

# A welfare economics foundation for health inequality measurement

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Received 3 May 2005; received in revised form 29 November 2005; accepted 9 January 2006

Available online 8 February 2006

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## Abstract

The empirical literature on the measurement of health inequalities is vast and rapidly expanding. To date, however, no foundation in welfare economics exists for the proposed measures of health inequality. This paper provides such a foundation for commonly used measures like the health concentration index, the Gini index, and the extended concentration index. Our results indicate that these measures require assumptions that appear restrictive. One way forward may be the development of multi-dimensional extensions.

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*JEL classification:* D63; I10

*Keywords:* Health inequality measurement; Preference foundation; Gini index; Concentration index; Achievement index

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## 1. Introduction

Preference foundations give conditions that are necessary and sufficient for a particular model and, thereby, allow assessing the empirical content of a model. The conditions that are identified can serve to justify or to refute a given model. In this paper we will derive preference foundations for the models that underlie the most common ways to measure health inequality.

The literature on the measurement of health inequalities is vast and rapidly growing and has benefited from contributions from a number of disciplinary perspectives.<sup>1</sup> Economists have made

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<sup>1</sup> Early reviews include Wagstaff et al. (1991) and Mackenbach and Kunst (1997). A recent review is Regidor (2004).

substantial contributions to the empirical literature on this subject, thereby often drawing on the accumulated knowledge in the field of income inequality measurement. Le Grand (1989) and Le Grand and Rabin (1986) have proposed the use of the Gini coefficient for the measurement of *pure* inequality in mortality. Wagstaff et al. (1989) have proposed the use of the concentration index for the measurement of relative *socioeconomic* inequality in health and health care. More recently, van Doorslaer and Jones (2003) and Wagstaff and van Doorslaer (2004) have drawn attention to the simple relationship between both types of rank-dependent health inequality measures, while Koolman and van Doorslaer (2004) have illustrated the redistribution interpretation of the concentration index. Wagstaff et al. (2003) have shown how the concentration index can be decomposed by sources, and Clarke et al. (2003) have illustrated its decomposition by components. Clarke et al. (2002) have shown that inequality comparisons based on absolute and relative inequality measures need not coincide. Finally, building on results obtained by Yitzhaki (1983) and Lerman and Yitzhaki (1984), Wagstaff (2002) has made the implicit weighting of individuals' health states in the concentration index more explicit, and has proposed the use of a so-called *achievement index* to simultaneously embody concerns about the mean and the degree of inequality of a health distribution.

While a welfare economics foundation for the measurement of income inequality and the comparison of income distributions has long been provided (Kolm, 1969; Atkinson, 1970; Lambert, 2001; Dutta, 2002), such a foundation has so far been lacking for the proposed measures of health inequality. Stecklov and Bommier (2002) have explored how the Atkinson and Bourguignon (1982) approach to measuring multi-dimensional inequality (e.g. in income and mortality) could be used to provide a welfare economics foundation for health inequality measurement and arrived at a negative conclusion. They restricted attention, however, to a specific notion of a just or equitable distribution of health, namely equality of access (see p. 502) and their negative conclusions are a consequence of this notion. The commonly used measures of health inequality are based on a different notion of equity, namely equality of health.<sup>2</sup> Fleurbaey (2005a) has justified the use of the concentration curve for health by interpreting it as a component in the decomposition of the Lorenz curve for welfare.

This paper takes a different route than Stecklov and Bommier (2002) and Fleurbaey (2005a) by demonstrating how some conditions for preference relations can usefully be applied to provide a welfare economics foundation for the commonly used measures of inequality in health. It draws on the work by Bleichrodt et al. (2004) to characterize the rank-dependent QALY model and on some results that have been derived in the theoretical literature on inequality measurement. By providing such a general preference foundation we hope that our paper will clarify what assumptions are implicit in the adoption of a particular measure.

In what follows, Section 2 describes the main measures of health inequality. Section 3 gives a preference foundation for these measures. We characterize the Gini index, the concentration index and Wagstaff's (2002) achievement index. We also briefly discuss the extension of our techniques to characterize and design absolute measures of health inequality. Section 4, which concludes the paper, discusses the appeal of the conditions introduced throughout the paper and, hence, of the measures that they characterize, and considers possible extensions and generalizations. All proofs are in Appendix A.

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<sup>2</sup> For a criticism of equality of access as a notion of equity see Culyer and Wagstaff (1993) and Fleurbaey (2005a).

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