Oxford Poverty & Human Development Initiative (OPHI)
Oxford Department of International Development
Queen Elizabeth House (QEH), University of Oxford

OPHI WORKING PAPER NO. 62

A Counting Multidimensional Poverty Index in Public Policy Context: the case of Colombia

Roberto Carlos Angulo Salazar*, Beatriz Yadira Díaz ** and Renata Pardo Pinzón***

August 2013

Abstract

Previous multidimensional indicators adopted in Colombian, as the Unmet Basic Needs or the Living Conditions Index, lose their policy relevance and arguably have become poor instruments for poverty measurement. This paper presents the Colombian Multidimensional Poverty Index (CMPI), a synthetic indicator that overcomes the methodological problems that arose from previous multidimensional indices, and that has a broad public policy scope of use. The CMPI is based on the methodology of Alkire and Foster (2011a); is composed of five dimensions (education of household members, childhood and youth conditions, health, employment and access to household utilities and living conditions); and uses a nested weighting structure, where each dimension is equally weighted, as is each indicator within each dimension. This paper proposes the CMPI to tracking multiple deprivations across the national territory, to monitor public policies by sector and to design poverty reduction goals, among other public policy uses. Analysis of the results demonstrates that multidimensional poverty in Colombia decreased between 1997 and 2010. Multidimensional poverty rates decreased in both urban and rural areas, but imbalances remain.

* Social Prosperity Department, Colombian Government. elblacaman@gmail.com

** Institute of Social and Economic Research, University of Essex. bydiaz@essex.ac.uk

*** National Planning Department, Colombian Government. rpardo@dnp.gov.co

Acknowledgements

1. Introduction

Several countries in the developing world have started to move away from a sole reliance on unidimensional measures of poverty based on income or consumption, and have started complementing these income-based indicators with multidimensional measures that also capture households' achievements in a range of areas relating to non-tradable goods. In Latin America, many countries make use of the Unmet Basic Needs Index (UBN), developed by the Economic Commission for Latin American Countries (ECLAC) specifically to measure multidimensional poverty[1]. Other multidimensional indicators proposed by supranational organizations, such as the Human Development Index (HDI) from the United Nations Development Programme or the World Bank´s recent Human Opportunities Index (HOI)[2,] have been widely discussed and disseminated among academics and policymakers.

Since the end of the 1980s the Colombian government has made particular advances in this area, not only implementing multidimensional indicators proposed by supranational organizations but also developing its own particular multidimensional indicators as the Living Conditions Index (LCI)[3] and the index used for targeting social programs, SISBEN (versions I, II and III);[4] these latter indicators were developed with the aim of measuring wellbeing or quality of life, and may also be adapted to measure poverty.

However, these existing Colombian multidimensional indicators have not proved entirely satisfactory. On one side, none of them satisfy a set of properties necessary for consistent profiles of multidimensional poverty. As example, a multidimensional poverty measure should capture welfare losses that result when poor households face greater deprivations. Nevertheless, the Unmet Basic Needs measure, one of the multidimensional indices used in Colombia, does not change if a poor household

---

[1] The UBN is a composite indicator comprising ordinal indicators on households' living conditions (housing materials, access to public services, critical overcrowding, economic dependency and school attendance) that identifies households with

[2] For World Bank's Human Opportunity Index for Colombia (HOI): Velez et al. (2010).

[3] The LCI is a standards of living measure composed of four aspects: household services, human capital, demographic conditions and housing materials. This indicator makes an assessment of the households' living standard by assigning them a value between 0 and 100 (the higher the index score, the better the living standards), which allows ordering and comparing households. The LCI uses the methodology of principal components. See Gonzalez and Sarmiento (1998) and Cortes, Gamboa and Gonzalez (1999a, 1999b).

[4] The SISBEN index is used to target potential beneficiaries of social programs in Colombia and its name corresponds to its acronym in Spanish: Sistema de Identificación de Potenciales Beneficiarios de Programas Sociales (SISBEN). The SISBEN index has had three versions; in its latter version, it is considered an indicator of standards of living that additionally includes variables related to a household's vulnerability. The index uses the fuzzy sets method to estimate the score that assigns values between 0 and 100, with the poor having lower scores. The cutoff points, differentiated for each social program, are defined based on the objectives and characteristics of the population they serve. See Cortes et al. (1999a); Castaño et al. (1999); and Flórez et al. (2011).

increases its number of deprivations. Also, a poverty measure should only reflect improvements among the universe of poor people, a property that the Living Conditions Index, another multidimensional index used in Colombia, fails to fulfill, as it is sensitive to changes in the living conditions of the non-poor. On the other side, there are problems with their content as well, so they are arguably becoming poor instruments for poverty measurement in the Colombian context.

These limitations, together with the need of a multidimensional poverty measure able to capture the actual living conditions in Colombia and the effect of public policies on the reduction of poverty, motivated the Colombian National Planning Department[5] initiative to design an improved multidimensional poverty index. In this context, this paper presents the proposed Colombian Multidimensional Poverty Index, henceforth the CMPI, which is based on the methodology of Alkire and Foster (2010), henceforth the AF methodology and includes, among others, dimensions regarding early childhood and youth conditions, access to health services and labor conditions, variables that had not been included in previous multidimensional indices.

When multidimensional approaches are used to measure poverty, questions arise about how to select the evaluative space, the dimensions and variables to be considered within such a space, the procedures to be used for aggregating variables and individuals, the unit of analysis and the identification of the poor. Most of the answers to those questions rely on value judgments based on social agreements across society. This paper, specifically Section 2, carefully describes the criteria used to answer those questions in order to design the multidimensional poverty index for the Colombian case. We present the main obtained results from the Index in terms of trends of poverty rates within the whole country and across urban and rural areas (Section 3); and also we outline public policy applications for such indicator.

Finally, it is worth highlighting that at the time of this paper's writing, the CMPI was being used as public policy tool in the Colombian context to track deprivations across the country, to monitor public policies by sector and to estimate the multidimensional poverty reduction goal of the 2010–2014 national development plan.

---

5 The National Planning Department (NPD) is a technical entity that promotes the implementation of the strategic vision of the country in the social, economic and environmental sectors through the design; the orientation and evaluation of public policies in Colombia; the management and allocation of public investments; and the realization of said plans, programs and government projects. (See http://www.dnp.gov.co/).

2.   Methodology and data

In developing a multidimensional poverty indicator, several decisions need to be made relating to the identification of the poor, the aggregation structure to be used, the dimensions to be included, appropriate cutoff points, weighting, and the unit of analysis. These are discussed in this section.

We use, for the CMPI case, the AF methodology to assess poverty as a conjunction of *n* dimensions of wellbeing simultaneously observed and experienced by households. The AF methodology produces a family of multidimensional poverty indicators that belong to the Foster Greer and Thorbecke (1984) family of poverty measures, some of which satisfy the axiomatic properties proposed by Sen (1976, 1979), desirable for any poverty indicator. [6] The methodology allows us to determine not only the incidence of poverty but its gap and severity as well.

The AF method has a number of distinct advantages for the formulation and monitoring of public policy.

- *Multidimensional poverty profiles comparable with unidimensional poverty profiles.* The AF methodology uses an explicit axiomatic property structure to produce a family of multidimensional poverty measures that are directly comparable with the analogous FGT indicators (commonly used unidimensional poverty measures based on income, expenditure or consumption). This facility to compare multidimensional measures with unidimensional income-based measures has clear advantages.

- *Clarity.* The methodology is simple and easily understood by non-specialists, including policy-makers and the general public.

- *The inclusion of quality-of-life dimensions and variables important to a society and sensitive to public policy implementation.* The AF methodology allows for the inclusion of dimensions which society deems to be particularly important or desirable at a point in time, which are alterable via social policy, or which reflects the main objectives of said social policy. Once the dimensions are chosen, the methodology allows for selecting variables that reflect direct actions from public policy aimed at reducing poverty.

- *Monitoring the efficacy of public policy.* The sum of the above-mentioned attributes plus its ability to be decomposed by the contribution of each dimension and/or population subgroups allows for the

---

[6] These properties were the basis for the Foster, Greer and Thorbecke proposal (1984). The AF methodology is also based on the axiomatic structure by Pattanaik and Xu (1990) defined for individual freedoms.

AF methodology to be used as an instrument for monitoring public policy actions aimed at reducing poverty. The clarity of the multidimensional notion of poverty expressed by the indicator is transmitted to the multi-sector discussion about design and strategic planning for the reduction of poverty. When the government is tracking the behavior of all dimensions and variables included in the CMPI, it is possible to determine which dimensions and variables register the highest deprivation rates among the poor and also which show relatively less improvement among poor households over time. Finally, if the dimensions in any way reflect social priorities, and the variables have been selected in order to monitor public policy actions, these warnings will either signal failures in policy execution or point out the need for them to be strengthened and redesigned.[7]

2.1 Identification of the poor population

Within the literature on multidimensional poverty measurement, there may be identified four types of methods for the identification of multidimensionally poor people: i) the unidimensional method; ii) the union approach; iii) the intersection approach; and, iv) the Alkire-Foster proposed identification method, the dual cutoff point approach.

The unidimensional method aggregates the achievements of different dimensions into a single wellbeing variable and uses an aggregate cutoff point to identify the poor. The LCI, for example, aggregates achievements of the different indices to include into one synthetic indicator. In its first version, Gonzalez and Sarmiento (1998) and Cortes, Gamboa and Gonzalez (1997b, 2000) did not use a cutoff point since it was conceived as a wellbeing or life standards index but not as deprivation one. Later version of it developed an aggregate cut-off point to differentiate deprived from non-deprived population. It is important to note that this LCI is unidimensional both in the sense that it uses *one wellbeing aggregate variable* (a cardinal score for standard of living, income, expense, etc.) and in the sense that it uses *one aggregate cutoff point*. This unidimensional method does not satisfy some of the axiomatic properties presented later in this paper and, as was pointed out by Alkire and Foster (2010), it losses information on specific deprivations.

On the other hand, the union approach considers a person to be multidimensionally poor if he or she is deprived in at least one dimension. This is the method that the Unmet Basic Needs index uses for the

---

[7] A poverty measure based on income or expenditure makes accountability difficult given that it is expressed in terms of one unique variable. Also accountability is difficult in the case of an indicator that does not allow decomposability.

identification of the poor. One of the limitations of this approach is that it may identify as poor people who are not poor, given that deprivation in one dimension may be due to reasons unrelated to poverty such as behavioral exceptions (for example, a person deciding, of his own free will, to live in a house built with austere materials, regardless of a high level of education, formal employment or generally good living conditions).

The third method is the <u>intersection</u> approach. This method identifies a person as poor if he or she is deprived in all of the indicator dimensions. This approach is too strict and therefore identifies only a very small part of the population. As an example, in large cities in Colombia, where household utilities coverage reaches almost 100%, the intersection approach would underestimate poverty by determining that almost no one is poor.

The AF identification method uses a <u>dual-cutoff point</u> approach. The first cutoff, defined separately for every dimension, determines whether a person is deprived in each dimension. The number of deprivations (c_i) is then calculated for each individual, using appropriate weights, and divided by the total number of possible deprivations, generating a deprivation share (v_i). The second cutoff is the share of deprivations k above which a person is considered poor. There is no deterministic method for the definition of the parameter k; the dual cutoff approach includes, as particular solutions, the union approach ($c_i=1$) and the intersection approach ($v_i=1$).

One difference between the AF method and the indicator developed in this paper, is that the AF method uses the individual is the unit of analysis, while we consider the household as the unit of analysis, assuming that if a household is deprived in a certain dimension, all household members will be deprived in that dimension. We discuss the reasons for this in section 2.3.

2.2 Aggregation

We use the aggregation method proposed by the AF methodology, which is based on the FGT indicators and adapted to the multidimensional space. Consequently, the measures that we use are the following:

- *Headcount ratio (H).* The headcount ratio or multidimensional poverty incidence rate is defined as $H=q/n$, where q is the number of people suffering a deprivation share of at least k, and n is the total population.

- *Adjusted headcount ratio (M0).* The adjusted headcount ratio combines information on the number of multidimensionally poor people and the breadth of deprivation. *M0=HA*, where *A* is the average deprivation share among the poor.

- *Adjusted poverty gap (M1).* The adjusted poverty gap adds in information about the depth of poverty (how far multidimensionally poor households are from ceasing to be so). *M1=HAG,* where *G* is the average poverty gap between each household's score on a dimension, and the cutoff point for that dimension, across all variables in where poor persons are deprived. The poverty gap identifies the distance between each dimension's cutoff point and the achievement of the poor population in the dimensions in which they are deprived. For the case of Colombia, the distance is based on the proportion of household members that face deprivation in each of the indicators. For example, the cutoff point for the health insurance variable, explained below, is 100% of household members with health insurance. In a poor household where only 80% of its members have health insurance, the gap is given by (100% – 80%) / 100% = 20%. The gap is censored at zero: that is, people who are not multidimensionally poor do not contribute to the calculation of G.

- *Severity (M2).* The severity indicator assigns a higher weight to deeper deprivations of poor people; in other words, it emphasizes households or persons that are severely deprived. By including the squared normalized gaps of the poor, the indicator provides information on the incidence, range and severity of multidimensional poverty. *M2=HAS,* where *S* is analogous to G, but the average of the *square*d normalized gaps.

2.2.1 Axiomatic properties

One of the advantages of using the AF methodology for the CMPI in comparison with previous multidimensional measures is that it fulfils of a number of axiomatic properties which other measures do not fulfil, and which make the CMPI more suitable for making poverty comparisons across time, geographical areas, dimensions and population subgroups. A full discussion of the properties of the AF family of measures and their presence across the members of the family can be found in Alkire and Foster (2010).

