r) \)

**BUT according to FAO**

- \( f_r(r) = \) distribution of **average** per capita calorie requirement (APCCR)
- MDER is the minimum of the distribution \( f_r(r) \)
- \( f(x,r) \) is not a continuous joint normal density but a mixed one, in which the event \( x = r \) is assigned finite positive probability.
Svedberg’s criticism

A zero probability event

«The common starting point is that there is a distribution of per capita calorie intakes and a distribution of minimum per capita calorie requirements (MPCCR) across households in all populations.» (p. 7)

undernourished
FAO methodological approach

Surely undernourished

Surely overnourished

Misclassifications

DER = DEC
A positive probability event
Practical implementation

• Choice of the **best distributional model**
  – Log Normal (parsimonious, not rejected by the tests)
  – Need of conduct more tests.
• **Estimate of the Mean of the distribution**
  – HH survey data vs. FBS
  – The 2 sources are measuring DES, as a proxy for DEC and are affected by various sources of errors
  – FBS as 2\textsuperscript{nd} best option but used historically because FBS can produce estimates for each country every year
  – HH surveys (of good quality) only recently are being conducted on a frequent basis, but are not available for each country every year
  – When available for the same year, both sources should be used and reconciled
Practical implementation

• Estimate of the Coefficient of Variation (CV)
  – Derived indirectly from HH survey data
  – Direct measures of variance in HH survey data are deemed unreliable:
    • higher variability in samples due to seasonal variations, outliers, missing data (e.g. food away from home), etc.
  – Clustering of individual households’ data to eliminate unwanted variability, $CVx/v$
  – Need to reintroduce physiological variability of DEC, $CVx/r$, capturing everything is orthogonal to income
Practical implementation

- Estimation of the cut-off level MDER
  - The need for estimating the minimum of a distribution (not a distribution of the minimum)
  - DER depends on BMR; BMR varies with sex-age, level of physical activity.
  - Normative values on the acceptable ranges of energy requirements are given for groups of same sex-age.
  - The minima of those ranges compatible with a light physical activity level are averaged across the sex-age composition of the population to provide a single estimate of MDER.
Do we do it well enough?

• Historically it has been a good compromise between precision and feasibility
• However, there is scope today for substantial improvements
  – FBS parameters to be updated regularly
  – Improve basic agricultural statistics through a renewed initiative of statistical capacity development
  – Systematic use of HH survey data, including for the mean of the distribution
  – Better communication to clarify the specific analytic objectives and theoretical basis
  – Provide a measure of uncertainty associated with point estimates;
  – Resist publication of data when deemed unreliable
Moving forward

- On-going comprehensive revision of current estimates
  - Test of log-normality of the DEC distribution
  - Use of HH surveys to estimate Mean of the DEC distribution
  - Time series of country-specific CVs
  - Revision of the FBS parameters/technical coefficients
  - Reconciliation of FBS and HH survey data
  - Interpolation techniques for in-between survey years
  - Methods for extrapolation (real time estimates)
Moving forward

• Additional indicators
  – Prevalence of over-nourishment (Maximum of the distribution of the average individual's requirement)
  – Prevalence of population under food stress (MDER corresponding to an economically active life)
  – Depth of food deficit (amount of energy that would be needed to ensure that hunger would be eliminated)

• FAO providing a platform for dissemination of a comprehensive set of food security indicators
Conclusions

• Appropriateness of the operational definition of chronic hunger
• Soundness of the methodological approach
• Need to improve the reliability of the estimates
• Possibility to produce additional indicators to monitor hunger or over-nutrition
• Partnership between various institutions for the common objective of strengthening our ability to monitor hunger
Thank you!