



The Importance of Reliability in the Multidimensional Poverty Index for Latin America (MPI-LA)

Maria Emma Santos & Pablo Villatoro

To cite this article: Maria Emma Santos & Pablo Villatoro (2020) The Importance of Reliability in the Multidimensional Poverty Index for Latin America (MPI-LA), The Journal of Development Studies, 56:9, 1784-1789, DOI: [10.1080/00220388.2019.1663177](https://doi.org/10.1080/00220388.2019.1663177)

To link to this article: <https://doi.org/10.1080/00220388.2019.1663177>



© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 25 Sep 2019.



Submit your article to this journal [↗](#)



Article views: 1066



View related articles [↗](#)



View Crossmark data [↗](#)



RESPONSE

The Importance of Reliability in the Multidimensional Poverty Index for Latin America (MPI-LA)

MARIA EMMA SANTOS*** & PABLO VILLATORO[†]

*Instituto de Investigaciones Económicas y Sociales del Sur (IEESS), Departamento de Economía, Universidad Nacional del Sur (UNS) – Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Bahía Blanca, Argentina, **Oxford Poverty and Human Development Initiative, University of Oxford, Oxford, UK, [†]División de Estadísticas, Comisión Económica para América Latina y el Caribe (CEPAL), Santiago, Chile

(Original version submitted April 2019; final version accepted August 2019)

ABSTRACT *We recently proposed a Multidimensional Poverty Index for the Latin America (MPI-LA) region implementing a broadly used methodology developed by Sabina Alkire and James Foster. The present note is a response to Hector Najera and David Gordon's paper (published in this volume), in which they claim that the MPI-LA is an 'unreliable measure of poverty' because it does not pass some statistical tests that they consider applicable to multidimensional poverty measurement. In this note we address each of their critiques in turn and explain why Najera and Gordon's claim is not correct.*

We recently proposed a Multidimensional Poverty Index for the Latin America (MPI-LA hereafter) region (Santos & Villatoro, 2018; Santos, Villatoro, Mancero, & Gerstenfeld, 2015) implementing a broadly used methodology developed by Alkire and Foster (2011). The present note responds to Hector Najera and David Gordon's paper criticising the MPI-LA (Najera & Gordon, 2019). We value this exchange and hope it leads to improvements both in the measurement of poverty and in policy making in the region.

The MPI-LA is composed of 13 indicators grouped into 5 dimensions. The dimensions and indicators are: **housing**, comprising the indicators of housing materials, overcrowding, and housing tenure, **basic services**, comprising the indicators of improved water sources, improved sanitation, and access to clean energy; **living standard**, comprising the indicators of monetary resources and durable goods; **education**, comprising the indicators of adult schooling achievement, children's school attendance and children's schooling gap; and **employment and social protection**, comprising the indicator of employment and social protection (namely, health insurance, and social security or pension).¹ The index was estimated for 17 countries of the region at two points in time – one around 2005 and the other one around 2012 – and the figures were published in the *Panorama Social de America Latina* 2014 (CEPAL, 2014).

Correspondence Address: Maria Emma Santos, Instituto de Investigaciones Económicas y Sociales del Sur (IEESS), Departamento de Economía, Universidad Nacional del Sur (UNS) – Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), San Andrés 800, Bahía Blanca 8000, Argentina. Email: maria.santos@qeh.ox.ac.uk; msantos@uns.edu.ar

© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

Najera and Gordon claim that the MPI-AL is an ‘unreliable measure of poverty’ because it does not pass some statistical tests that they consider applicable to multidimensional poverty measurement. Below we address each of their critiques in turn and explain why Najera and Gordon’s claim is not correct.

1. The reliability of the MPI-LA results

Najera and Gordon’s first critique is that the MPI-LA is unreliable because they get low values for coefficients α , β , and ω , originally used in psychometrics to assess the reliability of a set of items (or more precisely, statements) used to measure some non-observable psychological construct such as motivation, depression or attitudes. The three coefficients are essentially based on the correlations among the items (or statements) used.²

