

Understanding Child Deprivation in the European Union: The Multiple Overlapping Deprivation Analysis (EU-MODA) Approach

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UNDERSTANDING CHILD DEPRIVATION IN THE EUROPEAN UNION: THE MULTIPLE OVERLAPPING DEPRIVATION ANALYSIS (EU-MODA) APPROACH

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Abstract. Poverty has serious consequences for children's well-being as well as for their achievements in adult life. The Multiple Overlapping Deprivation Analysis for the European Union (EU-MODA) compares the living conditions of children across the EU member states, plus Iceland and Norway. Rooted in the established multidimensional poverty measurement tradition, EU-MODA uses the international framework of child rights to inform the construction of indicators and dimensions essential to children's material well-being, taking into account the needs of children at various stages of their life cycle. The study contributes to the literature on monetary child poverty and material deprivation in the EU by analysing several dimensions of child deprivation individually and simultaneously, constructing multidimensional deprivation indices, and studying the overlaps between monetary poverty and multidimensional deprivation. The paper demonstrates the application of the EU-MODA methodology to three diverse countries: Finland, Romania and the United Kingdom. The analysis uses data from the ad hoc material deprivation module of the EU-SILC 2009 because it provides comparable micro-data for EU member states and contains child-specific deprivation indicators.

Keywords: child poverty; child well-being; multidimensional poverty; poverty overlaps

JEL classification: I31, I32, J13

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1. INTRODUCTION

Poverty has serious consequences for children's present well-being (Brooks-Gunn & Duncan, 1997) as well as for their achievements in adult life (Corak, 2006; Esping-Andersen & Myles, 2009; Gregg & Machin, 2001). As children in the European Union are consistently found to be at a higher risk of monetary poverty (Atkinson & Marlier, 2010) and material deprivation (Gabos, Ozdemir, & Ward, 2011) than the population as a whole, the EU is committed to reducing child poverty¹ (Social Protection Committee, 2008). In February 2013, the European Commission launched the Recommendation "Investing in Children: Breaking the Cycle of Disadvantage" (European Commission, 2013). It urges member states to tackle child poverty and social exclusion through integrated strategies ensuring children's access to adequate resources, affordable quality services, and recreational and cultural activities. The Recommendation includes a broad list of indicators to monitor its implementation, including the at-risk-of-poverty rate for children and the proportion of children living in severely deprived households. Although a "child deprivation indicator" is listed in the monitoring framework, its precise definition is yet to be agreed on.²

This paper investigates child deprivation and its relationship to monetary child poverty in the European Union (EU) using the Multiple Overlapping Deprivation Analysis (MODA) methodology. MODA provides both a conceptual framework and a methodology to estimate the rates of monetary child poverty and multidimensional child deprivation, as well as the overlaps between these measures. Moreover, MODA studies both single deprivations and those experienced by children simultaneously (overlapping deprivations). Thus, it helps identify children who suffer from several deprivations at a time and, as such, could be best helped by a cross-sectoral policy effort. In addition to providing national estimates, MODA focuses on the characteristics of households with children to identify both the profile and composition of the most vulnerable children. In doing so it motivates further analyses and policy interventions. MODA combines simple counting techniques with the construction of multidimensional deprivation indices and their decomposition. The paper demonstrates the application of the MODA methodology to three diverse EU countries: Finland, Romania and the United Kingdom. As they have markedly different levels of child poverty and child deprivation (based on the standard EU material deprivation indicator),³ using these three countries as examples helps demonstrate the applicability of EU-MODA across the enlarged EU.

2. CHILD DEPRIVATION AND POVERTY MEASUREMENT IN THE EU CONTEXT

The EU uses relative (monetary) poverty concepts defining households as poor if their disposable income is lower than a specific threshold: most commonly, households are regarded as being 'at-risk-of-poverty' if their income is below 60% of the national median disposable equivalent income. Poverty among children is usually measured as the share of children living in poor households. It has, however, been recognized that the needs of household members differ depending on their age, especially those of children, and that children generally do not participate in household spending and consumption decisions (Feeny & Boyden, 2004; de Neubourg, de Milliano, & Plavgo,

¹ Using the "at-risk-of poverty" line set at 60% of the national median equivalent disposable household income.

² The Recommendation specifies that this indicator is "under discussion" (European Commission, 2013).

³ In 2009, the relative income poverty rate for children under 18 was 13.8% in Finland, 17.3% in the UK and 22.4% in Romania (Eurostat database, last update 16.06.2014). The proportion of children under 18 living in deprived households (using the enforced lack of 3 out of 9 standard items) ranged from 8.2% in Finland and 13.5% in the UK to 50.7% in Romania (Eurostat database, last update 04.06.2014).

2014).⁴ Discussions and research during the last two decades have led to identifying poor children by using measures that are complementary to monetary poverty. Many efforts have been made to measure child poverty using material deprivation indicators as a more direct way of measuring children's material well-being.

The EU measures material deprivation as households' reported inability to afford at least three out of nine items, using survey data from the EU Statistics on Income and Living Conditions (EU-SILC)⁵: 1) to face unexpected expenses; 2) to afford a one-week annual holiday away from home; 3) to pay for arrears; 4) to have a meal with meat, chicken or fish every second day; 5) to keep the home adequately warm; 6) to have a washing machine; 7) to have a colour TV; 8) to have a telephone; 9) to have a personal car. The severe deprivation rate is based on the same set of items, but the cut-off is drawn at four items rather than three. Proposed by Guio (2009), both material deprivation measures had been adopted by the EU Social Protection Committee. Alongside the indicators of income poverty and low work intensity, the severe material deprivation indicator forms part of the EU social exclusion target to lift at least 20 million people from poverty or social exclusion by 2020. In the absence of a dedicated child deprivation indicator, the official child deprivation rate in the EU is calculated as the share of children living in deprived households.

In line with the life cycle approach which distinguishes between children, working age adults and older people (Whelan & Maître, 2008), it is widely accepted that monetary child poverty and material deprivation need to be studied at the level of the child rather than that of the household (Chzhen & Bradshaw, 2012; de Neubourg, Bradshaw, et al., 2012; Guio, Gordon, & Marlier, 2012; Main & Bradshaw, 2012). Of course, certain domains, such as housing conditions, can be assumed to affect all household members uniformly and, as such, do not need to be measured at the level of the child. In contrast, information about children's access to child-specific items (e.g. educational materials) can be obtained from either children themselves or from their carers. The former is often used in surveys of school-age children. For example, the OECD Programme for International Student Assessment (PISA) asks children about their own educational possessions (e.g. calculator; dictionary). The Health Behaviour in School-Aged Children (HBSC) survey, while not a dedicated living conditions study, includes questions about children's self-reported family ownership of durables (e.g. car; personal computer). The International Survey of Children's Well-Being (ISCWeB) asks school-age children about various items they have access to in the household (e.g. computer; internet). However, surveys of children as respondents typically include older children, so less can be learned about the material well-being of their younger peers.

Household surveys can evidently gather relevant information about children of all ages. This approach is used in the 2009 edition of the EU Statistics on Income and Living Conditions (EU-SILC). Information about children aged 15 and younger⁶ is collected from the main household respondent. These are questions about children's access to 14 items recognized as important to their well-being: 1) some new clothes; 2) two pairs of properly fitting shoes; 3) fresh fruit and vegetables once a day; 4) three meals a day; 5) one meal with meat, chicken or fish (or vegetarian

⁴ This is also an argument against using monetary indicators of child poverty: "prioritizing economic welfare through the analysis of consumption and expenditure by *adults* tells us nothing about the welfare of children dependent on those adults, or about the intra-household distribution of that expenditure" (Feeny & Boyden, 2004, p. 7).

⁵ See Guio (2009) for a discussion of methodological issues involved in constructing the EU material deprivation indicator.

⁶ A number of questions refer to school-aged children only, while the majority of the items pertain to those between the ages of 1 and 15.

equivalent) once a day; 6) books at home suitable for their age 7) outdoor leisure equipment 8) indoor games 9) regular leisure activity; 10) celebrations on special occasions; 11) invite friends round to play; 12) participate in school trips and events; 13) suitable place to study; 14) outdoor space in the neighbourhood to play safely. Three additional items were optional, rather than compulsory for EU member states, so many did not collect this information.⁷

Although a new round of the EU-SILC is released approximately every year, the 2009 wave is currently the only source of measures of deprivation specific to children, rather than the household as a whole, collected in a thematic material deprivation module.⁸ Fortunately, many of the child specific items are to be integrated in the core EU-SILC survey from 2014 onwards, but the data will not be publicly available until 2016. It would be useful if instead of collecting information about the group of children in the household, deprivation indicators referred to each child separately. This would allow investigation of inequities within households.

The EU-SILC 2009 has been a valuable source of data to analyse child deprivation across the EU, to evaluate the extent to which the child-specific items identify the same children as the standard household-level deprivation items (which are currently used to estimate the official EU deprivation rate), and to explore the potential for constructing an official EU child deprivation indicator. Gabos et al (2011) found that the child-specific deprivation variables and the standard household-level deprivation items did not necessarily identify the same children as deprived, with the degree of discrepancy varying across countries. Although they have not proposed a method for combining the child-specific items into an indicator of childhood deprivation, they concluded that: “the relatively close correlation between the responses for the different items suggests that the construction of a composite indicator is both feasible and meaningful” (Gabos et al., 2011, p. 34). Using the Irish sample of the EU-SILC 2009, Whelan and Maitre (2012a) found that children exposed to childhood deprivation were only a sub-set of all children exposed to “basic” household deprivation. The authors maintained that: “conversely restricting our attention to childhood deprivation, as captured by the indicators in the SILC module, would lead us to miss out on larger numbers of children living in households experiencing basic deprivation” (Whelan & Maître, 2012a, p. 270). However, “basic” household deprivation was measured using a different set of items than those in the EU material deprivation indicator, so the conclusions cannot necessarily be generalised.

