Step-by-Step Guidelines to the

Multiple Overlapping Deprivation Analysis (MODA)

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STEP-BY-STEP GUIDELINES TO THE MULTIPLE OVERLAPPING DEPRIVATION ANALYSIS (MODA)

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Abstract. Multiple Overlapping Deprivation Analysis (MODA) is a UNICEF methodology which provides a comprehensive approach to the multidimensional aspects of child poverty and deprivation. MODA builds on earlier multidimensional poverty studies and encompasses a large set of tools ranging from deprivation headcounts in single dimensions via multiple overlap analysis to multidimensional deprivation ratios and their decomposition. The MODA methodology places the child at the heart of the analysis and concentrates on those aspects of well-being that are relevant for the children at particular stages of their lives. Moreover, the analysis indicates which deprivations children experience simultaneously. The information found when analyzing groups of children with overlapping and non-overlapping deprivations points towards mechanisms needed for effective policy design to address children's needs as accurately as possible.

These guidelines present a detailed step-by-step procedure of how to carry out a multiple overlapping deprivation analysis. They aim at providing technical guidance by capturing lessons acquired from previous research, indicating the range of decisions to be made and the various risks each of the different choices may lead to.

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1. INTRODUCTION

Multiple Overlapping Deprivation Analysis (MODA) provides a comprehensive approach to the multidimensional aspects of (child) poverty and deprivation. It is developed by the UNICEF Office of Research, with support from the Division of Policy and Strategy, to facilitate the analysis of inequities and to provide instruments to identify deprived children. Building on earlier studies and contributions,[1] it encompasses a large set of tools used in multidimensional poverty and deprivation analyses, ranging from deprivation headcounts in single dimensions via multiple overlap analysis to multidimensional deprivation ratios (in the literature often referred to as 'indices') and their decomposition.

MODA adopts a holistic definition of child well-being, concentrating on the access to various goods and services which are crucial for their survival and development. Along with monetary/consumption-based approaches, it provides a more comprehensive picture of child well-being. It recognizes that a child's experience of deprivations is multi-faceted and interrelated, and that such multiple, overlapping deprivations are more likely to occur, and with greater adverse effects, in more socio-economically disadvantaged groups.

The "whole-child approach" is at the heart of MODA emphasizing that children's well-being cannot be compartmentalized into sectors (e.g. health, nutrition, and education) and that the multiple aspects of children's lives need to be placed simultaneously at the centre of any deprivation analysis.

MODA has four main characteristics that may be distinguished from most existing studies. First, MODA concentrates on the child as the unit of analysis, rather than the household. Children experience deprivations and poverty differently from adults especially with regards to developmental needs, which can have lasting effects if they are not fulfilled (UNICEF, 2000).

Second, MODA acknowledges that children's needs are not homogenous across their childhood. For this reason MODA adopts a life-cycle approach analyzing separate age groups to reflect the different needs of early childhood, primary childhood and adolescence.

Third, MODA enhances knowledge of compartmentalized or sector-by-sector approaches (e.g. nutrition, health, and education) with an overlapping deprivation analysis. This analysis indicates which of the multiple facets of child poverty are experienced simultaneously and gives insight into the various levels of severity of deprivation.

Fourth, the whole-child oriented view of MODA supports the focus on equity, because it allows to concentrate on highly deprived groups in the society, and to create profiles which assist in determining their geographical and social position. The deprivation overlaps and profiles reveal specific characteristics of deprived children and can help to point towards mechanisms for effective policy design.

This paper provides general guidelines and step-by-step procedures highlighting the major decisions to be taken when starting a MODA analysis (choices to be made, options available and

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[1] UNICEF's Global Study (e.g. Gordon et al, 2003), the OPHI's Multidimensional Poverty Index (Alkire and Foster, 2007; Alkire and Santos, 2010), and other research carried out in the field of multidimensional poverty. For further references and a comprehensive literature survey on multidimensional poverty and deprivation analyses, see De Neubourg, C., de Milliano, M., Plavgo, I. (forthcoming), *Lost in Dimensions*, Office of Research Working Paper – forthcoming, UNICEF Office of Research, Florence.

consequences for each of the options). The paper is complemented by two additional documents: (1) a paper discussing the place of MODA within the academic tradition of multidimensional poverty and deprivation research (De Neubourg, de Milliano and Plavgo, forthcoming), and (2) a technical note on the Cross-Country MODA study (CC-MODA) (De Neubourg et al, 2012c).

This paper is structured to guide the potential MODA-user through the important steps that are to be taken when embarking on a MODA-type of analysis. Many decisions have to be taken and the results will partially depend on these decisions. The paper explicitly addresses these decisions and explores the implications of the potential choices to be made. While it is impossible to foresee all potential problems and options, the authors have tried to cover as much as is reasonably possible.

2. MODA APPLICABILITY AND SCOPE

MODA intends to analyze child deprivation by identifying deprived children from a multidimensional perspective. The MODA methodology is designed to be used in a specific country setting using recent and high quality survey data and making country specific choices on age groups, dimensions, indicators and thresholds. Besides country specific applications of the MODA methodology, it has also been used for cross-country comparison purposes.

The Cross-Country MODA study (CC-MODA) is a special application of the MODA methodology aiming at identifying deprived children and their characteristics in low- and middle-income countries using an internationally standardized approach on the most recent globally comparable data from the DHS and MICS.[2]

While in CC-MODA the age groups, dimensions, indicators and thresholds used for each country are the same to allow international comparability, National MODA (or N-MODA) opens the possibility to make country specific choices. In N-MODA, national databases can be used providing more and/or other indicators to analyze child deprivation; it is also possible to define specific thresholds, age groups and profiling variables capturing national values and objectives concerning child development. Although the results are not comparable with other countries, they can reveal more detailed and richer information on the extent and characteristics of child deprivations and the profiles of the children suffering from deprivations in a particular country.

N-MODA's focus is on producing country-specific analyses, with an aim to: i) capture national values and objectives concerning child development; ii) explore the profile of deprived children, to locate them both geographically and socially;[3] iii) improve the understanding of how the different deprivations by sector overlap to inform which deprivations may need to be addressed simultaneously; iv) inform equity-based public policy responses to child deprivation; and v) indicate deprivation coincidences that need further theoretical and empirical elaboration.

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[2] DHS – Demographic and Health Survey; MICS – Multiple Indicator Cluster Survey of UNICEF.
[3] Profiling is the basis for the equity analysis, showing differences between genders, geographical regions, urban and rural areas, parents' socio-economic situation, wealth quintiles, and other variables.

3. WHY FOCUS ON MULTIDIMENSIONAL CHILD DEPRIVATION?

Childhood poverty is widely understood as "deprivation of the material, spiritual, and emotional resources needed for children to survive, develop and thrive" (UNICEF, 2004), and is often measured by single dimensional, financial or sector-based (compartmentalized) development goal indicators. However, there is increasing recognition that these measures do not adequately capture the full extent of childhood poverty and its adverse effects, as they overlook the myriad interactions of key dimensions of childhood poverty through important feedback loops. There is the additional concern of hidden inequities in these measures, because they mask the multiple and overlapping deprivations that are more likely to occur in socio-economically disadvantaged group(s).

Over the last two decades, multidimensional deprivation analyses have been introduced as an attempt to address the aforementioned issues. Most of them, similar to monetary poverty analyses, are based on household level data, assuming equal access to services and equal resource distribution among all family members.

Consistent with the arguments elaborated in De Neubourg et al (forthcoming) and with the empirical studies in the UNICEF Report Card 10, 'Measuring Child Poverty' and its background papers (UNICEF IRC, 2012; Bradshaw et al. 2012, de Neubourg et al. 2012b), MODA distinguishes deprivation measures from poverty measures reserving the latter for money-metric measures (see also de Neubourg et al. 2010; Roelen et al. 2011).

Even though poverty has traditionally been associated with the lack of a certain income, many arguments have been made on the conceptual difference between 'income' and 'basic needs' poverty (Ravallion, 1998; UNICEF, 2000; Bourguignon & Chakravarty, 2003). Furthermore, measurement of the two fields of poverty has shown that the group of people identified as income poor does not fully coincide with the group that is found to be multidimensionally poor based on the basic needs approach (Bradshaw et al, 2008; Notten, 2008; UNICEF IRC, 2012; de Neubourg et al. 2012b). Both types of poverty analysis can make valid contributions to the objective of poverty reduction. Even though multidimensional poverty is often perceived as more complex than monetary poverty, data on household income, expenditure and consumption, alongside the information on the markets of basic goods, have been difficult to obtain for low- and middle-income countries (Bourguignon & Chakravarty, 2003). Additionally, with regards to children it has been argued that the use of household or adult poverty measures to represent child well-being is inaccurate or incomplete, since children's needs differ from the needs of their parents and households (UNICEF, 2000, Waddington, 2004; Delamonica & Minujin, 2007; Roche, 2009; de Neubourg et al. 2010). For these reasons, MODA measures child deprivation at the child level (rather than the household level) whenever the data allows a distinction between children in households to be made.

Recently developed literature on multidimensional child poverty/deprivation can be divided into two main approaches, namely 'child poverty/deprivation count measures' and 'child poverty/deprivation indices' (Roelen & Gassmann, 2008). The first method comprises the 'child poverty/deprivation count' measures, e.g. the studies of Gordon et al. (2003) and Gordon et al. (2010). UNICEF's Global Study on Child Poverty and Disparities uses this so-called Bristol approach and has made a substantial contribution to the use of multidimensional child poverty as a tool to

support child-focused policy making.[4] The second approach consists of 'child poverty ratios', such as OPHI's Multidimensional Poverty Index[5] (Alkire & Santos, 2010). OPHI uses the Alkire and Foster methodology (2007; 2011) to aggregate the various dimensions of poverty into one index. This aggregate combines information on the number of poor/deprived people within the population with the depth of poverty/deprivation of each individual, to give an indication of not only the incidence, but also the intensity of poverty/deprivation in a country or region. The index is decomposable by subgroups and dimensions which can show the contribution of each group and dimension to the overall figure.