The α and β coefficients can be useful in assessing a set of items measuring a unidimensional construct (Peters, 2014; Zinbarg, Revelle, Yovel, & Wen, 2005). For example, they can be informative in assessing the set of assets to be included in an asset index (Vollmer & Alkire, 2018), or the set of consumption items to be included in an index of material deprivation (Guio, Gordon, & Marlier, 2012). However, α is not adequate for evaluating the reliability of a set of indicators of a multidimensional poverty index. The α -coefficient has been widely criticised; see Revelle and Zinbarg (2009), Sijtsma (2009), Peters (2014), Crutzen and Peters (2017), McNeish (2018), among others. The α -coefficient must be implemented under the assumption of τ -equivalence, which entails that *all items measure the same underlying variable, that they do so on the same scale, and that they are equally strongly associated to that underlying variable* (Peters, 2014, p. 59), a requirement that is rarely satisfied in practice (Peters, 2014; Sijtsma, 2009; Vollmer & Alkire, 2018). Certainly, τ -equivalence is not satisfied by the MPI-LA, whose indicators represent different deprivations within a thematic domain (poverty), and therefore α cannot be used. The β coefficient is a variant of α that can be considered to be a lower bound of the proportion of total variance accounted by one common factor (Revelle, 1979; Revelle & Zinbarg, 2009).

The ω -coefficient (McDonald, 1999) does not assume τ -equivalence and can potentially be useful in assessing the reliability of a multidimensional construct. However, the computation of ω requires the specification of a factor model (Guio, Gordon, Najera, & Pomati, 2017; McNeish, 2018; Revelle & Zinbarg, 2009; Viladrich, Angulo-Brunet, & Doval, 2017), and thus its applicability to assess the MPI-LA is questionable. As it is further explained in Section 3 below, the MPI-LA does not intend to ‘explain’ poverty; it is not a measurement *model*. Quantifying the reliability of the MPI-LA based on a model that the MPI-LA was never meant to fit is pointless. The aim of the MPI-LA is less ambitious as it is simply a measurement instrument.

In any case, one of the motivations for moving from income or consumption poverty to multidimensional poverty is precisely the low association between the different kinds of deprivations (Alkire et al., 2015, chapter 1). Thus, relying on instruments that assess the MPI-LA indicators based on their correlations is at odds with the motivation for constructing a multidimensional poverty index. It is also worth noting that, unlike psychological variables which need to be measured through indirect measurement tools (McNeish, 2018), poverty *is* observable. In fact, like the Global MPI (Alkire & Santos, 2010, 2014), the MPI-LA is an implementation of *direct* poverty measurement as defined by Sen (1981).

The robustness analysis of the MPI-LA performed in Santos and Villatoro (2018) looks into the stability of the estimates to changes in the parameters’ values, considering various plausible changes in the poverty cut-off, indicators’ weights and the index structure. It is one of the most complete robustness analyses in the literature of multidimensional poverty measurement published to date. A total of 58 alternative specifications of the MPI-LA were estimated, varying one parameter at a time as well as several at the same time, and all of them were estimated for a range of k poverty cut-offs from 10 to 100 per cent.³ The robustness analysis was conducted by comparing the ranking of countries and the classification of people into poor and non-poor, and the results suggest that the measure is robust.

Moreover, MPI-LA estimates for each country are reported alongside their 95 per cent confidence intervals, obtained by way of *bootstrap* using 1000 replications (that is *re-samplings*) and these

confidence intervals are small. Therefore, it is highly unlikely that ‘if several samples were taken for the same population the ranking of the population as “poor” and “not poor” would show significant random fluctuations’, like Najera and Gordon claim.

2. The selection of indicators of poverty

The selection of the MPI-LA indicators was based on its antecessor, Unsatisfied Basic Needs (UBN) measures, and international conventions on economic and social rights. In addition, the pertinence of the indicators was statistically evaluated using Exploratory Factor Analysis, as we explain in [Section 3](#) below.

Najera and Gordon criticise the selection of some of these indicators. They implement a two-parameter Item Response Theory (IRT) model for each of the MPI-LA indicators. The first parameter of IRT provides information on the severity of the item, that is, on the difficulty to obtain that item, as measured by units of standard deviation from the average (Guio et al., 2017; Vollmer & Alkire, 2018). The second parameter provides information on the discrimination of an item, i.e. how well each item discriminates between the deprived and non-deprived respondents (Guio et al., 2012). Najera and Gordon find that the indicators of adult schooling achievement, employment and housing tenure ‘do not adequately discriminate between the poor and non-poor’ and, alongside the indicator of schooling gap, are ‘far too severe’ manifestations of poverty. From these results, they conclude that because the living standards in Latin America have improved over time, these indicators are not satisfactory measures of the living standards of the poor.