In contrast, de Neubourg, Bradshaw, et al (2012) argued that the standard EU material deprivation indicator was not ideal for identifying deprived children because the nine household-level items on which it is based were not child-specific, it mixed together financial and non-financial aspects of well-being, and it did not form a sufficiently reliable scale for the sample of children. They proposed an alternative child deprivation indicator based on 14 items from the EU-SILC 2009: all of the compulsory child-specific indicators available in the survey except ‘outdoor space’, plus the availability of an internet connection. Having drawn the threshold at lacking two or more items, de Neubourg, Bradshaw, et al (2012) observed a child deprivation rate ranging from under 3 per cent of children aged 16 or younger in Iceland, Sweden, Norway, Denmark, Finland and the Netherlands to over 50 per cent in Bulgaria and Romania. The proposed child deprivation indicator formed part

⁷ Going on holiday away from home at least once a year; unmet medical needs; unmet dental needs.

⁸ This module was repeated in 2013, although the child items are optional rather than compulsory for all member states, and in 2014 as compulsory for all member states. (See http://epp.eurostat.ec.europa.eu/portal/page/portal/income_social_inclusion_living_conditions/methodology/list_of_variables).

of two UNICEF Innocenti Report Cards that produced league tables of economically advanced countries: Report Card 10 on child poverty (UNICEF Innocenti Research Centre, 2012) and Report Card 11 on child well-being (UNICEF Office of Research, 2013).

At the same time, Guio et al (2012) proposed their own revision to the EU material deprivation indicator. They advocated the adoption of two separate measures, one for the whole population and one for children aged 1-15. Each item included in these indicators was selected on the basis of its suitability (i.e. it had to be perceived as necessary for an acceptable standard of living in a particular country) and validity (i.e. it had to be significantly correlated with independent predictors of material deprivation). The resulting composite scale had to be internally consistent and additive. These criteria produced a 13-item indicator for the whole population and an 18-item indicator for children. The latter consisted of 5 household level items⁹ and 13 child-specific items. Although Guio et al (2012) did not argue for a specific threshold, they demonstrated that drawing the cut-off at three or more items out of 18 produced a similar child deprivation rate to the one based on the standard EU material deprivation indicator. As a result of this analysis, the material deprivation items collected annually in the core module of the EU-SILC are being revised (Guio & Marlier, 2013).

Composite indices such as the one proposed by Guio et al (2012) are very useful for monitoring and advocacy purposes, but they lose their dimensionality when several deprivation items are aggregated into a single measure. In multidimensional poverty literature, such composite indices are regarded as one-dimensional (Bourguignon & Chakravarty, 2003; also see de Neubourg et al., 2014). Furthermore, while it has long been recognized that deprivation (as well as poverty in a wider sense) is a multidimensional concept, there is far less agreement about which dimensions to use and how to combine them. A number of recent studies exploited the expanded set of material deprivation items in the EU-SILC 2009 to identify separate dimensions and aggregate them into a multiple deprivation measure. Whelan and Maitre (2012b) used factor analysis to isolate six dimensions¹⁰ of household deprivation and studied their correlations with each other as well as with measures of household income and economic stress. Basic deprivation¹¹ produced the highest correlation with both income and economic stress. Whelan et al (2012) then took four of these six dimensions¹² and applied the identification and aggregation method developed by Alkire and Foster (2011) in order to estimate multidimensional poverty rates. In the identification stage, a dual cut-off was used: the first to identify those who were deprived in each dimension and the second to identify the multidimensionally poor. Using the second cut-off of two (out of four) dimensions, Whelan et al (2012) estimated the incidence of multidimensional poverty across countries, the intensity of deprivation among the poor, and the adjusted poverty headcount ratios that accounted for both the incidence of poverty in the population and its intensity among the poor. Finally, for each country they calculated the relative contributions of each dimension to the

⁹ These include incapacity to afford: replacing worn-out furniture; to pay for arrears; computer and internet; to keep the home adequately warm; a car.

¹⁰ The six dimensions included: basic, consumption, health of the household reference person, neighbourhood environment, housing facilities, and access to public services. See Table A1 in Annex 1 for the list of survey items included in each dimension.

¹¹ Basic deprivation included items related to the household reference person's enforced lack of a meal, clothes, shoes, a leisure activity, a holiday, a meal with meat or a vegetarian alternative, and adequate home heating (Whelan & Maitre, 2012b).

¹² Items related to housing facilities were excluded because they produced near-zero deprivation rates in richer countries, while the two items related to access to facilities were dropped because there were considered too few.

adjusted headcount ratio, as well as the relative contributions of various sub-groups of the population (i.e. social class, age group).

The Alkire-Foster method builds on the multidimensional poverty methodology proposed in Atkinson (2003) and Bourguignon and Chakravarty (2003), as well as on Sen's (Sen, 1979, 1999) capabilities approach to defining poverty. The new method informed the construction of the global Multidimensional Poverty Index (MPI) (Alkire & Santos, 2010) as well as the Inequality Adjusted Human Development Index (Alkire & Foster, 2010) used in the 2010 Human Development Report (UNDP, 2010). The Alkire-Foster methodology has also been applied to multiple national studies of multidimensional poverty in the developing world (Alkire & Seth, 2013; Salazar, Díaz, & Pinzón, 2013).

Alkire, Apablaza and Jung (2012) applied their method to extend the analysis of the EU-SILC 2009 by Whelan et al. (2012) to the period 2006-2010. Since the broader list of material deprivation indicators was only available in 2009, the trend analysis had to rely on the more limited set of indicators that are collected in every wave of the EU-SILC. However, the purpose of the analysis was not to emphasise the choice of particular indicators, but rather to demonstrate the feasibility of the Alkire-Foster method to study changes in multidimensional poverty over time using data from the EU-SILC. Unlike Whelan et al (2012) who used the household as the unit of analysis, Alkire et al (2012) used individuals aged 16 and over.

Although not developed specifically for children, the Alkire-Foster method has been used to study multidimensional child poverty. Using data for children aged under five from the Bangladesh Demographic Household Survey 1997-2007, Roche (2013) showed the increased relevance to policy making and child poverty monitoring of analysing deprivations experienced simultaneously by children rather than focusing on each dimension in isolation. The indicators and dimensions were constructed following Gordon, Nandy, Pantazis, Pemberton and Townsend (2003), which had been the first comparative study of the extent and nature of child poverty in all the low- and middle-income countries. Gordon et al (2003) used international children's rights¹³ to inform the construction of child deprivation dimensions and counted the number of children suffering from several deprivations simultaneously. Their work became part of the *UNICEF Global Study on Child Poverty and Disparities* (UNICEF, 2007). Using six of the dimensions constructed by Gordon et al (2003), i.e. nutrition, water, sanitation, health, shelter, information, excluding education because it was less relevant for under-fives, Roche (2013) observed a reduction in both incidence and intensity of multidimensional child poverty between 2000 and 2007 in Bangladesh.

Elements of the Alkire-Foster methodology have been adopted in the multiple overlapping deprivation analysis (MODA) by the UNICEF Office of Research (de Neubourg, Chai, de Milliano, Plavgo, & Wei, 2012). Following Gordon et al (2003) and the *Global Study on Child Poverty and Disparities* (UNICEF, 2007), MODA uses the international children's rights framework (United Nations, 1989, 1995; United Nations General Assembly, 2000) to guide the choice of dimensions of deprivation and treats the child, rather than the household, as the unit of analysis. It recognizes that poverty and deprivation may affect children differently to adults. However, unlike Gordon et al (2003) and Roche (2013), MODA explicitly distinguishes between the needs of children of

¹³ Convention on the Rights of the Child 1989, the General Assembly resolution 44/25.

different ages: early childhood, middle childhood and adolescence. It acknowledges that different dimensions may be relevant for children at various stages of their life cycle.

MODA can be carried out as a single country study (N-MODA) or as a comparative cross-country analysis (CC MODA). While N-MODA uses the indicators, dimensions and thresholds tailored to the context of a particular country, the cross-country application (CC-MODA) requires the use of identical (or, at least, comparable) indicators and dimensions across all the countries studied. This paper extends the MODA methodology to the study of multidimensional child deprivation in the EU. Similarly to CC-MODA¹⁴ developed for low- and middle- income countries (de Milliano & Plavgo, 2014; de Neubourg, Chai, de Milliano, & Plavgo, 2012), the Multiple Overlapping Deprivation Analysis for the European Union (EU-MODA) compares the living conditions of children across the EU member states using identical indicators and dimensions. It adds two extra levels of analysis that were not included in the CC-MODA due to the lack of data: monetary poverty and the overlaps between monetary poverty and multidimensional deprivation.

Rooted in the established multidimensional poverty measurement tradition (Atkinson, 2003; Bourguignon & Chakravarty, 2003; Gordon et al., 2003; Alkire & Foster, 2011), EU-MODA uses the international framework of child rights to inform the construction of indicators and dimensions essential to children's welfare, taking into account the different needs of children at different stages of their life cycle. It contributes to the literature on childhood poverty in the EU by analysing several dimensions of child deprivation individually and simultaneously as well as constructing multidimensional deprivation indices. This draws attention to the sectors of child well-being that children are most likely to be deprived in and the sectors in which children are simultaneously deprived, thus helping inform policies designed to tackle multiple disadvantages. Building on Alkire et al (2012) and Whelan et al (2012), EU-MODA demonstrates that multidimensional poverty analysis can be carried out at the level of the child using data from the EU-SILC, while distinguishing between different stages of children's life cycle. Finally, it contributes to the MODA literature by extending it to a cross-country study of the EU and by systematically analysing the overlaps between multidimensional child deprivation and monetary poverty. The paper illustrates the application of the EU-MODA methodology to three diverse countries: Finland, Romania and the United Kingdom.

3. DATA, INDICATORS, DIMENSIONS AND METHODS

EU-MODA uses data from the ad hoc material deprivation module of the EU-SILC 2009 because it provides comparable micro-data for EU member states and contains child-specific material deprivation indicators. When the child specific indicators become embedded in the annual EU-SILC data collection, the 2009 edition of EU-MODA can serve as a baseline. Following the life-cycle approach, but subject to data constraints, three distinct age-groups are analysed separately: preschool-age children (those between the age of one and the national minimum compulsory school-age¹⁵ at the time of the interview); school-age children under 16; and adolescents aged 17-

¹⁴ CC-MODA results for more than thirty low and middle income countries are available at: www.unicef-irc.org/MODA. Results for more countries are uploaded as they become available.