The MODA methodology takes a place in the debate by building on UNICEF's Global Study and by using Alkire and Foster's methodological components. MODA follows the Global Study in adopting a rights-based approach to child well-being. It also accounts for the number of deprivations experienced by each child or the 'cumulative incidence of deprivation'.

Besides the analysis of the number of deprivations, MODA has incorporated deprivation ratios as introduced by Alkire and Foster (i.e., the headcount ratio (H), the average deprivation intensity (A), and the adjusted headcount (M0)). These ratios have been adopted for three main reasons: (1) to facilitate subgroup comparison of child deprivation and profiling of the multidimensionally deprived; (2) to use the decomposability function of the adjusted headcount ratio and to show the contribution of subgroups and dimensions to the overall deprivation level; and (3) to facilitate cross-country comparison. It is acknowledged that the use of a composite ratio creates the risk of lack of clarity, misinterpretation and fragility in the construction of the measure (Ravallion, 2010; Ravallion, 2011). This document serves as guidance to the choice of components, and as clarification of the methodological decisions that need to be made.

Furthermore, MODA goes beyond the abovementioned 'counting' and 'aggregating' of deprivations by profiling the characteristics of children within each level of deprivation, and by analyzing the overlap of deprivations to identify which of the deprivations are experienced simultaneously. Overlap analysis generates a holistic view of the well-being of each child and can therefore help to inform effective policy design (Ferreira & Lugo, 2012).

Information subtracted from carrying out sector-by-sector (single deprivation) analysis, counting deprivations, analyzing deprivation overlaps, comparing various subgroups of the multidimensionally deprived children, and decomposing the composite ratios is intended to provide a complete[6] picture of child well-being both on an individual level and at a national level to better identify the most deprived children from a multidimensional perspective, to highlight inequity and to inform the design of policy responses.

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[4] For more information on the Global Study and for an overview of other studies on multidimensional child poverty, see: http://www.unicef.org/socialpolicy/index_childpoverty.html.
[5] For more information see: http://www.ophi.org.uk/policy/multidimensional-poverty-index/; and http://hdr.undp.org/en/statistics/mpi/.
[6] In this context "complete" is to be understood as limited by the data that are used to construct MODA; these limitations are country specific as the databases used are country specific.

4. THE STEP-BY-STEP GUIDELINES TO MODA

This section presents a detailed step-by-step procedure of how to carry out a multiple overlapping deprivation analysis. It aims at providing technical guidance by capturing lessons acquired from previous research, indicating the range of decisions to be made and the various risks each of the different choices may lead to.

The first steps of the MODA methodology are set to clarify the concepts and definitions, followed by guidance on dimension, indicator, and threshold choice. After that, sector-centered deprivation analysis, studying each indicator and dimension separately, is addressed. This is followed by a thorough explanation of how to carry out a child-centered deprivation analysis, offering approaches to study the various deprivation overlaps, to count deprivations, and to aggregate the estimates to measure the breath and severity of deprivation.

Table 1 - Summary of the step-by-step guidelines to MODA[7]

Description	Required actions
Getting started	
Concepts, definitions, data choice	· Choose field(s) of child well-being[8] to be analyzed · Define deprivation and specify its dimensions, based on the chosen definition · *Optional* – Define any other field of poverty · Select the dataset(s) and choose the unit of analysis
Preparation for the deprivation analysis	
Choice of dimensions, indicators, thresholds, and age groups	· For each dimension, select indicator(s) and define the reference population · Specify indicator threshold(s) and construct the indicator(s) · Decide upon the life-cycle stages and choose age group(s) for the multidimensional deprivation analysis · Decide whether to impute values on other members of the same household · Perform a correlation test and select the final indicators · Decide how to weight indicators and how to aggregate them into dimensions · *Optional* – Perform a scalability test and select the final dimensions · Decide how to weight dimensions · Decide upon the identification method of the multidimensionally deprived children
Single deprivation analysis	
Analysis by indicator and by dimension	· Estimate a child deprivation headcount ratio for each indicator and dimension · Select profiling variables and construct a profile of the deprived children for each dimension · *Optional* - For each indicator, construct a profile of the deprived children

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[7] For a schematic overview of all the possible components of MODA, see Annex: Framework of the MODA methodology.
[8] In the MODA methodology, "fields of child well-being" refer to different approaches to the concept of "lack of child well-being" (taken in its broad sense) and include in particular, deprivations and monetary poverty, but also subjective poverty, financial strains, social exclusion, and other fields of child well-being, depending on data availability. Within each of these fields, "dimensions" are defined, such as *education* or *health* among others in the deprivation field, or monetary poverty as the only dimension in the monetary poverty field. Finally, the status in each dimension is defined by one or several "indicators" such as school attendance to measure deprivation in the education dimension, or stunting, wasting, underweight as indicators in the nutrition dimension.

Multiple overlapping deprivation analysis	
Deprivation count and overlap analysis per age group	· For each child, estimate the number of dimensions in which (s)he is deprived · Calculate the share of children deprived in 0, 1, 2, …, d dimensions, both at the national level and by subgroup · Carry out a deprivation overlap analysis analyzing the overlap and non-overlap of deprivations · Construct a profile of the children in the deprivation overlaps
Identification of multidimensionally deprived children	· Estimate the multidimensional child deprivation headcount ratio (H) for each age group using various cut-off points · Estimate the average intensity of deprivation (A) among the deprived for each age group using various cut-off points · Estimate the adjusted multidimensional child deprivation headcount ratio (M_0) for each age group using various cut-off points · *Optional* - Estimate H, A, and M_0 for the entire child population · Construct a profile of the multidimensionally deprived children, calculating H and M_0 at subnational and subgroup level · Decompose each adjusted deprivation headcount ratio M_0 by (1) subgroup, and (2) dimension
Optional – Analysis of other fields of child well-being	
Monetary poverty analysis	· Decide upon the measurement of monetary poverty · Estimate the number of children living in financially poor families · Profile the monetary poor
Analysis of other fields of child well-being	· Analysis of any other field of child well-being chosen for the study by adapting the above-mentioned steps
Optional – Field overlap analysis	
Overlap analysis between different fields of child well-being	· Study the overlap between the different fields of child well-being chosen for the analysis, and profile each overlap/non-overlap group

4.1 Getting Started: Concepts, Definitions, Data Choice

> **Step 1 - Choose the field(s) of child well-being[9] to be analyzed**

MODA is primarily based on the analysis of child deprivations, meaning the absence of one or more of the essential determinants of child well-being. However, any field of child well-being can be included in the analysis provided that the available data includes the necessary information and refers to the same population. Besides deprivation, other common fields are:

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[9] In the MODA methodology, "fields of child well-being" refer to different approaches to the concept of poverty/deprivation (taken in its broad sense) and include in particular deprivations and monetary poverty, but also subjective poverty, financial strains, social exclusion, and other fields of poverty, depending on data availability. Within each of these fields, "dimensions" are defined, such as *education* or *health* among others in the deprivation field, or monetary poverty as the only dimension in the monetary poverty field. Finally, the status in each dimension is defined by one or several "indicators" (such as school attendance to measure deprivation in the education dimension, or wasting, adequate diet indicators in the nutrition dimension).

- Monetary poverty (i.e. poverty measured with reference to any type of international or national monetary benchmark usually measured as "children living in households with financial means below a set benchmark (a poverty line)");
- Subjective or self-assessed poverty/deprivation/well-being (i.e. the perception of the respondent on his/her living conditions/well-being);
- Financial strains (i.e. one's ability to afford certain goods or services);
- Social exclusion (i.e. the extent to which someone is able to participate in the society, which includes aspects such as discrimination, enrolment in training, and social activities).

Note: it is important to distinguish the different concepts well, since each refers to a specific aspect of well-being. Merging these concepts leads to a loss of dimensions rather than to a multidimensional analysis, since the overlap of the results will be self-evident rather than revealing a simultaneous experience of poverty/deprivation/lack of well-being. For a full discussion see "Lost in dimensions" (de Neubourg at al., forthcoming).

This paper focuses on the (multidimensional) analysis of deprivations (steps 2 – 22) that forms the quintessence of MODA (Multiple Overlapping Deprivation Analysis); the combination of deprivation analysis with monetary poverty, subjective (or self-assessed) well-being and social exclusion is shortly discussed in section 4.8.

> ➢ **Step 2 - Define deprivation and specify its dimensions, based on the chosen definition**

Defining 'deprivation' assists in setting the objective(s) of the analysis and choosing the appropriate dimensions. For country-specific studies (i.e. N-MODA), national norms and/or internationally-agreed definitions can be used, while cross-country studies (i.e. CC-MODA) require a definition that is accepted across countries.

Deprivation can be defined using one or more of the following sources:

- National norms, standards, or legislation;
- Internationally-agreed definitions, international conventions, e.g. United Nations Millennium Development Goals (MDGs), Convention on the Rights of the Child (CRC), UN resolutions and reports;
- Regionally-agreed definitions (e.g. by the European Union);
- Theories written by scholars, researchers, academia (e.g. Sen, 1999; Townsend, 1979; Gordon, 2003);
- Explicit or implicit assumptions about what people value or should value;
- Public "consensus";
- Empirical evidence regarding what children (or others) value most as elements of well-being.[10]

MODA prefers to use international standards as guiding principles for choosing the most relevant dimensions of child well-being. *The Convention on the Rights of the Child (CRC)* (1989), in combination with *the World Summit on Social Development* (1995) and *the Millennium Development Goals* (2000; 2003) can serve as a basis for the construction of a core set of

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[10] This option requires that an empirical assessment of what children (or others) consider as important elements of their well-being is available or can be made. Although this is not easily done, it accounts for what in a particular context or society is regarded as essential elements of a "happy" childhood. These elements are very context (country) specific and therefore can reflect well the specific conditions of childhood well-being in a particular country. Moreover, it gives weight to UNICEF's position that children should be given a voice in defining what is important in their life. It is also clear that this voice is more easily given to children above a certain age and that the elements of well-being for (very) young children have to be defined by others.

dimensions that are essential to any child's development irrespective of their country of residence, socio-economic status, or culture (see Table 2). The above-mentioned sources can then be used to further describe or complement these dimensions.