1. The aggregated indices from the CMPI are not sensitive to changes within a non-deprived dimension: that is, if a household which is not deprived in a particular dimension receives a higher score in that dimension, none of the indicators change. Thus, the AF methodology

satisfies the *deprivation focus axiom*[8]. This is in contrast to the LCI and SISBEN, which when used as poverty measures use the one-dimensional approach. Both are sensitive to changes across both deprived and non-deprived dimensions, and therefore and neither of them satisfies the deprivation focus axiom.

2. The CMPI is not sensitive to transfers between non-poor individuals; the construction of the indicator means that lower levels of poverty cannot be achieved by changes among the non-poor population. Thus, the CMPI fulfils the *poverty focus axiom*[9]. By contrast, when LCI and SISBEN averages are applied to a subgroup (as is generally the case), the measurement is sensitive to changes in the living conditions of the non-poor.

3. Three of the four measures we use (*M0*, *M1* and *M2*) satisfy the *dimensional monotonicity axiom* (if a poor household faces a new deprivation that was not previously suffered, a higher level of poverty will be recorded). Thus, these measures provide not only information about how many people lie below the poverty line, but also how poor they are in terms of the breadth of deprivation. The UBN, LCI and SISBEN do not satisfy the *dimensional monotonicity axiom*, and do not reflect the breadth of deprivation.

4. Moreover, two members of the family (*M1* and *M2)*, are not only sensitive to the number of deprivations suffered by poor people but also to the size of the need in each of the deprived dimensions. These poverty measures show greater poverty whenever a poor individual suffers an increase in the depth of deprivation in any of the dimensions in which he or she is deprived. This fulfills the *weak monotonicity axiom*[10] and the *monotonicity axiom.*[11] In the UBN, by contrast, changes (increments/reductions) in the level of any indicator do not necessarily produce changes (increments/reductions) in the aggregated score.

---

[8] Deprivation focus: A simple increase or improvement in a dimension with no deprivation does not change the measurement results.

[9] Poverty focus: A poverty measurement reflects only improvements among the universe of poor people. A decrease in the share of deprivations of a non-poor household, which would increase its living conditions, does not change the poverty measurement results.

[10] Weak monotonicity: Ensures that poverty does not increase when there is an unambiguous improvement in the population's living conditions. (*H*, *M0*, *M1* and *M2*)

[11] Monotonicity: Poverty decreases if the improvement occurs within a poor household's deprived dimension. (*M1* and *M2*)

5. Finally, the AF measures satisfy a number of other axiomatic properties desirable for any poverty measure, including: *decomposability,*[12] *replication invariance,*[13] and *symmetry.*[14] Also, some of the members of this family of measures satisfy the following properties which ensure that the measures behave in the expected way: *non triviality,*[15] *normalization,*[16] *weak transfer*[17] and *weak rearrangement.*[18]

2.3 The household as the unit of analysis

As mentioned earlier, the unit of analysis used in the construction of the CMPI is the household. This implies that the deprivations are simultaneously experienced by all household members rather than isolated individuals. For instance, if child employment is a deprivation (children between the ages of 5 and 17 working), we assume that this deprivation impacts not only upon the child who is working, but also to the whole household. This means that all other individuals living in this household are considered deprived with respect to this dimension (child labor). There are several good reasons for doing this.

In Colombia, previous indicators of poverty have focused on the household or the family, and so have strategies directed towards the reduction of poverty. SISBEN, the main instrument for targeting potential beneficiaries of social programs, is a standards-of-living measure that uses the household as the unit of analysis. Likewise, the objective of the Network for Overcoming Extreme Poverty (UNIDOS) is to ensure that families living in extreme poverty have access to all programs where they are eligible; in order to achieve this strategy, the UNIDOS offers families an *agent* to help them in the process. Finally, the government's conditional transfer program, Familias en Acción (Families in Action), which focuses on the household by design, not only contemplates household composition but also the solidarity relationship within it.

---

[12] Decomposability: Total poverty is the weighted average of poverty levels for all subgroups. The decomposition of measurements for any subgroup is a property that facilitates targeting, given that it focuses on population groups that suffer a larger share of deprivations. This property also implies that subgroup consistency is met: a total poverty increases if it increases in one subgroup, yet remains constant in another.

[13] Replication invariance: This measurement allows for meaningful comparisons across different-sized populations.

[14] Symmetry: If two households switch their living conditions, understood as their deprivations conditions, the poverty measurement is unaffected. In other words, if two households switch their deprivation vectors, the poverty measure remains unaffected.

[15] Non-triviality: M reaches at least two different values, a maximum if all living conditions are deprived (maximum deprivation) and minimum if all achievements reach or surpass the cutoff lines. (H, M0, M1 and M2).

[16] Normalization: M reaches a minimum value of 0 and a maximum value of 1. (H, M0, M1 and M2).

[17] Weak transfer: If the deprivation vectors are averaged amongst the poor, a lower or equal level of poverty is generated, when compared to the original. (M1 and M2).

[18] Weak rearrangement: A (progressive) redistribution of deprivations among the poor generates a lower or equal level of poverty when compared to the original (M2). Alkire and Foster (2007) define progressive redistribution as an association decreasing rearrangement among the poor.

There is empirical evidence indicating that in Colombia, it is families as a whole and not isolated individuals which respond to difficult situations. Empirical evidence indicates that households outside the social protection network show solidarity and work together in order to overcome negative shocks or adverse events; in particular homes made up of extended family members.[19] Families respond to difficult situations by implementing a combination of actions that involve different household members. In poor households, this strategy is generally linked with poverty traps. For example, the *Social Mission* (2002)[20] found that during the 1990s financial crisis the critical event with the highest impact on households was unemployment of the household's head, while the main recovery strategy was the entry of the spouse and children into the labor market.

The guarantee of decent living conditions established by the social agreements is not defined by individuals' responsibilities in an isolated manner. Colombia's Constitution recognizes joint responsibility between the family, society and the state in ensuring the population's living conditions and rights – in particular, decent living conditions for children and senior citizens, and essential aspects such as education.[21] Although the term *household* is not equal to the term *family* in Colombia´s LSMS carried out in 2008, approximately 82% of households are made up of members of the same family (60% of households correspond to nuclear families and 22% to extended families).

Comparability with monetary poverty measures. A household-based multidimensional poverty measure is arguably more consistent with FGT poverty measures based on monetary indicators, since these almost always use household-based measures of income, consumption or expenditure. Thus, it is also easier to compare the two.

Going back to the example at the beginning of this section, if the individual was the analysis unit, deprivation would only be assigned to the child rather than to the whole household. The result would indicate that the same household would hold individuals with and without deprivations, which would

---

19 Social Mission (2002) found that within the city limits, the 1990's crisis led to the disintegration of poor biparental nuclear families, which then changed into extended monoparental families.

20 *Misión Social* (2002).

21 Colombia's Political Constitution recognizes the family as "society´s basic institution". Some examples from the Constitution, related to the protection of children, senior citizens and education are: "The family, society and the state are under the obligation of assisting and protecting children in order to guarantee their harmonious and comprehensive development, and their rights" (Art. 44). "The state, society and the family will concur in order to protect and assist senior citizens, and promote their active integration in the community" (Art. 46). "The state, society and the family are responsible for the education, which will be compulsory between the ages five to fifteen" *(Art. 67).*

mean that the same household was made up of poor and non-poor people. This situation would impede the use of the index to orientate and monitor public policy.

2.3 Dimensions and variables

In terms of the evaluative space within which to select dimensions and variables, while Alkire and Foster (2007, 2011a) recognize their methodology is motivated by Sen's (1993; 1995; 1987) capabilities approach,[22] we believe a poverty measure addresses Sen's approach not only by resolving the multidimensional measurement problem but also by incorporating variables that are capable of measuring functionings. The construction and measurement of functionings is not strictly a mathematical problem; it is also an empirical problem which refers to the instruments and methodologies to gather quality-of-life variables. Therefore, the AF methodology addresses Sen's notion of poverty through their family of indices, but as they recognize it, it is part of the ongoing discussion which is far from finished.

For the CMPI proposed here, the strategies described below were followed in the process of defining dimensions, indicators and cutoff points:[23]

- A review of frequently used variables from other indices applied to Latin America. The Human Development Index, the Human Poverty Index, the Subjective Conditions Index, CEPAL's Social Cohesion Index, the World Bank's Human Opportunity Index, and Oxford University's Dissimilarity Index were reviewed, among others.

- A review of the literature with regard to: i) key dimensions and variables often used in multidimensional indices applied to Colombia (UNB, LCI, SISBEN III); ii) priorities established by the Constitution of Colombia; iii) relevant variables raised by the study of *Voices of the Poor* for Colombia; iv) the thresholds set by the Millennium Development Goals (MDGs Colombia) and by the respective public policy sector.

- The government's social policy. The variables were selected in such a way that all of them are susceptible to modification by public policy.

---

[22] Among other things, the AF methodology seeks to compare opportunity sets in terms of their levels of freedom: "Sen's Capability Approach requires a basis for comparison of opportunity sets in terms of levels of freedom or the extent of choice that they allow" (Alkire and Foster 2007). "The multidimensional measure could seek to reflect capability poverty. In this case then, following Sen (1987, 1992), the selection of relevant functionings is a value judgment, as is the selection of weights and cutoffs" (Alkire and Foster 2011b).

[23] Part of this exercise is shown in Table A.1.

- Availability of data within a single source (The Living Standards Measurement Surveys of the National Statistics Department – DANE).

- Discussions with experts and sector heads.

Once the variables were defined, an analysis was made to determine the sample precision for each of the study's domains, and only those with a coefficient of variation (*cv*)[24] below 15% were selected.

As a result of this process, five dimensions were selected (household education conditions, childhood and youth conditions, health, employment and access to household utilities, and living conditions). These five dimensions are measured using 15 indicators.

i. Dimension of household education conditions

Educational achievement

The indicator is measured by the average level of education for individuals 15 years old and over within the household. However, it is worth noting that if a household member selects preschool as the highest level of education approved, zero years of schooling is assigned to such a member.

In terms of the cutoff point used by this indicator, a household is considered deprived when the average years of schooling of its members aged 15 and over is below nine years of schooling.[25] But, when there are no household members aged 15 years old and over within the household, the household is automatically considered as deprived in terms of educational achievement.

Literacy

This indicator is defined as the percentage of people aged 15 or above in the household that know how to read and write. A household is considered deprived if at least one of the household members aged 15 or older does not know how to read or write (i.e. less than 100% of its members 15 years old and over are able to read and write). When there are no household members 15 years old or over, the household is considered deprived.

---

24 The coefficient of variation (*cv*) is defined as the ratio of the standard errors obtained from sample to the mean : . This measure is also known as the relative standard deviation and shows the extent of variation of a measure in relation to the population mean. According to DANE (2008), the cv "measures the variability of the estimator's sampling distribution, that is, it indicates the accuracy with which universe characteristics are being estimated." It is considered that an estimate is accurate if the *cv* <7%, has acceptable accuracy if 7% < *cv* <15%, accuracy is regular if 15% ≤ *ve* ≤ 20%, and finally, the estimate is inaccurate if *cv*>20%.

25 The cutoff point was determined according to the Sector Plan for Education 2006–2007 presented by the National Ministry of Education and the basic competencies acquired by an individual in primary school (1st – 5th grades) and secondary school (6th – 9th grades) that are required to have a decent job.

ii. Dimension of childhood and youth conditions

School attendance

The indicator is calculated as the proportion of school-age children (6 to 16 years old) in a household who attend an educational institution. According to this indicator, a household is considered deprived if at least one of the children between 6 and 16 years old do not attend school (i.e. less than 100% of children 6 to 16 years old are attending school). Households with no children between 6 and 16 years old are not considered deprived in this indicator.

No school lag

School lag is calculated for the households with children between the ages of 7 and 17. The school lag of each child is defined as the difference between the number of legally expected years of schooling by age and the number of school years completed in fact. The legally expected years of schooling by age are defined by the Sector Plan for Education 2006–2010 presented by the National Ministry of Education, as is shown in Table 1.

Table 1. Number of normative educational years by age

Age	Legally expected number of school years completed
7	1
8	2
9	3
10	4
11	5
12	6
13	7
14	8
15	9
16	10
17	11

Source: Sector Plan for Education 2006–2010

A household is considered as deprived in this variable if any of the children between 7 and 17 years are lagging in school. In other words, the desired result is 100% of children in a household without school lag. Households with no children between 7 and 17 years old are not deprived in this indicator.

Access to childcare services

This indicator provides the percentage of children 0 to 5 years old in each household who have access to childcare services (health, proper nutrition, and adult supervision or education) simultaneously. A household is considered to be deprived in access to childcare services if there is at least one child between 0 and 5 years old with no simultaneous access to all childcare services. Thus, a household is not

deprived if its children under the age of 5: i) spend most of the week at a community home, nursery or preschool, or are under the care of a responsible adult;[26] ii) are covered by health insurance; and iii) receive lunch in the care facility where they spend most of time (the latter in the case of children going to a community home, nursery or preschool).[27]

Children not working

According to the International Labour Organization (ILO)[28] and the Colombian National statistical Department (DANE), child labour refers to children under 18 years old that carry out household chores for more than 15 hours per week, children under 14 years old classified as employed, and children under 18 years old involved in hazardous work[29]. In the case of the CMPI and given the data constraints of the LSMS, the CMPI only includes the percentage of children in the household between 12 and 17 who are employed. The indicator of children not working is defined as the percentage of children who are out of the labor market. A household is deprived in this variable if at least one child between 12 and 17 years old is employed. A household with no children between 12 and 17 years old is considered not deprived.

iii. Dimension of employment

Absence of long-term unemployment

This indicator measures the percentage of the economically active population[30] (EAP) in the household that has been unemployed for more than 12 months. The indicator is calculated as follows:

---

[26] A child is considered under the care of a responsible adult if *i)* he remains at home under the care of father or mother, *ii)* is under the care of a relative, *iii)* is under the care of a nanny or maid, or *v)* is under the care of neighbors or friends. The last two were taken into consideration given that there is no evidence that indicates inadequate care, at least in relation to the options identified as inadequate. Secondly, a nanny is considered adequate, and since it is not possible to separate the responsibilities of the maid from those of a nanny, the whole option is considered adequate. Lastly, the fact that the age of friends and neighbors is unknown is not sufficient to determine deprivation. A child that *i)* is taken to work by a parent, ii) remains home alone, or iii) remains under the care of other minors younger than him is considered to be under inadequate care.