¹⁵ Information on the compulsory age of starting school in European countries in 2009 is obtained from the Eurydice network (<http://www.nfer.ac.uk/nfer/index.cfm?9B1C0068-C29E-AD4D-0AEC-8B4F43F54A28>, last updated April 2013). The compulsory school starting age was: six in Austria, Belgium, Czech Republic, Germany, Denmark, France, Ireland, Iceland, Italy, Luxembourg, Norway, Poland, Portugal, Romania, Slovenia, Slovak Republic and Spain; five in Cyprus, Greece, Hungary, Latvia, Malta, the Netherlands, and the United Kingdom; seven in Bulgaria, Finland, Estonia, Lithuania, and Sweden.

18. For consistency with Eurostat’s at-risk-of-poverty estimation methodology, age at the end of the reference period (rather than age at interview, or, alternatively, survey year minus year of birth) is used to define age groups.

MODA uses the Convention on the Rights of the Child (United Nations, 1989) to inform the construction “of a core set of dimensions that are essential to any child’s development irrespective of their country of residence, socio-economic status, or culture” (de Neubourg, Chai, de Milliano, & Plavgo, 2012, p. 6). See Table A1 in Annex A for a summary of MODA dimensions and the corresponding articles of the Convention on the Rights of the Child.

Figure 1 lists the dimensions available in EU-MODA.¹⁶ Data on clothing, information and housing dimensions are available for all three age groups. Leisure and social activities, however, are measured only for school-age children and adolescents, while child development is used as a comparable dimension for preschool children. Because education needs tend to be age specific, the education dimension is embedded in Early Childhood Education and Care (ECEC) for preschool children,¹⁷ educational resources for school-age children,¹⁸ and economic activity for the 17-18-year-olds.¹⁹ Access to health care, although relevant for all children, is only used for adolescents aged 17-18 for data availability reasons. Conversely, the nutrition dimension, although relevant to all children, is only included for the two younger age groups due to the lack of relevant data for the oldest age group.

Material deprivation questions in the EU-SILC that ask if a particular resource is available to the household often have three potential responses: yes; no – because the household cannot afford it; no – for some other reason. Most, if not all, analyses of material deprivation using the EU-SILC define the household (or an adult/child) as deprived only if the item is lacking because it cannot be afforded. This is also how the official EU material deprivation indicators are constructed (see Guio 2009). However, focusing on the enforced lack of resources implicitly introduces a financial dimension to the analysis of deprivation, while the MODA approach aims to keep the monetary and non-monetary dimensions separate. Moreover, parents may under-report the extent of deprivation of their children in order to comply with societal norms, and the full extent of the resulting bias is difficult to establish with certainty (Gabos et al., 2011). Insofar as the degree of the bias may vary across countries, focusing exclusively on non-affordability would affect the international comparability of the results. Finally, the CRC protects children’s rights irrespective of their parents’ or guardians’ “race, colour, sex, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status” (United Nations, 1989).

¹⁶ The EU-SILC does not collect information about child exploitation, cruelty and violence, birth registration, or civil rights. No data about the health of children under 17 are collected. Environmental pollution is excluded from EU-MODA because the relevant item in the EU-SILC is subjective in nature, with no clarification in the data collection guidelines as to what constitutes a problematic level of pollution. Moreover, local environment items in the EU-SILC tend to be influenced by the rural/urban divide (Whelan & Maître, 2012b). The social security dimension is excluded because, although the EU-SILC records the income components of each household, including child-related benefits, there is no information on eligibility and take-up. Thus, children who have no access to the benefits they are entitled to cannot be identified with certainty.

¹⁷ It is restricted to children between the age of three and the compulsory school-age because 0-2-year-olds may be too young to fully benefit from the educational component of the ECEC systems. ECEC programmes “are normally designed for children from age 3 and include organised learning activities” (UNESCO, 2007). Eurostat uses age at survey year to calculate statistics on formal childcare arrangements, rather than the age at the end of the income reference period. This explains the discrepancies between the deprivation rates on the ECEC indicator and the official childcare use statistics published by Eurostat.

¹⁸ There is no information about school attendance or school achievement in the EU-SILC. Although there is information about compulsory school enrolment for children up to the age of 12, nearly all attend compulsory school for at least one hour a week.

¹⁹ For the oldest age group, the education dimension is labelled as activity because the end of compulsory schooling varies across the EU, so 17-18-year-olds may be in education, training, work or “not in education, employment or training” (NEET).

Since children do not tend to have resources of their own, they should not be excluded from the consumption of goods and services that are important to their well-being because of the preferences of their parents. Therefore, EU-MODA considers a child who has no access to a particular item *for any reason* as deprived in the corresponding indicator. Although this approach predictably produces somewhat higher deprivation counts than otherwise, it is consistent with the child centred focus of MODA and, as such, accentuates the situation of children within households.

Table 1 summarises the indicators used to construct the dimensions for each age group in the study. The child-specific deprivation items used here were also included in the child deprivation index²⁰ by Guio et al (2012), who conducted a variety of robustness checks on these variables. EU-MODA does not include the holiday item because it does not substantively fit into any of the chosen dimensions, while the three household-level items are either impossible to separate from their financial aspect (i.e. ability to afford to keep the home adequately warm) or they do not fit easily with the dimensions studied here (i.e. ability to replace worn-out furniture; having a car). For a more detailed description of the EU-MODA dimensions, indicators, methods and the treatment of missing values, see Chzhen and de Neubourg (2014).

EU-MODA uses the union approach to aggregating indicators into dimensions, whenever this is more than one indicator to form a dimension. Being deprived in one of the indicators is a sufficient condition for counting as being deprived in the corresponding dimension. This implies that the indicators complement rather than substitute each other. Thus, the absence of deprivation in one indicator does not make up for the deprivation in another. For instance, if a child lives in overcrowded accommodation, he/she is counted as deprived in the housing dimension (i.e. their right to a safe living environment is already violated) even if the dwelling does not suffer from multiple housing problems or water and sanitation deficiencies. The union approach is also used to construct indicators whenever they are based on more than one survey item (e.g. social activities for preschool-age children).

A number of implications of using the union approach have to be noted. First, indicators forming a dimension on their own (e.g. ECEC for preschool children; NEET for 17-18-year-olds) implicitly have a greater influence on the overall multiple deprivation count than the indicators that are grouped together into a single dimension (e.g. overcrowding, water and sanitation, and multiple housing problems for the housing dimension). Second, a greater number of indicators forming a dimension may result in a higher deprivation rate for this dimension (since being deprived in one of the indicators means being deprived in the whole dimension). However, it is important to keep the indicators that fit together conceptually as a part of the same dimension because if studied as separate dimensions in their own right, certain domains of child well-being would be given disproportionate significance in the analysis (e.g. there would be two or three housing-related dimensions rather than one).

²⁰ Guio et al. (2012) also included “one week holiday away from home” among the 13 child-level indicators in addition to five household-level items (of these, “computer” and “internet” are also used in EU-MODA) used to construct their 18-item child deprivation indicator.

3.1 Methods

This paper follows the EU-MODA methodology set out in detail in Chzhen and de Neubourg (2014) as well as general MODA guidelines (de Neubourg, Chai, de Milliano, Plavgo, et al., 2012). There are four main stages of analysis: 1) single deprivation; 2) multiple deprivation; 3) monetary poverty; 4) multiple deprivation and monetary poverty overlap. Firstly, children's well-being is evaluated using one dimension or indicator of deprivation at a time. This helps identify particular problem areas for child well-being as well as sectors that are performing relatively well.

Secondly, multiple deprivation analysis examines the number and type of deprivations children experience simultaneously. It shows: (1) the distribution of the number of dimensions children are deprived in; (2) the degree of overlap between various dimensions; (3) the multidimensional deprivation ratios; (4) the profile of the multiply deprived and the most vulnerable; and (5) the contribution of various household characteristics and dimensions to the adjusted deprivation headcount ratio. The results help identify the household characteristics of the most vulnerable children and highlight the multidimensional nature of child deprivation.

The distribution of the number of deprivations among children in a given age group at the national level indicates the intensity of the overall child deprivation for this age group. To identify multidimensionally deprived children, a cut-off must be selected. A child is multidimensionally deprived if the number of his/her deprivations is greater or equal to the cut-off. Comparing the results using different cut-offs can give valuable insights into the breadth of child deprivation, but this paper focuses on deprivation in one or more dimensions. All dimensions are given an equal implicit weight because the international children's rights framework does not prioritise particular child rights over and above the others.

The headcount ratio (H) refers to the number of children in a given age group who are multiply deprived according to a particular cut-off point, as a percentage of all children in this age group.

Average deprivation intensity (A) can be calculated as the number of deprivations that a multiply deprived child suffers from divided by the maximum number of dimensions studied (d), averaged out across all the deprived children in the relevant age group. It captures the percentage of all possible deprivations an average deprived child suffers from.²¹ Since the headcount ratio is not sensitive to deprivation intensity, it can be adjusted accordingly (Alkire & Foster, 2011). The adjusted headcount ratio (M_o) is then calculated as:

$$M_o = H * A$$

The adjusted headcount ratio satisfies the condition of "dimensional monotonicity", which implies that the deprivation rate should fall when a deprived child experiences an improvement in one of the dimensions. Thus, unlike the raw headcount ratio, the adjusted measure is sensitive to the breadth of deprivation experienced by each child. A product of two proportions, M_o is a number ranging between 0 and 1.

²¹ Note that this is a censored measure: it is calculated only for the children who are deprived based on the chosen cut-off.