Table 2 - Child Well-being Dimensions according to the CRC

Categories	Dimensions	Source
Survival	Food, nutrition	CRC Art. 24
	Water	CRC Art. 24
	Health care	CRC Art. 24
	Shelter, housing	CRC Art. 27
	Environment/pollution	CRC Art. 24
Development	Education	CRC Art. 28
	Leisure	CRC Art. 31
	Cultural activities	CRC Art. 31
	Information	CRC Art.13, 17
Protection	Exploitation; child labour	CRC Art. 32
	Other forms of exploitation	CRC Art. 33-36
	Cruelty, violence	CRC Art. 19, 37
	Violence at school	CRC Art. 28
	Social security	CRC Art 16, 26, 27
	Birth registration; nationality	CRC Art. 7, 8
Participation	Birth registration; nationality	CRC Art. 7, 8
	Information	CRC Art.13, 17
	Freedom of expression, views, opinions; being heard; freedom of association	CRC Art.12-15

Source: authors' selection (article numbers refer to the CRC)
Note: the definition of deprivation should provide you with an ideal list of dimensions, which you would like to include in the analysis. The list of dimensions that will actually be included in MODA, including their required indicators, will be defined later in the process based on data availability.

- o **Optional – Define any other field of child well-being and specify its dimension(s)**

The same type of sources as specified in step 2 can be used to define any other field of well-being to be included in the analysis (See sections 4.6-4.8).

- ➢ **Step 3 - Select the dataset(s) and choose the unit of analysis**

The MODA methodology can be applied using various datasets: internationally administered datasets, such as MICS or DHS; regional ones, such as the European Union Statistics on Income and Living Conditions (EU-SILC); national household surveys; or local surveys. The quality of the dataset to be used is important. The sampling method and sample size should be adequate to be representative for the geographical area that MODA is supposed to cover and that may range from a local entity (city, urban or rural area, district, or region) to a national state or even a group of countries.

Cross-Country (CC-) MODA has used MICS and DHS data, for the main reason that these include recent data on various deprivations that are comparable across a number of low and middle-income countries. Since National (N) MODA does not aim to be comparable across countries, a dataset can be chosen that provides details on as many of the specified dimensions as possible.

Besides the richness of information, the choice of an N-MODA dataset should also be guided by the data quality, the sample size, the possible unit of analysis, and the level of representativeness. The latter is important if the analysis is to be used to profile specific groups or communities in the society.

With regards to the unit of analysis, there are three possible levels that can be used to analyze child poverty:

- The individual (child) level;
- The household level with a child focus (using household level indicators with a specific child focus);
- The household level (using indicators that apply equally to all household members).

Child level data are the only data that allow for the identification of age- and gender-driven differences (i.e. intra-household differences). Individual child level data are the preferred option, because they can make child-specific needs visible. Generic household level data can be used when indicators are equally applicable to all household members (e.g. source of drinking water).

4.2 Preparation for the Deprivation Analysis: Choice of Dimensions, Indicators, Thresholds, and Age Groups

> **Step 4 - For each dimension, select indicator(s) and define the reference population**

Indicators are to be seen as measurement tools, which independently or as a set, are able to report on the well-being of a child for each of the selected dimensions. Examples of indicators are, for instance, adequate feeding practices (diets) for the nutrition dimension or school attainment for the education dimension. The choice of indicators should be conceptually sound with the definition of the dimension, and is furthermore driven by data availability and data quality.

It is important to note that, while steps 4 – 11 discuss the types of decisions to be made separately, decisions in one of the steps may require revisiting earlier steps. Decisions on thresholds, age groups or imputation (steps 5–7) may require that the choices of the indicators are changed in order to guarantee internal consistency (step 8) or to ensure that all dimensions are covered in an equal way (step 9).

Choosing indicators is not easy and largely depends on two main considerations:

- data availability; and
- the purpose and internal consistency of the analysis.

De facto, MODA exercises are mostly data-driven unless one has the time and resources to design a survey to produce a child deprivation analysis. The choice of indicators is subject to various considerations.

Seven main criteria are used to select indicators;[11]

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[11] These criteria were applied to CC-MODA taking into account the specific nature of the cross-country requirements. In country-specific N-MODA other choices can be made.

Relevance: the indicators selected should be relevant for indicating levels of child well-being and child deprivation. Outcome indicators are preferred but not always available or meaningful. To identify the meaningful dimensions to be covered, the CRC can be used as a guiding principle.

Attribution to dimensions: in order to enhance the policy relevance of the indicators it is recommendable to use indicators that can be interpreted as deprivations originating in a particular policy domain. This is not always possible. Stunting, for instance, even though widely used for measuring malnutrition outcomes, can be attributed to many more sectors than nutrition (e.g., quality of housing, water, sanitation, access to health care, among others). Due to its intersectoral nature, stunting has not been included as an indicator in CC-MODA, as indicators that cannot be attributed to a specific sector have not been applied in the cross-county study. When carrying out N-MODA, however, it may be meaningful to use stunting if it fits the purpose of the analysis and can be attributed to a dimension of interest.

Variance: analyzing overlapping deprivations requires variance; for every indicator there must be a number of children who are deprived and non-deprived according to that indicator. Indicators for which in a particular country almost all or the vast majority of the children are deprived are potentially very important, but are not very useful in an overlap analysis. Lacking a birth certificate, for instance, is potentially important as an indicator as being registered is a child's right with many consequences for access to services; it may, however, not be very useful as a deprivation indicator as there may be a lack of variance in this indicator (i.e., most children registered or not registered, depending on the efficiency of public administration).

Coverage: the very objective of identifying children with overlapping deprivations has important implications for the indicator choice. Indicators should be available for all children in the respective age group to allow the identification of the overlap in the deprivation: children for whom no information is available on a specific indicator would distort the results if the indicator was used (see also step 7 and the note below on missing values). Meaningful indicators available in the datasets sometimes cannot be used because they are available only for a limited number of children in the age groups chosen for the analysis (see also steps 6 and 7).

Free from measurement bias: this may be especially important for variables that rely on underlying administrative definitions such as the definition of a "life birth", or on differences in the public administration such as for birth registration. It may also apply to variables that assume judgment that is culturally biased such as the perception of tolerable or accepted levels of violence. These types of measurement bias problems are usually more common in international comparative studies, but may be relevant also in countries with large ethnic and cultural diversity or multi-ethnic societies.

Scalability: the aggregation of dimensions implicit in the construction of the deprivation ratios requires a certain degree of scalability (internal consistency) of the dimensions. Dimensions that considerably reduce the scalability may be dropped from the analysis For more information on scalability, see the optional step described after Step 9.

Parsimony and internal consistency: for a MODA type of analysis it is important that children analyzed have a similar probability of being deprived or non-deprived in each of the dimensions studied. Thus, it is advisable to avoid including different numbers of indicators across dimensions

and giving different weights to the dimensions used in the analysis. In the CC-MODA, for instance, it has been decided to use two indicators per dimension (and no more than two) wherever possible in order not to distort the probability of being deprived across dimensions and to avoid weighting problems. Weighting will be further discussed in steps 9 and 10.

When choosing indicators it is also important to take into account that:
(1) The indicators should reflect *actual deprivation* instead of the *possible causes* of deprivation. For instance, the distance to school influences the probability of children not being in school. However, in itself it does not report an actual deprivation (children living far from school may nevertheless attend school if transportation needs are met). With regard to the deprivation in education, indicators such as "being enrolled in school" and "attending school regularly" are more suitable.
(2) Missing values can distort the sample representativeness and with this the outcomes of the deprivation ratios. Since the direction of the bias is unknown, it is recommended to control for the percentage of missing values for each indicator and to select indicators with as low a percentage of missing values as possible.
(3) Deprivation indicators can be age- and/or gender-specific (e.g., vaccinations, education, and early marriage). The reference population for each indicator should be defined by specifying which age and which gender each indicator refers to. The reference population of an indicator on primary school attendance, for instance, should be all children of legally defined primary school age.

Note: variables of interest that do not fulfil the criteria on attribution to the dimensions, coverage and/or scalability can still be included in the analysis, in the form of profiling variables. Using them as profiling variables provides the opportunity to study their interaction with deprivation. This is further discussed in step 13.

> **Step 5 - Specify indicator threshold(s) and construct the indicator(s)**

A deprivation threshold for each indicator is needed to define whether a child is deprived or not: the thresholds are the demarcation line between deprivation and non-deprivation.

The choice of deprivation thresholds can be based on:

- Internationally agreed definitions (e.g. WHO, MDGs, UN Habitat, ILO, providing definitions on (un)improved water sources, (un)improved sanitation, malnutrition, crowding of dwellings, child labor, etc.);
- National norms, standards and legislation (concerning school enrolment, access to insurance, etc.);
- A continuum or relative approach to measure well-being.

The CC-MODA study uses international agreements for the determination of the thresholds. For the indicator on the source of drinking water, for instance, thresholds were chosen using the WHO classification of improved and unimproved water sources (WHO, 2011). It should be noted, however, that the cross-country study used a rights-based approach to deprivation, applying minimum values which are necessary to fulfil basic child rights. In N-MODA national norms can be applied, which are more suitable to the socioeconomic, cultural or natural environment of the country. Using the previous example, improved water source includes both piped water and water from protected wells and springs; depending on national standards it could be decided to opt for a threshold

identifying everyone who does not have a piped water connection as deprived.

