

# Multidimensional Child Poverty: From Complex Weighting to Simple Representation

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**Abstract** Within the debates on poverty measurement among experts as well as the discussions about Sustainable Development Goals (SDGs) an interesting shift has taken place in recent years, away from uni-dimensional measurements (based on a poverty line) and towards multi-dimensional approaches. Any multi-dimensional approach is, by definition, dealing with the complexity of poverty across a range of aspects which need to be assessed separately before they can be combined (weighted) to produce an overall, synthetic measure. This measure, in turn, if it is going to be more than a theoretical curiosity, must be translated for and presented to the public at large and decision-makers in order to impact programs and policies to reduce and eliminate poverty. In this paper, all the steps involved in the last two sentences are explored. This is done in the context of the measurement of Child Poverty that was initiated over a decade ago by UNICEF. After a brief review of the history and evolution of the measurement of Child Poverty, three consecutive sections dealing with the issues raised above are introduced. First, based on the experience of over 70 countries from all developing continents, the selection of indicators is discussed. This is followed by a simple simulation showing the pitfalls of endogenous weights. The third of these sections explores the challenges in presenting these results to a wide, lay audience which are shown to be less intractable than the issues faced by weighted composite indexes and the “dollar-a-day” uni-dimensional metric. An additional section deals with the problem of embedding the Child Poverty measurement within the larger poverty picture of

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the country (i.e. comparing and complementing metrics of adult and overall poverty). The final section summarizes the main results and conclusions of the paper.

**Keywords** Complexity · Multi-dimensional poverty · Child Poverty

## 1 Introduction

Children suffer poverty differently from adults. Thus, an independent measurement of Child Poverty is needed. Otherwise, policies to reduce and eliminate poverty may leave children out (and occasionally hurt them if family poverty is reduced by increasing child labor or adults working long hours which results in child neglect). As income is not the most important issue for children but their access to food, housing, education, health, etc., actually is, the best way to measure Child Poverty is using a multidimensional approach. This raises issues of synthesizing the complex measurement of multi-dimensional poverty in an indicator that is useful for policy-making and meaningful to a wide audience.

Thus, the main objective of this paper is two-fold: to address head-on the conceptual and empirical challenges of dealing with a plurality of data related to a complex socio-economic problem (Child Poverty) and presenting it in a straightforward and understandable way to a large audience. This is done by first discussing issues of selecting, combining, and weighting several dimensions of Child Poverty to construct a synthetic indicator. Once the complexity of measuring Child Poverty has been dealt with (by arriving at a multi-dimensional measurement), and if this measure is going to be more than a theoretical curiosum, it must be translated for and presented to the public at large and decision-makers in order to impact programs and policies to reduce and eliminate poverty. Consequently a set of proposals is offered on how to convey the results of the measurement of Child Poverty, including how to embed it in an overall measurement for the whole population. In other words, the paper shows (through the example of measuring Child Poverty grounded on current practice, the theoretical literature, and child rights) multi-dimensional poverty can be estimated in a way which is simple to understand. In so doing, the case is made for measuring Child Poverty with an unweighted (i.e. a normative-based, equal weighting) selection of a few child rights that constitute poverty.

The outline of the paper is as follows. A review of the concept of Child Poverty and its history is put forth first (Sect. 2), followed by a description and rationale for selecting the dimensions to be included in its estimation (Sect. 3). This is followed by two sections dealing, respectively, with the challenges of weighting various dimensions of Child Poverty in terms of measuring it (Sect. 4) and in reporting these results (Sect. 5). The problem of embedding the Child Poverty measurement with the larger poverty picture of the country (i.e. comparing and complementing metrics of adult and overall poverty) is introduced in the section that follows these discussions (Sect. 6). The final section summarizes the main results and conclusions of the paper.

## 2 History and Rationale of Child Poverty Measurement

While measuring poverty using a monetary poverty line based on the cost of a set of basic consumption goods and services is over a century old (Rowntree 1902; Booth 1902), multi-dimensional approaches to deprivation (Townsend 1954) are more recent (Wratten 1995;

Boltvinik 1998). Although they are not necessarily new (ILO 1976; Morris 1978; Streeten et al. 1981), their application to understanding and measuring Child Poverty took off at the turn of the century.

In UNICEF (2000) two approximations were offered. One was an attempt to estimate the proportion of children among the 1.2 billion persons who at the time were struggling to survive with less than a PPP dollar (of 1985) a day. This was based on region-specific Total Fertility Rates among the lowest wealth quintiles, given the empirical observation that fertility is higher among the (monetary or assets-based) poorest families. The “average” composition (i.e. numbers of children per adult) among the poorest families was estimated to arrive at the number of children living in households with insufficient monetary resources.

Besides recognizing the limitation of data and assumptions of this approximation, the many limitations of the monetary approach to estimate Child Poverty were also probed. It was recognized that children suffer poverty from various deprivations, many of which are not related to their parents’ monetary income or consumption. Thus, the second approximation, i.e. multi-dimensionality, was introduced in the conceptualization of Child Poverty.

The experience of poverty by children involves elements which differ from those of adults (Christian Children’s Fund 2005; Minujin et al. 2006; Noble et al. 2006; Lyytikäinen et al. 2006; Jones and Sumner 2011). When nurses, clinics, teachers, schools, and water delivery systems do not exist (in a particular geographical area at a point in time), questions about the sufficiency or not of income to hypothetically purchase a minimum set of goods and services becomes nugatory for the wellbeing of children whose right to education or health would be impaired.

Another reason to avoid measuring Child Poverty only through the sufficiency of household income is that increases in family income could have detrimental effects on children. This would be the case if higher income is due to child labour or to parents working long hours (and consequently neglecting children). In addition, monetary estimates of poverty usually assign (although they do not need to) a lower weight to children than adults. While this is based on the idea there are economies of scale in the utilization of assets (e.g. the housing unit and some household amenities like stoves), it is not at all obvious nor established empirically that these economies of scale are not compensated by higher (and different) needs of children in terms of health and education expenditures compared to adults. Other ways to deal with economics scale, which do not assume that children “cost less” than adults, are preferable and have been explored long ago (Citro and Michaels 1995) but they are not widely applied.

Moreover, improvements can take place in terms of multi-dimensional poverty among adults without benefitting children. For instance, adults could enjoy the expansion of a health insurance scheme but children are not taken to clinics when they are ill or literacy campaigns could be put in place but their financing takes away from the primary school budget leaving children out of school. As a result, it may seem that poverty is declining at the population-wide, aggregate level but actually children are worse off (these examples do not even take into account that a fundamental issue for children, malnutrition, is usually not measured for adults beyond the Body Mass Index), leading to incorrect conclusions about progress in the quest to eliminate poverty. In order for policy-makers to arrive at an accurate evaluation of poverty trends, the specifics of Child Poverty (i.e. poverty affecting a distinct group which often comprises between a quarter to half of the total population) need to be assessed and measured.