We certainly agree that poverty indicators need to be continuously revised and updated if and when needed. Still, with the MPI-LA being a regional index, the heterogeneity across countries in terms of phases of development may require making some compromises in the choice and definition of indicators, so that these are applicable to the whole set of countries. For example, according to IRT models, radio and bicycle are items that fit less well into the asset deprivation index of the Global MPI; however these indicators have been retained because either data on ‘substitution items’, such as computer and/or internet access (for radio) and motorbike (for bicycle) are still missing, or the items themselves are still not owned widely (Vollmer & Alkire, 2018, p. 46).

More generally, Najera and Gordon’s concern regarding these individual deprivations not being linked to poverty is not relevant because the MPI-LA does not use a *union* poverty cut-off but an *intermediate* poverty cut-off. Someone is identified as poor if he or she lives in a household which experiences 25 per cent or more of the weighted deprivations. In other words, one sole deprivation (let it be schooling gap, housing tenure or any other) will not lead to a household being identified as poor.

As Santos and Villatoro (2018) report, the headcount ratios of multidimensional poverty – as measured by those experiencing 25 per cent or more of the weighted deprivations – around the year 2012 vary from 78 per cent in Nicaragua to 6.8 per cent in Chile, a wide range that shows that altogether the indicators of the MPI-LA are not outdated and they do not reflect *only* severe poverty, as Najera and Gordon imply.

3. The meaning of dimensions in multidimensional poverty measurement

Najera and Gordon’s last critique is that they ‘test the validity’ of the ‘5-dimensional hierarchical model’ ‘imposed’ by the MPI-LA using Confirmatory Factor Analysis (CFA) and conclude that it has a low fit and that only weak multidimensionality is found. This finding is not surprising given that the structure of the MPI-LA does not intend to ‘explain’ poverty, nor does it intend to propose a hypothesis of the correlations between dimensions and indicators. Thus, there is no formal construct that needs to be confirmed.

At this point it is important to note that there is a fundamentally different understanding of the concept of ‘dimension’ in the statistical literature employed in psychometrics, and in the literature in development studies. In the statistical literature employed in psychometrics, dimensions are latent factors that explain the variability in the observed indicators. In contrast, in the development studies literature in general and in multidimensional poverty measurement in particular, dimensions are

‘conceptual categories into which indicators may be arranged for intuition and ease of communication’ (Alkire et al., 2015, p. 201); they are ‘component aspects of something’, whether human development or poverty, ‘that co-exist with other components’ (Alkire, 2002, p. 182).

Such understanding of ‘dimensions’ has been present since the early work on composite indices of development (Hicks & Streeten, 1979). The concept of ‘dimensions’ in this sense became widely accepted with the introduction of the Human Development Index (UNDP, 1990), and other companion indices introduced since then, including the Global Multidimensional Poverty Index (UNDP, 2010).⁴ Thus, at no point are we expecting the dimensional structure of the MPI-LA to reproduce the variability observed in a certain selection of datasets. The *dimensional* structure of the index responds to conceptual categories driven by common sense and linked to areas of social policy. Currently used national MPIs also illustrate this procedure: Colombia and Costa Rica’s MPI structural dimension was guided by the configuration of sectorial social policies in those countries (Angulo, Díaz y Pardo, 2013; Instituto Nacional de Estadística y Censos, 2015). Moreover, not surprisingly, the dimensions of the MPI-LA are in line with the thematic specialisation of international agencies and programmes such as UN-Habitat, JMP and GTF, UNESCO and ILO.⁵

It is also worth clarifying that we used Exploratory Factor Analysis (EFA) ‘to verify the empirical relevance of the indicators as indicators of poverty, complementing the normative arguments’, not to define the dimensional structure of the MPI-LA. We found all indicators to have higher loadings on the first factor. While Najera and Gordon interpret that as a sign of unidimensionality and consider that a flaw, it is actually a strength, as the indicators account for one phenomenon: poverty. This result does not make poverty in the region any *less* multidimensional. Conceptually, say for example housing and education, are *still* different aspects of poverty.

4. The importance of the normative perspective

Najera and Gordon label our work as ‘idiosyncratic’, subject to ‘confirmation bias’ and ‘unscientific’. They cite Principle 4 proposed by the World Bank’s Commission on Global Poverty for the portfolio of complementary indicators to monetary poverty, which states that indicators ‘should be sufficiently robust and statistically validated; there should be a clear structure of accountability for its definition and construction’ (World Bank, 2017, p. 104). However, Najera and Gordon provide no justification for why the methods they use, primarily employed in psychometrics, are appropriate in the field of multidimensional poverty measurement. Specifically, while poverty could be considered to be an unobserved or latent phenomenon, the conditions for this to be the case need to be clearly spelt out. The assumptions underlying statistical methods require scrutiny, especially in the case of model-based methods, as the ones applied by Najera and Gordon.