[27] Due to a lack of information, it is assumed that children under the care of a responsible adult receive adequate nutrition.

[28] See ILO convention No 138 on the minimum age for admission to employments and work and ILO convention No 182 on the worst forms of child labour, 1999.

[29] The definition of hazardous work varies from country to country, as well as among sectors within countries. According to the World Health Organization, for example, what makes child labor hazardous is the presence of hazards and risks at the workplace (such as the presence of chemicals, noise, ergonomic risks like lifting heavy loads, etc.) and working conditions (long hours, night work, harassment).

[30] The economically active population in this case is made by household members 12 years old and over who are either employed or actively seeking employment (unemployed).

Long term unemployed EAP

A household where there is at least one person in long-term unemployment is considered to be in deprivation. Households with no economically active population are considered deprived in this variable, with the exception of households made up of people living on a pension.

Formal employment

This indicator takes the proportion of the economically active population within the household that is employed and actively affiliated to a pension fund (affiliation to a pension fund is taken as a proxy of formality). A household is considered deprived when less than 100% of the EAP has formal employment.

Employees affiliated to a pension fund EAP

This indicator also captures unemployment. For this reason, the long-term unemployed are removed from the denominator in order to avoid counting them in deprivation twice. Children under the age of eighteen who hold a job are also eliminated in order to be congruent with the non-child employment policy.[31] Households with no EAP are considered deprived.

iv. Dimension of health

Health insurance coverage

Health insurance coverage is defined as the proportion of household members covered by the Social Security Health System.[32] A household is deprived if any of its members is not affiliated with a health insurance regime. Given that the access-to-childcare-services variable takes into account the health insurance status of children between 0 and 5 years old, this indicator is measured only for the population older than five.

Access to health services in case of need

This indicator measures the proportion of people in a household who have access to health services in case of need. A household is not deprived in access to healthcare services if all of its members who in

---

[31] It is a contradiction to determine that a child is deprived when he is employed and at the same time that he is deprived if unemployed or actively seeking employment. The objective of the policy for elimination of child labor is for children to be excluded from the job market, and therefore not be classified as employed or unemployed.

[32] It includes any type of health insurance regime: Contributory Regime: for those with sufficient income and/or are formally employed, whose affiliation is subject to a monthly contribution of 12.5% of their income. Subsidized Regime: for the poor population without payment capacity, identified with SISBEN instrument. Special Regimes: for people who have or had a labor relation with ECOPETROL (national petroleum company), the armed forces, the national police, the National Teaching Fund and public universities.

the last thirty days have suffered an illness, an accident, dental problems or any other health issues that have not required hospitalization, have been attended by a doctor, specialist, dentist, therapist or health institution. Households where no one has had a need for healthcare services are not considered to be deprived.

v. Dimension of access to public utilities and living conditions

It is worth noting here that the indicators that belong to this particular dimension are naturally measured at the household level – meaning that each indicator is equally defined across all the household members. This particular issue arises since household members share the available amenities at the dwelling. This feature is fully concordant, then, with the above-mentioned indicators that were defined at the household level as well.

Access to improved drinking water

This indicator was defined using WHO-UNICEF guidelines,[33] where urban households are considered deprived when they have no access to public water services. In rural areas, households are considered deprived when they have no access to public water services and the water used to prepare food is obtained from a well, rainwater, a river, spring water source, public tap or standpipe, water truck, water carrier or any other source other than piped water.

Adequate elimination of sewer waste

In this case urban households without access to a public sewer system are considered deprived. Rural households are considered deprived if they have a toilet without a sewer connection, a latrine or if they simply do not have a toilet.

Adequate floors

Households with dirt floors are considered deprived.

Adequate exterior walls

An urban household is considered deprived when the exterior walls are built of untreated wood, boards, planks, guadua (a type of bamboo) or other vegetation, zinc, cloth, cardboard, waste material or when no exterior walls exist. A rural household is considered deprived when exterior walls are built of guadua or other vegetation, zinc, cloth, cardboard, waste materials or if no exterior walls exist.

---

[33] These guidelines are designed to calculate the percentage of the population that has access to improved drinking water and the percentage of the population that has adequate access to improved sewer systems.

No critical overcrowding

An urban household is considered critically overcrowded, and therefore deprived, when the number of people sleeping per room (excluding kitchen, bathroom and garage) is greater than or equal to three; a rural household is considered deprived when the number is more than three people per room.

2.4 Weighting structure

There is no definitive procedure of assigning weights over dimensions in a multidimensional measure of poverty. For the Colombian Multidimensional Poverty Index we use a nested weighting structure where each dimension has the same weight (0.2) and each variable has the same weight within each dimension.[34] This weighting structure was established based on the following points: i) although the weighting structure should ideally take into account correlations between variables, there is still no well-established way to implement this without compromising some of the indicator's other properties[35] ii) the equal weight assigned to each dimension reflects their equal importance as constituents of quality of life, and iii) in the debate among experts this was the option on which there was greater agreement.

Table 2. Dimensions and Variables for CMPI

Dimensions	Variable		Cut off point
	Variable	*Indicator*	
Household education conditions (0.2)	Educational achievement (0.1)	Average education level for people 15 and older living in a household	9 years
	Literacy (0.1)	Percentage of people living in a household 15 and older who know how to read and write	100%
Childhood and youth conditions (0.2)	School attendance (0.05)	Percentage of children between the ages of 6 and 16 in the household that attend school	100%
	No school lag (0.05)	Percentage of children and youths (7–17 years old) within the household that are <u>not</u> suffering from school lag (according to the national norm)	100%
	Access to childcare services (0.05)	Percentage of children between the ages of 0 and 5 in the household who simultaneously have access to health, nutrition and education	100%
	Children not working (0.05)	Percentage of children between 12 and 17 years old in the household that are not working	100%
Employment (0.2)	No one in long-term unemployment (0.1)	Percentage of a household´s EAP that is not facing long-term unemployment (more than 12 months)	100%
	Formal employment (0.1)	Percentage of a household´s EAP that is employed and affiliated with a pension fund (formality proxy)	100%

---

34 The weight assigned to each dimension and variable is shown in parenthesis.

35 "Nor has it even been established that the potential interrelationships must be reflected in an overarching methodology for evaluating multidimensional poverty. Instead, the interconnections might be the subject of separate empirical investigations that supplement, but are not necessarily part of, poverty measurement" (Alkire and Foster 2007).

Health (0.2)	Health insurance (0.1)	Percentage of household members over the age of 5 that are insured by the Social Security Health System	100%
	Access to health services (0.1)	Percentage of people within the household that has access to a health institution in case of need	100%
Access to public utilities and housing conditions (0.2)	Access to water source (0.04)	Urban households are considered deprived if lacking public water system. Rural household are considered deprived when the water used for the preparation of food is obtained from wells, rainwater, spring source, water tank, water carrier or other sources.	1
	Adequate elimination of sewer waste (0.04)	Urban households are considered deprived if they lack a public sewer system. Rural households are considered deprived if they use a toilet without a sewer connection, a latrine or simply do not have a sewage system.	1
	Adequate floors (0.04)	Households with dirt floors are considered deprived.	1
	Adequate external walls (0.04)	An urban household is considered deprived when the exterior walls are built of untreated wood, boards, planks, guadua or other vegetation, zinc, cloth, cardboard, waste material or when no exterior walls exist. A rural household is considered deprived when exterior walls are built of guadua or other vegetation, zinc, cloth, cardboard, waste materials or if no exterior walls exist.	1
	No critical overcrowding (0.04)	Number of people sleeping per room, excluding the kitchen, bathroom and garage	**Urban:** 3 or more people per room **Rural:** More than 3 people per room

Source: National Planning Department (NPD), Social Development Unit (SDU), Social Promotion and Quality of Life Division (SPQLD). 2011. **Note:** The weight assigned to each dimension and variable is shown in parenthesis.

2.5 Selecting the value of k

As with any other poverty measure, poverty levels vary according to the threshold selected; lower poverty thresholds produce lower poverty rates and higher thresholds produce higher poverty rates. In general for the AF methodology and specifically for the CMPI, the *k*-threshold to identify the poor and non-poor populations represents the minimum share of weighted indicators[36] in which a household should be deprived in order to be identified as poor. Therefore, the cutoff point *k* is the minimum weighted deprivation share that a household must have to be considered as poor. *k* may potentially take any value from 0% (everyone is automatically poor) to 100% (nobody is ever poor).

As previously mentioned, there is no deterministic method for choosing this second cutoff point, and in much of the analysis in this paper we compare poverty estimates obtained using the full range of *k*-thresholds. However, it is often necessary to generate a single estimate based on a selected value of *k*; this section outlines the process of making this selection.

---

36 It is important to keep in mind that since each dimension is measured by a different number of indicators, and within each dimension the indicators are equally weighted, the 15 indicators are not equally weighted. As can be seen in Table 1, in the dimensions with more indicators each indicator weights less and *vice versa*.

The first step towards defining an initial range of values for *k* was to discard those *k*-thresholds that would produce ranges of poverty estimates which could not be captured by the survey; at this stage, we excluded any possible *k* threshold that would produce poverty indicators with a *cv* greater than 15% (*H, M0*, *M1* and *M2*).[37] In the case of *H* and *M0*, estimates with poor precision were observed for *k* values greater than or equal to 40%. By contrast, for *M1* and *M2*, estimates with a *cv* greater than 15% were observed for *k* starting at 45%. Also taking into account minimum thresholds, the set of *k*-values generating accurate estimates is the interval [7%, 40%], hereafter called *the robust band of k values*, for the *H* and *M0*, and the interval [9%, 45%] for *M1* and *M2*.

We supplement these statistical criteria with empirical evidence on the share of deprivations faced by different groups. As shown in Table 3, the average deprivation share across the whole population is 27%. This varies according to a household's experience of poverty, measured both subjectively and via income-based measures. Households who do not identify themselves as poor and households which are not income-poor, face an average deprivation share of 21%. Households that define themselves as poor, or are poor by income, face an average deprivation shares of 33% and 35%, respectively.

Table 3. Average share of deprivations, 2008

Population subgroup	Average share of deprivations
Population where the household head perceives the household as poor	33%
Population below the (income) poverty line	35%
Population where the household head perceives the household as poor and is beneath the poverty line	37%
Population where the household head does not perceive the household as poor	21%
Population above the poverty line	21%
Total population	27%

Source: LSMS 2008

This indicates that *k*=21 would be too low, while 37% would be too high. Within this range, we computed 95% confidence intervals for *H* and *M0* for different values of *k*. For both *H* and *M0,* the confidence intervals overlap for *k* =27% and *k*=33%, hence we infer the selection between these two values of *k* could be indifferent.[38] For *M1* and *M2,* there is also overlap between confidence intervals at *k*=27% and *k*=36%.

---

37 This was done at the national level and for each analysis domain.

38 Given that overlapping of confidence intervals is not a definite condition for concluding the existence of equal means, one may conclude that there may be no significant statistical difference between the estimates of *k*=27% and *k*=33%.

This combination of statistical methods and empirical data suggests a value of $k=33\%$ for the over-all threshold for all H and $M0$ and $k=36\%$ for $M1$ and $M2$[39].

We also review the values of k used in other papers. We find that most use a value of k of around 30%. For example, Lopez-Calva & Ortiz-Juarez (2009) use a k of 2/6 and Alkire and Santos (2010) take a k of 1/3 (3.33/10). Hence, our chosen k-threshold is very similar to the k threshold selected by other authors in similar contexts.

2.6 Data

When measuring deprivations simultaneously in the same household, the methodology requires that all variables come from the same data source. But once the source is chosen, its own limitations determine the thematic scope. For the Colombian case the selected data is the Colombian Living Standards Measurement Surveys (LSMS). The Colombian LSMS is a nationally representative survey conducted by the National Statistical Department (Departamento Administrativo Nacional de Estadisticas – DANE) in order to track living conditions among the Colombian population. The Colombian LSMS, which began 1993, is the most complete survey measuring socioeconomic conditions in Colombia. The survey is a repeated cross-sectional dataset with waves in 1993, 1997, 2003, 2008 and 2010. After 2010 the survey was collected on an annual basis. By selecting this survey as the main source for the CMPI, the government will be able to continue to track multidimensional poverty year by year.

The survey implements a clustered, multi-stage, stratified and probabilistic sample of 9,121 households for 1997, 22,949 for 2003, 13,600 for 2008 and 14,801 for 2010. The estimates of the current paper include results for 1997, 2003, 2008 and 2010, based on the LSMS. The results were calculated at the national level, for urban and rural areas, and by regions (Atlantic, East, Central, Pacific, Bogotá, San Andrés, Amazonia and Orinoquia and Antioquia). The LSMS does not include information for the territories of Guainia, Guaviare, Vaupes and Vichada. This paper focuses the discussion on the national figures and the rural and urban disaggregation[40].

We also use data from the 2005 national census to develop a municipality-level multidimensional poverty indicator comparable with the one obtained using the LSMS. This national census was undertaken by the national statistical department and provides socio-demographic information for the whole country; our

---

[39] Later in the document is explained the same process applied to M1 and M2.
[40] The regional analysis could be accessed by request.

analysis is based on a subsample of 1.3 million households which was asked a broader selection of questions.

3. Empirical results

This section presents estimates of multidimensional poverty for the years 1997, 2003, 2007 and 2010. We use a simple *k*-dominance analysis technique, which involves plotting estimated poverty rates for the years in question for all possible choices of *k*, the poverty threshold. In this way, we are able to assess whether estimated changes in poverty rates are observed only for certain values of *k*, or whether they are robust to different assumptions about the k poverty threshold. As well as national-level estimates, we present urban/rural profiles.