Two special methods to use indicator thresholds are the continuum and the relative approach. The first method allows to set several thresholds (e.g. for moderate, severe and extreme deprivation) on one indicator.[12] It provides an opportunity to inform about the deprivation severity within one indicator. For example, stunting can be measured using several thresholds, indicating moderate stunting if the height-for-age indicator is more than -2 standard deviations from the median of an international reference population, and severe stunting if it is -3 standard deviations. The continuum approach is especially useful when carrying out single sector analyses, as it gives more information than the standard method of dividing the child population into 'deprived' and 'non-deprived'. This approach, however, has some drawbacks when carrying out multiple (overlapping) deprivation analysis. Firstly, it is difficult to separate the deprived from non-deprived since each category of each indicator will have its own score that will range, for example, from 0 (no deprivation) to 1 (absolute deprivation). The sum of deprivations for each child will thus be a deprivation score rather than the number of deprivations each child experiences. Secondly, assigning deprivation scores to each category introduces considerably more arbitrariness in the process.

Another alternative for setting thresholds is the relative approach. Some indicators are country-specific and a relative approach can be used to observe national norms. For instance, if at least 50 per cent of the reference population lives with three or more people per room on average, this may be seen as socially acceptable, regardless of the definitions found in the internationally agreed conventions. When the relative approach is used the distribution of the responses should guide the choice of thresholds. This approach does, however, imply a risk of disregarding deprivations suffered by a considerable part of the society solely because they are widespread.

Unless it is chosen to construct indicators using a deprivation score (e.g. weighting indicators, or applying the continuum approach), indicators should be constructed as binary variables with 0 indicating 'non-deprived' and 1 meaning 'deprived'. These guidelines do not further discuss deprivation scores as MODA applies the binary variable method by assigning no more than one threshold per indicator, and does not use different indicator weights as they are selected to reflect the fulfillment of children's rights. It is, however, acknowledged, that indicators may be sensitive to slight threshold changes, so MODA advocates for carrying out a sensitivity analysis to see how robust the results are to slight changes in the chosen thresholds and the treatment of the data.

➢ **Step 6 - Decide upon the life-cycle stages and choose age group(s) for the multidimensional deprivation analysis**

One of the distinctive characteristics of the MODA methodology is the adoption of the life-cycle approach. In line with UNICEF principles, children have different needs during the different stages of their lives. By dividing childhood into different stages, MODA acknowledges the heterogeneity within children's needs throughout the first 18 years of their lives. The use of life-cycle stages finds its origin in the health sector, where it is used to measure child development. Claeson and Waldman (2000) have applied the various life stages specifically to health and nutrition interventions. Nevertheless, using life stages is also relevant to other aspects of child development.

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[12] Note that estimating statistical significance becomes more complicated when more than two categories are used.

Adopting a life-cycle approach and analyzing the different age groups separately will provide more precise and transparent results as children's needs are different depending on their age, and can help avoiding under-estimation of the deprivation levels.[13] For instance, while the needs of children in early childhood are mainly concerned with health and nutrition, children of school-age are (also) concerned with education and access to information. Since deprivations differ depending on children's age and not all deprivations apply to all children, division of the total child population into several age groups becomes necessary when analyzing child well-being.

Typical stages of a child's life cycle are 'pregnancy and child birth (-9 months-0 years)', 'infancy (0-1 year)', 'pre-school years/early childhood (1-5 years)', 'school age/ childhood (5-16 years)', 'adolescence (10-20 years)'.[14]

Figure 1 – Main stages of an individual's life-cycle
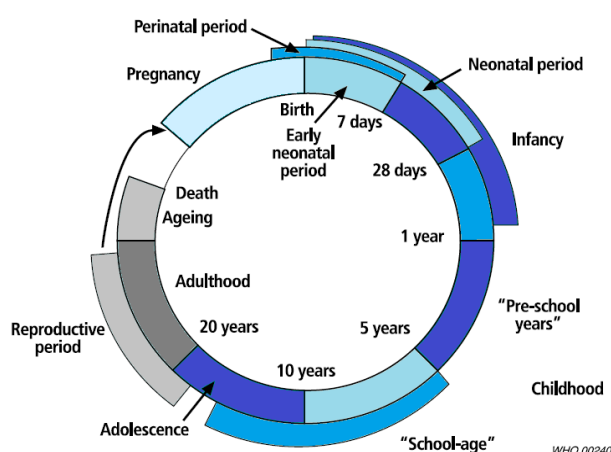
Source: Claeson & Waldman, 2000

The decision on which of the life cycle stages to use is usually made together with the selection of the indicators when observing the reference population of each indicator. The age groups should be chosen to fit the reference populations of the relevant indicators and dimensions as accurately as possible.

For the single deprivation analysis (indicator by indicator and dimension by dimension), it is advisable to exclude all children who are outside the reference population when doing calculations for each indicator or dimension separately. This is to ensure that the results of this type of analysis refer not to the entire age group, but only those children to whom each indicator or dimension applies. When the dimensions are aggregated into a multidimensional deprivation analysis, it is necessary that the sample size of each dimension is the same to ensure comparability between the dimensions. For this reason, the multidimensional deprivation analysis uses the applicable age group rather than the reference population. Children who are not part of the reference population, but are included within the relevant age group, are considered non-deprived. To illustrate this with an example; in CC-MODA the age group 0-4 (i.e., children below the age of five) includes an indicator on DPT vaccinations with a reference population of children aged 1 to 4. Since the

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[13] The decision to classify missing values as non-deprived results in an under-estimation of multidimensional deprivation levels.
[14] The exact ages for each stage may differ, depending on the country, the context, and data availability.

multidimensional deprivation analysis requires input on all children within the same age group, children below the age of 12 months are considered not deprived with regards to immunization. In the single indicator analysis, however, children below the age of the reference population have not been included in the calculation to limit the bias on the outcomes.

For some of the key outcomes of MODA, the results can also be presented by combining the age groups, in a form of single-figure national averages. Multidimensional deprivation levels for all children between 0 and 18 years can be provided to give an insight into the deprivation situation of the entire child population within one country. It should, however, be emphasized that such results are not more than a rough estimation of the average level of deprivation among all the children. More detailed information on the single and multiple deprivations among children in each stage of life is the main focus of MODA.

Notes:
- When deciding upon age groups, be aware that the sample size for each age group should remain large enough to perform the deprivation analyses and profiling exercises.
- Children within the relevant age group, but outside the reference population of a particular indicator, are considered 'non-deprived' in this indicator. This decision is based on the argument that a child cannot be deprived of something which is at that very moment irrelevant for the child's well-being. Even though the deprivation might become relevant in the child's future, MODA measures only actual deprivation at the moment of data collection and does not predict the probability of future deprivations.

> **Step 7 - Decide whether to impute values on other members of the same household**

It may occur that some survey questions of interest have answers only for one (part of an) age group or for only one child of each household. For example, questions on child discipline in the MICS are only asked about one child between 2 and 14 years per household. In such an event, the following choices can be made:

- Assign indicator values only to children who have information on the indicator;
- Assign indicator values to all children of the same household;
- Assign indicator values to some children of the same household, imputing data only on those who belong to the same gender and/or age group.

The first option is preferred, even though it might lead to high percentages of missing values. In the case of single dimension analysis, the missing values can possibly cause an unknown distortion of the representativeness of the results, and in the multidimensional deprivation analysis it leads to an under-estimation of deprivation. Nevertheless, using unmodified data gives the opportunity to identify real intra-household differences. Furthermore, the decision on whether to impute individual-level values to other household members is always based on assumptions and value judgments creating a bias which is more difficult to observe and explain. This option should only be chosen in special cases when deprivations are clearly affecting the well-being of all household members. For example, CC-MODA uses the aforementioned indicator on child discipline with imputed values for all children in the same household. Due to the imputation, this indicator cannot be used as a measurement of direct violence towards children, but serves rather as a proxy to measure whether a child grows up in an environment in which (s)he is exposed to domestic violence.

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Note:
- Values should never be imputed for children to whom the deprivation does not refer to (e.g. school attendance for children below compulsory school age).
- It should be re-emphasized that indicators should, among others, be selected on the basis of their data quality. Indicators with high percentages of missing values are not preferred in order to avoid any unnecessary bias.

> ➢ **Step 8 - Perform a correlation test and select the final indicators**

Correlation tests can help to provide information about the relation between indicators within one dimension, as well as about the relation between indicators of different dimensions. Correlation results between indicators in the same dimension show to what extent they substitute (negative correlation) or complement (positive correlation) each other in explaining a particular dimension. When the correlation is 100% the indicators are perfect complements, which would suggest that only one indicator would suffice. A correlation close to zero may indicate that the two indicators are explaining a different deprivation and should therefore not be grouped into the same dimension. The information found from correlation tests can be used to select the final set of indicators for each dimension. Moreover, it can also be used to assist in the decision-making on how to aggregate indicators into dimensions.

The correlation test between indicators of different dimensions serves as a control to observe whether they are by accident measuring the same deprivation. When indicators of two different dimensions show a very strong correlation, the definitions of the dimensions should be re-evaluated to control whether the concepts overlap. In order to avoid double-weighting it is advised to either merge these dimensions or to drop one of them.

For the final decision on which indicators to use in the analysis, it should be noted that the probability of being deprived in a particular dimension is affected by the number of indicators within that dimension. When using the union approach (one is deprived if (s)he is deprived on at least one indicator), the likelihood of being deprived rises with each additional indicator included in one dimension. The reverse would be true if the intersection approach (meaning one is deprived if (s)he is deprived on all indicators) was used. For consistency across the dimensions it is important to harmonize the number of indicators that are selected for every dimension as much as possible. As an example, in the CC-MODA each dimension consists of one or two indicators.

> ➢ **Step 9 - Decide how to weight indicators and how to aggregate them into dimensions**

The multiple overlapping deprivation analysis is performed using dimensions rather than separate indicators. While a deprivation in each indicator can be considered as a violation of a child's rights, aggregation of some indicators into a single dimension can be carried out if these indicators refer to the same deprivation, in order to improve the inclusiveness of each dimension and to avoid double-weighting of each deprivation. The choice between using various aggregation methods, such as intersection, union or intermediate approach, is widely discussed by scholars as for example Atkinson (2003), Bourguignon & Chakravarty (2002; 2003) and Duclos et al. (2006a; 2006b). Even though the current discussion is often related to the aggregation across dimensions rather than within dimensions, it can also be applied to the latter.

