

**Abstract for “When more does not necessarily mean better: Health-related illfare comparisons with non-monotone welfare relationships”**

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Target 1.C from the Millennium Development Goals states that the proportion of people who suffer from hunger should be halved between 1990 and 2015. Although this objective is presumed not to be met in 2015, the share of undernourished individuals has declined during the period (de Onis, Blössner, Borghi, Frongillo, and Morris, 2004, Department of Economic and Social Affairs of the U. N. Secretariat, 2012). For instance, the FAO finds that the share of undernourished people in the developing world fell from about 20% to 15% during the period 1990-2010. However, a stylized fact in most developing countries is that progress with respect to undernutrition have often been associated with increase in obesity (Popkin, Adair, and Ng, 2012). This so-called nutrition transition raises the issue of a net gain in social welfare with respect to health. Should we consider that the level of welfare in a society has improved if undernutrition has declined but other forms of malnutrition have become more severe? If we want to perform a global assessment of the social progress with respect to nutrition, then we need to render the situations of underweighted and overweighted individuals socially comparable.

Wellbeing is generally supposed to be monotonically related to the variables used for the analysis in poverty and welfare studies. While this assumption can be regarded as reasonable for many dimensions of wellbeing like income, education, or empowerment, there are some cases where it is definitively not relevant, in particular with respect to health. For instance, health status is often proxied using the Body Mass Index (BMI) in the case of adults, or using weight-for-age or height-for-age in the case of children and adolescents. Low BMI values can capture undernutrition or the incidence of severe illness, yet a high BMI is neither desirable as it indicates obesity. That is why the BMI is usually compared against a left-tail and a right-tail cut-off which work as deprivation lines, e.g. 18.5 kg/m<sup>2</sup> and 25 kg/m<sup>2</sup>, respectively. Estimating aggregate illfare using traditional poverty indices, based on a unique (left-tailed) deprivation line, is therefore not appropriate. Likewise several other health indicators are characterized by the use of two deprivation lines for diagnostic purposes because they relate to situations in which either “having too much” or “too little” is detrimental to health. That is the case of several blood tests, including blood pressure, Thyroid function, hemoglobin and total cholesterol.

This paper first proposes illfare indices that are consistent with situations of nonmonotonic relationships between wellbeing and its indicators, like the aforementioned examples. These indices are decomposable into two indices that, respectively, measure a concept of “loss” illfare and another one of “excess” illfare. While “loss” illfare is identical to the

traditional understanding of poverty as insufficiency, “excess” illfare refers to wellbeing harmed by suboptimal abundance. The family of indices is axiomatically characterized and includes extensions to traditional poverty indices like the Foster-Greer-Thorbecke family and the Watts index. For the purpose of characterization we introduce key alterations to the traditional axioms of focus, monotonicity and transfers. Indices provide precise and useful informations as well as a complete ordering of observed distributions. However, they are all based on specific underlying welfare functions (Blackorby and Donaldson, 1980) upon which agreement may not be met. Of course, in the health context, risks of death or severe disease may theoretically be precisely estimated for the different values of the variable under consideration, but it is not so clear how people value such risks in terms of wellbeing. The relationship becomes even more complex once psychological and social aspects of health are taken into account. For these reasons, it is necessary to look for criteria that make it possible to draw robust conclusions about the state of illfare that is to obtain results that do not depend on the specific functional forms used to assess illfare. The paper also examines the partial orderings of different distributions, according to sub-families of our class of illfare indices, by deriving the required first and second-order stochastic dominance conditions. We also study the conditions for partial orderings when the experience of one form of illfare (e.g. “loss” illfare) is considered to be worse than the other one (e.g. “excess” illfare).