3.1 A national pattern of a reduction in multidimensional poverty

Figure 1 presents estimates of the multidimensional poverty headcount (*H*) at the national level. One line is shown for each of the years 1997, 2003, 2007 and 2010. As expected, all lines slope downwards, indicating that higher poverty thresholds yield lower levels of poverty[41].

The fact that the line for each year lies everywhere below the line for the earlier year in the series indicates that headcount poverty (*H*) in Colombia decreased continuously between 1997 and 2010; this is robust to changes in the value of *k*.

---

[41] This stands in contrast to the analogous result for income-based poverty measures, where a higher poverty threshold would produce higher poverty rates; here, because *k* indicates the percentage of possible deprivations *above which* people are defined as poor, a negative relationship is observed.

Figure 1. Multidimensional Poverty Headcount Ratio (*H*) for different values of *k*, 1997–2010
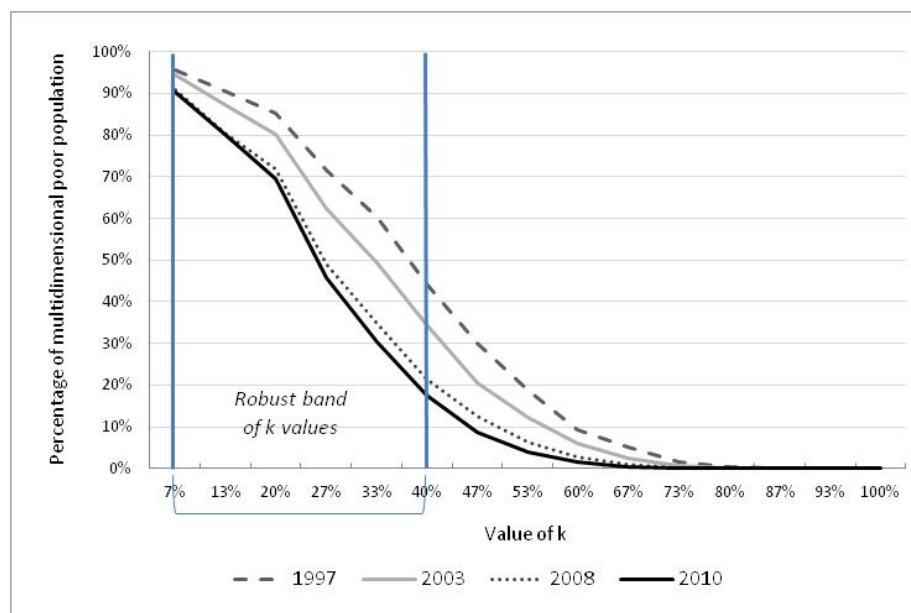
Source: LSMS

The results at *k*=33%, the threshold chosen for the estimation of indices in Colombia, are presented in Table 4. These show a reduction in the percentage of multidimensionally poor people between 1997 and 2010, from 60.4% to 30.4%, representing a reduction of 30 percentage points[42] or half of the 1997 level. About half of this reduction occurred between 2003 and 2008, a period in which major improvements in education and health insurance coverage were introduced[43].

Table 4. Multidimensional poverty headcount ratio (H), 1997–2010 for *k*=33%

	1997	2003	2008	2010	2010 – 1997 reduction (p.p.)	2010-1997 % reduction
National Total	60.4%	49.2%	34.7%	30.4%	30.0	50%

Source: LSMS. **Note:** The percentage change represents the relative change between the old value and the new one.

Figure 2 shows how the average share of deprivations among individuals in poor households changed between 1997 and 2010. On average, the share of deprivations decreased over this period. Again, dominance analysis shows that these estimated changes are robust to the choice of *k* for all values in the robust band (7% < *k* < 40%).

---

42 This is the absolute change in percentage points.

43 See the evolution of the rate of deprivation by variable across 1997, 2003, 2008 and 2010 in Figure A.2.

Figure 2. Average percentage of deprivation among the multidimensional poor population for different values of k, 1997 – 2010
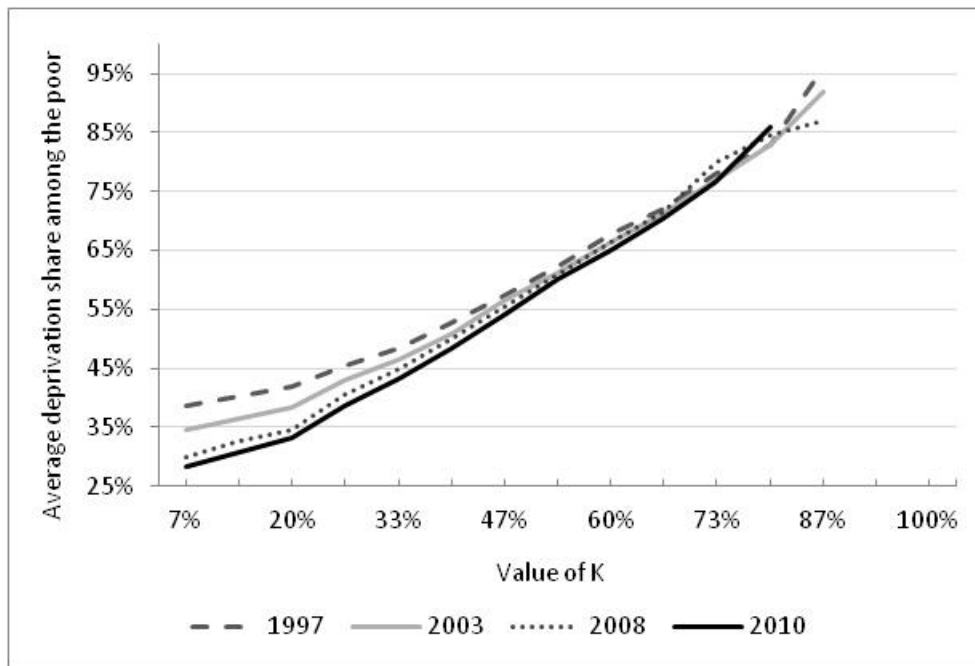
Source: LSMS. Note: the sample is not able to capture the average deprivation share among the poor for values of K greater than 87%.

At our preferred threshold of *k*=33%, the estimated percentage of deprivations among the poor population decreases by around 7 percentage points during the period of analysis (from 50% in 1997 to 43% in 2010).

Figure 3. Adjusted headcount ratio (M0) for different values of k, 1997 – 2010
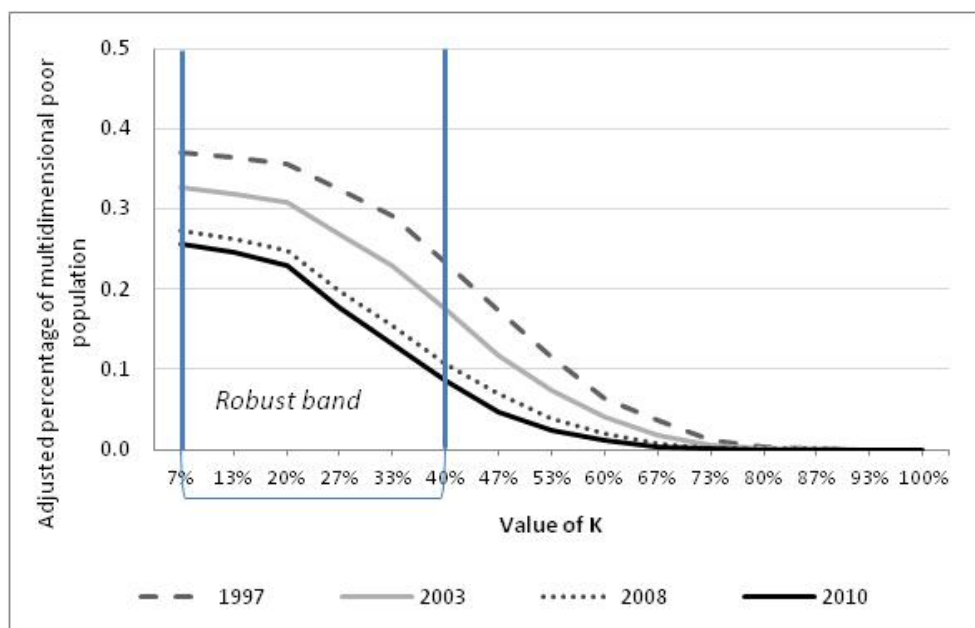
Source: LSMS

Figure 3 shows trends in the adjusted headcount ratio (*M0*), which adjusts the headcount ratio by the number of deprivations. Note that the scale on the vertical axis for MO is different to the scale for H, because the two measures are calibrated differently Again, *M0* decreased over the period concerned, independently of the value of *k*. Between 1997 and 2010, *M0* decreased from 0.29 to 0.13, indicating a reduction of around 55% of the original level. This is similar in magnitude to the reduction in the headcount ratio (*H*), but slightly larger. This difference arises because *both* the number of multidimensionally poor people *and* the proportions of deprivations experienced by the poor decreased over this period.

3.2 The urban/rural gap

In this section, we assess whether national reductions in multidimensional poverty were experienced equally in urban and rural areas. Figure 4 plots estimated values of *H* for all values of *k*, for urban and rural areas separately. In line with what other analysis has shown, levels of poverty are higher in rural than in urban areas. However, in *both* urban and rural areas, there are clear reductions in multidimensional poverty rates over all values in the robust band of *k*.

Figure 4. Multidimensional poverty headcount ratio (H) for different values of k, urban and rural areas
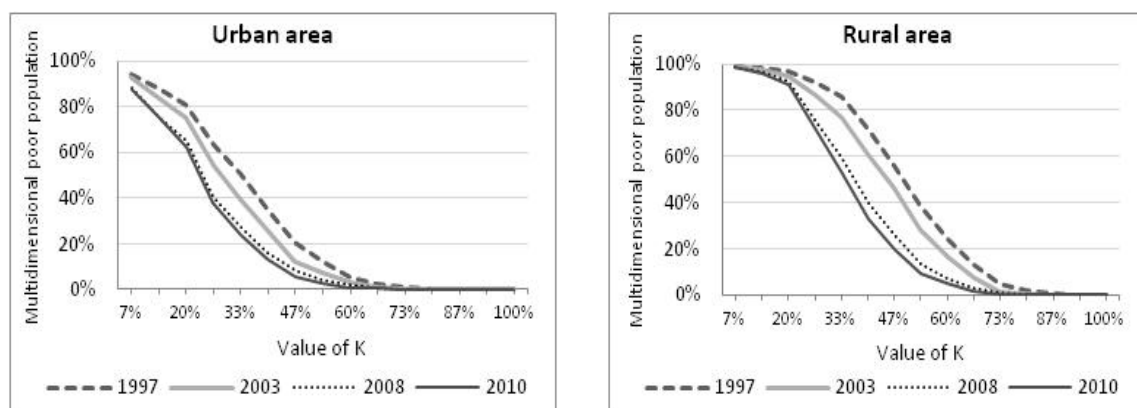
Source: LSMS

Table 5 presents estimates of poverty rates in urban and rural areas at our selected threshold *k*=33%. The incidence of multidimensional poverty declined over time in both urban and rural areas. In terms of percentage points, the drop was rather larger in rural than in urban areas (33pp vs 27pp); however, when

reductions are expressed in terms of a percentage of the original level, the reduction was substantially higher in urban than in rural areas (54% vs. 38%)[44].

What does this mean in terms of rural/urban differences? The third row of Table 5 shows differences in poverty rates between rural and urban areas for each year, and the differences in the overall percentage point and percentage reductions. The fourth row shows rural poverty rates as a multiple of urban poverty rates.

Table 5. Multidimensional Poverty Headcount ratio (H) for urban/rural areas, for *k*=33%

	1997	2003	2008	2010	2010–1997 reduction (p.p.)	2010-1997 % reduction
Urban	51%	40%	27%	23%	27.3	54%
Rural	86%	77%	60%	53%	32.9	38%
Rural/urban gap	35%	33%	33%	30%	5.6	16%
Rural/urban ratio	1.7	1.9	2.2	2.3		

Source: LSMS

The magnitude of the gap between rural and urban poverty rates remains fairly stable over the period, reducing from 35% in 1997 to 30% in 2010. This may suggest that rural areas have benefited more than urban areas from improvements in living standards. However, when we examine the *ratio* between rural and urban poverty rates, we see that they have diverged: rural poverty rates were 1.7 times higher than urban poverty rates in 1997, but 2.3 times higher in 2010. This implies a steady widening of the rural/urban gap within this period, and suggests that rural populations have not benefited as much as urban populations from improvements in coverage of public services.

In fact, this effect is not driven solely by coverage in public services, as the same widening of the rural/urban gap is observed in official estimates of income poverty. Here, the same trend in poverty reduction from 2003 to 2010 may be observed in urban and rural areas; both types of indicators show faster reductions in poverty in urban than in rural areas. In the case of income poverty, rural poverty declined from 57% in 2003 to 49% in 2010 and from 45% to 33% in urban areas[45] – a drop in 12 percentage points in both rural and urban areas, but a much larger drop as a percentage of the original levels in urban areas.

---

[44] This represents a significant reduction, as most of Colombia's population resides in urban areas (in 2010 close to 77% of the population lived in urban areas).

[45] DANE based on the National Household Survey GEIH because its acronym in Spanish (Gran Encuesta Integrada de Hogares).

We now proceed to look at the range of deprivations experienced by the poor, and how this varies between urban and rural areas.

Table 6 shows the average deprivation share among the poor in urban and rural areas. A higher average of deprivation is observed among the poor living in rural areas than among those living in urban areas for every year of analysis and for every value in the robust band of k (Figure A.1). The intensity of poverty decreases in both urban and rural areas over the period studied. Although the intensity of poverty is higher throughout among the rural poor, the decrease between 1997 and 2010 was larger in rural than in urban areas, both in terms of percentage points (8pp vs 4pp) and in terms of percentages of the original levels (14% vs 8%).

