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# The FAO chronic hunger index

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# Outline

- The context
- The FAO hunger index
  - What do we do, and why
  - How do we do it
  - Moving forward
- Conclusions

# 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"*

***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 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, $f_x(x)$

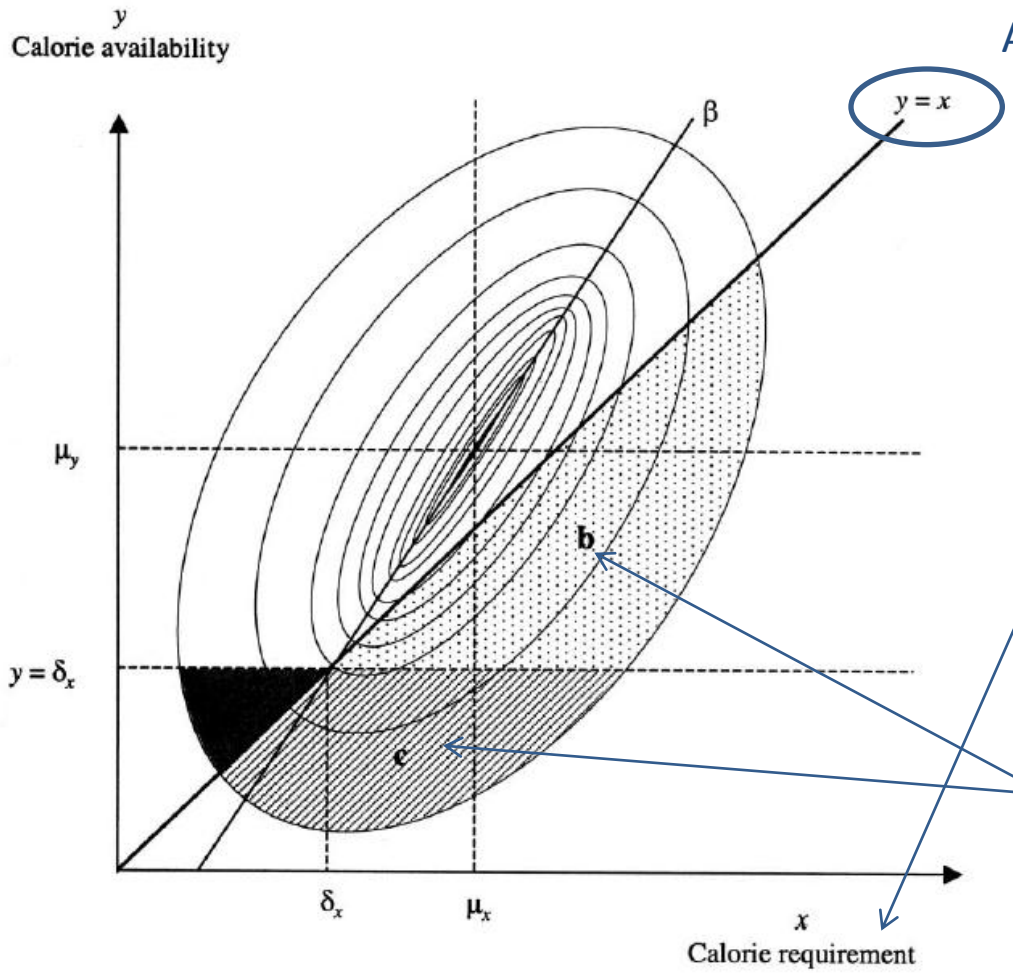
# Svedberg's criticism

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

**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

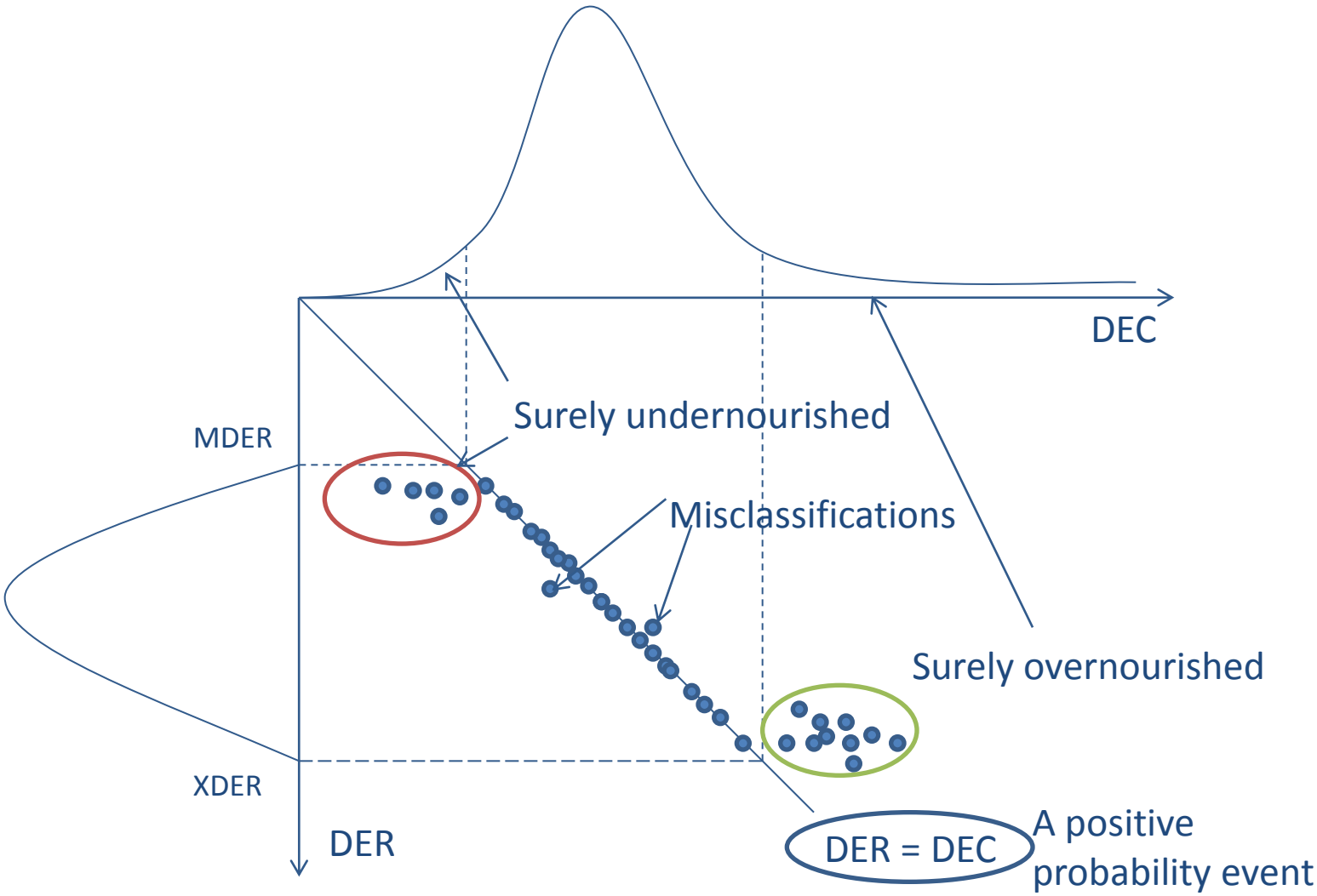



A zero probability event

*«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



# 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!

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