



Technical Note 3

The Excessive (and Wasteful) Consumption of Food

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In a sense, food is “wasted” every time it is acquired by individuals or households in excess of their actual individual or collective nutritional needs (Box 1). Quantities acquired in excess of needs might be actually eaten by humans (with the likely consequence of contributing to malnutrition in the form of overweight and obesity when the corresponding amount of excess energy is not burned away, often as a way to fuel the growing “fitness” industry), reused as feed or food for pets, recycled as organic matter for compost or as fertilizer, or simply literally wasted in dumps.

Box 1 The paradox of excess food consumption from the food insecurity perspective

Many would argue that food consumption also serves functions other than nutrition and therefore it may be limiting to study adequacy of household’s food expenditures only through the nutritional lenses. There may be cultural, religious, and psychological needs that are fulfilled by consuming food either in excess or short of one’s actual nutritional needs, and the levels of food expenditure—economists would maintain—is one way of revealing the value that people attach to them.

Nevertheless, we believe it is important to have an idea of the order of magnitude of such excessive consumption, given that the phenomenon has serious implications in terms of food security, from economic, social, and ecological points of view. Excess demand will tend to raise food prices locally, with welfare distributional implications so that the welfare of those who “waste” food is increased at the expenses of those who can no longer afford it; use of resources—land, water, fossil fuels—devoted to the production of food may be inefficient and unsustainable in the long term.

Without a careful consideration of the actual extent of the phenomenon, and knowledge of by whom and where food is wasted, the solution to the problems they create cannot be addressed effectively, and certainly not by the kind of interventions that are usually thought of when addressing food security in general. A major conundrum emerges for example with reference to food prices: in a sense, wasteful acquisition of food is a reflection of a price that is too low to reflect the full social cost of the resources used in its production. Should we then raise prices? What would be the implications for those who are already food insecure and cannot afford the food they truly need?

To estimate the likely extent of this cumulative excess of food acquisition, we use an approach that parallels the one that is used to estimate the prevalence of undernourishment (SOFI 2012). As the approach has been subject to innumerable misinterpretations, (for example, by Svedberg 2000) it is important to describe it in some detail to clarify the statistical inferential basis on which it is founded.

In essence, the **percentage of individuals in a population who tend, on a regular basis, to acquire food in excess of their needs**, is obtained by estimating the probability that, by randomly sampling a member of the population, the level of food consumption is found to be excessive when assessed against that person’s energy requirements.

To do so directly, one would need to take a sample of the population, collect detailed information on the quantity and quality of the food that is regularly acquired and on the physical and livelihood conditions that determine dietary energy requirements (that is, age, body mass, gender, habitual physical activity level—PAL—and metabolic efficiency) and analyze them to establish the acquisition–needs balance. The required probability would then be obtained as the frequency in the sample of cases with a positive balance (that is, consumption – needs > 0).

As anybody who has ever put her or his “hands” on actual household surveys data knows, the possibility to do this properly is very much just wishful thinking: the precision and the detail of the data collected in large-scale surveys of the population is insufficient to conduct a reliable assessment of adequacy *at the level of individual households*. Even if the theoretical possibility exists of designing such an integrated survey that would collect the information a nutritionist would need to establish the individual energy balance, its cost would be prohibitive.

For this reason, statisticians at the Food and Agriculture Organization of the United Nations (FAO) have devised what has been defined the “parametric” or “cut-off” approach, based on the definition of a probability distribution for the food consumption *of the average individual in the population*. The distribution can be used to estimate the probability of consumption in any range, including that of levels outside the range that can be considered normal for such average individual.

Traditionally, the prevalence of undernourishment (PoU) has been estimated as the probability below the minimum dietary energy requirement (MDER) of the average individual in the population, and we now propose to estimate the prevalence of excess food consumption (PoE) as the probability above the maximum dietary energy requirement (XDER) of the same average individual.

$$\text{PoU} = \int_{-\infty}^{\text{MDER}} f(x)dx$$

$$\text{PoE} = \int_{\text{XDER}}^{+\infty} f(x)dx$$

The concept of the distribution of food consumption *of the average individual* in the population has been probably the main source of confusion for many who have thought to trace a parallel with other measures based on the distribution (for example, with headcount poverty measures). What must be stressed is that the distribution used to estimate PoU and PoE *is not* a representation of the empirical distribution of food consumption levels in the population. If we were to use that distribution, the proper analysis should be conducted under a *joint distribution* of consumption and requirements, as energy requirements vary—and considerably—across individuals.¹ As opposed to any actual individual (of which sex, age, body mass, and PAL might be known), only a *range* of dietary energy requirement can be associated with the average individual of the population, which is a statistical construct reflecting the many differences that exist in the population, and only values outside such range can be considered inadequate or excessive.

