The FAO chronic hunger index

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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 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"*

__Masset__ (2011), "A review of hunger indices and methods to monitor country commitment to fighting hunger", Food Policy, 36, S102-S108

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 <u>operational definition</u> of hunger

    b) soundness of the <u>methodological approach</u> on which the estimate is obtained

    c) <u>reliability of the elementary data</u> used to compile the estimate.

Context

- **New demands**:
  a) Estimates <u>disaggregated geographically</u> (at sub-national level) and <u>by socio-economic groups</u>
  b) <u>Consistency between income growth (and poverty reduction) & hunger trends</u>
  c) <u>Real time monitoring</u> 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.)

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 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): <u>probabilistic model</u>
  - Observations on individual DEC & DER are virtually impossible to obtain
  - Hypothesis on the marginal distributions and on a <u>strong correlation between x and r</u> (self regulating homeostatic energy balance, Sukhatme & Margen, 1982). <u>PU can be expressed in terms of only the marginal distribution of DEC</u>, $f_x(x)$

Svedberg's criticism

- $f_r(r)$ = distribution of **<u>minimum</u>** per capita calorie requirement (MPCCR)

- Joint normal density $f(x,r)$

BUT according to FAO

- $f_r(r)$ = distribution of **<u>average</u>** per capita calorie requirement (APCCR)