Moreover, they ignore Principle 3, which states that ‘the definition of the indicator should be generally accepted as valid and have a clear *normative* interpretation’ (emphasis added) (World Bank, 2017, p. 104). Certain functionings have intrinsic value for a life with human dignity (Nussbaum, 1997) and this intrinsic value is not subject to empirical validation. Paradoxically, Gordon, Nandy, Pantazis, Pemberton, and Townsend (2003)’s work on global child poverty, rooted in the international framework of child rights and embraced by UNICEF (2004), made no use of the statistical techniques that Najera and Gordon now claim to be indispensable for poverty measurement (techniques which were already available at that time). A child was defined to be in absolute poverty if he or she suffered from two or more different types of severe deprivations (p. 9), where the threshold for severe deprivation in each indicator (food, safe drinking water, sanitation facilities, health, shelter, education, information and access to services) was defined according to ‘internationally agreed standards and conventions’ (p.7). Certainly, this work is no less *scientific* for not employing the techniques that Najera and Gordon now so eagerly advocate.

In line with Principle 4 of the World Bank (World Bank, 2017), we acknowledge that indicators need to be robust and statistically validated. However, in line with Principle 3 (World Bank, 2017), we also note that the indicators need to have a clear normative interpretation. Therefore, taking any statistical method

as the *sole* decision tool constitutes quite an extreme, almost radical, approach, which ignores axiomatic properties, normative arguments and common sense, all in the name of a specific technique.

Notes

1. The housing, basic services, living standard and education dimensions are equally weighted with 22.22 per cent, whereas the social protection dimension receives half of this weight, 11.11 per cent. Weights within dimensions are equally distributed in the case of the housing, basic services and education dimensions, and unequally distributed within the living standard and the social protection dimensions, with income and employment receiving twice the weight of durable goods and social protection within the corresponding dimensions. As a result, all deprivations receive the same weight (7.4%), except for social protection (3.4%) and income (14.8%).
2. The α coefficient (Cronbach, 1951) is the average inter-item covariance (weighted by the total number of items) as a proportion of the total variance. The β coefficient (Revelle, 1979) is the average inter-item covariance between the split of items that minimises the average covariance ('the worst split'), obtained by hierarchical cluster analysis. By definition, $\beta \leq \alpha$. The ω total coefficient (McDonald, 1999) is computed from an estimated factor model, using the sum of the squared loadings on the general factor and on group factors (i.e. factors common to some but not all of the items); by definition $\omega \geq \alpha$ (Zinbarg et al., 2005). When τ -equivalence is satisfied, the three coefficients are equal (Zinbarg et al., 2005).
3. For details on the different alternatives that we considered and the results, see section 3.3 of Santos and Villatoro (2018, p. 68–74). Najera and Gordon's statement that we impose 'marginal variation' to the weights is not correct. For example, the explicit weight assigned to income ranged from a minimum of 3.7 per cent to a maximum of 25 per cent.
4. Regardless of what different indices are designed to measure (poverty, development, gender inequality, etc), and what dimensions and indicators they use, the meaning of dimensions is common to all.
5. JMP is the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene, established by WHO and UNICEF. The Global Tracking Framework (GTF) is led jointly by the World Bank/Energy Sector Management Assistance Programme (ESMAP) and the International Energy Agency (IEA). UNESCO is the United Nations Scientific and Cultural Organisation. ILO is the International Labour Organisation.

Funding

This work was supported by the ANPCyT-PICT [2079] and Universidad Nacional del Sur PGI [24/ZE30].

Disclosure statement

No potential conflict of interest was reported by the authors.