In order to address these limitations and estimate Child Poverty properly and independently of adults, at the turn of the century, UNICEF commissioned the London School of Economics and Bristol University to apply a Human Rights-based approach to the then-available comparable household surveys (basically Demographic Health Surveys and Multiple Indicators Cluster Surveys, which, at the time, covered more than 70 countries). In this estimate of Child Poverty consistent definitions and indicators were used across all countries. Thus, the first-ever scientifically based estimate of Child Poverty throughout the developing countries was estimated (Gordon et al. 2003). In order to avoid criticisms of trying to exaggerate the plight of poor children, thresholds of severe deprivation were used in all the dimensions (which are described in the next section).

Based on these results, in 2005, the flagship UNICEF publication, *The State of the World's Children* dealt with Child Poverty, its consequences, and ways to address it. Further, in 2007, the United Nations General Assembly adopted a multi-dimensional definition of Child Poverty.

At the same time, between 2005 and 2010, UNICEF launched Conferences and a Global Study to motivate countries to estimate their own measurement of Child Poverty and to design policies to combat it. It was agreed and accepted that different countries may adopt and adapt the indicators and thresholds in the dimensions of Child Poverty to their idiosyncratic circumstances. However, the human rights based approach was to be followed and overall indexes of child well-being should be clearly differentiated from Child Poverty (Pemberton et al. 2005; UNICEF 2007, 2011).

In East Asia and Latin America, these efforts took root, resulting in region wide estimates of Child Poverty encompassing the majority of countries in those regions (ECLAC-UNICEF 2010; Minujin et al. 2014). In Latin America, in collaboration with the UN Economic Commission (ECLAC-UNICEF 2012), on-line training modules on how to estimate Child Poverty were prepared and made available for free to national statistical institutes. Also, the results from the surveys were combined with census data to prepare maps for (almost) all countries in the region with small area estimates of Child Poverty (ECLAC-UNICEF 2010). More recently, for most countries in Latin America and a few in the Caribbean, the time trends of Child Poverty incidence for the period 2000–2010 were presented in the ECLAC annual publication, *Social Panorama 2013* (ECLAC 2013).

During the same period, some countries in Africa and the Middle East also estimated Child Poverty using the same approach. As in Latin America, some of them cross-tabulated Child Poverty with the incidence of monetary poverty among the adults in the households. Simultaneously, a group in UNICEF developed a software capable of estimating and graphically presenting Child Poverty using this approach as well as other deprivations and inequities.

In sum, for almost 15 years academics and practitioners have been grappling with the issues of measuring and presenting the complexity of multi-dimensional Child Poverty in a simple and understandable way. The consensus has been, since the beginning of these efforts, to analyze the various deprivation simultaneously suffered by the individual child, as can be observed in the articles collected by Minujin and Nandy (2012).

### 3 Selection of Dimensions: Rights That Constitute Poverty

From the historical overview just presented, it is clear that a crucial element to understand, measure, and describe Child Poverty is the selection of dimensions and indicators. A fundamental issue is to distinguish, conceptually, Child Poverty from many other child

rights violations and bad things that can happen to children. Fortunately, various strands of literature in different disciplines converge to a relatively stable set of Child Poverty dimensions.

Fundamentally among them is the human rights literature. In particular, the analysis of the human rights approach to poverty (Hunt et al. 2002; OHCHR 2012), which distinguishes rights that constitute poverty (e.g. to water or housing) from instrumental rights (e.g. the right to vote). Simplifying, the rights that constitute poverty are associated to some material deprivation.<sup>1</sup> Instrumental rights, first of all, are not related to lack of material resources and, secondly, can be helpful in addressing poverty. For instance, the right to vote can be used to influence pro-poor policies.

More importantly, constitutive rights are not be thought of as indicators that are associated, correlated, or caused by (monetary) poverty. The deprivation of a right that constitutes poverty is what makes the person poor.<sup>2</sup> The dimensions of poverty (the rights that constitute poverty) in this literature include, among other ones, education, housing, health, and nutrition.

While, obviously, not all the strands of literature are exactly congruent in terms of the lists of dimensions, there is a high degree of agreement and overlap. However, this should not be surprising given they all start from a similar and basic understanding of poverty as deficiency in a few dimensions entailing material deprivation. While not attempting a thorough and detailed review, it can be observed that attempts to operationalize Sen's (1985) capabilities approach (e.g. Nussbaum 2001) include, among other ones, elements such as health, housing, and education. Similarly, the Unsatisfied Basic Needs approach (Streeten et al. 1981; Stewart 1985) was applied empirically in many countries and different contexts. Thus, there is no set list as it varied across studies. Nevertheless, although not focused on children, the most common Basic Needs used in these estimations included health, education, water and sanitation, and housing, all of which are rights constitutive of Child Poverty.

In addition, there are international conventions and inter-governmental agreements. One of them, mentioned, above, is the UN resolution of 2007 on Child Poverty. Another one, which informed the work by Gordon et al. (2003), was the World Summit for Social Development (UN 1995), where the elements constituting poverty were listed and agreed by more than 180 participating governments.

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<sup>1</sup> Lack of material resources and wealth (monetary or otherwise) is the lay persons' intuitive understanding of poverty as well as the typical dictionary definition. Other problems people might face are distinct from poverty. Saying people are poor because they are sad, tired, victims of rape, religiously discriminated, caught in a traffic accident, traumatized from witnessing a crime, kidnapped, afraid to walk alone at night, worried about the future, etc., would fly in the face of any reasonable understanding of the meaning of poverty. Of course, there is also various streams of literature on subjective well-being and poverty, but they addresses different issues ranging from alternative estimates of the poverty line to inclusion of children's perception of feeling pressured at school as part of their well-being (Groedhart et al. 1977; Marks 2007; Bradshaw et al. 2007; Hoelscher et al. 2012). Similarly, authors working within the Capabilities Approach have measured multi-dimensional capabilities deficiencies (which is different from poverty) by including non-material elements of child welfare such as parental affection or feeling of autonomy which go beyond poverty (Apablaza and Yalonetzky 2011; Ballet et al. 2011; Trani and Biggeri 2013; Stoecklin and Bonvin 2014).