Indicators can be aggregated into dimensions using three different approaches:

- union approach;
- intersection approach;
- intermediate cut-off approach.[15]

MODA uses the union approach to aggregate indicators into dimensions in order to capture all the children who are deprived in any of the chosen indicators. This method is, however, insensitive to the severity of deprivation, because the value of the dimension will not change depending on the number of indicators a child is deprived in.

If indicators are not seen as representing specific child rights on their own, but rather as a component of a particular right, an intersection or a cut-off approach can also be applied. The results of the previously performed correlation tests can be used to inform the choice of the aggregation method.

A third option is to assign weights to each of the indicators and to use a cut-off approach to determine whether one is deprived within a given dimension. This intermediate approach compares the total weight of the indicators belonging to a specific dimension with a specified threshold. Weighting allows to place additional emphasis on certain indicators in comparison to the others in the same dimension. However, setting weights reflects important value judgments about the various aspects of well-being. Decanq and Lugo (2009) have analyzed various methods of setting weights in multidimensional indices to determine the main features and trade-offs of each method. In their article they discuss the use of (1) equal weights, (2) data driven weights (e.g. frequency based, most favorable, statistical and regression based weights), and (3) normative-based weights. They conclude that equal weights are by no means neutral, and should be seen as any other weighting scheme with the accompanied trade-offs as a result. The second method, data driven weights, are often not straightforward in their interpretation and therefore lack transparency. In addition, statistical methods, such as multivariate approaches, can lead to normative inappropriate results. The derived weights can appear counter intuitive to people, because weights are derived based on algorithms, which only consider the frequency and/or distribution of data rather than their normative meaning. The third approach to weighting is normative weighting. Normative weighting incorporates the value judgment (of a subsample) of the society of each dimension into the creation of the weights. This method requires participatory approaches in the derivation of the weights, which might be data demanding. Besides, the weights according to this approach will represent a subjective perspective to well-being, rather than a more objective prioritization of dimensions that are deemed necessary for development.

A special case of weighting is when indicators within each dimension are equally weighted. This **m**eans that the more indicators are aggregated into one dimension, the lower the weights attributed to each of the indicators are (in a dimension with two indicators each would get a score of 0.5, while it would be 1 if there was only one indicator). A consequence of this approach is that,

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[15] The union approach regards someone who is deprived in a single indicator as deprived in the dimension. The intersection approach, on the other hand, requires a person to be deprived in all indicators belonging to one dimension before being identified as deprived in that particular dimension. The cut-off approach can be seen as an intermediate approach (if cut-off point k≥1), setting a cut-off point which is a threshold derived from a specified number of indicators or weight (all assigned to a specific dimension) a person needs to be deprived in to be classified as deprived in that dimension.

when counting the deprivations, the total number of deprivations per person will be a deprivation score rather than the number of dimensions each child is deprived in. This method leads to a deprivation score rather than the identification of children deprived in a particular dimension.

Note:
- The aggregation process of indicators may lead to a loss of useful information on each indicator.
- Despite the use of correlation and scalability tests, there is a high risk of arbitrariness in deciding which indicators to aggregate and how they should be aggregated and weighted. In order to keep as much information as possible, it is advisable to also perform a deprivation analysis by indicator (see Step 13).

o **Optional - Perform a scalability test and select the final dimensions**

To see whether the chosen dimensions scale well together Cronbach's Alpha can be applied. Cronbach's Alpha measures the internal consistency and is used to show whether there is a latent construct among the selected dimensions. A strong and normally accepted Cronbach's Alpha should reach at least 0.7. However, the selected dimensions may have more than one underlying construct of well-being, and the deprivations may not necessarily have common sources and driving forces. In such cases the Cronbach's Alpha will be lower. Furthermore, Cronbach's Alpha may be lower due to the differences between dimensions based on individual and household-level data, and the proportion of missing values within a dimension. Overall, the scalability test should serve as an indication of the extent to which the different dimensions scale together and have common driving forces, but should not serve as the main criteria for selecting or dropping dimensions if these dimensions have been selected based on a conceptually strong framework of child well-being. The scalability test can help to indicate to what extent each of the dimensions contributes to the overall aggregated measure. However, the emphasis of the deprivation analysis should not only be placed on the multidimensional deprivation ratios where scalability is important, but also on the single deprivation analysis and multiple deprivation overlap analysis.

➢ **Step 10 - Decide how to weight dimensions**

Weights are used to indicate the relative importance of the different deprivations. The decision to use weights can be made:

- to emphasize certain dimensions; or
- to value dimensions with different numbers of indicators similarly.

Methods of weighting are described in the previous step with regards to assigning weights to indicators, but can also be applied to setting weights for dimensions.

When carrying out multiple overlapping deprivation analysis, all the deprivations a child is facing should be assumed to be of equal importance since deprivations are understood as violations of one or more of the child's rights, derived from the CRC and other international standards. Therefore, MODA does not assign any explicit weights to dimensions when counting the deprivations each child suffers from, treating all the dimensions equally. Although using such an approach means that no explicit weighting is assigned, it should be noted that implicitly equal

weights are assigned. This reveals exactly which deprivations children are facing, making the severity and overlap analysis feasible and transparent.

> ➢ **Step 11 - Decide upon the identification method of the multidimensionally deprived children**

The same three methods that are used for the aggregation of indicators into dimensions can also be used for the identification process of the multidimensionally deprived, namely the union, intersection, and cut-off approach.

- Union approach, identifying a child as multidimensionally deprived if (s)he experiences at least one deprivation used for the analysis (0<K≤1)
- Intersection approach, identifying a child as multidimensionally deprived if (s)he experiences all deprivations that are used for the analysis (K=d)
- Intermediate cut-off approach, identifying a child as multidimensionally deprived if (s)he experiences a specified number of deprivations (0<K<d)

where
K – cut-off point;
d – total number of deprivations included in the analysis, considered per child (or the total deprivation score if the dimensions are not weighted equally).

The choice between any of these methods requires a value-judgment taking into consideration the aim of the study and the type of deprivation one wants to show. The union and the intersection approaches are in essence special representations of the cut-off approach, showing respectively the minimum and maximum severity of deprivation.

To avoid making an arbitrary decision, MODA presents the outcomes **for all possible cut-off points**, thus incorporating all three methods. The union approach is used to identify those deprived since all the deprivations are seen as violations of children's rights and are weighted equally. However, application of higher cut-off points is also used as it allows focusing on those children who suffer from higher numbers of deprivations simultaneously, giving insights into the breadth of deprivation in the country and facilitating comparison between the multidimensional deprivation incidence results that are based on different deprivation severity levels among children. It is also beneficial for profiling purposes when comparing subgroups of children as it allows analysis of the differences and characteristics between the deprived children, depending on the number of deprivations they experience.

4.3 Single Deprivation Analysis: Analysis by Indicator and by Dimension

> ➢ **Step 12 - Estimate a child deprivation headcount ratio for each indicator and dimension**

The deprivation headcount ratio for each indicator and dimension is the number of children deprived in each specific indicator and dimension as a share of the child reference population to whom each specific indicator and dimension refers. The calculation of the deprivation headcount ratio uses the formula below:

$$h_{j,r} = \frac{q_{j,r}}{n_r}$$

$$q_{j,r} = \sum_{i=1}^{n_r} y_j$$

where

$h_{j,r}$ - headcount ratio of children deprived in dimension *j* of the reference population *r;*

q_j - number of deprived children in dimension *j* of the reference population *r;*

n_r - total number of children in the reference population *r;*

y_j - deprivation status of child *i* in dimension *j,* with $y_j = 1$ if $x_j < Z_j$ (deprivation) and $y_j = 0$ if $x_j \geq Z_j$ (no deprivation);

x_j - value of dimension *j* for child *i;*

Z_j - threshold of the dimension *j.*

When calculating the headcount ratio by indicator a similar formula as for the headcount ratio by dimension can be used. Note that the deprivation status *x* is determined by the value of the indicator rather than the dimension, and that the reference population *r* is determined with respect to the indicator and may therefore also be different from the one used at the dimension level.

Note: within the single deprivation analysis, missing values on particular indicators and dimensions remain missing. As a consequence, children with missing information will be excluded from the calculation (both from the numerator and denominator) of the deprivation headcount ratio.

> ➤ **Step 13 – Select profiling variables and construct a profile of the deprived children for each dimension**

Profiling aims primarily at defining who are the children with a higher probability of being deprived in a specific dimension. It also supports the equity analysis, identifying whether deprivations are concentrated in specific geographic areas, or among girls, children of a specific ethnic group, and so forth. Moreover, the identification of differences between low and highly deprived children may assist in determining appropriate mechanisms for policy design.

The selection of profiling variables is guided by the objective of the analysis and by data availability. The criteria of relevance, variance, coverage, absence from bias and parsimony also apply in this case. Variables that were not fulfilling selection criteria on the attribution to dimensions or scalability can be included as profiling variables since these criteria are irrelevant in this context. Also those variables that were not fulfilling the criteria on coverage with regards to the selected age groups may be used as profiling variables, provided that the sample size is sufficiently large, and given that these variables assist in identifying children's characteristics. The main purpose for adopting profiling variables should be to contribute to the identification of those who are deprived.

The elements used for profiling will depend on data availability and the purpose of the study. Possible elements of profiling include: age, gender, geographic area, household size, parents' educational level, ethnicity, work intensity, wealth by quintile, and so forth.

Profiling is done by calculating the headcount ratio for each subgroup of the selected profiling variable. For example, when a profile is made of children deprived in nutrition by area, the reference populations will be the number of children in rural areas and the number of children in urban areas. Subsequently, the sum of the deprived children in nutrition is also calculated with respect to the two subgroups.