Although the adjusted headcount ratio (M_o) can be criticised for hiding the dimensionality of deprivation (by being a single number), it has several useful properties that give insight into what drives the multidimensional deprivation at each cut-off. M_o can be decomposed into the shares contributed by various sub-groups of children and, separately, into the shares contributed by each dimension. The higher the incidence and severity of deprivation among children in a particular sub-group and the higher the prevalence of this household characteristic in the population of children, the more this household characteristic will contribute to the overall adjusted deprivation headcount. If a particular dimension exhibits a disproportionately high deprivation rate, compared to other dimensions, it will drive the overall adjusted headcount ratio, given a particular cut-off. See a more detailed description of the multidimensional deprivation analysis methodology in Annex B.

The monetary poverty analysis presents the at-risk-of-poverty rates of children with different household characteristics. Any number of poverty lines can be used, such as, for instance, 60%, 50%, and 40% of the national median disposable equivalent household income measured in 2009 (income reference year 2008, except for the United Kingdom and Ireland). An additional poverty line is based on 60% of the median income measured in 2005 (income reference year 2004) and is then updated with inflation for all the intervening years. Contemporary poverty lines are sensitive to sudden shifts in the income distribution: median household income may fall during an economic downturn, reducing the poverty line and resulting in an artificially lower child poverty rate even if the number of poor children remains the same. “Anchoring” the poverty line in 2005 (in real terms) helps circumvent this limitation by keeping the threshold fixed at a moment in time rather than allowing it to move with the current income distribution. However, for the purposes of illustrating the EU-MODA approach, this paper uses the 60% of the contemporary median threshold only.

The final set of analyses looks at the extent to which monetary poverty and multidimensional deprivation overlap among children in each age group. First, it identifies the dimensional deprivations that poor children are more likely to suffer from as well as the ones that do not have a statistically significant income gradient. Second, it analyses the profile and composition of children who are at risk of both poverty and deprivation, in comparison with the profile and composition of children who are: deprived but not poor, poor but not deprived, or neither poor nor deprived. This helps draw attention to the situation of different sub-groups of children. Those who are income poor but not materially deprived may be targeted with cash transfer policies, while those who are deprived while not being income poor may require better access to services. Children who are both poor and deprived may require a combination of policy responses.

4. RESULTS

To illustrate the application of EU-MODA, this paper uses data for three countries (Finland, Romania and the United Kingdom) and one age group (preschool-age children).²² This section includes selected results of single deprivation analysis, multiple deprivation analysis and the

²² The share of children in the preschool-age group excluded from the analysis due to having missing values for at least one of the indicators ranges from 1% in Romania, to 5% in the UK and 9% in Finland. However, this is not statistically significantly related to income in Finland or Romania, while in the UK income poor children are over-represented in the study ($p < 0.05$). In the UK, 1.5% and 5.5% of income poor and non-poor preschool-age children, respectively, have missing values.

analysis of the overlaps between multiple deprivation and monetary poverty. The full set of EU-MODA results will be made available via an interactive web portal.²³

4.1 Single and multiple deprivation

Figure 2 shows the incidence of deprivation for preschool children separately by dimension. Across the three countries, child deprivation rates are highest in Romania in each of the six dimensions, with the largest differences between Romania and the other two countries observed in housing, information and child development.²⁴ Across the six dimensions, some of the highest deprivation rates are observed in housing: 86% in Romania, 33% in the United Kingdom and 15% in Finland. According to Table 2, which shows deprivation rates separately by indicator, the housing dimension is driven by multiple housing problems in the United Kingdom (25%) and Finland (9%) and by overcrowding in Romania (72%).

The distribution of the number of dimensions children are deprived in, i.e. the overall severity of deprivation, varies noticeably across the three countries (Figure 3). In Finland, just under two-fifths (37%) of preschool-age children are deprived in one, two or three dimensions out of six, with the rest not deprived in any. The distribution is similar but more spread out in the United Kingdom, with just over one-half (54%) of preschool-age children deprived in one, two or three dimensions, 1% deprived in four or five, and the rest not deprived in any. The distribution is more symmetric in Romania: fewer than one in ten children are not deprived in any dimensions (7%) or all six (3%), while about as many are deprived in one or two dimensions (34%) as in four or five (30%). The distribution peaks at three dimensions (26%). Thus, the vast majority (93%) of preschool-age children in Romania are deprived in at least one dimension, while one-third (33%) are deprived in at least four.

To delve deeper into the pattern of multidimensional deprivation in each country, EU-MODA examines the extent to which specific dimensions overlap with each other in groups of three. There are 20 unique combinations of three dimensions at a time, but for the sake of representation Figure 4 illustrates the overlaps between one set only: nutrition, child development and housing. It is an interesting mixture because the first two are measured at the level of the child while the third is defined at the household level and then applied to each child in the household. The pattern of overlap is strikingly different across the three countries. In Finland, these three dimensions do not overlap with each other at all. In the United Kingdom, the extent of overlap is minimal: while virtually no one (0.4%) is deprived in all three simultaneously, 3% are deprived in nutrition and housing and 1% are deprived in child development and housing. In contrast, there is a substantial degree of overlap between the three dimensions in Romania: 27% are deprived in all three at once. Furthermore, nearly all children who are deprived in nutrition are deprived in both child development and housing. Only 1% are deprived in nutrition on its own, 1% are deprived in nutrition and child development but not in housing, and 3% are deprived in child development without being deprived in any of the other two. Thus, it is often the same children who are deprived in housing, nutrition and child development in Romania, while in Finland and the United

²³ Currently under construction, with more countries being added, to be made available via www.unicef-irc.org.

²⁴ If deprivation were to be defined as lacking an item because the household cannot afford it rather than for any other reason, child deprivation rates would be lower for all indicators except the ones forming the ECEC and housing dimensions (because for these the survey did not distinguish between non-affordability and other reasons). The biggest differences were observed for “computer” and “internet” in the information dimension (see Table A2 in Annex 1).

Kingdom, where fewer children are deprived in each of these dimensions to start with, these tend to be different children.

An alternative way of examining the overlap of each dimensional deprivation with the rest of the deprivations analysed is to check how many other dimensions children are deprived in if they are deprived in a specific dimension. Figure 5 decomposes the deprivation rate for nutrition, child development and housing (separately) into the proportions of children deprived in this dimension alone and the proportions deprived in this dimension as well as in two, three or more dimensions simultaneously. In Romania, 86% of preschool-age children are deprived in housing. However, only 11% of these children (or 10% of all children) are deprived in this dimension only, while the rest are deprived in one to five other dimensions. A quarter of all preschool-age children (25%) in Romania are deprived in housing and two other dimensions. In contrast, 33% of preschool-age children are deprived in housing in the United Kingdom, but one-half of these children (or 17% of all children) are deprived in this dimension only.

4.2 Multidimensional deprivation indices

The prevalence and intensity of multiple deprivation varies substantially across the three countries (Table 3). Preschool-age children in Romania are more likely to be deprived than their counterparts in the United Kingdom and Finland at every deprivation cut-off. Thus, more than nine in 10 (93%) children in Romania are deprived in one or more dimensions out of six, compared with just over one-half (55%) in the United Kingdom and just over one-third (37%) in Finland. Children in Romania tend to experience greater intensity of deprivation: those who are deprived in at least one dimension suffer from 3.1 deprivations, on average. In the United Kingdom and Finland, children deprived in one or more dimensions tend to suffer from 1.5 and 1.2 deprivations, respectively. Since both the deprivation incidence and its intensity are higher in Romania at each cut-off, the corresponding adjusted multidimensional deprivation ratios are also higher than in the other two countries.

Although M_0 does not have an intuitive interpretation, it can be decomposed into the shares contributed by each dimension to investigate their relative importance in each country. Figure 6 shows that ECEC and housing contribute most to the adjusted headcount in Finland, while housing and information do so in the United Kingdom and Romania. Nutrition makes the same contribution (10-11%) in all three countries; clothing is similarly important in Finland and Romania but contributes somewhat more in the UK; ECEC is considerably more important in Finland²⁵ (34%) than in the UK (11%) or Romania (6%); child development makes a far greater contribution in Romania (21%) compared with the UK (4%) or Finland (3%); information is relatively more important in Romania (24%); while housing is more important in the UK (40%) than in Finland (33%) or Romania (30%). While not claiming that any one country has higher deprivation rates than the others in a particular dimension (e.g. ECEC in Finland), this analysis draws attention to the types of deprivations most likely to be experienced by children within a country.

²⁵ In Finland parents can care for children at home until the youngest child's third birthday (paid parental leave followed by paid homecare leave), which may help explain why many preschool-age children do not use formal childcare.

4.3 Multiple deprivation and monetary poverty overlap

Children deprived in various dimensions do not necessarily live in income poor families. This section examines the extent to which monetary poverty and multidimensional deprivation overlap. Using 60% of the median equivalent household income as the poverty line, Figure 7 shows that in all three countries, poor children are significantly more likely to be deprived in each dimension, with the exception of nutrition in Finland and the UK and ECEC in Romania, for which there are no statistically significant differences. With respect to the ECEC dimension, these results indicate that when children in Romania do not attend formal childcare facilities, it is likely to be due to accessibility or availability reasons, while in Finland and the UK, it is more likely to be an affordability issue. In Romania, nearly all income poor children are deprived in housing (98%), information (91%) or child development (87%), suggesting a high degree of overlap between monetary poverty and material deprivation.

Based on the multidimensional cut-off of one dimension, Figure 8 plots the overlap between income poverty and deprivation. In all three countries, deprivation incidence at the cut-off of one deprivation or more is higher than monetary poverty incidence, with a large degree of overlap. In Finland, where 12% preschool-age children are income poor and 37% are deprived in one or more dimensions, 8% are both poor and deprived and 29% are deprived while not being poor. In Romania, 26% are income poor (while also being deprived) and 67% are deprived while not being poor. While in Romania all poor children are deprived in at least one dimension, 4% and 5% are poor but not deprived in Finland and the United Kingdom, respectively.