<sup>2</sup> There is a conceptual shift from traditional economics here. For instance, we do not say the cause of a person having no house (the right to housing being violated) is poverty, nor do we say that we identify as monetary poor as those without a house. Instead, we say he or she who has no house is poor (irrespective and independently of whether they have monetary resources or not). Housing deprivations "makes" them poor ("constitutes" being poor).

Thus, for estimating Child Poverty, the constitutive rights that have been widely used for years are: Health, Nutrition, Education, Information, Water, Sanitation, and Housing. These have been used by Alkire and Roche (2012), CONEVAL (2010, 2015), El Sayed and Zahran (2016), Gordon et al. (2003), Minujin et al. (2014), and Nanivazo (2015) among others. Having been used by independent academics, Official Statistical Offices in many countries, and UN agencies, there is clearly much convergence across continents on the basic list of dimensions that constitute poverty (see also “Appendix”).

This raises a question about the inclusion of other indicators. On many occasions issues such as violence, child labor, and teen pregnancy are suggested to be included in the estimation of Child Poverty. However, it can easily be observed that these problems (and indeed, they are gross violations of child rights) do not constitute poverty in so far as they cannot be in any way described as deprivations of material resources.<sup>3</sup> Jones and Sumner (2011) and White et al. (2002) have, in different ways, also made this distinction between Child Poverty as material deprivation and other aspects of child well-being and welfare.

Moreover, including them (and any other “child issues”) as part and parcel of the measurement of Child Poverty would preclude a whole range of interesting analyses and correlations. For instance, it would be very interesting (and important at the time of designing policies) to explore the relationship (if any) between Child Poverty and various types of violence. However, this would result in a spurious correlation if being a victim of violence is part of the measurement of Child Poverty (unlike the appropriate and feasible analysis of correlation among the individual components of Child Poverty).

Nevertheless, it is possible to think of adaptations and expansions of the dimensions that constitute Child Poverty as it has been estimated in most countries so far. A particularly interesting one could be the material deprivations that prevent the realization of the right to play,<sup>4</sup> quite arguably a constitutive right of Child Poverty too. For example, recently, Roelen and Gassmann (2012), Universidad de los Andes and UNICEF (2013), and Cid-Martinez (2016) have included information on whether children are deprived of access to playgrounds or toys in their estimates of Child Poverty.

#### 4 A Simple Simulation and Empirical Data on the Pitfalls of Weighting Rights Dimensions

Once the dimensions have been selected, based on constitutive rights, at least three issues arise. One of them is which indicators to choose to measure deprivation in each dimension. Another one is which thresholds to use in each indicator to assess if the child is deprived of that right (in that dimension). Finally, there is the issue of applying weights (and which ones) or not to the various dimensions in order to arrive at a synthetic indicator. In this section, all three of these topics are addressed but the main focus will be on the latter

<sup>3</sup> The issue of teen pregnancy provides an interesting illustration of the relationship between deprivations and problems which do not constitute poverty. While teen pregnancy is the result of (and also causes) many problems and child rights violations, it is not in itself a material deprivation. However, lack of access to (reproductive) health care for teen agers (male and in particular female) is indeed a material deprivation that constitutes poverty (irrespective of the availability of income).

<sup>4</sup> Or linking this issue to the analysis of time-poverty (Antonopoulos and Memis 2010; Boyden and Bourdillon 2012).

question. It is posited, as the main point of this section, that weights should not be applied to child rights when measuring Child Poverty.

Two frameworks can be used to deal with the question of which indicators to use. Pragmatic solutions can be found in the spectrum between these two extremes. One option is to select whatever available indicators exist for that dimension which would be available in surveys (comparable across countries) that also have information about the other dimensions. This last condition is critical as, per definition, all dimensions have to be measured for the same child (vide section on History) in order to measure Child Poverty. Imaginably, this is a very restricted set of indicators. Some of them are very reasonable and standard (e.g. stunting, wasting, and underweight for the right to nutrition) but other ones could be considered somewhat arbitrary (e.g. television and radio for the right to information).

At the other extreme, all possible indicators which pertain to the dimension can be used, regardless of their availability and comparability with other countries, whether they come from standard household surveys, specialized surveys with idiosyncratic indicators, or participatory consultations among families (the consensual approach). This was done in El Salvador, South Africa and Benin (Noble et al. 2004; Nandy and Main 2015; Nandy and Pomati 2015; UNDP 2014; on the consensual approach more generally, see Mack and Lansley 1985).

While international comparability is a positive feature of any measure of poverty, it need not be the overriding concern in any particular country setting. Those variables which are relevant should be included. This is the road taken in practice in most countries and regional estimations. Moreover, while a specific set was used by Gordon et al. (2003) when comparing over 70 countries throughout the world, most country and regional estimations have marginally adapted the indicators. Of course, this is perfectly acceptable and, in some occasions, it is possible to estimate Child Poverty using exactly the same indicators as in Gordon et al. (2003) as well as with the different indicators to analyze the difference between the two estimates.<sup>5</sup> However, as more and more variables are included, the probability that a child will be missing out on any one of them cannot decline and it will likely rise.

Clearly, the same applies to dimensions. Thus, it is important to restrict dimensions to a few and strategically chosen ones based on the concept of constitutive rights. As explained in the previous section, deprivation in these rights is closely associated to material deprivation as opposed to other outcomes children suffer from such as lacking affection, feeling deprived of independence (in particular among adolescents), suffering from social exclusion, or being victims of xenophobia. Similarly, indicators for each dimension should be few and carefully chosen to represent the attainment of those rights while satisfying conditions of suitability, validity and reliability (EUROSTAT 2012).

Determining thresholds can be dealt with in the same way as choosing indicators. The ones used by Gordon et al. (2003) are considered severe deprivation by the authors.<sup>6</sup> They explicitly opted for erring on the side of caution to avoid the criticism of attempting to inflate the estimate of Child Poverty (vide History section).<sup>7</sup> ECLAC-UNICEF (2010)

<sup>5</sup> This provides the basis for sensitivity analysis, as is mentioned below.

<sup>6</sup> And established as such by international experts (e.g. WHO for moderate and severe malnutrition in each of the anthropomorphic nutrition indicators and the WHO-UNICEF Joint Monitoring Programme on water and sanitation access).

<sup>7</sup> For instance, for nutrition, instead of using two standard deviations from the norm (i.e. the international definition of moderate malnutrition), they used three standard deviations (the international norm for severe malnutrition), deprivation in education was determined by the child having never attended any type of formal schooling.

opted for moderate deprivation thresholds, given the realities of the Latin American and Caribbean context. Nevertheless, the Gordon et al. (2003) thresholds were also used to estimate “extreme” Child Poverty for Latin America and the Caribbean. As in the case of the indicators within each dimension, sensitivity analysis can and should be carried out to explore the impact of the different methodological decisions on the actual estimate of Child Poverty.