Table 6. Average percentage of deprivations among the poor population (A), 1997–2010, for k=33%

	1997	2003	2008	2010	2010–1997 reduction	2010–1997 % reduction
Urban	46%	44%	44%	42%	4	8%
Rural	52%	50%	46%	45%	8	14%
Total	48%	47%	45%	43%	5	11%

Source: LSMS

We have seen that urban populations have benefited more than rural populations in terms of reductions in poverty rates, while the urban poor have benefited more than the rural poor in reductions in the intensity of deprivation. What does this mean for the adjusted headcount ratio *M0* ? Estimates of *M0* are presented in Table 7[46,] and show that it is the effect of reductions in poverty rates in urban areas which dominate. Although the percentage point decrease in *M0* is much larger in rural than in urban areas (0.21 vs 0.13), the reduction expressed as a percentage of 1997 levels is lower in rural areas (47% against 57% in urban areas).

This may also be observed in the last row of Table 7 where rural poverty rates expressed as a percentage of urban poverty rates increase from 2.0 to 2.4 between 1997 and 2010. This again implies that rural populations have benefited less from social interventions than urban populations, although the change is less stark than in Table 5, showing the ameliorating effect of changes to poverty intensity in rural areas.

Table 7. Adjusted headcount ratio *M0*, 1997–2010 for k=33%

Area	1997	2003	2008	2010	2010–1997 (reduction, pp)	2010–1997 % reduction

---

46 See Figure A.3 for the dominance analysis performed for M0 across every value of k for rural and urban areas.

Urban	0.23	0.18	0.12	0.10	0.13	57%
Rural	0.45	0.39	0.28	0.24	0.21	47%
Total	0.29	0.23	0.16	0.13	0.16	55%
Rural/urban gap	0.22	0.21	0.16	0.14	0.08	10%
Rural/urban ratio	2.0	2.2	2.3	2.4		

Source: LSMS

3.3 Inequalities among the poor

In Section 2.1.2 we explained two indicators which adjust for the depth of poverty:

M1=HAG, in which the headcount measure is adjusted by the average share of possible deprivations experienced by poor households (*A*) and the average gap, over all the indicators on which a household is poor, between its achieved level and the poverty threshold for that indicator (*G*).

M2=HAS, in which the headcount measure is adjusted here not only by *A* also by the average squared poverty gap over all indicators and all poor people.

These two measures reflect the magnitude of the poverty gap among the poor, with *M2* placing greater weight on the poorest people; they are particularly useful in that they offer additional information on the magnitude of poverty, facilitating the targeting of social policy.

In contrast to *H* and *M0*, *M1* and *M2* require cardinal information – that is, not just a measure of whether an individual or a household meets a particular threshold, but by how far it falls short of that threshold. The CMPI consists of household-level aggregates of (a) individual-level categorical variables for the first four dimensions, and (b) household-level indicators for the housing conditions dimension. All the indicators on the housing conditions dimension take the value 0 or 1, and thus do not provide cardinality; these indicators are therefore excluded from this analysis. However, the indicators over the other dimensions are aggregated across all household members, and thus may take a range of values between 0 and 1. These values indicate the fraction of household members who do not meet each target. Thus, they do not exactly represent the normalized gap between the achievements of a household (or its individual members) and the deprivation threshold, as strictly required for the calculation of *M1*, but they do allow for the calculation of statistics analogous to *M1* and *M2* which capture the degree of deprivation and the need at the household level.

The poverty gap on each indicator (g_{ij}, for household i and indicator j) is calculated as the distance between this percentage and the threshold for each indicator (see Table A.2 in the Appendix for the definition of the gap for each indicator). The gap reflects the proportion of eligible household members who face deprivation on that indicator: taking, for example, the formal employment indicator, which has a cutoff point of 100% of the household's economically active population (EAP) holding formal employment, this would mean that a household where 100% of members hold an informal job has a deeper deprivation than a household where only 10% of its members face this deprivation. Note, however that the proportion of 'eligible' household members differ across indicators – for example, the school attendance variable in the childhood and youth dimension has a different number of eligible members (hence denominator of the normalized gap) than the formal employment indicator.

The total gap for each household (g_i for household i) is calculated as the weighted average size[47] of all the gaps over all the indicators on which the household is deprived. Finally, the mean gap over all deprived households is calculated. As the denominators differ, the mean gap can be roughly interpreted as the (weighted) average proportion of the eligible household members in each indicator who are actually deprived in the indicators. Multiplying *M0* by the mean gap will lead to a reduction in the value of the poverty measure in all situations except that in which all eligible household members are deprived in all dimensions (the mean gap is 100%). Thus, in a sense the *M1* corrects the *M0* measure by adjusting the adjusted headcount ratio even more precisely to reflect the true proportion of <u>individuals</u> in Colombia who are poor, given intra-household differences. Note that care must be exercised in interpreting the *M1* and *M2*. The reason is that the values may change due to differences in household size and composition. In areas in which all households are single people, then the mean gap will always be 100%; as the size of households increases, the mean gap is likely to be lower. Similarly if there is one versus many children.

The same statistical criteria as were outlined in Section 2.3.4 are used to find the robust band of *k* values, which is calculated as the interval [9%, 45%]; based on the same empirical techniques as outlined in Section 2.3.4, we select the value *k*=36% for the calculation of *M1* and *M2*.

As for the poverty incidence measurements reported previously, we plot results for all possible values of *k*, including those outside the robust range, as a dominance analysis exercise, before showing results for the selected *k*.

---

[47] Weights are rearranged according to the number of indicators within each dimension.

M1 and *M2* are plotted in Figure 5, for all values of k and for four years between 1997 and 2010. 2010 dominates all previous years for all value of *k* inside the robust band (and for most values outside). Both the adjusted poverty gap and severity decrease between 1997 and 2010, regardless of the selected *k*.

Figure 5. Multidimensional poverty gap (*M1*) and severity (*M2*) for different values of *k*, 1997–2010
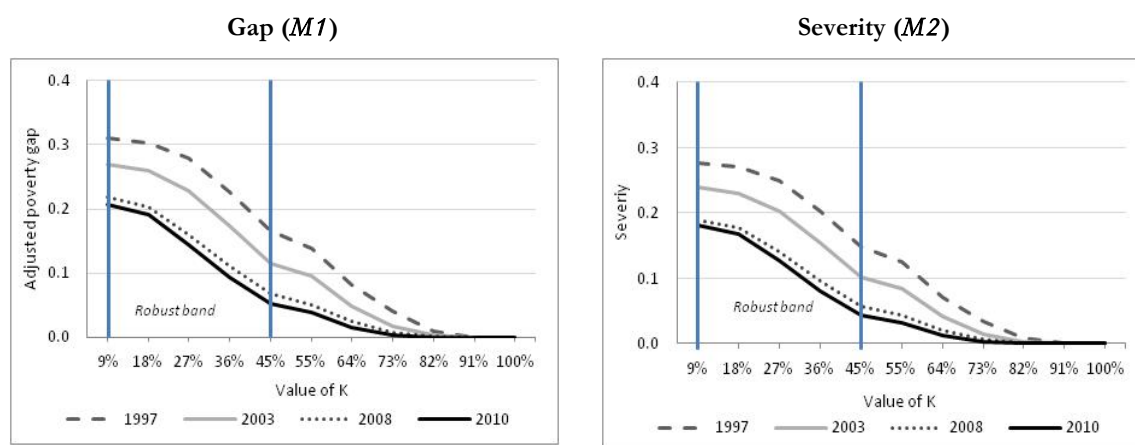
Source: LSMS

M1 and *M2*, calculated at *k*=36% is presented in Table 8. Both decrease substantially between 1997 and 2010; *M1* decreases from 0.23 to 0.09, and *M2* from 0.21 to 0.08. This is an important reduction as it implies that the households classified as poor are not only facing a lower proportion of deprivations in Colombia, but also that the magnitude of their deprivations is lower. In other words, the proportion of household members facing deprivations has decreased.

The last two column of Table 8 indicate the decrease in *M1* and *M2* between the year 1997 and 2010. The decrease in the two indicators is similar, both in terms of the magnitude of the drop (0.14 and 0.12) and the percentage decrease (59% and 61%). Comparing these with the percentage reductions in *H* (50%) and *M0* (55%), this suggests that a reduction in the intensity of poverty has accompanied a reduction in the incidence of poverty. However, the percentage decreases in *M1* and *M2* are too similar to say with any confidence that reductions in the intensity of poverty have been greater for the very poorest people.

Table 8. Multidimensional poverty gap (*M1*) and severity (*M2*), 1997–2010, for *k*=36%

	1997	2003	2008	2010	2010–1997 (absolute decrease)	2010–1997 % decrease
Gap (M1)	0.23	0.18	0.11	0.09	0.14	59%
Severity (M2)	0.21	0.16	0.10	0.08	0.12	61%

Source: LSMS

Tables 9 and 10 disaggregate *M1* and *M2* by urban and rural areas. The poorer living conditions of the rural population are once again evident, with both indicators being almost twice as high in rural as in urban areas. In both urban and rural areas, *M1* and *M2* decreased between 1997 and 2010, and the magnitude of the decrease was larger in rural areas. However, expressed as a percentage of the original levels, the magnitude of the decrease was larger in urban areas. Looking at the last rows of Tables 9 and 10, this is reflected in an increase over time in the rural/urban poverty ratio: on both measures, it increases by about 0.2 over the period concerned. The comparable increases in *H* and *M0* are 0.6 and 0.4 respectively. This indicates that on whatever measure we use, there has been increasing disadvantage for rural relative to urban areas. This increase in urban/rural inequality is less marked when the depth and severity of poverty are taken into account, and indicates that some progress has been made in reducing the most severe poverty in rural areas. However, the fact that urban/rural inequality is increasing on all measures indicates that greater and better efforts are required in terms of targeting public policy towards the rural poor.

Table 9. Multidimensional poverty gap (*M1*) by area, 1997–2010, for *k*=36%

Area	1997	2003	2008	2010	2010 – 1997 absolute drop	2010-1997 % drop
Urban	0.19	0.14	0.09	0.08	0.11	60%
Rural	0.34	0.28	0.18	0.15	0.19	56%
Rural/urban diff	0.15	0.14	0.09	0.07	0.08	4%
Rural/urban ratio	1.77	1.96	1.95	1.96		

Source: LSMS

Table 10. Multidimensional poverty severity (*M2*) by area, 1997–2010, for *k*=36%

Area	1997	2003	2008	2010	2010 –1997 absolute drop	2010–1997 % drop
Urban	0.17	0.12	0.08	0.07	0.10	61%
Rural	0.31	0.25	0.16	0.13	0.18	57%
Rural/urban diff	0.14	0.13	0.08	0.06	0.08	4%
Rural/urban ratio	1.84	2.04	2.04	2.03		

Source LSMS

4. Policy applications

The CMPI was developed as a tool for tracking the success of public policy. This section outlines some of ways in which it has been applied by Colombian government agencies, and other possible applications.

4.1 A national indicator to track overall poverty, including sectorial goals

Given that the indicators included within the CMPI index have been selected on the basis that they may be altered by public policy, the CMPI can be used to measure the achievements of poverty reduction strategies set forth in the National Development Plan (NDP). Thus, the Colombian government decided to include several targets derived from the CMPI in its 2010–2014 NDP. Targets based on the headcount ratio are shown in Table 11: so, for example, one goal was to decrease H from a baseline of 34.7% to 22.5% by 2014.

Each government department set its own targets for improvement (see Table A.3 in the Appendix). Following this, the aggregate effect of these improvements was simulated using the CMPI model on the LSMS data, with a random assignment of improvements over the poor population. The resulting counterfactual estimate of H became the overall poverty target for the NDP; the target numbers of poor and non-poor people shown in Table 11 are also the result of this exercise. Additionally, although the government's CMPI goal is expressed in terms of the headcount ratio (*H*), the same methodology also allows for estimation of the adjusted headcount ratio (*M0*), the adjusted poverty gap (*M1*), and the severity (*M2*).

Table 11. Multidimensional Poverty Incidence (*H*) Goal for the NDP

Indicator	2008 (Baseline)	2014	Difference
Headcount ratio (CMPI)	34.7%	22.5%	-12.2%
Absolute number of poor people by CMPI	15,421,703	10,701,692	-4,720,011
Absolute number of non-poor people by CMPI	29,029,444	36,960,095	7,930,651

Source: NPD, estimates updated on May 12, 2011

4.2 Micro-simulations of the effects of public policy

The direct relationship between the CMPI and the NDP offers additional advantages in terms of policy design. One example is the possibility of estimating the cost of reducing multidimensional poverty

through different areas of social expenditure, as performed by Angulo, Gomez and Pardo (2012). This is possible as there is precise budgetary information for the accomplishment of NDP goals. Another advantage is the possibility of measuring, regional achievements as components of progress towards the aggregate goal.

Also, the method of microdata imputation may be used in the construction of counterfactual scenarios to evaluate the effect of public policy on CMPI behavior. For example, the effect on multidimensional poverty from the implementation of a policy on a specific dimension could be analyzed. By inputting the microdata on the expected effect of the policy on a specific dimension, while holding everything else constant, one may uncover the impact of public policy on multidimensional poverty reduction in that dimension. Similarly, it offers the possibility of analyzing the effectiveness of the targeting of social programs by simulating different achievements according to the targeting instrument.

4.3 Geographical targeting

With the purpose of improving information on poverty at the municipal level in Colombia a CMPI proxy[48] was constructed using Census data from 2005. New poverty maps for Colombia have been constructed from the information obtained, which have become a source of information for geographic targeting. This information has been used for prioritizing investment projects funded by transfers from the national level to the municipalities and was also used for differentiating conditional transfers for the program "Mas Familias en Accion" across regions.