Changing the deprivation cut-off from one to two dimensions makes a visible difference in every country in terms of deprivation rates and the overlap between deprivation and income poverty. This is illustrated for the United Kingdom in Figure 9 which shows that changing the deprivation cut-off from one to two dimensions reduces the proportion of children who are both poor and deprived from 17% to 9%. It has to be noted that EU-MODA does not advocate a particular deprivation cut-off, but rather provides tools for examining the sensitivity of the results to different thresholds.

Finally, Table 3 shows the variation in the risks of being both poor and deprived; deprived only; and poor only by household characteristics. In all three countries, children in households where adults work less than half of the potential time are significantly more likely to be both poor and deprived in at least one dimension, or deprived only, but less likely to be poor but not deprived. Everything else being equal, the odds of simultaneous poverty and deprivation are significantly higher for rural children and children in large families in Finland and Romania; for children in non-owner occupied housing in Finland and the United Kingdom; for children in migrant households in Finland; and for those with one or two parents not present in the household (i.e. children in lone parent families) in Romania.

5. CONCLUSION

This paper illustrated the application of the Multiple Overlapping Deprivation Analysis for the European Union to three European countries (Finland, Romania and the United Kingdom) for children between the age of one and compulsory school age. The full rendering of EU-MODA (Chzhen & de Neubourg, 2014) for three different age groups is best displayed as an interactive

web portal, due to the proliferation of different combinations of dimensions, deprivation cut-offs, poverty thresholds, and profiling variables. Although the present analysis barely scraped the surface of EU-MODA, it demonstrated that the framework can be applied to both newer and older EU member states using child specific deprivation data from the ad-hoc deprivation module of the EU-SILC 2009. This serves as a baseline for future analysis using child deprivation indicators from the forthcoming waves of the EU-SILC.

It is well documented that the newest accession states tend to have the highest rates of material deprivation in the EU. Thus, it is not surprising that the deprivation rates for preschool-age children are higher in Romania than in Finland or the UK in each of the six dimensions, but the differences are particularly large with regards to housing, information and child development. Nevertheless, sizeable proportions of preschool-age children in Finland and in the UK are deprived in housing, largely due to multiple housing problems.²⁶ The analysis shows that in Romania children who are deprived in housing are often deprived in several other dimensions at once, while in Finland and the UK housing deprivation overlaps with other dimensions to a lesser degree. Overall, deprived children in Romania suffer from three deprivations on average, while those in Finland and the UK are usually deprived in just one at a time.

As regards the overlap between multidimensional deprivation and income poverty, there are substantial similarities across the countries studied here. In all three countries, income poor children tend to be significantly more likely to be deprived in each dimension than non-poor children; nearly all of those who live in income poor households are deprived in at least one dimension; and similar household characteristics are associated with a higher likelihood of being both poor and deprived (e.g. lower work intensity of adults in the household).

It has to be noted that the application of EU-MODA is vulnerable to a number of limitations. First, the current analysis is based on data from the EU-SILC 2009, so the results may have been affected by the global financial crisis. This is particularly relevant to relative poverty indicators because median national incomes may have fallen during the crisis (indeed this happened in the UK between 2008 and 2009). Thus, a comparison between the results of EU-MODA 2009 and those based on forthcoming child-specific deprivation data from the EU-SILC 2014 would need to use an anchored poverty line (that is not sensitive to short-term fluctuations in the national median income). However, child material deprivation indicators should not have been significantly affected at the start of the Great Recession. Unlike the standard EU material deprivation indicators that are based on the enforced lack of resources, EU-MODA removes the financial element and considers a child who has no access to a particular item for any reason as deprived.

Second, EU-MODA is based on the EU-SILC and, as such, is subject to all the limitations with regards to data quality that the underlying survey suffers from. In particular, the variation across countries in the prevalence of missing values and their often non-random nature (i.e. the association with household income) are a cause for concern. Guio et al (2012) document the pattern of missing values in the EU-SILC 2009 deprivation module, drawing attention to the most “problematic” countries (e.g. Sweden) and calling for identifying best practices in data collection to

²⁶ Multiple housing problems are defined as suffering from at least one of the following: leaking roof, damp roof/walls/foundation; rot in window frames or floor; there is not enough daylight from windows.

avoid large portions of non-random missing values. Chzhen and de Neubourg (2014) investigate the pattern of missing values separately for the three age groups included in EU-MODA and analyse the relationship between income poverty and the probability of being excluded from the study due to missing values.

To conclude, as a framework for analysis complementary to the official Eurostat indicators, EU-MODA can be modified and taken forward in various ways. The construction of indicators and dimensions described in Chzhen and de Neubourg (2014) followed in this paper is open to debate and improvement. EU-MODA may evolve with time, as it is an analytical framework rather than a finite set of estimates. Moreover, EU-MODA can be adapted into country-specific MODA studies, using data from richer national household surveys, or into smaller regional studies. The version of EU-MODA based on the EU-SILC 2009 should be updated with data from subsequent waves of the EU-SILC that contain comparable child specific information. Finally, EU-MODA can be adjusted to study material deprivation among adults, using suitable indicators and dimensions.

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FIGURES

Figure 1 Life cycle stages and dimensions used for the EU-MODA analysis

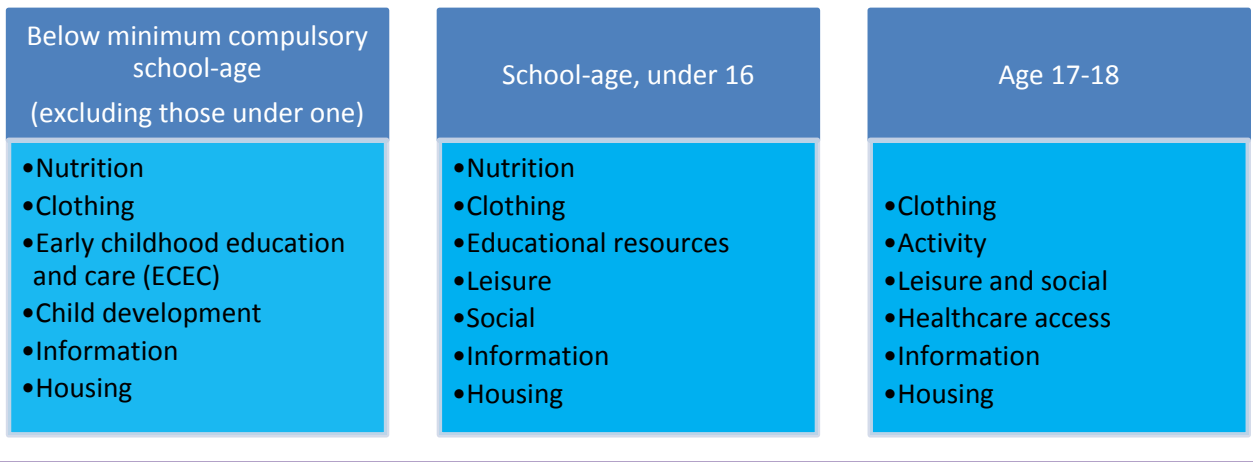
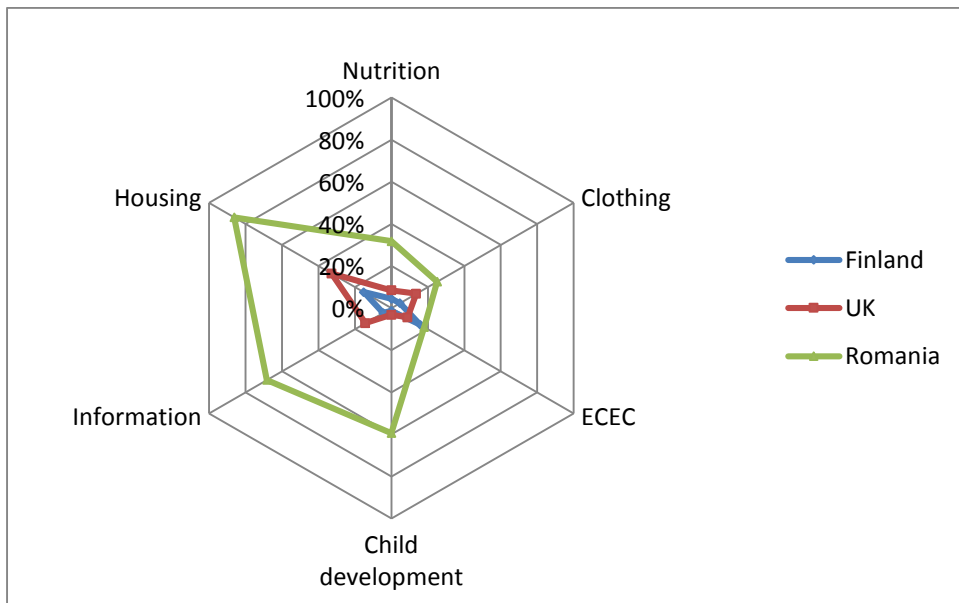
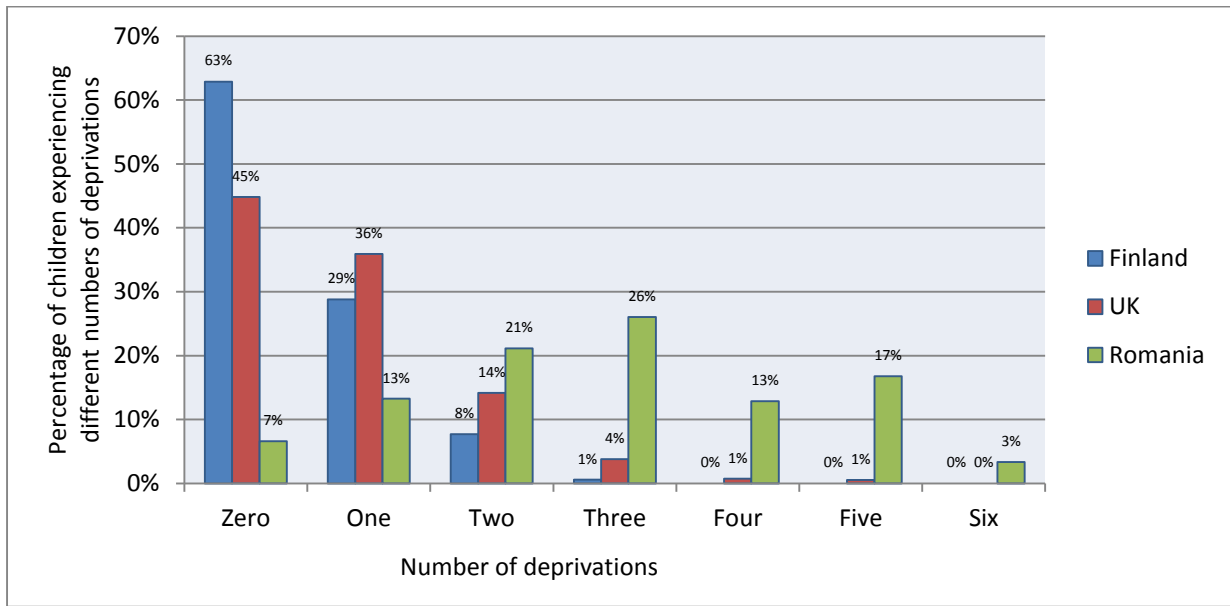


Figure 2 Deprivation incidence by dimension and country (preschool children)



Source: EU-SILC 2009 (version 01.03.2013).