The topic of weighting (or not or how) the dimensions is at once the simplest but also most complex. Three perspectives are going to be brought to bear and then the discussion will be carried over to the next section (on presenting the results to a lay audience).

One perspective is based on the premise that each dimension refers to a child right enshrined in the Convention of the Rights of the Child (1989).<sup>8</sup> Being rights, each dimension (access to water, to education, etc.) cannot be traded off with each other.<sup>9</sup> Thus, they cannot be ranked. All rights are equally “valuable”. In other words, there is no logical, conceptual, or empirical reason to say that the right to health is more important than the right to education or to water. It should also be noticed that if weights are being sought, it is not a question of just ranking the rights. A specific numerical value is needed to express *how much more important* one right is compared to the other one, i.e. a statement as follows is needed: “education is 4.37 times more important than health”. Clearly, such a statement does not stand up to any scrutiny.

A second perspective attempts to weigh the different dimensions. Although there are various ways to do this, they rely mostly in empirical (not conceptual) statistical analyses.<sup>10</sup> For example, if a child is deprived in a dimension in which all but a few children are satisfied, it would mean this child is really disadvantaged *vis-à-vis* the other children. In contrast, being deprived in a dimensions in which very few children enjoy that right, is not “as bad”. Thus, the weights are inversely proportional to how widespread the right is satisfied.<sup>11</sup> Other than introducing a layer of calculations and

<sup>8</sup> This is not the only convention dealing with these rights. The African Charter on the Rights and Welfare of the Child and the Covenant on the Rights of the Child in Islam also stipulate these rights. Earlier international law instruments (e.g. Declaration) also included them. The virtues of the CRC are its universality (all but two countries have ratified it) and, being a convention, is stronger than a declaration.

<sup>9</sup> In the Human Rights literature it is said rights cannot be given up (even voluntarily, i.e. rights are inalienable) and they are interrelated (UNDP, 2003).

<sup>10</sup> It is also conceivable to assign arbitrary weights or rely on experts’ opinions. These options are not worthwhile addressing here. However, it is important to clarify that, in this case, equal weighting is different from arbitrary weights. The two are equated in the otherwise clear and elucidating discussion of weighting mechanisms by Decanq and Lugo (2012) as both are clustered together under the category they label “Normative”. The notion that rights are inalienable, non-tradeable, and equally valuable is part of the theoretical framework which establishes the equal weights and would be acceptable (actually the ideal situation) in Decanq and Lugo’s classification. It is not an imposition of arbitrary equality or one based on ignorance. Similarly, Nussbaum (2001) and Dixon and Nussbaum (2012) provide arguments for equal weighting across capabilities which confirms the argument in the previous section about the convergence of approaches.

<sup>11</sup> Of course, as weights usually are made to add up to 1, they can be endogenously adjusted. Moreover, there are other methods (e.g. principal component analysis, multiple correlation, etc) which, although a bit more convoluted, basically follow the same logic. Ferreira and Lugo (2013) propose using Venn diagrams, copula functions, and multivariate stochastic dominance analysis to avoid having to use weights and yet be able to explore correlations and juxtapositions across dimensions to compare across time and space. However, these comparisons are relative and do not provide a clear and unequivocal “headcount” or incidence of poverty.



(pseudo) complexity, there is no obvious advantage to weighting the different dimensions/rights.<sup>12</sup>

A third issue to take into account when considering weights for different dimensions is the interpretation of the estimated level of poverty, in particular what it means for each individual child counted as poor or not. A simple simulation is used to present this point. In Fig. 1, the information from Table 1 is shown. The situation of four children (A through D) in terms of their satisfaction (or not) in four dimensions (rights) is presented. For each dimension there is a threshold below which children are said to be deprived of that right.<sup>13</sup> In Fig. 1 it can be seen that one child is deprived in the first dimension, three children are deprived in the second dimension, one child is deprived in the third dimension, and two children are deprived in the fourth dimension. While child A is not deprived at all, child C is deprived in all four dimensions. Child B is deprived in two dimensions and child D is deprived in one. In other words, three children are deprived in one to three dimensions. There is a “total” of 7 deprivations out of all the possible ones.

The incidence of Child Poverty will depend crucially on the number of deprivations which a child suffers in order to be considered poor.<sup>14</sup> In this simple case, there are four (natural numbers<sup>15</sup>) options (Fig. 2). Children could be considered poor if they are deprived in all dimensions, the “intersection” case, following Atkinson (2003). Only child C would be considered poor in this example and the incidence would be 25% (one out of four children). If the threshold were three dimensions instead of four, the incidence would be the same. However, if the threshold were two dimensions, then child B would also be considered poor and the incidence would be 50%. If the threshold were one dimension (the “union” approach, as per Bourguignon and Chakravarty (2003) and Tsui (2002), where any child suffering from at least one deprivation is considered poor<sup>16</sup>), the incidence could be 75% (as child D would also be considered poor).

However, the situation would be altered if weights were given to each right/dimension. In Table 1, it can be observed that weights have been given: 0.3 for the first and last dimensions and 0.2 for the other two (in this case in completely arbitrary ways for the sake of the example). In Fig. 3 it can be seen that only one child is considered poor when the threshold is one deprivation. There is no Child Poverty if the threshold is more than one. It

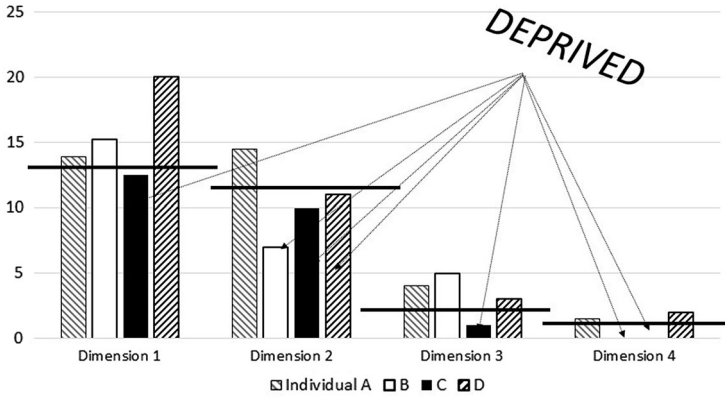
<sup>12</sup> Hagerty and Land (2007) also found the best approach in the construction of composites indexes is to avoid weighting dimensions. Gordon et al. (2012), following Ghiselli et al. (1981), make similar arguments based on the empirical evidence that when weights across items are similar, there are many variables, and they are correlated (as it is the case in multi-dimensional poverty analysis) weighting does not improve estimates.

