The FAO chronic hunger index

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Outline

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Context

“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 it 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 or for targeting purposes”

Context

• 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, as a socially/demographically relevant phenomenon, 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 hunger index is an indicator of chronic hunger = captures the evolution of fundamental, not contingent, elements that drive long term nutritional status
  – 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.)

• FAQ hunger index is not supposed to closely follow the series of total food production or aggregate food prices
What do we do

• **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 with respect to specific unintended analytic objectives
How do we do it

• Theoretical considerations
  – Observations on individual DEC & DER are virtually impossible to obtain
  – Joint distribution for the individual DEC & DER in a country, \( f(x,r) \): probabilistic model
  – 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

- Joint normal distribution $f(x,r)$
- $f_r(r) = \text{distribution of } \textbf{minimum} \text{ per capita calorie requirement (MPCCR)}$

\textbf{BUT according to FAO}

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

«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

MDER

XDER

DER

DEC
Practical implementation

• Choice of the **best distributional model**
  – Log Normal (parsimonious, not rejected by the tests)
  – Need of conduct more test. Reliability?

• **Estimate of the Mean of the distribution**
  – HH survey data vs. FBS
  – The 2 sources are measuring DES, as a proxy for DEC
  – The 2 sources are plagued by various sources of errors
  – 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)**
  - Reliability of direct measures of variance in HH survey data: higher variability in the sample
    - Seasonal variation, outliers, food away from home missing
  - 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 healthy nutrition for 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 improvement**
  - FBS parameters to be updated regularly
  - Renewed initiative of statistical capacity building with increased investment in basic agricultural statistics
  - 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 punctual 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
  – capacity development to improve elementary data used to compile the FBS
  – regular revision of the key parameters of the FBS
  – use of HH survey data and reconciliation with the FBS
  – development of interpolation and extrapolation methods
• 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!