- <u>MDER is the minimum of the distribution</u> $f_r(r)$

- $f(x,r)$ is <u>not a continuous joint normal density</u> but a mixed one, in which the event (x = r) is assigned finite positive probability.
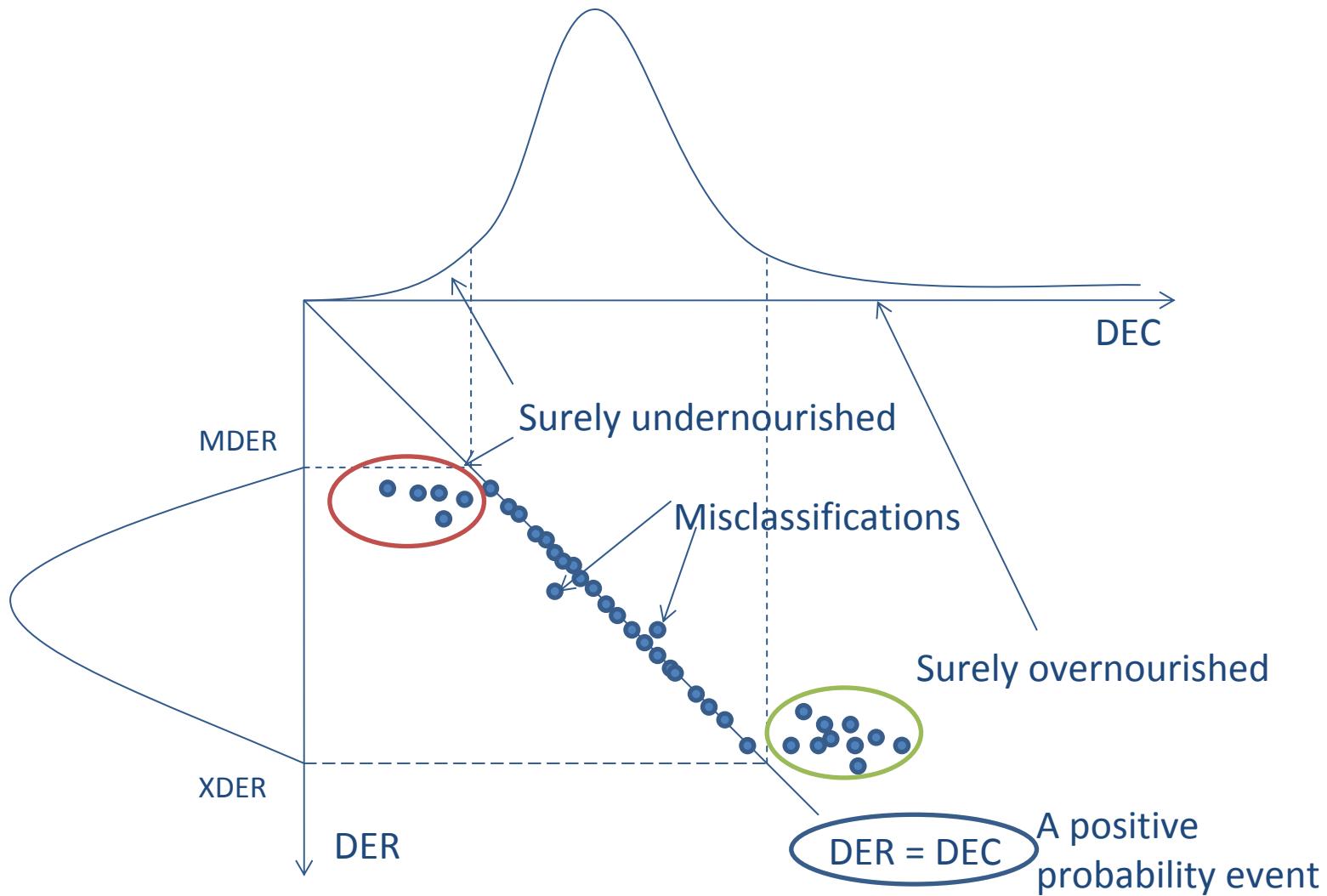
Svedberg's criticism
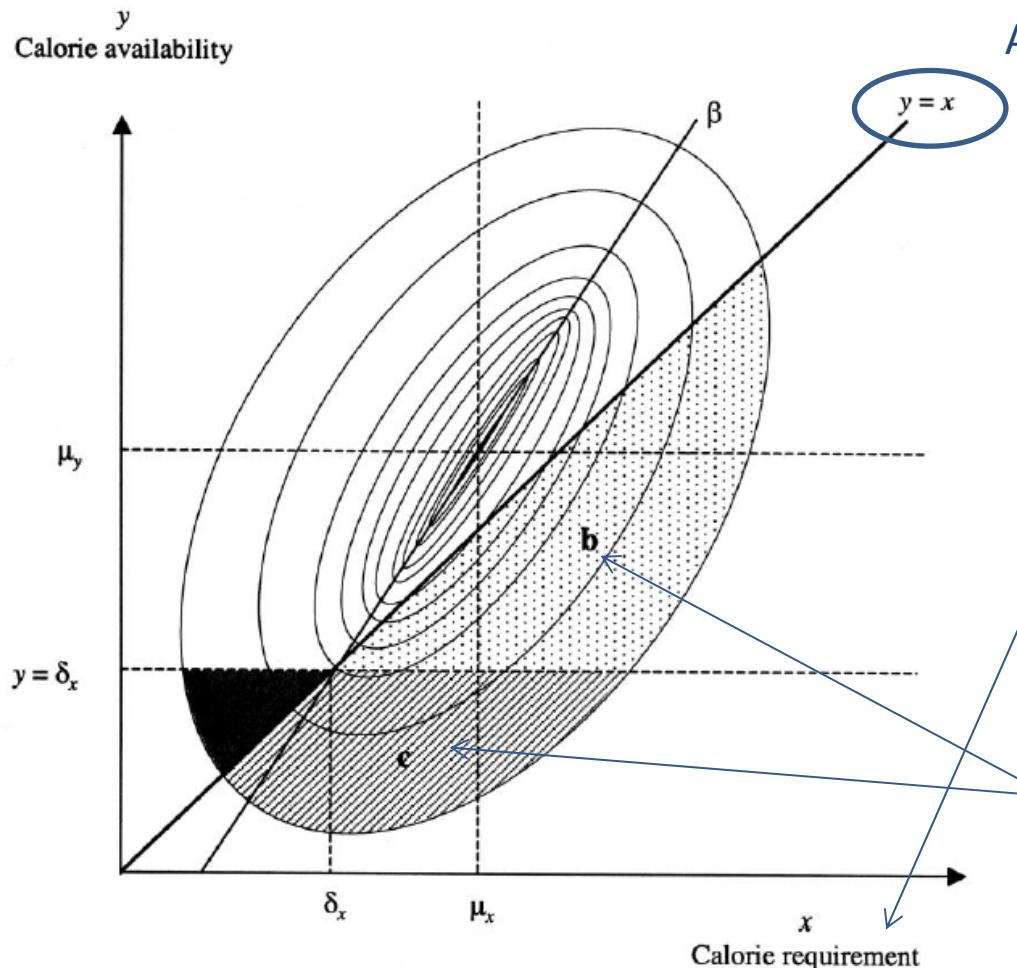
A zero probability event

«*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

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 2nd 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 <u>log normality</u> of the DEC distribution
  - <u>Use of HH surveys</u> to estimate Mean of the DEC distribution
  - <u>Time series of country-specific CVs</u>
  - <u>Revision of the FBS parameters/</u> technical coefficients
  - <u>Reconciliation of FBS and HH survey data</u>
  - <u>Interpolation techniques</u> for in-between survey years
  - <u>Methods for extrapolation</u> (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!

http://www.fao.org/economic/ess/en/