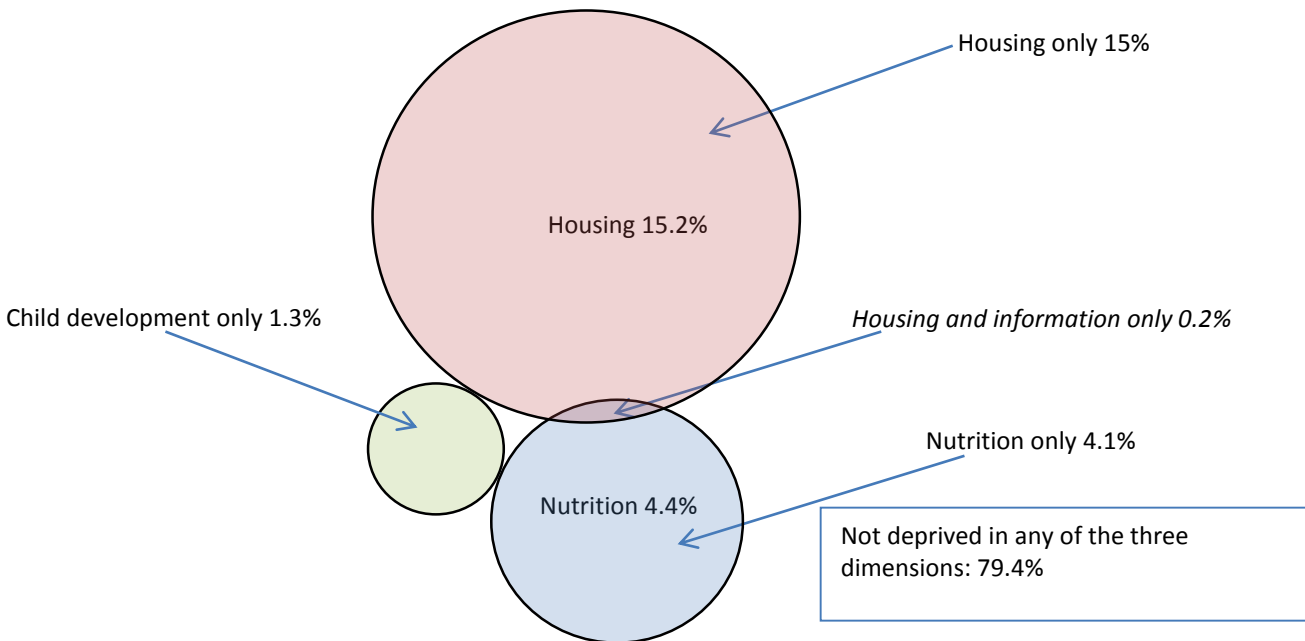
Figure 3 Distribution of number of deprivations by country (preschool children)



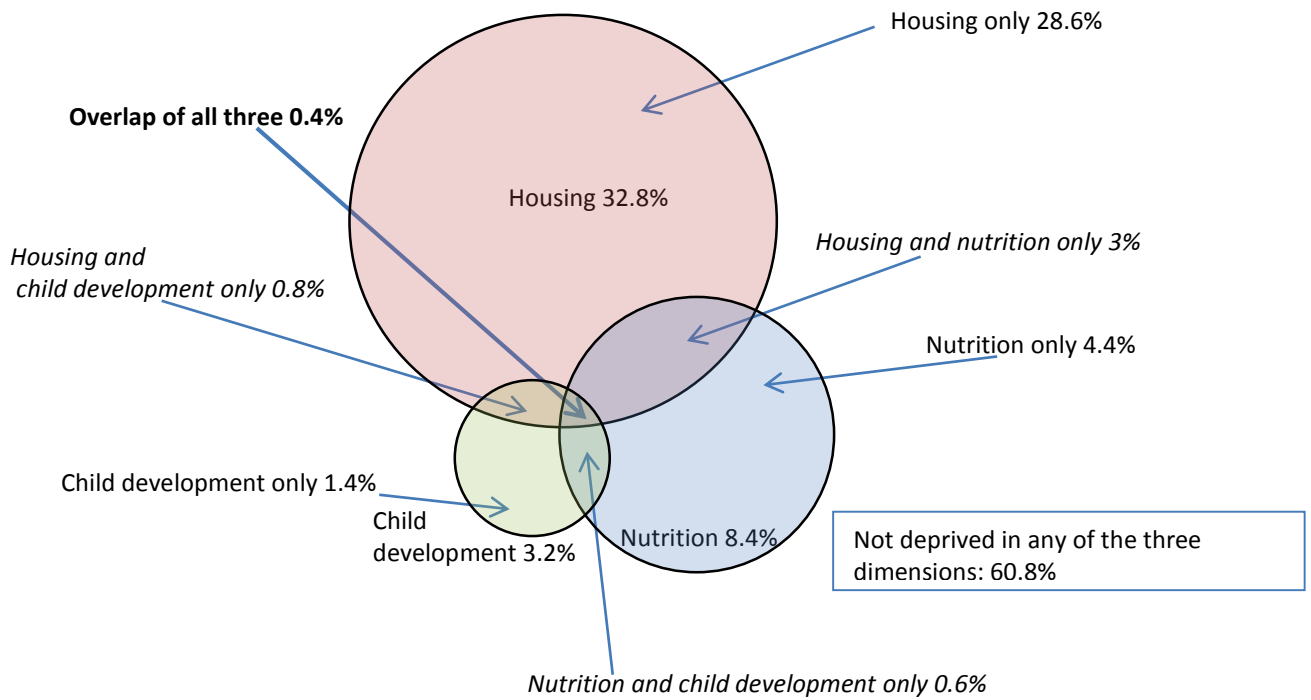
Source: EU-SILC 2009 (version 01.03.2013).

Figure 4 Deprivation overlap of three dimensions (Nutrition, child development, and housing), by country