References

- Alkire, S. (2002). Dimensions of human development. *World Development*, 30(2), 181–205.
- Alkire, S., & Foster, J. E. (2011). Counting and multidimensional poverty measurement. *Journal of Public Economics*, 95, 476–487.
- Alkire, S., Foster, J. E., Seth, S., Santos, M. E., Roche, J. M., & Ballon, P. (2015). *Multidimensional poverty measurement and analysis*. Oxford: Oxford University Press.
- Alkire, S., & Santos, M. E. (2010). Acute multidimensional poverty: A new index for developing countries. *OPHI Working Paper 38*, University of Oxford.
- Alkire, S., & Santos, M. E. (2014). Measuring acute poverty in the developing world: Robustness and scope of the multidimensional poverty index. *World Development*, 59, 251–274.
- Angulo, R., Díaz, B. Y., y Pardo Pinzón, R. (2013). A counting multidimensional poverty index in public policy context: The case of Colombia. *OPHI Working Paper*, 62.
- CEPAL. (2014). *Panorama Social de América Latina 2014*. Santiago de Chile: Author.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297–334.
- Crutzen, R., & Peters, G. Y. (2017). Scale quality: Alpha is an inadequate estimate and factor-analytic evidence is needed first of all. *Health Psychology Review*, 11(3), 242–247.
- Gordon, D., Nandy, S., Pantazis, C., Pemberton, S., & Townsend, P. (2003). *Child poverty in the developing world*. Bristol: The Policy Press.
- Guio, A.-C., Gordon, D., & Marlier, E. (2012). *Measuring material deprivation in the EU*. Eurostat. Methodologies and Working Papers.

- Guio, A.-C., Gordon, D., Najera, H., & Pomati, M. (2017). Revising the EU material deprivation variables. *Eurostat Statistical Working Papers*.
- Hicks, N., & Streeten, P. (1979). Indicators of development: The search for a basic needs Yardstick. *World Development*, 7, 567–580.
- Instituto Nacional de Estadística y Censos (INEC). (2015). *Índice de Pobreza Multidimensional. Metodología*. San José de Costa Rica: Author.
- McDonald, R. P. (1999). *Test theory: A unified treatment*. Hillsdale: Erlbaum.
- McNeish, D. (2018). Thanks Coefficient Alpha. We'll take it from here. *Psychological Methods*, 23(3), 412–433.
- Najera, H., & Gordon, D. (2019). The importance of reliability and construct validity in multidimensional poverty measurement: An illustration using the Multidimensional Poverty Index for Latin America (MPI-LA). *The Journal of Development Studies*. Advance online publication. doi:10.1080/00220388.2019.1663176
- Nussbaum, M. (1997). Capabilities and Human Rights. *Fordham Law Review*, 66(2), 273–299.
- Peters, G. Y. (2014). The alpha and the omega of scale reliability and validity. Why and how to abandon Cronbach's alpha and the route towards more comprehensive assessment of scale quality. *The European Health Psychologist*, 16(2), 56–69.
- Revelle, W. (1979). Hierarchical Cluster analysis and the internal structure of tests. *Multivariate Behavioral Research*, 14, 57–74.
- Revelle, W., & Zinbarg, R. E. (2009). Coefficients Alpha, Beta, Omega, and the GLB: Comments on Sijsma. *Psychometrika*, 74(1), 145–154.
- Santos, M. E., & Villatoro, P. (2018). A multidimensional poverty index for Latin America. *Review of Income and Wealth*, 64(1), 52–82.
- Santos, M. E., Villatoro, P., Mancero, X., & Gerstenfeld, P. (2015). A multidimensional poverty index for Latin America. *OPHI Working Paper No 79*.
- Sen, A. K. (1981). *Poverty and famines. An essay on entitlement and deprivation*. Oxford: Oxford University Press.
- Sijsma, Y. (2009). On the use, the misuse, and the very limited usefulness of Cronbach's Alpha. *Psychometrika*, 74(1), 107–120.
- UNDP. (1990). *Human development report 1990*. New York: United Nations Development Programme.
- UNDP. (2010). *Human development report 2010: Pathways to human development. The real wealth of nations*. New York: United Nations Development Programme.
- UNICEF. (2004). *The State of the World's Children 2005: Childhood Under Threat*. New York: Author.
- Viladrich, C., Angulo-Brunet, A., & Doval, E. (2017). A journey around alpha and omega to estimate internal consistency reliability. *Anales de Psicología*, 33(3), 755–782.
- Vollmer, F., & Alkire, S. (2018). "Towards a Global assets indicator: Re-assessing the assets indicator in the Global multidimensional poverty index. *OPHI Research in Progress 53a*.
- World Bank. (2017). *Monitoring Global Poverty*. Report of the Commission of Global Poverty. Washington, DC: Author.
- Zinbarg, R. E., Revelle, W., Yovel, I., & Wen, L. (2005). Cronbach's α , Revelle's β and McDonald's ω_H : Their relations with each other and two alternative conceptualizations of reliability. *Psychometrika*, 70(1), 123–133.