Note:
- The applicability of profiling variables can differ between age groups due to their relevance to particular stages in children's lives (e.g. a profiling variable on early marriage is relevant for adolescents, but not for infants), or due to data availability.
- Variables for which the reference population is (partly) inconsistent with the age group can be used as profiling variables. Nevertheless, the selection of such variables comes with the risk that a smaller sample can produce a representativeness bias.
- A significance test is required to control whether the subgroup results of each profiling variable are significantly different from each other.

   o **Optional - For each indicator, construct a profile of the deprived children**

Indicators based on individual-level data are particularly useful to show intra-household and/or gender inequalities. Presenting indicators, such as compulsory school attendance and primary school attainment by gender, for instance, provides a profile on the differences in the deprivations between boys and girls. In addition, the use of indicators also gives detailed information on the specific aspects in which inequalities are observed.

Note:
- A significance test is required to control whether the subgroup results of each profiling variable are significantly different from each other.
- Gender-focused analyses can only be performed if the data is collected at an individual level. Indicators referring to household conditions or indicators with imputed values for all children in the household cannot be used in this type of analysis.

4.4 Multiple Overlapping Deprivation Analysis: Deprivation Count and Overlap Analysis Per Age Group

   ➤ **Step 14 - For each child, estimate the number of dimensions in which (s)he is deprived**

A child-centred multidimensional approach means that the total number of deprivations of each child should be counted in order to identify children with 0, 1, 2, 3, 4, .., d deprivations. Counting deprivations should happen firstly for each individual separately to inform about the breath of deprivation for each child. Moreover, the total amount of deprivations per child will also be further used in the identification of multidimensionally deprived children.

The deprivation count uses the following formula:

$$D_i = \sum_{j=1}^{d} y_j$$

where

D_i – total number of dimensions each child i is deprived in; with $y_j = 1$ if child i is deprived in the dimension j; $y_j = 0$ if child i is not deprived in dimension j.

Note: for each of the age groups, the dimensions and their quantity may differ, hence the counting of deprivations and the calculated headcounts cannot be compared across the different age groups.

> ➤ **Step 15 - Calculate the share of children deprived in 0, 1, 2, …, d dimensions, both at the national level and by subgroup**

Accumulating the number of deprived children for each number of deprivations will give an overview of what share of all the children is deprived in 0, 1, 2,…, *d* dimensions in each age group. Note that the deprivation distribution should be presented as a percentage of the relevant child population on the national level or of each subgroup of the profiling variable. The results between the subgroups of the same age group are comparable and the distribution can give an insight into the differences in severity of child deprivations between the subgroups. Profiling children suffering from no, one, or multiple deprivations can help to identify the characteristics of those who have a low risk of being deprived, as well as of those who are deprived in multiple dimensions. See Step 13 for more information on profiling possibilities.

Note: the differences between the deprivation distributions of binary profiling variables can be best presented using an age-structure diagram, replacing the ages by the number of deprivations.

> ➤ **Step 16 - Carry out a deprivation overlap analysis analyzing the overlap and non-overlap of deprivations**

Deprivation overlap analysis helps to understand which types of deprivation children experience simultaneously. The knowledge that can be withdrawn from the joint distribution of deprivations can be used to direct policy interventions.

Deprivation overlap can be studied by combining (maximum) three dimensions in a Venn-diagram. The diagram gives a good visual representation of the extent to which the deprivations coincide. Each figure comprises eight different groups of children: three groups with children deprived in only one of the three dimensions, three groups of children deprived in two dimensions, one group of children who are not deprived in any of the three specified dimensions, and the last group of children deprived in all three dimensions simultaneously. In particular, the latter group deserves additional attention, since they may be the most vulnerable with respect to the dimensions analyzed.

Figure 2 - Deprivation overlap analysis based on three dimensions
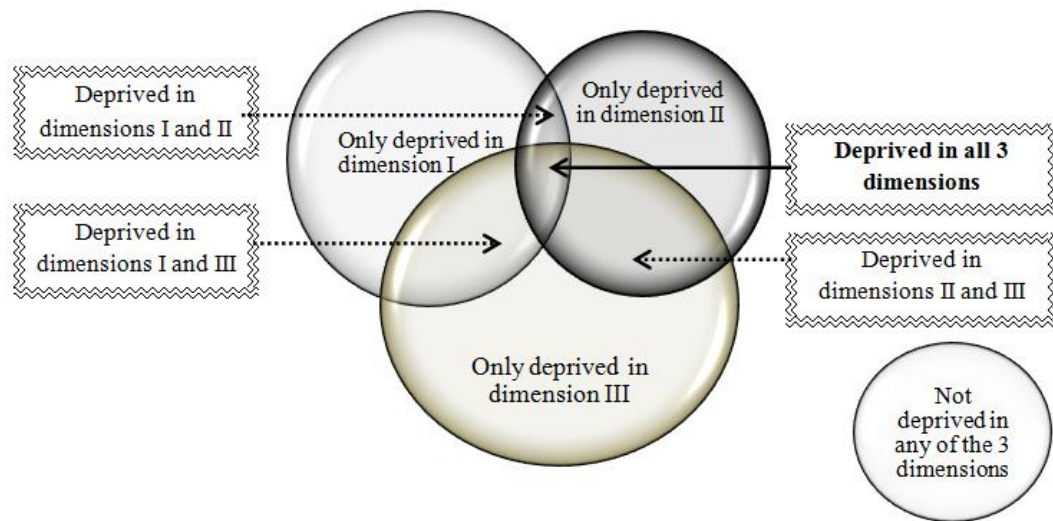
> ➢ **Step 17 - Construct a profile of the children in the deprivation overlaps**

Each of the eight groups created by the Venn-diagram overlap analysis can be further specified applying a profiling analysis (provided that the sample size is large enough). The information found in this analysis may contribute to policy-making and intervention design. The profile of the children in the deprivation overlap can help to find the characteristics of the most deprived. Moreover, profiling all of the (aforementioned) eight groups may show who requires a single-sector response to reduce their deprivation and who requires an integrative response. See Step 13 for more details on profiling.

Note: A significance test is required to control whether the subgroup results of each profiling variable are significantly different from each other.

4.5 Multiple Overlapping Deprivation Analysis: Identification of the Multidimensionally Deprived Children

> ➢ **Step 18 - Estimate the multidimensional child deprivation headcount ratio (H) for each age group using various cut-off points**

The multidimensional deprivation headcount measures the number of children deprived depending on the dimensions selected for each age group and the chosen cut-off point to identify the deprived. As explained in Step 11, the MODA methodology uses the **cut-off approach with various cut-off points, K**. This means that child i is considered deprived if the number of dimensions in which the child is deprived (D_i) is equal to or larger than the cut-off point, K. This can be defined as follows:

$$y_K = 1 \text{ if } D_i \geq K,$$

$$y_K = 0 \text{ if } D_i < K$$

To calculate the multidimensional child deprivation headcount, the following formula can be applied:

$$H = \frac{q_K}{n_a}$$

$$q_K = \sum_{i=1}^{n} y_K$$

where

H - multidimensional child deprivation headcount ratio according to cut-off point *K* in age group *a;*
q_K - number of children affected by at least *K* deprivations in the age group *a;*
n_a - total number of children in the age group *a;*
y_K - deprivation status of a child *i* depending on the cut-off point *K;*
D_i - number of deprivations each child *i* experiences*;*
K - cut-off point.

Note:
- When the cut-off point is larger than one (K>1), only those children who reach a certain number of deprivations will be classified as deprived, excluding the children who have a number of deprivations below the cut-off point from the calculation of the headcount ratio.
- Aggregating the dimensions leads to a loss of information and a loss of dimensions. This is compensated for by carrying out the overlap analysis explained in the previous steps.

> ➢ **Step 19 - Estimate the average intensity of deprivation (A)16 among the deprived for each age group using various cut-off points**

The average intensity of multidimensional deprivation *A* measures the breadth of child deprivation among the multidimensionally deprived children. It is the sum of all existing deprivations among children identified as deprived, as a share of the sum of all possible deprivations among those deprived in at least K dimensions.

The average intensity of deprivation uses the following formula:

$$A = \frac{\sum_{1}^{q_K} c_K}{q_K \times d}$$

where
A - average intensity of multidimensional deprivation according to the cut-off point *K* for the age group *a;*
q_K - number of children affected by at least *K* deprivations in the age group *a;*

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[16] *A* is what Alkire and Foster (2007) define as "intensity of poverty (A)". Note that A_1 is similar to Alkire's and Foster's "intensity of poverty (A)", but differs in one important way; instead of measuring the average intensity of deprivations among the multi-dimensionally deprived, only (K>1), A_1 measures the average intensity of deprivations for the whole reference population with any number of deprivations, as long as the total number of deprivations is higher than 0.

d - total number of dimensions considered per child within the relevant age group *a*;

c_K - number of deprivations each multidimensionally deprived child *i* experiences, with $c_K = D_i * y_K$.

Note:
- When the cut-off point is one (K=1), the average number of deprivations per child takes into consideration the sum of all deprivations experienced by all children of the age group *a*.
- When the cut-off point is higher than one (K>1), the average intensity of deprivation is calculated using only the total number of deprivations experienced by multidimensionally deprived children. The deprivations experienced by children who are not multidimensionally deprived are not counted. In other words, the average intensity is censored, referring to those children having *K* or more deprivations, excluding those who also experience deprivation(s) but do not reach the cut-off point.

> ➤ **Step 20 - Estimate the adjusted multidimensional child deprivation headcount ratio (M₀)[17] for each age group using various cut-off points**

M_0 consists of both the multidimensional child deprivation headcount ratio and the average intensity of deprivations of the deprived. This measure satisfies various of the basic properties of poverty measures, such as the "dimensional monotonicity".[18] Dimensional monotonicity suggests that in a situation where a multidimensionally poor person increases his or her poverty by becoming deprived in a dimension on which (s)he was previously not deprived, overall poverty levels will increase. In other words, it means that this poverty measure is sensitive to the breadth of poverty that is experienced by each individual. This feature is one of the main reasons for adopting this measure as a key instrument in MODA methodology.

The multidimensional child deprivation headcount ratio uses the following formula:

$$M_0 = H * A = \frac{\sum_1^{q_K} c_K}{n_a * d}$$

where

M_0 - adjusted multidimensional child deprivation headcount ratio among children affected by at least *K* deprivations in age group *a*;

c_K - number of deprivations each multidimensionally deprived child *i* experiences, with $c_K = D_i * y_K$.