<sup>13</sup> For instance, if the threshold indicates that children are deprived of health when they have received less than 3 vaccines out of the mandatory immunization protocol, the bars in the figure would indicate the number of vaccines received by each child. Those children below the line representing the threshold would be considered deprived of their right to health.

<sup>14</sup> In the Alkire-Foster formulae for multi-dimensional poverty among adults, this is the cut-off parameter  $k$ .

<sup>15</sup> Theoretically, the cut off of deprivations to be considered poor (whether as a number or a proportion), the parameter  $k$ , could be any rational number (see, among others, Alkire and Foster 2011; Santos and Alkire 2011).

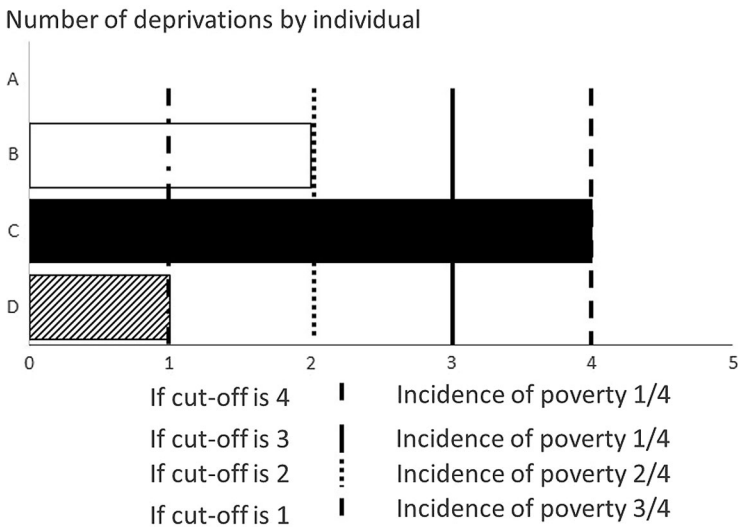
<sup>16</sup> Besides being consistent with the discussion above on the fact that each dimension corresponds to a right, and all rights are equally important, there is an additional advantage of avoiding weights. While some of the indicators are measured on an interval scale (e.g. weigh or height of the child), most of them are ordinal (e.g. in-house piped water is better than a well outside which in turn is better than getting water from a river or other open source). This means that individual deprivations cannot be numerically manipulated. However, combinations of achievement/deprivation in the various dimensions can be (partially) ordered and evaluated (Fattore and Maggino 2014; Fattore 2016).



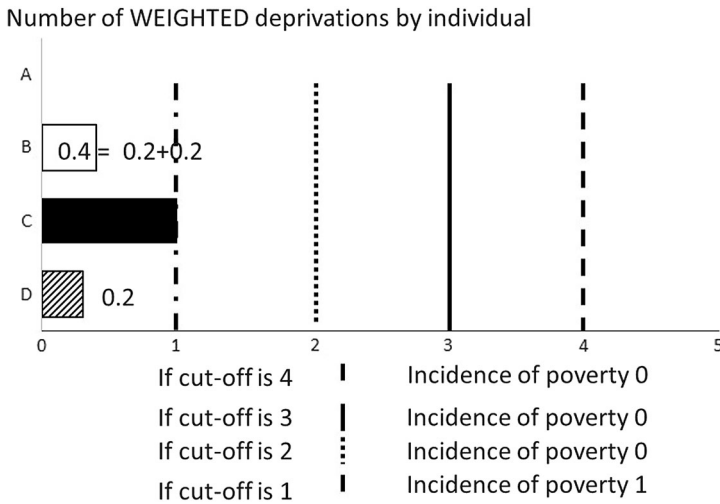
**Fig. 1** Simple example with four children and their deprivation/satisfaction in four dimensions

**Table 1** Simple hypothetical example of deprivation/satisfaction

	Dimension 1	Dimension 2	Dimension 3	Dimension 4
Child A	14	14	4	2
Child B	15	7	5	0
Child C	12	10	1	0
Child D	20	11	4	2
Cut offs	13	12	3	1
Weights	0.3	0.2	0.2	0.3



**Fig. 2** Counting the number of poor children when all rights are equally weighted (for different thresholds of deprivations to be considered poor)



**Fig. 3** Counting the number of poor children when all rights are NOT equally weighted (for different thresholds of deprivations to be considered poor)

is important to understand how this results is derived, i.e. what it means for each individual child counted as poor or not in this case. In what follows, only the case of a cut-off of one deprivation (i.e. the union approach) is considered for simplicity of exposition. However, this should not be interpreted as a critique of this approach or as an issue that only applies in the case of the union approach.

In the case where all rights are equally weighted, no calculation or further manipulation of the data takes place. Simply, if for a particular dimension the child’s achievement is below the threshold, the child is considered deprived of that right. Then, the number of children deprived in at least one dimension is just counted (no addition or multiplication by non-intuitive coefficients is required). However, when weights are applied, the number of deprivations cannot be counted in a straightforward way. In order to know “how many” deprivations the child suffers, each deprivation is multiplied by the weight assigned to that right and then each of these results are summed up. Thus, each deprivation the child suffers is counted only as a “fraction” of a deprivation. In the simplified example presented here, a deprivation in the first dimension is not a “full” deprivation but “only 0.3” of a deprivation.

Consequently, it is possible that a child suffers from two deprivations (or more) but when they are multiplied by their weights they “amount to” less than a deprivation. That is what happens in this example for child B who, suffering from deprivation in two rights (weighted at 0.2 and 0.3 respectively), is assigned only 0.5 of a deprivation. Unless the cut-off to be considered poor is below 1 (i.e. not a whole right, in this example “half a right”), the child is not considered poor. Similarly, child D is not considered poor because the weighted sum of the deprivations is 0.2. This is very difficult to explain, defend, and communicate as it means that in order to be considered poor the cut off is a fraction of a right (which conceptually makes no sense) or that a child is deprived of one or more rights but still not considered poor (which is counter-intuitive).