Multidimensional Poverty Incidence (*H*) at the municipal level is shown in Map 1. A clear imbalance is seen between the urban and rural areas in terms of poverty and quality of life. Urban areas have a lower percentage of multidimensionally poor people than rural areas. Only 11% of municipalities in Colombia have a headcount ratio of less than 50%. On the opposite side, 30% of municipalities have an incidence of more than 80%. Consequently, on average, a poor household in the central area faces fewer deprivations. Households in most municipalities (60%) suffer, on average, less than 50% of all possible deprivations. In only 6% of municipalities do households suffer, on average, 60% of all possible deprivations.

---

[48] Due to differences between the information available in the LSMS and the Census, some of the variables used to calculate the CMPI at the municipal level were adapted according to Census data 2005: i) the long-term unemployment indicator is replaced by the economic dependence rate, ii) a proxy for adequate nutrition is constructed for the childcare variable, which considers a household in deprivation if the child did not receive any of the three basic meals one or more days of the previous week due to lack of money, and iii) access to healthcare services refers to the previous 12 months.

Map 1. Headcount ratio (*H*) at the municipal level, using *k*=33%2005
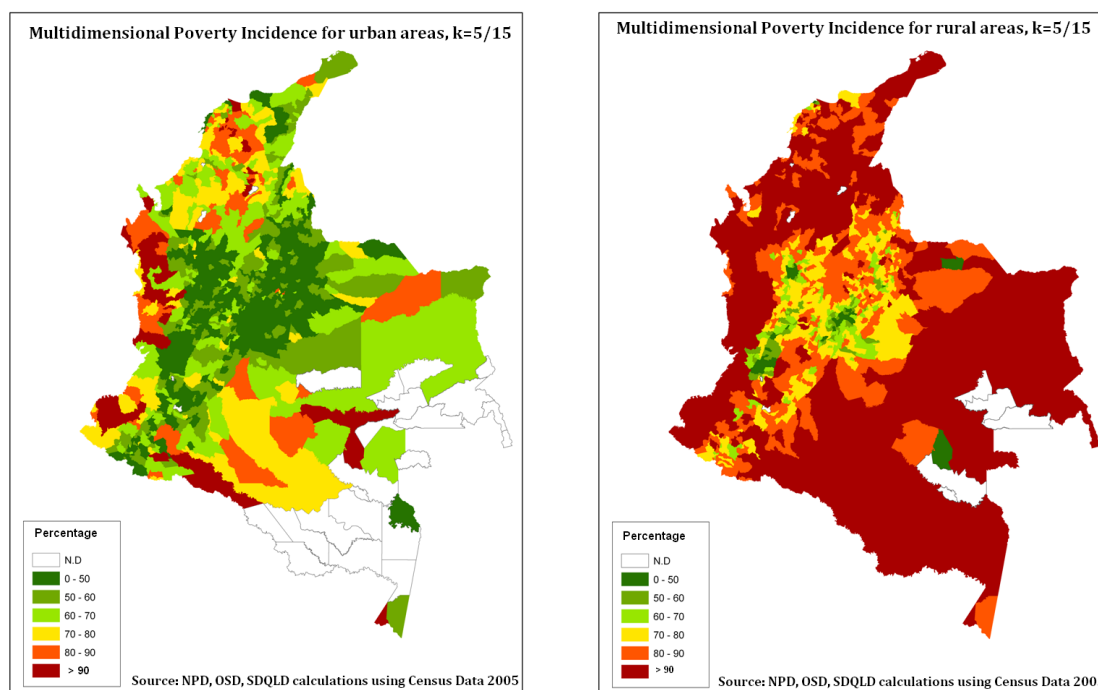
Source: 2005 Census

4.4 Social promotion of families from the Extreme Poverty Reduction Strategy – UNIDOS

The main strategy used by the Colombian government for the reduction of extreme poverty is the UNIDOS safety net. It operates through the joint work of governmental agencies, municipalities and families to promote income generation, wealth and improvement in life conditions.

In 2007, when the program began its operation, a household was eligible in case it belonged to the poorest 1.500.000 households according to the SISBEN score, or in case it was cataloged as either a displaced or an indigenous household. After this first targeting process there were no more families included within the safety net. However, UNIDOS is not a permanent program of support, rather, it is dependent on a family's living conditions; therefore, once the situation of extreme poverty is resolved by the family, the accompanying support should finish. Consequently, nowadays the CMPI (specifically the headcount ratio, *H*) is used to help on the identification of those current beneficiary households that are eligible to be "promoted", that is, current UNIDOS families whose living conditions are sufficiently favorable as to allow them to generate means of self-sufficiency without the network's support.

This *promotion mechanism* is done in two stages; firstly, the CMPI is used as a means of geographical targeting of municipalities with potential families to be promoted. In this matter, municipalities with

potential families to be promoted are the ones that belong to the 2nd and 3rd quintiles of the municipal CMPI headcount ratio (as described in Section 4.3 above).

The second stage of the *promotion mechanism* occurs at the household level. Together with a measure of income sufficiency, the CMPI is used to verify whether the family is not in extreme poverty by income,[49] nor is multidimensional poor (*k*=33%). These settings satisfy the sufficient conditions for a household to leave the program[50].

5. Conclusions and further directions

This paper describes the elements and features that were used when designing the Colombian Multidimensional Poverty Index launched by the Colombian government in August 2011. This paper also outlines public policy applications for the index and describes the main results in terms of trends of poverty rates within the whole country and across urban and rural areas. It is worth highlighting that at the time of this paper's writing, the CMPI was being used as public policy tool in the Colombian context to track deprivations across the country, to monitor public policies by sector and to design the poverty reduction goals of the 2010–2014 national development plan.

Multidimensional indicators of poverty involve the selection of a parameter *k*, as a threshold of deprivation. We selected values for this parameter based on statistical criteria, empirical analysis and comparability with other work in the area; however, our analysis included dominance techniques which showed that our estimates were robust to different choices of *k*. We find that multidimensional poverty in Colombia decreased between 1997 and 2010, and that this finding is robust over a wide range of values of *k*.

Larger reductions in poverty were observed over the five-year period between 2003 and 2008, than over the preceding six-year period between 1997 and 2003. This may be explained by the large increase education coverage (at all levels), access to childcare services and health insurance coverage between 2003 and 2008, which thus contributed to a reduction in households' deprivation rates, and which is still ongoing.

---

[49] Whose income is below the extreme poverty line.

[50] Although, the necessary condition to be promoted from the UNIDOS safety net is the fulfillment of the achievements prioritized by the household itself in its Family Plan.

In contrast, the variables which are most difficult to change quickly via public policy, and consequently those that continue to show the greatest proportion of deprivation are formal employment and educational achievement for the population 15 and older. In 2010, 81% of households faced deprivation in formal employment. This means that in 81% of households at least one employed member held an informal job. On the other hand, 55% of households faced deprivation from *sufficient* educational achievement for people 15 and older; that is, in 55% of households the average educational achievement of people 15 and older was less than nine academic years.

The analysis of urban and rural areas shows that regardless of the reduction in all multidimensional poverty measurements (*H*, *M0*, *M1* and *M2*) in both urban and rural areas, imbalances remain – in fact, the imbalance between urban and rural areas has steadily increased on all indicators between 1997 and 2010, particularly with regard to the rural/urban ratio for the multidimensional poverty headcount (*H*), which increased from 1.7 to 2.2.

Finally, regarding the multidimensional poverty gap (*M1*) and severity (*M2*), a greater reduction in severity (*M2*) is observed, suggesting that poverty reduction achievements have reached the poorest population through targeting.

5.1 Further development of the CMPI

A number of unexplored topics arose from the exercise carried out for selecting the CMPI dimensions, variables and weights, as well as from the experience of presenting the results and methodology in different seminars. This section includes a discussion of such topics and improvements to consider for the near future in the design of the CMPI.

5.1.1 Dimensions and variables for consideration

In general terms, the possibility of including variables to measure the quality of basic services needs to be discussed. In countries like Colombia, where health services, education and public utility coverage has greatly improved, there is a need for finding new variables that capture deprivation in those aspects, beyond coverage. In this way, the inclusion of indicators on the quality of services is considered.

Variables related to quality of employment could offer more information on the population's living conditions. In the case of Colombia, place of employment, number of working hours and type of contract were analyzed as possible variables to be included; however, consensus on the parameters for selecting of the cutoff point under which a person is considered deprived was difficult to establish.

There was, for example, difficulty in establishing a direct relation between the 14 categories[51] in the survey for place of employment and the deprivation condition. On the other hand, these variables indicate a strong correlation to formal employment; therefore, in the case of Colombia these variables were excluded from the index in order to avoid capturing the same phenomena thought several variables and consequently producing duplication.

Other aspects, such as security, dignity and subjective and/or psychological wellbeing are frequently discussed as possible dimensions to be considered as part of the index. In the report from the Commission on the Measurement of Economic Performance and Social Progress (CMEPSP 2009), presided over by Stiglitz, Sen and Fitoussi, for example, the eight minimum dimensions that should be simultaneously considered to measure wellbeing were: i) material living standards (income, consumption and wealth), ii) health, iii) education, iv) personal activities including work, v) political voice and governance, vi) social connections, vii) environmental conditions; and viii) economic and physical security.

It is worth noting that the possibility of including these aspects is limited to the availability of information held in the survey. Therefore, it is important to move toward the inclusion of the required information in the survey used.

5.1.2 Alternative schemes for assigning weights to dimensions

Several methods exist to assign weights to the dimensions that make up a multidimensional index. Decancq and Lugo (2008), for example, identify three different types of methods to assign weights: i) data driven (obtained from the same data used descriptively or statistically), ii) normative, and iii) hybrid. However, there is no consensus on the weighting scheme that should be used; therefore, weight selection is completely in the hands of the researcher. What should be taken into account are the implications of the method selected, as for example that variation of weights affects both identification and aggregation.

For the CMPI two approaches to set the weights were tested, both related to the households' deprivations (data driven). For the first approach each dimension received an equal weight and the weight assigned to the variables within them was set according to the households' deprivation rates in

---

51 At a company or hiring individual's location, At a rented or own location, At home, In someone else's home, On the street, In a kiosk or stand, Door to door, In a vehicle (taxi, car, bus, motorboat, boat) In a mine or quarry, In a construction site, In a farm or land, owned, rented or crop shared, Somewhere else (ocean or river).

each variable, which gave a higher weight to variables with high deprivation rates. For the second approach, different weights were set to each dimension, as well as for each variable within the dimensions, according to the deprivation rates.

These approaches, and data-driven methods in general, face a constraint: the moment in time when the weights are calculated. For example, for the case of Colombia if weights were set according to households' deprivations in 1997, a high weight would have been assigned to the health insurance variable; whereas today this variable has relatively moderate deprivation rates and in the coming years will drop even more. Therefore, one of the disadvantages of data-driven methods is that weights change over time, while with a normative method weights remain constant. When weights change for each measure, it is impossible to compare indexes over time.

The nested-weight method used for the CMPI offers a normative approach. All dimensions carry the same weight, indicating that they are equally important in terms of wellbeing and quality of life of the population. One of the limitations of this approach is that the weight assigned to variables within dimensions that have many variables is lower in comparison to that of the variables within dimensions that have few variables (See example in Table 2, the difference in the weights given to the variables in the health dimension vs. living conditions dimension).[52] This limitation, however, is lessened if the variables chosen are a good expression of the dimensions they represent (considering that the dimensions do weigh the same). Other normative approaches may be those that determine weights according to the budget allocation for each dimension.

Finally, weights determined according to revealed preferences are found among the hybrid options. Battiston, Cruces, Lopez-Calva, Lugo and Santos (2009), for example, assigned weights based on the study *Voices of the Poor*, in which the poor population was asked about their assessment of different dimensions.

---

[52] On the contrary, in cases where all variables carry the same weight, a higher percentage is assigned to dimensions with a greater number of variables.

6. Annexes

Table A.1. Alternatives for the selection of CMPI dimensions

Dimensions	Colombian Political Constitution, laws and codes	Millennium Development Goals[53]	Multidimensional poverty indicators in Colombia	Public policy documentation in Colombia (Conpes)	*Voices of the Poor*
Household educational conditions	**Article 67**. "Education is an individual right and a public service with a social object: it strives to seek knowledge, access to science and technology and all other cultural goods and values. The State together with society and the family is responsible for education, which is compulsory between the ages of 5 and 15, and which as a minimum will cover one year of preschool and nine years of basic education."	**Goal 3.2.** "By 2015, increase by 2 the average number of school years for the population between the ages of 15 and 24." **Goal 3.1.** "By 2015, reach a 1% illiteracy rate for the population between the ages of 15 and 24."	**Living Conditions Index** Level of education reached by the population older than 12 **SISBEN III Index** Percentage of adults suffering from functional illiteracy Percentage of adults who did not finish high school		"Without exception, the great majority of students living in the communities analyzed did not finish high school. Of 10 students that enroll in primary only 6 finish this academic cycle and only 3 finish high school."
Childhood and youth conditions	**Colombian political Constitution** **Article 44**. "Children are entitled to the following human rights: life, physical integrity, health, social security, a balanced diet, their name and nationality, a family, and not be separated from them, care and affection, education, culture, recreation and freedom of expression. They will be protected against abandonment, physical or moral violence, kidnapping, trafficking, sexual abuse, labor or economic exploitation, and high risk jobs."	**Goal 2**. Between 1990 and 2015 reduce the percentage of hunger by half.	**Unsatisfied basic needs** School absenteeism: when a child between the ages of 7 and 11 does not attend a formal education institution.	**Conpes 109**. The specific objectives of policies and programs directed towards children and infants are, among others: "strengthen and improve initial education coverage, in terms of comprehensive attention in community, family and institutional environments. Promote healthcare, nutrition and healthy environments from conception through age 6, prevention and attention of illness and promotion of healthy lifestyle practices and basic hygiene and living conditions."	…" Participants in the research study request continuous education opportunities, that aside from offering general access to school age children, also address urgent economic and social needs…"