¹ A point correctly made among others, by Svedberg (2000). In criticizing the FAO methodology, however, Svedberg mistakenly interpreted the distribution used by FAO as the *marginal distribution of food consumption* derived from the joint distribution of consumption and requirements, by integrating requirements out. (See Naiken 2007, Cafiero and Gennari 2011, and SOFI 2012 for a definitive rebuttal of Svedberg’s methodological criticism.)

Implementing the method thus amounts at estimating the function $f(x)$ and the range MDER–XDER. This is traditionally done by assuming a parametric model for $f(x)$ and estimating its parameters using available sources of the data.²

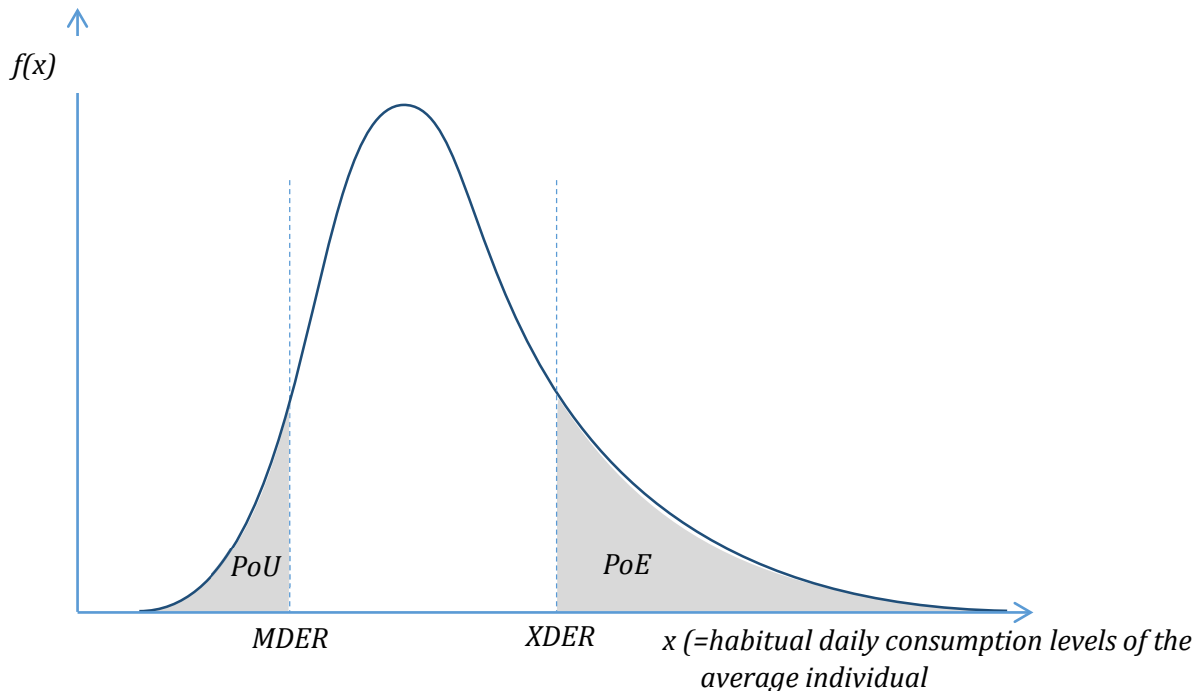
For the FAO national-level estimates, the mean of the distribution is estimated from the per capita dietary energy supply (DES) provided by the Food Balance Sheets available through FAOSTAT. The coefficient of variation and the skewness of the distribution are estimated in different ways depending on the availability and quality of the data, either directly from suitable household income and expenditure surveys or indirectly based on countries' income distributions and indexes of the relative price of food (Wanner 2014).

As for the range of normal requirements, per capita values of energy requirement based on sex, age, ideal weight for observed height, and physical activity levels are taken into account together with information on the sex, age, and height distribution in population to define the needed range. For each sex and age group, the specific MDER corresponds to the lower end of the distribution of ideal weight (5th percentile of the BMI distribution in healthy populations) and physical activity level (PAL coefficient of 1.55), while the XDER corresponds to the respective upper ends (95th percentile of the BMI distribution and PAL = 2.10). The population's MDER and XDER are then obtained as weighted averages across sex and gender with the relative number of people in each group as weights.

The method and the meaning of the distribution of food acquisition is summarized in the graph of Figure 1.

Figure 1 Framework for the calculation of the percentage of individuals in a population who tend, on a regular basis, to acquire food in excess of their needs

² Recently, a three-parameter model of the class of skewed normal distributions has been adopted by FAO in substitution of the previous two parameter log normal distribution to be able to better capture the changes in skewness that may occur over time in the distribution of food acquisitions across households. The class of skewed normal distribution (Azzalini 1985) includes the log normal as a special case.



References

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