However, there is no obvious reason to explain why such weights should be favored at all. Moreover, this is not an empirical curiosum resulting from an over-simplified simulation. Given the conceptual premise that being deprived of a right constitutes poverty,

**Table 2** Numbers of deprivation by region, circa 2000

Number of deprivations	Developing world	Sub-Saharan Africa	South Asia	Middle East and North Africa	Latin America and Caribbean	East Asia and Pacific
0 (not poor)	52	16	19	38	70	80
At least 1	48	84	81	62	30	20
1	16	16	18	22	15	14
2	12	19	23	16	8	4
3	10	19	21	12	4	1
4	6	16	13	8	2	1
5	3	10	5	3	1	–
6	1	4	1	1	–	–
7	–	1	–	–	–	–
Total	100	100	100	100	100	100

Source: Gordon et al. (2003)

ANY weighting mechanism will UNDER-estimate Child Poverty by leaving children who are deprived of (at least) one right uncounted (i.e. counted as non-poor) unless the cut-off to be considered poor is a fraction equal to the weight of the dimension with the lower weight. This however, is equivalent to the cut-off of one right when all the rights are equally valued (which is a simpler approach, founded on a rights perspective, and consistent with the theoretical literature on weights).

In Table 2, the original results of Gordon et al. (2003) by region are presented. The total percentage of children from the developing world suffering no deprivations (52%) is included in the first column as well as the percentage of children suffering exactly one, two, etc., deprivations. In the absence of weighting and with a cut-off of one deprivation (i.e. deprived of any one right that constitutes Child Poverty), 48% of the children were identified as poor<sup>17</sup> at the turn of the century in the developing countries. Now suppose that weights are given to each right. Regardless of the weighting scale, no single dimension counts as a full deprivation. They would count as 0.1 or 0.2 or 0.5 or 0.9999 but not as a full deprivation. This means that, using a cut-off of deprivation in one right to be considered poor, the 16% of children suffering one deprivation would not be counted as poor. Thus, roughly a third of the poor children would not be counted as poor. In Latin America and the Caribbean, 50% of the poor children would be left uncounted and in East Asia and the Pacific 70% of the poor children would be left out of the Child Poverty estimation.

In conclusion, unless the cut-off for being considered poor is established at a value equivalent to the weight of the least weighted dimension, weighting will always consider those children who are deprived of only one of the rights that constitute poverty as not poor (some children suffering from multiple deprivations could also be missed). This would seriously misrepresent the plight of Child Poverty.

<sup>17</sup> This measurement is just the prevalence (equivalent to the headcount in monetary poverty). For the analysis of depth and severity there are additional formulae and mechanisms (which are compatible with this headcount) ranging from very simple ones to more elaborate ones (see Delamonica and Minujín 2007; ECLAC-UNICEF 2010; Alkire et al. 2015).

## 5 Presenting to a Wide Audience

This section deals with the difficulties in reporting the results of both uni- and multi-dimensional measurement of poverty in general. Also, the case for a simple multi-dimensional measurement of Child Poverty is made on the basis of ease of understanding by a wide audience. In this case, “simple” means all dimensions have equal weight.

Admittedly, a unidimensional measure of poverty could be considered simple to understand and communicate. One proof of this argument is the ease with which the so-called “dollar-a-day” poverty line is reported by journalists in newspapers throughout the world. Two arguments are made in this section. First, its wide usage and appeal are largely based on it being misunderstood, both conceptually and empirically. Secondly, once these misunderstandings are corrected, a simple multi-dimensional measure is more accurate and easier to interpret.

Many authors have covered the issues related to the shortcomings of the “dollar-a-day” estimates of global poverty (see Pogge and Reddy (2006), Reddy and Minoiu (2007), Vandemoortele (2002), and Deaton (2003, 2010), among others). These can be summarized as: a) the line is not related to the actual cost of a minimum basket of consumption, and b) the instability in the estimates of the PPP across countries and time. The first point means that -although the value of the “dollar-a-day” line is similar to the national poverty lines of the few low income countries that had properly estimated poverty lines based on minimum consumption requirements in the mid-to late-1980s according to the PPP conversations at the time, World Bank (1990), it is not aligned with the actual national poverty line<sup>18</sup> of the vast majority of countries. Thus, comparing the national poverty incidence in almost any country with the estimate of monetary poverty based on the “dollar-a-day” measure is off by several percentage points.<sup>19</sup> In other words, the “dollar-a-day” is not a poverty line (conceptually) so it grossly misrepresents the extent of poverty (empirically).

Moreover, the expression “dollar-a-day” poverty line (the one that has wide appeal and is often used) is wrong. The actual expression is “one dollar and 25 cents Purchasing Power Parity dollars of 2005” (or the recently updated line of 1.90 PPP dollars of 2011). Once this (correct) statement is used, it is clear that the appeal of ease of interpretation is based on a mischaracterization of what the indicator actually measures. Moreover, most of the writers (and their readers among the lay public and policy-makers) are not aware that they are not comparing the income or consumption of people with an American dollar per day (a real, concrete currency which they know and use for transactions) but a complex accounting construction used to compare national accounts and growth rates across countries.

In addition, this construction is fraught with empirical problems. As stated at the International Monetary Fund website: “The biggest [drawback] is that PPP is harder to measure than market-based rates. [Estimating PPP] is a huge statistical undertaking, and

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<sup>18</sup> I.e. the cost of the basic goods and services every person should be able to consume in order not to be considered poor (see Desai 1986; Laderchi et al. 2003; Lipton and Ravallion 1994; Orshansky 1965; among many others). Freeman (2007) clearly explains the PPP conversation exaggerates the reduction of poverty because the conversion hides the decline of consumption good prices *vis-à-vis* intermediate and capital goods. As the latter are under-represented in the PPP calculations, it seems that households are able to afford more goods when, actually, it is not the case at all.

<sup>19</sup> In some cases more than 20 percentage points which means many millions of persons (just taking a few large and small countries form around the world like Brazil, Cameroon, Colombia, Cote d’Ivoire, Egypt, Guatemala, Niger, Pakistan, and Thailand, results in over 120 million not properly counted as monetary poor).

new price comparisons are available only at infrequent intervals.”<sup>20</sup> The same IMF source explains that the PPP calculation “does not cover all countries” and that there is a “large gap between market and PPP-based rates in [most] emerging market and developing countries...[the ratio] is between 2 and 4”.

Consequently, the proof of the pudding in terms of conveying the complexity of poverty to a lay audience in a simple way is in comparing the statement “the percentage of people whose income or consumption is below 1.25 Purchasing Power Parity dollars of 2005, i.e. a fictional monetary unit calculated for conversion of Gross Domestic Product across countries” with a statement summarizing the results of multidimensional poverty. This leads into the second part of the argument.

As discussed in the previous section multi-dimensional estimates of poverty can be carried out using endogenous or arbitrary weights for the various dimensions. Also, a threshold to determine how many dimensions should show deficiency or deprivation in order to consider the child as poor is needed. This results in expressions like: “a child is poor when a weighted average (based on an endogenous weighting algorithm) of x-number of dimensions is below an endogenous established parameter”. Undoubtedly, this is a bit awkward. The statement “poor children are those deprived in 2.3 dimensions” does not help much either. Thus, not all multi-dimensional estimates are easier to communicate to a lay audience than a simple multidimensional estimate.