> ○ **Optional - Estimate H, A, and M₀ for the entire child population**

The multidimensional headcount ratio (*H*), the average intensity of deprivations (*A*), and the adjusted headcount ratio (*M₀*) should initially be calculated for each age group separately (see previous steps). However, these measures can be combined if, for policy-making purposes, single

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[17] This is what Alkire and Foster (2007) define as "Adjusted Headcount Ratio of Multidimensional Poverty (M₀)" – also known as the Multidimensional Poverty Index.
[18] The adjusted headcount also satisfies properties on: *Normalization* (if all are non-poor the value of the ratio is zero); *Symmetry* (or anonymity, any characteristic of a person other than the attributes used to define multidimensional poverty do not affect the poverty measure); *Scale invariance* (only the relative distance of attributes to the poverty line matters; poverty will therefore be indifferent to scale transformations); *Replication Invariance* (the measure should be indifferent to population changes that preserve the structure and depth of poverty); *Focus* (if a person is non-poor in a certain attribute, giving this person more of this attribute will not change the measure); *Weak monotonicity* (if the situation of a person improves in any dimension, the overall poverty measure should decrease); *Decomposability* (if the population is divided into subgroups, then the overall poverty is the population share weighted average of the subgroup poverty levels); *Transfer,* for α>1 (averaging the achievements among the poor does not increase the original poverty measure).

numbers for the whole child population[19] are required (see Step 6). In this case averages, adjusted for the amount of children in each age group, are preferred.

The formula is:

$$H = \left(\frac{n_{a1}}{n_{at}} \times H_{a1} \right) + \left(\frac{n_{a2}}{n_{at}} \times H_{a2} \right) + \cdots + \left(\frac{n_{ax}}{n_{at}} \times H_{ax} \right)$$

where
H - deprivation headcount among children affected by at least K deprivations in the total child population studied;
$a_{1,2,..,x}$ - age groups;
a_t - total child population aged 0 to 17, with $a_t = \sum_1^x a1 + a2 + \cdots + ax$.

The average intensity of deprivation among the multidimensionally deprived child population *(A)* can be calculated using a similar approach by calculating the weighted average of all age groups. The total M_0 can be obtained by multiplying *H* with *A*.

> ➤ **Step 21 - Construct a profile of the multidimensionally deprived children, calculating H and M₀ at subnational and subgroup level**

Both the deprivation headcount ratio and the adjusted headcount measure M_0 can be used to identify deprivation levels of specific subgroups within the national child population. This facilitates profiling of children characterized by, for example, regions, wealth quintiles.[20] and household characteristics. The creation of a profile of particularly vulnerable children and the comparison between groups of children with different levels of deprivation are useful and can help to indicate mechanisms for the design of effective policy instruments.

For instance, the national deprivation level can be calculated for two separate regions to profile the children living in different geographic areas. Having region 1 with population n_1 and deprived children q_1, and region 2 with population $n_2 = n-n_1$ and deprived children $q_2 = q-q_1$, it is possible to calculate the multidimensional deprivation headcount ratio for the two regions in the following way:

$$H_1 = \frac{q_{K,1}}{n_1}$$

$$H_2 = \frac{q_{K,2}}{n_2}$$

It is also possible to calculate the average intensity, *A*, and the adjusted headcount ratio M_0, for each of the two regions separately, using the following formulas:

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[19] Calculating the averages of the total child population may be problematic due to one or more missing ages (such as in the case of lack of indicators concerning children at the age of five in the DHS and MICS). This can be addressed by imputing average values from other age groups to the missing ages.
[20] Note that the traditional "wealth quintiles" as defined within DHS and MICS methodologies may have to be adjusted if elements/variables that are used to construct deprivation indicators are also used to estimate the wealth quintile to which a household/child belongs. In order to avoid tautological inferences it may be necessary to construct a "new" wealth index. In CC-MODA this issue has been dealt with by constructing "assets quintiles" for rural and for urban populations.

$$A_1 = \frac{\sum_1^{q_{K,1}} c_K}{q_{K,1} * d}$$

$$A_2 = \frac{\sum_1^{q_{K,2}} c_K}{q_{K,2} * d}$$

$$M_{0_1} = H_1 * A_1 = \frac{\sum_1^{q_{K,1}} c_K}{n_1 * d}$$

$$M_{0_2} = H_2 * A_2 = \frac{\sum_1^{q_{K,2}} c_K}{n_2 * d}$$

> **Step 22 - Decompose each adjusted deprivation headcount ratio M_0 by (1) subgroup and (2) dimension**

The adjusted headcount ratio M_0 also satisfies the axiom on 'decomposability', which requires that overall deprivation levels are the sum of the weighted average of subgroup deprivation levels. The weights for each subgroup are equal to the population shares of each subgroup.

The ability to decompose the national adjusted deprivation headcount into subgroups creates an understanding of the contribution of each of the subgroups to the national deprivation level. For instance, the contribution of two regions to the overall adjusted headcount ratio M_0 can show which of the two regions contributes the most to the national deprivation level.

The decomposition by subgroup can be calculated using the following formula:

$$\frac{M_{0_1} \left(\frac{n_1}{n}\right)}{M_0} + \frac{M_{0_2} \left(\frac{n_2}{n}\right)}{M_0} = 1$$

Decomposability by dimension is also possible, estimating the contribution of each dimension to the depth of the overall deprivation. The adjusted headcount ratio M_0 can be broken down into dimensions to reveal which contribute the most to multidimensional deprivation in any given country, region, or population group.

The contribution of each dimension *j* to the overall deprivation level is expressed as a share of the total adjusted headcount ratio M_0 and can be defined as follows:

$$P_j = \frac{\sum_{i=1}^n (y_j * y_k)}{n_a * d * M_0}$$

where
P_j – contribution of dimension *j* to the adjusted headcount ratio M_0
$\sum_{i=1}^n (y_j * y_k)$ – total number of children *i* deprived in dimension *j* while also being deprived multidimensionally according to the cut-off point *K*
y_j=1 if child *i* is deprived in dimension *j*, and y_j=0 if child *i* is not deprived in dimension *j*
y_k=1 if child is multidimensionally deprived with $D_i \geq K$ and y_k = 0 if child is not multidimensionally deprived with $D_i < K$

d – total number of dimensions used in the analysis

n_a – total number of children of the relevant age group *a*.

Decomposition by dimension can also be carried out by subgroups such as geographic areas and regions to account for dimension contribution differences depending on the geographic location or the household's socio-economic characteristics.

Note:
- If the cut-off point is *K>1*, decomposition will be only among children facing *K* or more deprivations, excluding from the calculations children who experience only one deprivation (or more than one but below the cut-off point K). Such an approach can lead to underestimating the contribution of dimensions that are experienced in isolation when children do not suffer from any other deprivation included in the analysis. Furthermore, the results will depend on the indicator and threshold choice as well as the number of dimensions chosen rather than which dimensions contribute most to the overall deprivation. Thus, decomposition of M_0 by dimension should also be done using a cut-off point *K=1*, either as part of the methodology or as sensitivity analysis.
- All of the decomposition results should be interpreted with care since the percentages are not internationally comparable; they indicate how much each of the dimensions contribute to the overall deprivation level in each particular country or subgroup, but cannot be compared across countries.

4.6 Optional – Analysis of Other Fields of Child Well-Being: Monetary Poverty Analysis

o **Decide upon the measurement of monetary poverty**

Decisions need to be made whether to use:

- Consumption or income based poverty;

- Equal division by household size or equivalence scales to adjust household income/expenditure;

- Which poverty line(s) to use:

  o A national poverty line;
  o Different poverty lines for rural and urban areas;
  o A relative poverty line (e.g. 60% of the median income);
  o An internationally comparable absolute poverty line (e.g. 1.25$ or 2$ PPP per day).

➢ **Estimate the number of children living in financially poor families**

The formula for estimating poverty headcount can be the same as in Step 12. The poverty status of each child is determined by considering the child as poor if the per capita income or consumption is below a specified threshold (poverty line).

➢ **Profile the monetary poor**

See Step 13 for more information on profiling. A similar method can be applied to the monetary poor.

4.7 Optional – Analysis of Other Fields of Child Well-Being

Analysis of any other field of child well-being chosen for the study can be performed by adapting the above-mentioned steps (see Step 1 for more information on the different fields of child well-being).

4.8 Optional – Field Overlap Analysis: Overlap Analysis between Different Fields of Child Well-Being

> ➢ **Study the overlap between the different fields of child well-being chosen for the analysis, and profile each overlap/non-overlap group[21]**

If more than one field of poverty has been analyzed, it is possible to explore how the different fields of poverty overlap.

When studying the overlaps (and non-overlap) between "deprived children", "poor children" and any other field of poverty explored in the analysis, it is necessary to **look at all the possible overlap and non-overlap groups**. For example, if two fields of poverty are considered - monetary poverty and deprivation - four groups can be profiled:

1. Neither monetary poor nor deprived;
2. Deprived only;
3. Monetary poor only; and
4. Deprived and monetary poor simultaneously.

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[21] If the deprivation analysis has been applied to more than one age group of children, each analysis should be kept separate and the overlaps or non-overlap with other fields of child well-being should be carried out with each age group separately. Profiling can be seen as equity analysis, analyzing the poor and deprived according to their gender, wealth quintile, geographical area, ethnic group, etc.

BIBLIOGRAPHY

Alkire, S., Foster, J. (2007). 'Counting and Multidimensional Poverty Measurements', *OPHI Working Paper No. 7*, University of Oxford.

Alkire, S., Foster, J. (2011). 'Understandings and Misunderstandings of Multidimensional Poverty Measurement', *OPHI Working Paper No. 43*, University of Oxford.

Alkire, S., Santos, M. E. (2010), 'Acute Multidimensional Poverty: A New Index for Developing Countries', *OPHI Working Paper No. 38*, University of Oxford.