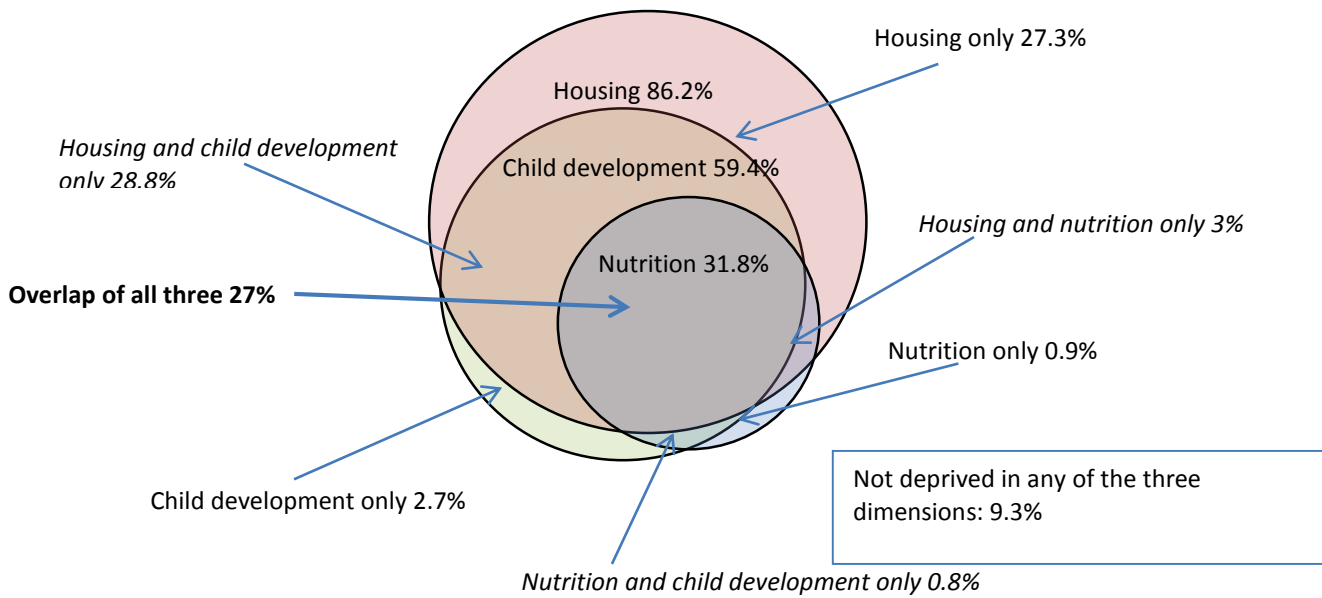
Finland



United Kingdom

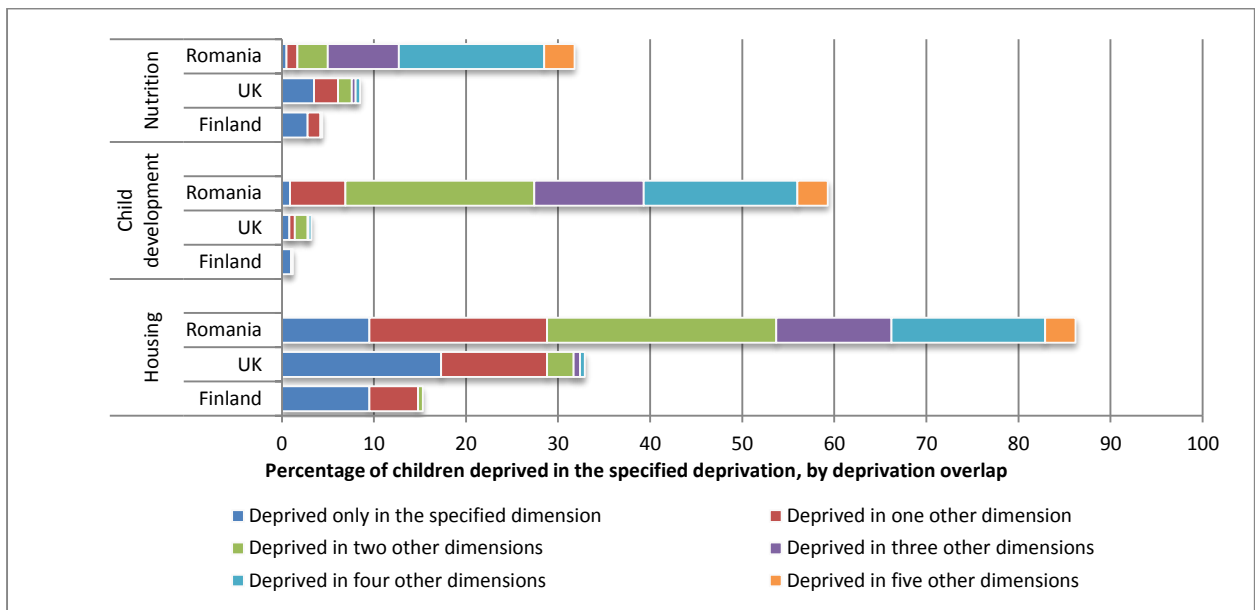


Romania



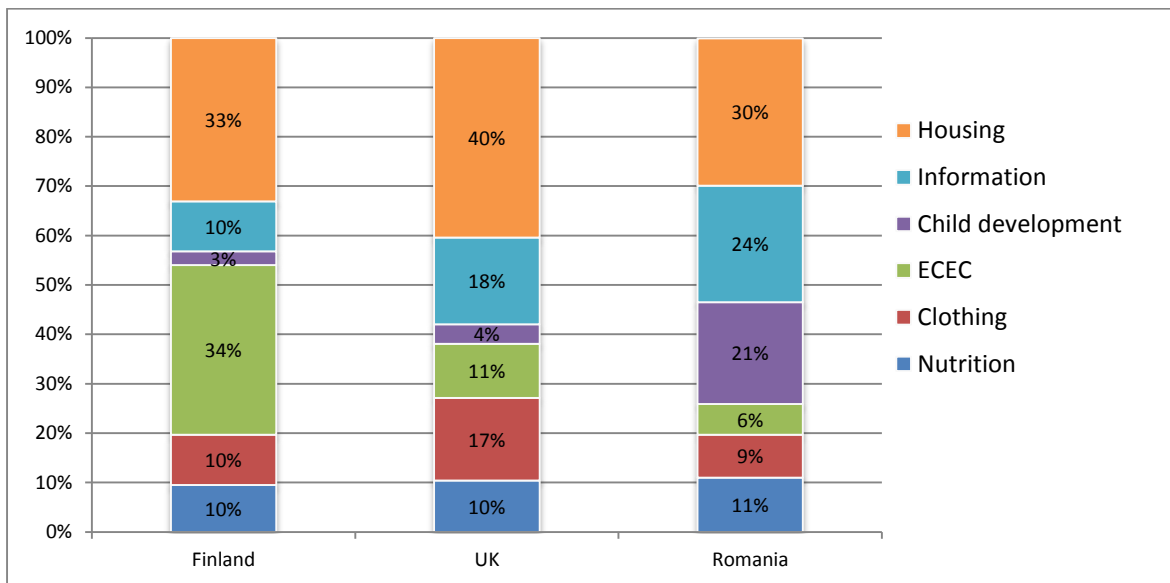
Source: EU-SILC 2009 (version 01.03.2013).

Figure 5 Deprivation overlap for selected dimensions



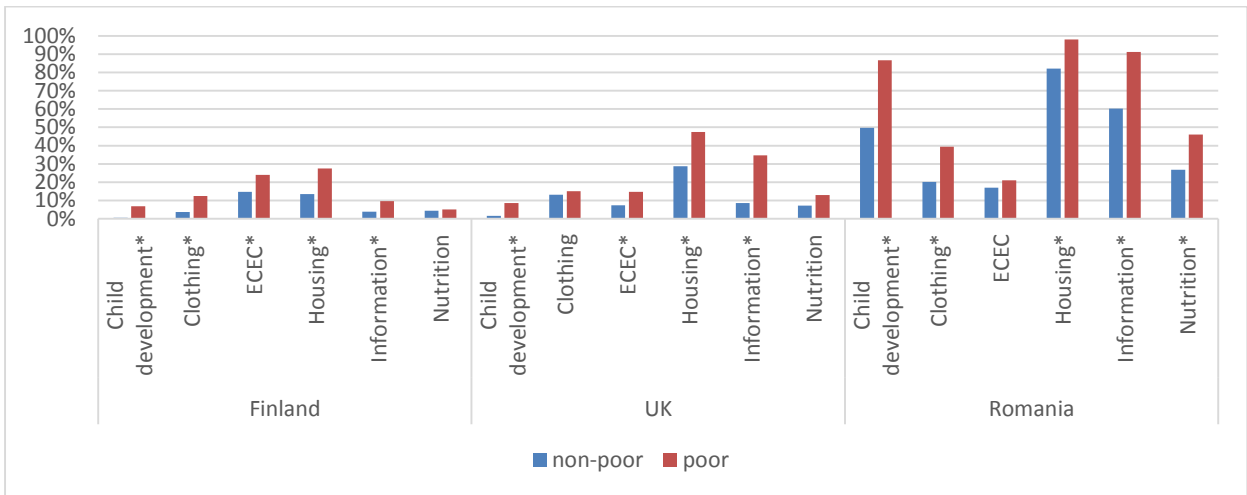
Source: EU-SILC 2009 (version 01.03.2013).

Figure 6 Decomposition of the adjusted deprivation headcount by dimension



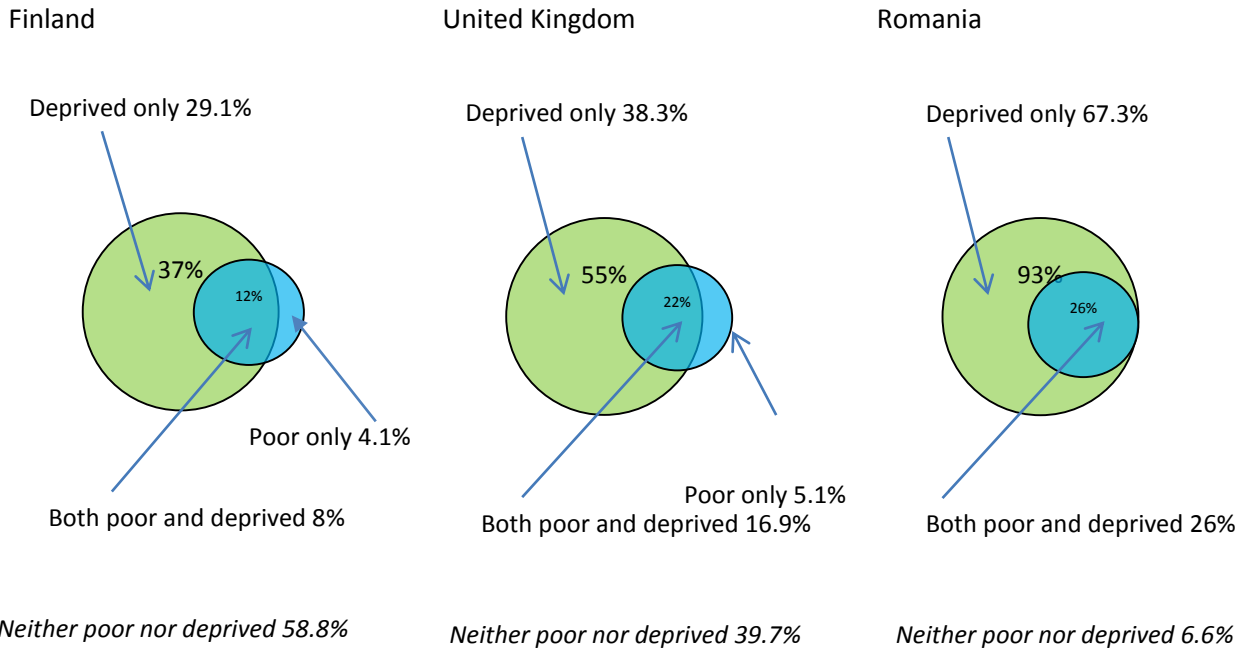
Source: EU-SILC 2009 (version 01.03.2013).

Figure 7 Deprivation headcounts for poor and non-poor children



Note: *p<0.05.
Source: EU-SILC 2009 (version 01.03.2013).