However, if all rights have equal weights and children are considered poor when they suffer deprivation in at least one right (as discussed above, based on the human right approach to poverty), the situation is much clearer. The expression becomes: “x per cent of children are deprived at least of one of the following rights: education, housing, water, sanitation, information, health, and nutrition”. This statement is concise. Also, it is clear and accurate. Moreover, any policy-maker and lay person can intuitively grasp it as it refers to elements of life they are familiar with and observe concretely in their everyday lives.

Most importantly, estimating Child Poverty as described here is a sound and scientifically valid way of estimating poverty. It is compatible with the family of Alkire and Foster (2011) and Bourguignon and Chakravarty (2002) formulae (it is a special case when the weights are all equal across dimensions and the minimum number of deprivations to be considered poor is established a priori at one). It has been empirically tested throughout the world (for instance, Alkire and Roche 2012; Nandy 2010).

## 6 Embedding Child and Adult Poverty

Another issue that is often raised by policy-makers is the complexity of having to deal with different estimates (even practical steps to estimate) child and adult poverty. In addition, there is the concern of having “too many” poverty estimates (for different age groups). These concerns are addressed in this section as they also are part of the discussion on how to convey the complexity of poverty (in particular multi-dimensional poverty across the life-cycle) to a large audience. Thus, in this section a discussion about how to carry out the singling out of Child Poverty and its eventual merging or embedding into an overall measure of poverty for the whole population. This point also has implications for countries trying to operationalize

<sup>20</sup> The quotes are from an article by the Assistant Director in the IMF’s External Relations Department (Callen 2012). The article was published in the most important information dissemination outlet of the IMF for a wide audience: the *Finance and Development* magazine website.

the recently approved Sustainable Development Goals which refer to measuring poverty in all its dimensions and for all age groups of men and women (SDG Goal 1.2).

The measurement of Child Poverty based on the actual deprivations and experience of children, independently of the income of their caretakers,<sup>21</sup> described in this paper is grounded on the fact that the elements that satisfy children's needs and rights are not always bought in a market (see Sect. 2). They could be freely available as publicly provided goods (in which case income is not required to avoid deprivation). In other cases, the goods or services might not be available at all, then families and their children would be deprived even if they had sufficient income to hypothetically purchase them.

However, the imperative to estimate Child Poverty separately from adult poverty raises concerns about the possibility to "sum across" different age groups of cohorts.<sup>22</sup> This is simple and straightforward to address. First of all it is important to realize that answers to three different questions are being sought when trying to embed child and adult poverty measures (Delamonica 2014). These three questions are:

- What percent of the population is poor?
- What percent of the poor are under 18 years old?
- What percent of children are poor?

Comparing the first and third questions it can be seen that both arrive at the prevalence of poverty (one for the total population, the other one for a specific sub-group). The answer to the second question needs to be compared with the share of the under-18 population to ascertain if children are disproportionately represented among the poor or not. That all the answers would be different numbers should not be confusing, nor should be it be expected that the prevalence of poverty should be higher among children than adults. This may or may not be the case in any particular country. Whether one is higher than the other one is irrelevant. The point is that they are different (in the way they are experienced and, concomitantly, in the way they should be measured) and that both should be eliminated.

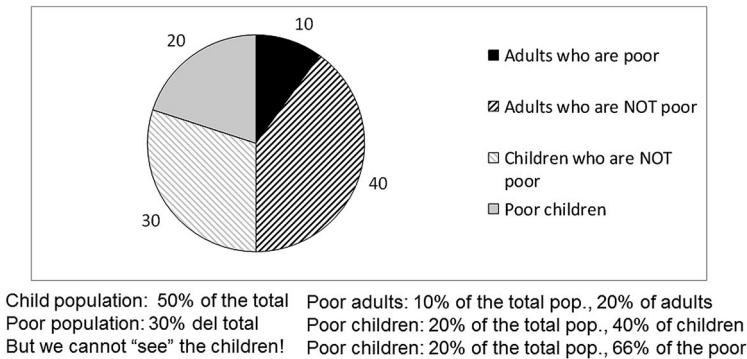
A simulated situation is depicted in Fig. 4 where half of the population are children. It shows how to answer these three questions. This is similar to the approach by Alkire and Santos (2010) to estimate the incidence of multi-dimensional poverty across sub-groups although they have not used it for separating child and adult poverty.

It should be noticed that it is possible to estimate (multi-dimensional) Child Poverty for the child population and use either a monetary approach or adult-specific dimensions (different from the ones used to measure Child Poverty) to estimate poverty among the adults. It would still be possible to calculate the proportions in Fig. 4 to show that 40% of

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<sup>21</sup> Deaton and Paxton (1997), use various levels and adjustments of monetary poverty lines to estimate monetary poverty among children and the elderly.

<sup>22</sup> This issue is not germane only to multi-dimensional Child Poverty. "Separating" those under 18, while it visualizes Child Poverty, is not sufficient to understand properly what is happening to children and their poverty if the same indicators are used for adults and children. This is certainly the case with monetary poverty because, as mentioned above, children are not supposed to have an independent source of income to be pooled with the rest of the household. Thus, estimating monetary Child Poverty from the percentage of children living in monetary poor household assumes that monetary resources are shared equally within the family (Cockburn et al. 2009). We know from the gender literature that resources are definitely not shared equally within the household. Thus, it is not possible to estimate the percentage of children who are monetary poor. What can be calculated is the proportion of children who live on households where the level of monetary resources is less than the poverty line (for that number of household members). This is important information. It can and should be cross-tabulated with Child Poverty (e.g. CONEVAL 2010, 2015 and ECLAC-UNICEF 2010, carried out this type of analysis).



**Fig. 4** Embedding Child Poverty into total poverty (even if they are estimated with different methodologies)

the children are poor, which answers the third question asked above. Also, 20% of the adult population are poor.

As 40 per cent of the children is equivalent to 20% of the population (because in this simulation half of the population are children) and, similarly, 20% of the adult population is equivalent to 10% of the population, in total 30% of the population are considered poor (even if the way to estimate Child and adult Poverty are different). This answers the first of the three questions presented above.

Moreover, it is easy to see that of the poor population, two-thirds are children and the other third are adults. This answers the second question asked above.