Atkinson, A. (2003), 'Multidimensional deprivation: contrasting social welfare and counting approaches', *Journal of Economic Inequality,* Volume 1: 51-65.

Bourguignon, F., Chakravarty, S. R. (2002). 'Multi-dimensional Poverty Orderings', in *DELTA Working Papers,* No. 22.

Bourguignon, F., Chakravarty, S. R. (2003). 'The Measurement of Multidimensional Poverty', *Journal of Economic Inequality*, pp. 25–49, Kluwer Academic Publishers.

Bradshaw, J., Hoelscher, P., Richardson, D. (2008), *Child Well-being in Central and Eastern European Countries (CEE) and the Commonwealth of Independent States (CIS)*, Springer Science.

Bradshaw, J., Chzhen, Y., De Neubourg, C., Main, G., Martorano; B., Menchini, L. (2012). 'Relative Income Poverty among Children in Rich Countries', *Innocenti Working Paper* 2012-01, UNICEF Innocenti Research Centre, Florence.

Claeson, M., Waldman, R. (2000). 'The evolution of Child Health Programmes in Developing Countries: from Targeting Diseases to Targeting People', *Bulletin of the World Health Organization,* Number 78: 1234-1245.

Decanq, K., Lugo, M.A. (2009), 'Setting Weights in Multidimensional Indices of Well-being and Deprivation', *OPHI Working Paper,* Number 18.

Delamonica, E. E. and A. Minujin (2007), 'Incidence, Depth and Severity of Children in Poverty', in *Social Indicators Research*, Volume 82, Number 2: 361-374.

De Neubourg, C., Roelen, K., Gassmann, F. (2010), 'Making Poverty Analyses Richer – Multidimensional poverty research for policy design' in Boyser, K., C. Dewilde, D. Dierckx and J. Friedrichs (Eds), *Between the Social and the Spatial – Exploring Multiple Dimensions of Poverty and Social Exclusion*, Ashgate Publishing, pp. 35-56.

De Neubourg, C., Bradshaw, J., Chzhen, Y., Main, G., Martorano, B., Menchini, L. (2012b), 'Child Deprivation, Multidimensional Poverty and Monetary Poverty in Europe', *Innocenti Working Paper* 2012-02, UNICEF Innocenti Research Centre, Florence.

De Neubourg, C., J. Chai, M. de Milliano, I. Plavgo, Z. Wei (2012), 'Cross-country MODA Study: Multiple Overlapping Deprivation Analysis (MODA) - Technical note', *Working Paper 2012-05*, UNICEF Office of Research, Florence.

De Neubourg, C., M. de Milliano, I. Plavgo, (forthcoming), 'Lost in Dimensions', Office of Research Working Paper, UNICEF Office of Research, Florence.
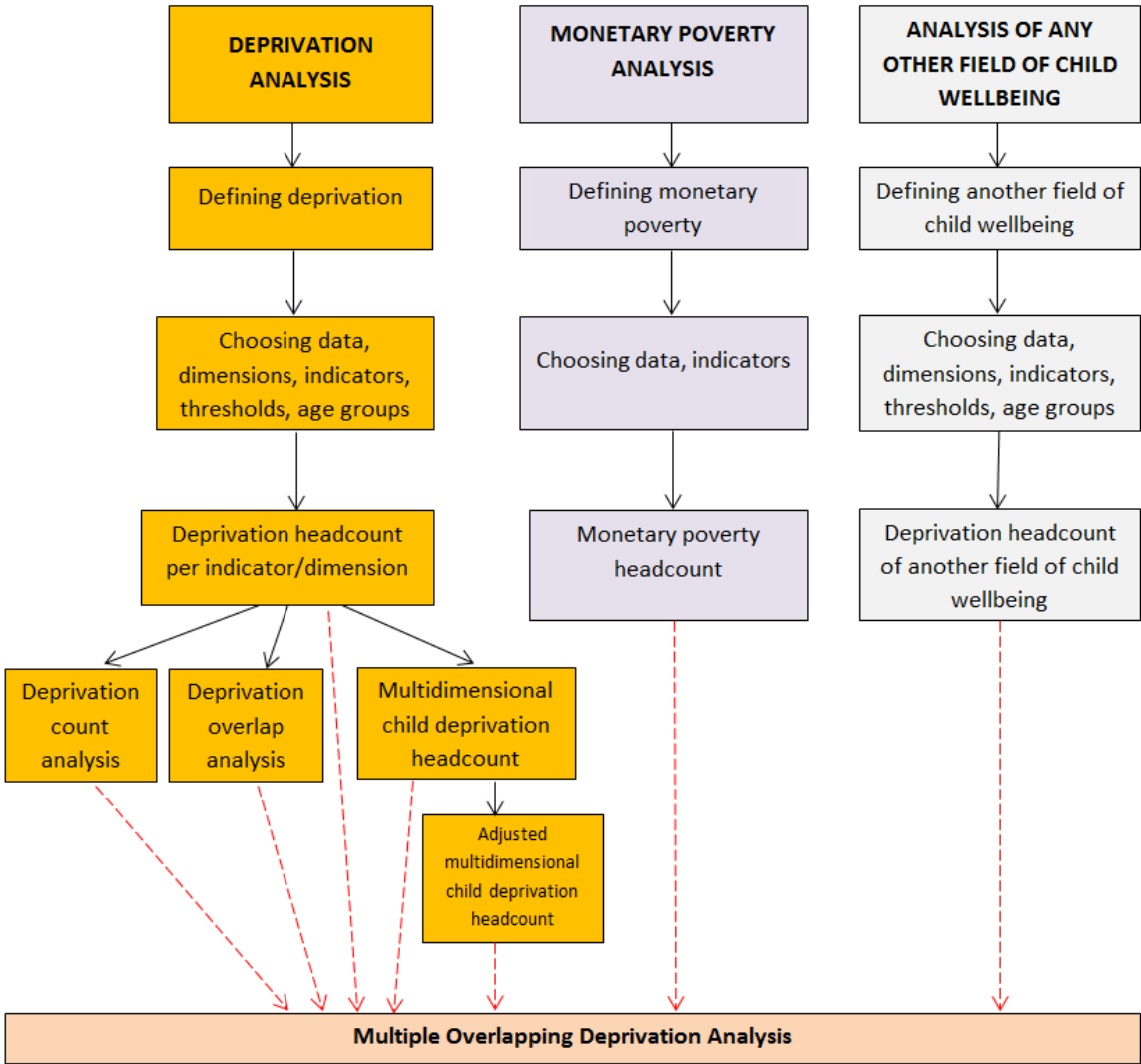
Duclos, J., Sahn, S., Younger, S. (2006a), 'Robust Multidimensional Poverty Comparisons', in *The Economic Journal,* Volume 116, Issue 514: 943-968.

Duclos, J., Sahn, S., Younger, S. (2006b). 'Robust Multidimensional Spatial Poverty Comparisons in Ghana, Madagascar, and Uganda', in *The World Bank Economic Review,* Volume 20, Issue 1: 91-113.

Ferreira, F., Lugo, M.A. (2012), 'Multidimensional Poverty Analysis – Looking for a Middle Ground' in *Policy Research Working Paper,* no. 5964. World Bank: Washington, D.C.

Gordon, D., Nandy, S., Pantazis, C., Pemberton, S., Townsend, P. (2003), *The Distribution of Child Poverty in the Developing World*, University of Bristol.

Gordon, D., Nandy, S., Pantazis, C., Pemberton, S. (2010), *Measuring Child Poverty and Deprivation*, Townsend Centre for International Poverty Research, University of Bristol.

Notten, G. (2008), 'Multidimensional Poverty in the Republic of Congo: Being Poor Simultaneously in Many Ways', *BWPI Working Paper 65*. Brooks World Poverty Institute.

Ravallion, M. (1998), 'Poverty Comparisons: A Guide to Concepts and Methods', *Living Standards Measurement Study Working Paper No. 88*, World Bank: Washington, D.C.

Ravallion, M. (2010), 'Mashup indices of developmen't, *World Bank Policy Research Working Pap*er, 5432.

Ravallion, M. (2011), 'On Multidimensional Indices of Poverty', in *Journal of Economic Inequality*, No. 9: 235-248.

Roche, J. M. (2009), *Child Poverty Measurement in Bangladesh: Improving upon existing measures,* OPHI, University of Oxford.

Roelen, K., Gassmann, F. (2008), 'Measuring Child Poverty and Well-Being: a literature review'*, Maastricht Graduate School of Governance Working Paper* MGSoG/2008/WP001.

Roelen, K., Gassmann, F., de Neubourg, C. (2011), 'False positives or hidden dimensions: what can monetary and multidimensional measurement tell us about child poverty in Vietnam?' in *International Journal of Social Welfare 2011.*

Sen, A. K. (1999), *Development as Freedom*, Oxford: Oxford University Press.

Townsend, P. (1979), *Poverty in the United Kingdom*, London: Penguin Books.

UN CRC (1989), *Convention on the Rights of the Child*, the General Assembly resolution 44/25.

UN (1995), *The Copenhagen Declaration and Programme of Action: World Summit for Social Development 6-12 March 1995*, New York: United Nations Department of Publications.

UN (2000), *United Nations Millennium Declaration 55/2,* Resolution adopted by the General Assembly, UN.

UNICEF (2000), Poverty Reduction Begins with Children. UNICEF, New York.

UNICEF (2004), 'State of the World's Children 2005 – Children under threat'. UNICEF, New York.

UNICEF IRC (2012), 'Measuring Child Poverty: New league tables of child poverty in the world's rich countries', *Innocenti Report Card 10*, UNICEF Innocenti Research Centre, Florence.

UN MDG (2003), *Indicators for Monitoring the Millennium Development Goals: Definitions, Rationale, Concepts, and Sources,* United Nations Publication: New York. Waddington, H. (2004), Linking Economic Policy to Childhood Poverty: A Review of the evidence on growth, trade reform and macroeconomic policy. *CHIP Report,* no. 7.

ANNEX: FRAMEWORK OF THE MODA METHODOLOGY

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