---

[53] Taken from document Conpes 91 of 2005 which defines Colombia´s goals and strategies for achieving the millennium development goals for 2015. Documents Conpes are policy documents approved by the National Council for Economic and Social Policy, Conpes for its Spanish acronym (Consejo Nacional de Política Económnica y Social)

Dimensions	Colombian Political Constitution, laws and codes	Millennium Development Goals[54]	Multidimensional poverty indicators in Colombia	Public policy documentation in Colombia (Conpes)	*Voices of the Poor*
	Article 45. "Adolescents are entitled to protection and comprehensive education. The State and society guarantee the active participation of youths and adolescents in public and private organizations that are responsible for the protection, education and progress of youths."	**Goal 3.3.** "By 2015 achieve a gross coverage rate of 100% for basic education (from grade 0 through 9; including preschool, primary and secondary school)."	**Living conditions Index** Children between the ages of 5 and 11 that attend an educational institution. Youths between the ages of 12 and 18 that attend middle/high school or university.	**Conpes 113.** "Food and nutrition safety will be formulated as part of the Social Protection System, as well as in public health actions that seek to improve the population's nutritional conditions, especially for vulnerable groups, such as children (infant, children and adolescent groups)"	"In rural communities, child labor in the fields and at home, has been the norm for many years… Everyone is perfectly aware of the damage caused by this practice on the education and future of children."
	Article 50. "Any child under one year of age who is not covered by social security or another protection agency has the right to free services in any health institution that receives government funding."	**Goal 3.4.** "By 2015 achieve a gross coverage of 93% for grades 10 and 11."	**SISBEN III Index** Percentage of non-school attendance for children between the ages of 5 and 11 and youths between 12 and 17. Average school lag for children 5–17. Percentage of children who work.		"Poor people who participated in this research study revealed that for a long time their children attend schools irregularly before completely abandoning it. Although the most popular reason cited for low school attendance is a need to work, additional problems arise, such as lack of parent support, teenage pregnancy, the attraction of earning easy money, and drugs, that make children abandon their schooling."
	Law 1098 , 2006. Infancy and Adolescent Code **Article 28**. Boys, girls and adolescents have the right to quality education. The State is under the obligation to offer one year of preschool and nine of basic education.	**Goal 5**. "Reduce child mortality in children under the age of 5."			

---

[54] Taken from document Conpes 91 of 2005 which defines Colombia´s goals and strategies for achieving the millennium development goals for 2015. Documents Conpes are policy documents approved by the National Council for Economic and Social Policy, Conpes for its Spanish acronym (Consejo Nacional de Política Económnica y Social)

Dimensions	Colombian Political Constitution, laws and codes	Millennium Development Goals[55]	Multidimensional poverty indicators in Colombia	Public policy documentation in Colombia (Conpes)	*Voices of the Poor*
	Article 17. "Boys, girls and adolescents have the right to life, good living conditions, and a healthy environment in decent conditions and the right to fully enjoy their rights. Decent living conditions are essential for their comprehensive development as human beings. This right assumes adequate conditions regarding attention, protection, and adequate nutrition, access to healthcare services, education, clothing, recreation and housing with proper access to public utilities in a healthy environment, from the moment of conception onwards."				
	Article 20. "Boys, girls and adolescents will be protected against: any job that due to its nature, or due to the conditions in which it is carried out, could potentially affect their health, integrity, safety, or prevent their right to attend school, and the worst types of child labor, according to ILO Convention 182."				
Employment	**Article 25**. "Employment is a right and a social obligation, and receives special protection from the State. Everyone is entitled to decent and fair working conditions."		**Unsatisfied basic needs** Economic dependence rate: a high economic dependence rate is considered for households where more than three members hold jobs, and where simultaneously, the head of household has an educational level below three years.		

---

[55] Taken from document Conpes 91 of 2005 which defines Colombia´s goals and strategies for achieving the millennium development goals for 2015. Documents Conpes are policy documents approved by the National Council for Economic and Social Policy, Conpes for its Spanish acronym (Consejo Nacional de Política Económica y Social)

Dimensions	Colombian Political Constitution, laws and codes	Millennium Development Goals[56]	Multidimensional poverty indicators in Colombia	Public policy documentation in Colombia (Conpes)	*Voices of the Poor*
	Article 53. Minimum basic principles contained in the Worker's Statute: "equal opportunities for employees, minimal vital and mobile remuneration proportional to the quantity and quality of the position, work stability, non-waiver of minimal legal benefits; the right to settle and conciliate uncertain and debatable rights; situation favorable to the employee in case of doubt of the application and interpretation of formal legal sources; precedence over formalities established by human resource personnel; social security guarantee, training, and adequate rest; special protection for women, expectant mothers and underage workers."			**Conpes 3668**. "National competitiveness policies, in a strategy to increase business competitiveness, include the formalization of employment in their action plans. This plan focused on defining informality, promoting a culture of legality, improving information aids and implementing programs designed by the Ministry of Social Protection."	"The time when jobs were paid in full, including severance pay, vacations, insurance and bonuses, disappeared a long time ago…" "Given the lack of employment opportunities, people frequently change their occupation. This versatility is not rewarded with better income." "Paying employees full wages has become the norm, which implies medical coverage. However reality is that employees must take what's offered, even if their income does not cover their medical expenses."
Health	**Colombian Political Constitution** **Article 48**. "Social security is a mandatory public service offered under the direction, coordination and control of the State, as stated by the Law and subject to the principles of efficiency, solidarity, and globalism Everyone is guaranteed the inalienable right to Social Security." **Article 49**. "Healthcare and environmental sanitation are public services provided by the State. Everyone is guaranteed access to promotion, protection and recovery health services."				

---

[56] Taken from document Conpes 91 of 2005 which defines Colombia´s goals and strategies for achieving the millennium development goals for 2015. Documents Conpes are policy documents approved by the National Council for Economic and Social Policy, Conpes for its Spanish acronym (Consejo Nacional de Política Económnica y Social)

| Dimensions	Colombian Political Constitution, laws and codes	Millennium Development Goals[57]	Multidimensional poverty indicators in Colombia	Public policy documentation in Colombia (Conpes)	*Voices of the Poor*
	Law 100 of 1993				
	Article 3. "The State guarantees the inalienable right to social security to anyone living within the nation´s borders."				
	Article 162. "Mandatory Health Plan. The General Social Security Health System created the necessary conditions in order to access a Mandatory Health Plan for the entire population before the year 2001. This Plan offers comprehensive medical protection for families, due to maternity, general illness, as well as the promotion of good health, and the prevention, diagnosis and rehabilitation and treatment of all illnesses according to the percentage of use and definition of the level of attention and complexity."				
Access to public utilities and housing conditions	**Article 51.** "Every Colombian has the right to decent housing. The State will define the necessary conditions for this right to take effect, and will promote social interest housing, adequate long term financing systems, and ways in which these housing programs may be implemented in a collaborative manner."	**Goal 10.1**. By 2015 reduce by half the percentage of people that in 1993 had no access to improved water sources in urban areas.	**Unsatisfied basic needs** - Households with inadequate sewage and water public services - Households built with inadequate materials - Critical overcrowding	**Conpes 3604**: "One of the factors that most contributes to the fragility of households found in these settlements is water supply and basic sewage systems, given that more than 50% of households lack said services; therefore the improvement of sanitation and water infrastructure constitutes one of the primary catalyst for the success of any comprehensive improvements neighborhood program of project."	
	Article 365. "Public services are inherent to the State's social purpose. It is the States' duty to ensure the e efficient provision to everyone living within the nation's borders."	**Goal 10.2**. By 2015 reduce by half the percentage of people that in 1993 had no access to improved water sources in rural areas.	**Living conditions index** - Water supply (aqueduct) - Sewage service - Wall material - Flooring material - Number of people per room		

---

[57] Taken from document Conpes 91 of 2005 which defines Colombia´s goals and strategies for achieving the millennium development goals for 2015. Documents Conpes are policy documents approved by the National Council for Economic and Social Policy, Conpes for its Spanish acronym (Consejo Nacional de Política Económnica y Social)

Dimensions	Colombian Political Constitution, laws and codes	Millennium Development Goals[58]	Multidimensional poverty indicators in Colombia	Public policy documentation in Colombia (Conpes)	*Voices of the Poor*
	Article 366. "The general wellbeing and improvement of the quality of life of the population are both part of the State's social purpose. The solution of unsatisfied health, education, sanitation, environmental and drinking water needs are considered part of the State's basic objectives.	**Goal** 10.3. By 2015, reduce by half the percentage of people that in 1993 lacked access to improved sewer systems in urban areas. Goal 10.4. By 2015, reduce by half the percentage of people that in 1993 lacked access to improved sewer systems in rural areas.	**SISBEN III Index** - Drinking water source - Type of sewage connection - Flooring material - Wall material - Overcrowding		

**Source**: Based on Alkire (2007)'s methodology

---

58 Taken from document Conpes 91 of 2005 which defines Colombia´s goals and strategies for achieving the millennium
   development goals for 2015. Documents Conpes are policy documents approved by the National Council for Economic
   and Social Policy, Conpes for its Spanish acronym (Consejo Nacional de Política Económnica y Social)

Figure A.1. Average deprivation rate suffered among the poor population (A) for different values of *k*, urban and rural areas
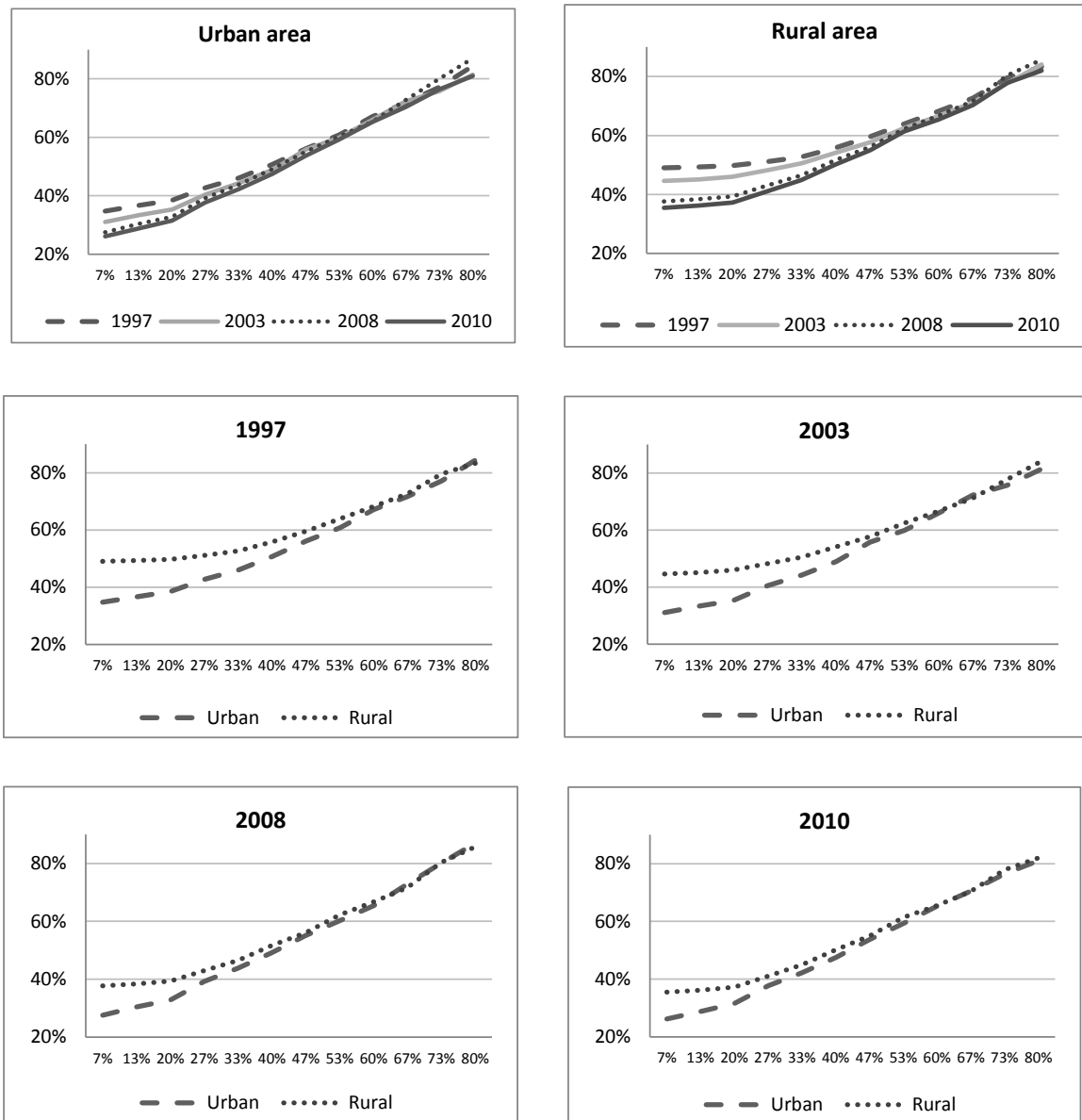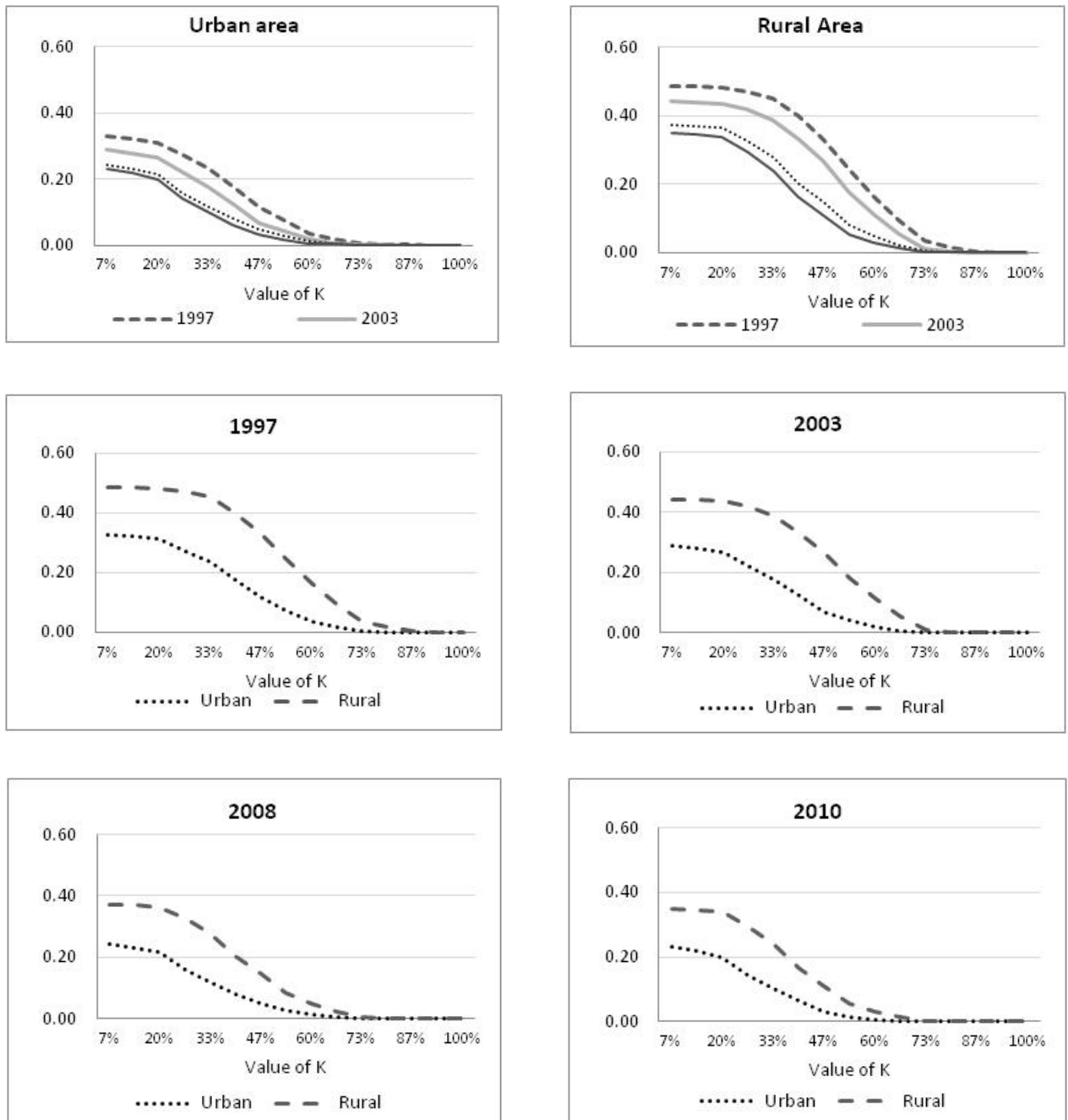