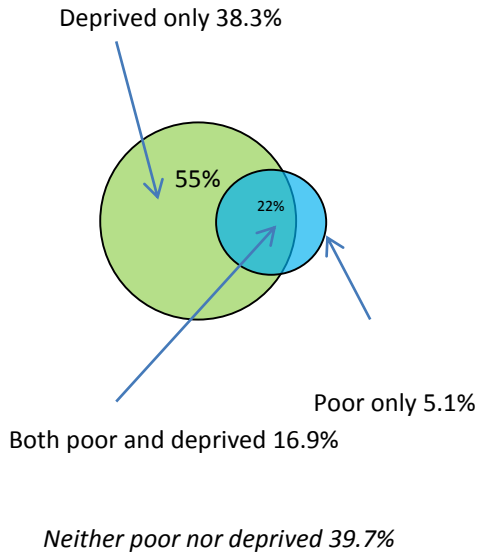
Figure 8 Overlap between multiple deprivation and monetary poverty (deprived in at least one dimension; equivalent household income below 60% of the national median)



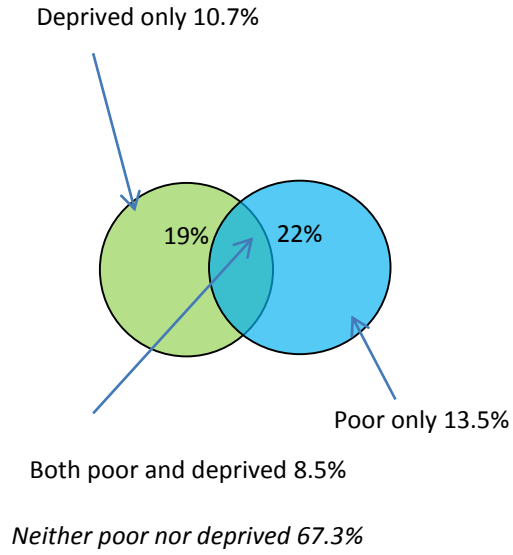
Source: EU-SILC 2009 (version 01.03.2013).

Figure 9 Overlap between multiple deprivation (one or two dimensions) and monetary poverty (United Kingdom)

Deprivation cut-off: 1



Deprivation cut-off: 2



TABLES

Table 1 Indicators by dimension and age group

Dimension	Preschool-age	School-age	17-18
Nutrition	Fruit/vegetables once a day One meal with meat once a day		
Clothing	Some new clothes Two pairs of shoes		Some new clothes Two pairs of shoes
Education	Early childhood education and care (ECEC)	School trips Suitable place at home to study	Not in education, employment or training (NEET)
Child development	Books at home Games (outdoor, indoor) Social activities (celebrations, inviting friends)		
Leisure		Books at home Games (outdoor, indoor) Regular leisure activity	Regular leisure activity
Social		Celebrations on special occasions Having friends round to play	Social life
Healthcare access			Medical needs Dental needs
Information		Computer Internet	Mobile phone Computer Internet
Housing		Overcrowding Sanitation Multiple housing problems	

Notes: Children one or two years of age are excluded from the estimation of the ECEC indicator deprivation headcount rate, but are considered non-deprived in calculation of the dimension deprivation rate.

Housing indicators are constructed as follows. "Sanitation": a bath/shower for sole use of the household; an indoor flushing toilet for sole use of the household; hot running water. "Multiple housing problems": a leaking roof, damp roof/walls/foundation, rot in window frames or floor; there is not enough daylight from windows. Overcrowding is measured using the Eurostat definition.²⁷

²⁷ A dwelling is overcrowded if the household does not have at its disposal: one room for the household; one room per couple in the household; one room for each single person aged 18 or more; one room per pair of single people of the same gender between 12 and 17 years of age; one room for each single person between 12 and 17 years of age and not included in the previous category; one room per pair of children under 12 years of age

Table 2 Indicator deprivation rates for preschool children (%)

		Finland	UK	Romania
Nutrition	Fruit/vegetables once a day	3.8	5.9	23.1
	One meal with meat once a day	0.5	3	27.8
Clothing	Some new clothes	3.6	3.9	23.3
	Two pairs of shoes	1.5	10.9	17.1
ECEC	Early childhood education and care (ECEC)	21.8	16.7	27.9
Child development	Books at home	1.3	1.8	38.6
	Games (outdoor, indoor)	0.0	0.8	49.6
	Social activities	0.2	1.1	29.1
Information	Computer	3.1	9.3	58.6
	Internet	4.4	13.8	67.4
Housing	Overcrowding	4.8	11.1	71.8
	Sanitation	2.9	1.0	54.0
	Multiple housing problems	8.8	24.7	30.7

Source: EU-SILC 2009. Children under the age of three are excluded from the estimation of the deprivation rate for the ECEC indicator. However, children under three are assumed to be non-deprived in the ECEC dimension. This explains the discrepancies in the deprivation incidence for the ECEC indicator and the ECEC dimension.

Table 3 Multidimensional deprivation ratios

Cut-off	Finland				United Kingdom				Romania			
	H (%)	A (%)	A	M ₀	H (%)	A (%)	A	M ₀	H (%)	A (%)	A	M ₀
1-6	37.1	20.6	1.2	0.08	55.2	24.6	1.5	0.14	93.4	51.6	3.1	0.48
2-6	8.3	34.5	2.1	0.03	19.2	39.3	2.6	0.08	80.1	57.3	3.4	0.46
3-6	0.6				5.0	56.0	3.4	0.03	59.0	65.9	4.0	0.39
4-6	0.0				1.3				33.0	78.5	4.7	0.26
5-6	0.0				0.5				20.1	86.1	5.2	0.17

Deprivation intensity (A) and adjusted deprivation headcount (M₀) are not reported if n<30.

Table 4 Odds of being both income poor and deprived in one or more dimensions

	Poor and deprived			Deprived only			Poor only	
	FI	UK	RO	FI	UK	RO	FI	UK
Thinly populated area	3.53**	1.12	16.29* **	1.19	0.72	0.28** *	0.60	0.94
Main carer has tertiary education	0.63	0.71	-	0.71*	0.96	-	0.40*	0.54
One or more migrants in the household	2.66*	1.71	-	0.46*	1.06	-	1.21	0.73
Three or more children under 16 in the household	3.55** *	1.64	1.93*	1.33*	0.85	0.76	2.03*	1.84
Lives in owned accommodation	0.21** *	0.33**	0.60	0.52**	0.71	1.20	0.63	0.73
One or both parents are not present in the household	0.98	0.94	2.39*	1.19	1.67*	0.82	1.64	0.67
Adults in the household work at least half of the potential time (WI>=0.5)	0.11** *	0.08** *	0.26** *	1.87*	3.21** *	2.68**	0.22** *	0.26* *
Intercept	0.20**	1.06	0.14**	0.38**	0.31** *	2.04	0.21**	0.16** *
N	1573	843	583	1573	843	583	1573	843
Pseudo R-squared	0.33	0.33	0.23	0.03	0.03	0.10	0.15	0.10

* p<0.05; ** p<0.01; *** p<0.001.

Notes: insufficient case numbers of preschool children in migrant households in Romania; no children with higher educated main carers are both poor and deprived in Romania.

ANNEX A

Table A1 Child Well-being Dimensions According to the CRC

Categories	Dimensions	Source
Survival	Nutrition	CRC Art. 24
	Water and sanitation	CRC Art. 24
	Health care	CRC Art. 24
	Shelter, housing, clothing	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 labor	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
Participation	Birth registration; Nationality	CRC Art. 7,8
	Information	CRC Art.13,17
	Freedom of expression, views, opinions; being heard;	CRC Art.12-15
	Freedom of association	

Source: adapted from Table 1 in Cross-Country MODA Study Technical Note (de Neubourg et al, 2012).

Table A2 Indicator deprivation rates for preschool children: alternative definitions (%)

	Finland		United Kingdom		Romania	
	Deprived for any reason	Non-affordability only	Deprived for any reason	Non-affordability only	Deprived for any reason	Non-affordability only
Fruit/vegetables once a day	3.8	0.4	5.9	0.8	23.1	21.7
One meal with meat once a day	0.5	0.0	3.0	0.3	27.8	25.6
Some new clothes	3.6	3.0	3.9	2.0	23.3	21.9
Two pairs of shoes	1.5	0.8	10.9	2.6	17.1	15.5
Books at home	1.3	0.6	1.8	0.2	38.6	32.0
Games (outdoor, indoor)	0.0	0.0	0.8	0.1	49.6	41.1
Social activities	0.2	0.0	1.1	0.6	29.1	24.5
Computer	3.1	1.0	9.3	5.5	58.6	41.2
Internet	4.4	0.9	13.8	6.6	67.4	32.9

Source: EU-SILC 2009.

ANNEX B

Technical note – multidimensional deprivation analysis

Each child is deprived in up to six or seven dimensions (d), depending on their age group: $d=6$ for preschool-age children and 17-18-year-olds; $d=7$ for school-age children. A child i is multiply deprived if the number of his/her deprivations is greater or equal to the cut-off ($K=1, \dots, d$):

$$i_k = 1 \text{ if } D_i \geq K$$

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

A different deprivation headcount ratio is associated with every cut-off point K . The multidimensional headcount ratio (H_k) is defined as:

$$H_k = \frac{q_k}{n}$$

Where $q_k = \sum_{i=1}^n i_k$

Following Alkire and Foster (2011), the average deprivation intensity among the deprived, expressed as a percentage, is defined as follows:

$$A = \frac{\sum c_{i,k}}{q_k * d}$$

Where $c_{i,k}$ is the number of dimensions that a multiply deprived child is deprived in with respect to the cut-off K ; q_k is the total number of children deprived based on this cut-off; and d is the total number of dimensions in the analysis. Thus A is a censored measure: it is calculated only for the children who are deprived based on the chosen cut-off.

The adjusted headcount ratio (M_0) is then calculated as:

$$M_0 = H * A$$

M_0 is the weighted average of sub-group deprivation measures, where the weights are the shares of these sub-groups in the population. For instance, if there are two groups of children, n_1 and n_2 :

$$M_0 = M_{01} * \frac{n_1}{n} + M_{02} * \frac{n_2}{n}$$

The relative contribution of the j th dimension to the overall adjusted headcount rate is calculated as:

$$P_j = \frac{\sum D_{i,j} * i_k}{n * d * M_0}$$

Where $\sum D_{i,j} * i_k$ is the total number of children deprived in the j th dimension who are also multiply deprived according to the cut-off K , and n is the number of children in a particular age group in the sample.