HHS Public Access

Author manuscript

AIDS. Author manuscript; available in PMC 2018 May 29.

Published in final edited form as:

AIDS. 2017 March 13; 31(5): 742. doi:10.1097/QAD.0000000000001388.

Limitations of using the Lorenz curve framework to understand the distribution of population viral load

Alexander Tsai, MD

Massachusetts General Hospital

Dear Editor

I read with interest the Research Letter by Christopoulos et al. on applying the Lorenz curve to understand the distribution of population viral load [1]. The authors suggest that this framework could be used to inform targeting a small group of patients with the aim of reducing population viral load. Presumably the same reasoning might be applied to inform targeting across populations or subpopulations (e.g., targeting clinics or counties most responsible for concentrated "viral load wealth" with the aim of reducing population viral load). To do so, one might use the population Lorenz curves to calculate the corresponding Gini coefficients (i.e., the area between the Lorenz curve and the 45-degree line of perfect equality, divided by the total area under the 45-degree line); and then direct resources across populations based on their coefficient values. The authors may or may not have had such an idea in mind when writing the article, but I thought it prudent to point out some potential limitations of the framework should such an idea someday take hold.

First, in some circumstances Lorenz curves can cross, yielding identical or similar Gini coefficient values. These scenarios would complicate the comparison of Gini coefficients across populations.

Second, computation of the Gini coefficient is most sensitive to inequalities in the middle portion of the population viral load distribution [2,3].

Third, there are a number of other measures that could be used to measure the concentration of viral load wealth [4], namely: (a) the decile ratio: viremia copy-months among the "wealthiest" 10% of patients divided by viremia copy-months among the "poorest" 10% of patients; (b) the Robin Hood Index: the maximum vertical distance measured from the Lorenz curve to the 45-degree line of perfect equality; and (c) the Atkinson index: the Gini coefficient modified so that different portions of the population viral load distribution are given different weights. There are, of course, a number of other measures that could be used, all with different advantages and disadvantages.

Fourth, the Gini coefficient is downward-biased in small samples [5]. In such situations the asymptotic distribution of the Gini would be of little use.

References

1. Christopoulos K, Hartogensis W, Glidden DV, Pilcher CD, Gandhi M, Geng EH. The Lorenz curve: a novel method for understanding viral load distribution at the population level. AIDS. Epub 7 Nov 2016.
2. Atkinson AB. On the measurement of inequality. J Econ Theory. 1970; 2:244–263.
3. Hey JD, Lambert PJ. Relative deprivation and the Gini coefficient: comment. Q J Econ. 1980; 95:567–573.
4. Kawachi I, Kennedy BP. The relationship of income inequality to mortality: Does the choice of indicator matter? Soc Sci Med. 1997; 45:1121–1127. [PubMed: 9257403]
5. Deltas G. The small-sample bias of the Gini coefficient: results and implications for empirical research. Rev Econ Stat. 2003; 85:226–234.