Source: LSMS

Figure A.2. Raw headcount ratios (Percentage of deprivation by variable), 1997 – 2010
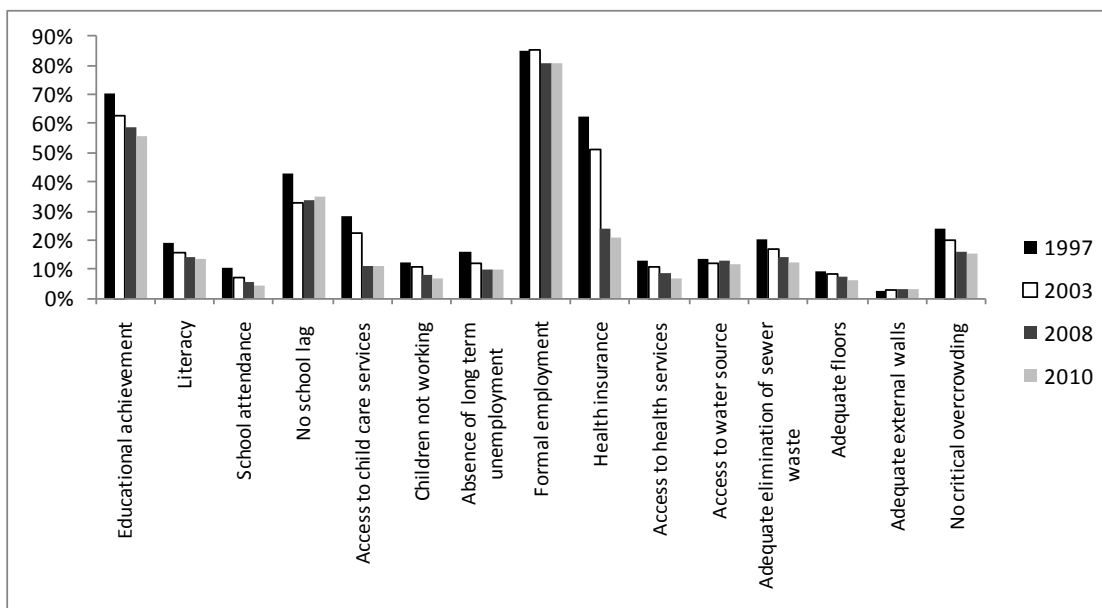
Source: LSMS

Figure A.3. Adjusted multidimensional headcount poverty ratio (M0) for different values of *k*, urban and rural areas

Source: LSMS

Table A.2. Indicators' redefinition for calculating the adjusted gap

in each dimension in which poor households are deprived

Variable	Cutoff point for each indicator	Poverty gap calculation
Education (9+ years of schooling)	Household ave. 9 years	
		Note: The cutoff point for the calculation of *H* is a household average of 9 years of education, while the poverty gap is calculated as the percentage of adults who have fewer than 9 years of education. This means that some households which are not classified as deprived on this indicator for the purposes of H, will have one or more adult members with fewer than 9 years of schooling, and thus would be indicated as having a poverty gap on this indicator. However, the gap for these households is not included in the calculations of M1 and M2, because gaps are defined only for households deprived on each dimension.
Literacy	100%	
School attendance	100%	
No school lag	100%	
Access to childcare services	100%	
Children not working	100%	
No one in long-term unemployment	100%	
Formal employment	100%	
		Note: As previously explained long-term unemployed are removed from the denominator in order to avoid counting them in deprivation twice. On the other hand, children under the age of 18 who hold a job are also eliminated in order to be congruent with the non child labor policy.
Health insurance	100%	
Access to health services	100%	
Critical overcrowding	<u>Urban</u>: 3 or more people per room	
	<u>Rural</u>: more than 3 people per room	

Table A.3. CMPI association with NDP sector goals

CMPI		NATIONAL DEVELOPMENT PLAN GOALS 2010-2014		
Dimension	**Variable - Indicator**	**NDP Indicator**	**Baseline 2009**	**Goal 2014**
Household educational conditions	Average education achievement	Average number of completed school years by the population between the ages of 15 and 24	9.15 completed school years	9.80 completed school years
	Literacy	Illiteracy rate (15and older)	6.70%	5.70%
Childhood and youth conditions	School attendance	Gross rate of secondary school coverage	79.27%	91.0%
	No school lag	School desertion rate per year (preschool, elementary and secondary)	5.15%	3.80%
	Access to childcare services	N.A.		
	Children not working	Number of boys, gilds and adolescents (5–17 years of age) in the job market	1,768,153	1,149,300
Employment	Absence of long-term unemployment	Unemployment rate. National total (%)	12%	8.9%
	Formal employment	Affiliated to a pension fund	32%	42%
Health	Health insurance	Affiliated to a contributory system	18,116,769	19,593,047
		Coverage of a subsidized system	90,27%	100%
	Access to health services	N.A.		
Access to public utilities and housing conditions [59]	Access to water source	Water service coverage	91.79% households	94.12% households
	Adequate elimination of sewer waste	Sewer service coverage	87.48% households	90.76% households
	Adequate flooring	Percentage of households with shortfalls in building materials	9.40%	6.70%
	Adequate exterior walls			
	No critical overcrowding	Percentage of households with critical overcrowding	12.50%	8.20%

Source: NPD

---

[59] 2014 goals for access to public utilities and housing conditions dimension were agreed upon by the Division of Urban Development of the National Planning Department.

7. References

Alkire, S. (2007) "Choosing Dimensions: The Capability Approach and Multidimensional Poverty," OPHI Working Paper 88.

Alkire, S. and Foster, J. (2007) "Counting and Multidimensional Poverty Measurement," OPHI Working Paper 7.

Alkire, S. and Foster, J. (2011a) "Counting and Multidimensional Poverty Measurement," *Journal of Public Economics*. August 2011.

Alkire, S. and Foster, J. (2011b) "Understandings and Misunderstandings of Multidimensional Poverty Measurements," OPHI Working Paper 43.

Alkire, S. and Santos, M.E. (2010) "Multidimensional Poverty Index," OPHI Brief, July 2010.

Alkire, S. and Santos, M.E. (2010) "Acute Multidimensional Poverty: A New Index for Developing Countries," UNDP, Human Development Research Paper 2010/11.

Alkire, S., and Seth S. (2008) "Measuring Multidimensional Poverty in India: A New Proposal," OPHI Working Paper 15.

Atkinson, A. B. (1987) "On the Measurement of Poverty," *Econometrica*, 55.

Battiston, D. et al. (2009) "Income and Beyond: Multidimensional Poverty in Six Latin American Countries," OPHI Working Paper 17.

Castaño, E., Deutsch, R. and Vélez, C.E. (1999) "Una Interpretación Económica del Sistema de Focalización de Programas Sociales: El Caso SISBEN en Colombia" Revista Coyuntura Social, No. 21, November, Fedesarrollo.

CMEPSP (2009) Report of Commission on the Measurement of Economic Performance and Social Progress, September 14.

Cortés, D., Gamboa, L.F. and González, J.I. (1999a) *Un Marco Teórico para un Indicador Tipo SISBEN*.

Cortés, D., Gamboa, L.F. and González, J.I. (1999b) "ICV: Hacia una Medida de Estándar de Vida," Revista Coyuntura Social, No. 21, November, Fedesarrollo.

Cortés, D., Gamboa, L.F. and González, J.I. (2000) "Algunas Consideraciones Analíticas Sobre el Estándar de Vida," Revista de Economía de la Universidad del Rosario, III.

Departamento Administrativo Nacional de Estadística (DANE) (2001) "Análisis de los resultados de la encuesta sobre caracterización de la población entre 5 y 17 años en Colombia."

Departamento Administrativo Nacional de Estadística (DANE) (2008) "Estimación e interpretación del coeficiente de variación de la encuesta cocensal, censo general 2005 – CGRAL."

Departamento Administrativo Nacional de Estadística (DANE) (2009) "Metodología Censo General 2005," Colección documentos No. 86.

Departamento Nacional de Planeación (DNP) (2007) "Política Pública Nacional de Primera Infancia "Colombia por la Primera Infancia," Documento Conpes Social 109. Bogotá.

Departamento Nacional de Planeación (DNP), Programa de las Naciones Unidas para el Desarrollo (PNUD), Programa Nacional de Desarrollo Humano (PNDH) and Agencia de Cooperación Técnica Alemana al Desarrollo (GTZ) (2006) *Los Municipios Colombianos hacia los Objetivos de Desarrollo del Milenio. Salud, Educación y Reducción de la Pobreza.*

Flórez, C.E., Sanchez, L., Espinosa, F. and Angulo, R. (2011) "El Indice Sisben III" Mimeo, presented at the HDCA Conference 2011, The Hague, The Netherlands, September 5-8th, 2011.

Foster, J., Greer, J. and Thorbecke, E. (1984) "A Class of Decomposable Poverty Measures," *Econometrica*, 52(3), 761-766.

González, J. and Sarmiento, A. (1998) "Algunos Aspectos Conceptuales del Índice de Condiciones de Vida," *Coyuntura Social*, 19, 67-88.

López Calva, L. F. and Ortiz Juárez, E. (2009) "Medición Multidimensional de la Pobreza en México: Significancia Estadística en la Inclusión de Dimensiones no Monetarias," *Estudios Económicos*, 3-33.

Misión Social (2002) "Familias Colombianas: Estrategias Frente al Riesgo" DNP-PNUD-PDH-ICBF. Bogotá. Editorial Alfa Omega.

Muñoz, M. (1995) "Los indicadores de Necesidades Básicas Insatisfechas (NBI)" Boletín de Estadística DANE 507/June.

Pattanaik, P. and Y. Xu (1990) "On Ranking Opportunity Sets in Terms of Freedoms of Choice." Recherches Economiques de Louvain.

PNUD-UNICEF-DANE, Departamento Nacional de Planeación y Ministerio de Agricultura (1987) "Magnitud de la Pobreza en Colombia –Primer Informe del Proyecto de Indicadores de Pobreza," Boletín de Estadística DANE 411/June.

Sen, A. K. (1976) "Poverty: An Ordinal Approach to Measurement," *Econometrica*, 44.

Sen, A. K. (1979) "Issues in the Measurement of Poverty," *Scandinavian Journal of Economics.*

Sen, A. K. (1987) *The Standard of Living*, Cambridge University Press, 1-38.

Sen, A. K. (1992), *Inequality Re-examined*, Oxford: Clarendon Press.

Sen, A. K. (1993) *Capability and Wellbeing*, Oxford: Clarendon Press, 30-53.

Sen A. K. (1998) "Progreso y Déficit Social: Algunas Cuestiones Metodológias" en: Desai Meghnad, Amartya Sen y Julio Boltvinik, *Índice de Progreso Social. Una Propuesta*, México: UNAM.

UNESCO International Institute for Educational Planning and OEI (2008) "Informe sobre Tendencias Sociales y Educativas en América Latina: La Escuela y los Adolescentes." Buenos Aires.

Vélez, C.E., Azevedo, J. and Posso, C. (2010) "Oportunidades para los Niños Colombianos: Cuánto Avanzamos en esta Década," World Bank. Colombia.