## 7 Summary and Way Forward

Four propositions have been put forth in this paper. First, children experience poverty differently from adults (Sect. 2). Thus, unless Child Poverty is measured specifically, overall estimates of poverty may portray a misleading picture about the trends and evolution of poverty. Secondly, in order to measure Child Poverty, there is an extensive literature and wide consensus (developed and built for almost 15 years) that establishes the limited set of dimensions which constitute Child Poverty (Sects. 2 and 3). While slight adaptations and adjustment may occur in any specific country setting, these dimensions are: health, information, nutrition, education, water, sanitation, and housing. Thirdly, each of these dimensions is a right to which children (all over the world) are entitled, as established in the Convention of the Rights of the Child and other covenants. As a result, fourthly, dimensions should not be ranked or weighted when constructing a composite index of multi-dimensional Child Poverty (Sect. 4).

These propositions help to disentangle the problem emanating from the inherent complexity of measuring poverty, in particular multi-dimensional poverty. More specifically, the point that each dimension, by virtue of being a right, cannot be traded-off or compared with another dimensions leads to a multi-dimensional estimate of poverty with equal weights. Moreover, being deprived of any one right already constitutes poverty. Thus, two of the most contentious issues in the poverty measurement debates are readily solved to establish a synthetic measure of Child Poverty.



Additionally, addressing the issue of translating a complex socio-economic problem into simple a representation, it was shown that a Child Poverty multi-dimensional measure so constructed is easier to represent and explain to a wide audience of non-experts and of decision-makers than the often used “dollar-a-day” estimates or a weighted multi-dimensional metric. The latter (which obviously can be and has been calculated) leads to non-intuitive results where children suffering severe deprivation in several dimensions are likely to be not counted as poor (Sect. 5). The former not only fails to capture whether families can afford a minimum basket of goods and services but also is difficult to convey properly given the transformations that are required to go from actual currencies to PPP estimates.

While Child Poverty, as described in the paper, has extensively been calculated for many countries all over the world, two points for further development were raised. One is that there are refinements in terms of the dimensions which have not been sufficiently explored, such as including material or time deprivation denying children the right to play. Another suggestion for future empirical work, which may be important for countries monitoring and tracking the newly minted SDGs, is the possibility of synthesizing in one single measure of total poverty the (multi-dimensional) Child Poverty estimates with measurements of adult poverty which may be based on a different set of parameters, formulae, and dimensions (expanding on the suggestions introduced in Sect. 6). This would close the circle of combining a plurality of poverty data in a simple indicator which can easily be translated to the public at large.

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## Appendix

See Table 3.

**Table 3** Brief comparison of dimensions of Child Poverty dimensions across studies and theoretical perspectives

Source and coverage	Constitutive rights									
	Education	Housing	Water	Sanitation	Health	Information	Nutrition	Leisure		
<i>Generic (i.e. not child specific)</i>										
Hunt et al. (2002)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nussbaum (2001)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Streeten et al. (1981)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
United Nations (1995)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Developing countries</i>										
Alkire Roche (2012): Bangladesh	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Apablaza and Yalonetzky (2011): Ethiopia, India (Andhra Pradesh state), Peru, and Vietnam	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cid-Martinez (2016): Côte d'Ivoire and Nigeria	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CONEVAL (2010): Mexico	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ECLAC (2013): Latin America and Caribbean countries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
El Sayed and Zahran (2016): Egypt	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gordon et al. (2003): Developing countries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lyyltikäinen et al. (2006): Ethiopia, India (Andhra Pradesh state), Peru, and Vietnam	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Minujin et al. (2014): East Asian and Pacific countries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nandy (2010): Developing countries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nanivazo (2015): Democratic Republic of Congo	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Notten et al. (2008): Congo	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Roeslen and Gassmann (2012): Vietnam	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Trani and Biggeri (2013): Afghanistan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Universidad de los Andes and UNICEF (2013): Colombia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Rich countries</i>										
EUROSTAT (2012): Countries members of the European Union	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fernandes et al. (2011): theoretical, not applied to specific countries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UNICEF (2012): Countries members of the Organization for Economic Co-operation and Development or the European Union	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**Table 3** continued

Source and coverage	Other child rights which are used sometimes but are not constitutive rights				Developmental issues	Emotions
	Safety	Child labour	Social security	Birth registration		
<i>Generic (i.e. not child specific)</i>						
Hunt et al. (2002)	✓					
Nussbaum (2001)						Attachment, affiliation
Sreeten et al. (1981)						
United Nations (1995)						
<i>Developing countries</i>						
Alkire and Roche (2012): Bangladesh		✓				Practical reason, control over own environment, living with concern for animals and plants
Apablaza and Yalonetzky (2011): Ethiopia, India (Andhra Pradesh state), Peru, and Vietnam						
Cid-Martinez (2016): Côte d'Ivoire and Nigeria					Electricity, cooking fuel	Parental affection
CONEVAL (2010): Mexico			✓			
<i>ECLAC (2013): Latin America and Caribbean countries</i>						
El Sayed and Zahran (2016): Egypt						
Gordon et al. (2003): Developing countries					Electricity, cooking fuel	



**Table 3** continued

Source and coverage	Other child rights which are used sometimes but are not constitutive rights				Emotions			
	Safety	Child labour	Social security	Birth registration	Other welfare indicators (not rights)	Non-material based capabilities	Developmental issues	
Fernandes et al. (2011): theoretical, not applied to specific countries	✓				Clothes, shoes		Concentration, aggressive behaviour, disability, lack of interest in any activity	Friends, parents
UNICEF (2012): Countries members of the Organization for Economic Co-operation and Development or the European Union							Clothes, shoes	

The categories, indicators, and dimensions, are not exactly as presented by these authors because classifications are different (and indicators within each dimension are also usually different). They have been rearranged for comparability purposes

The first four rows are clearly not an exhaustive review. They are just examples to show that the constitutive rights in all the other, child-focused studies, are aligned with the broader literature on capabilities, basic needs, and human rights

Some studies also included a monetary poverty dimension which is left out in this table

Lack of information for some dimensions in particular surveys is mentioned by some authors as preventing inclusion of some dimensions (e.g. nutrition) which they would have preferred to have included. Thus, in some cases constitutive rights were not included because data were not available (not because the authors purposefully excluded them on the basis of not constituting Child Poverty)

The last eight columns show the desire of many authors to include many other aspects of child rights and well-being which are not linked to material deprivation (including capabilities and functionalities, e.g. having friends or being loved by parents) which, although incredibly important, are not poverty. These, however, are much less common than the constitutive rights about which, as explained in the text, there is broad consensus and convergence

Rich countries are presented separately both to show the similarity (convergence) in dimensions (rights) as well as the focus of this literature on different items which are not rights enumerated in the Convention of the Rights of the Child (e.g. shoes) or are not included because they have been universally satisfied in those countries (e.g. water or sanitation)

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