



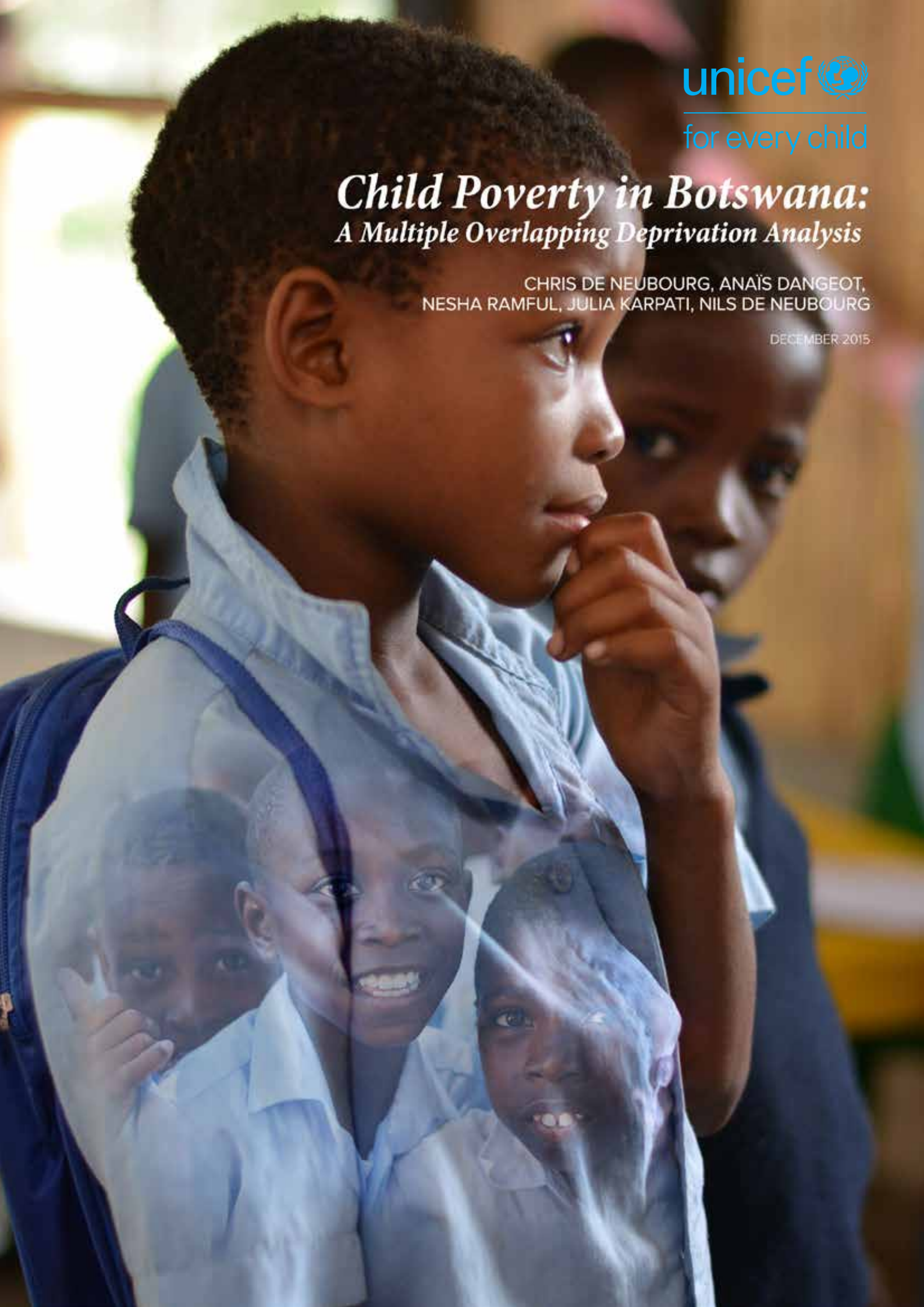
unicef

for every child

# *Child Poverty in Botswana: A Multiple Overlapping Deprivation Analysis*

CHRIS DE NEUBOURG, ANAÏS DANGEOT,  
NESHA RAMFUL, JULIA KARPATI, NILS DE NEUBOURG

DECEMBER 2015



# Table of Contents

<b>Table of Contents</b>	2
<b>List of Tables</b>	3
<b>List of Figures</b>	3
<b>1 Introduction</b>	5
<b>2 MODA Applicability and Scope</b>	10
2.1 Indicator and dimension selection	12
<b>3 Most common deprivations</b>	13
3.1 Children aged 0 – 4 years	13
3.2 Children aged 5 – 12 years	17
3.3 Children aged 13 – 17 years	21
<b>4 Access and outcomes dimensions. How do they relate?</b>	24
4.1 Children aged 0-4 years	25
4.2 Children aged 5-12 years	25
4.3 Children aged 13-17 years	26
<b>5 Links between deprivations in different dimensions</b>	27
5.1 Children aged 0-4 years	27
5.2 Children aged 5-12 years	32
5.3 Children aged 13-17 years	35
<b>6 Breaking and Connecting Dimensions</b>	39
6.1 Children aged 0 – 4 years	39
6.2 Children aged 5– 12 years	41
6.3 Children aged 13 – 17 years	42
<b>7 Regional disparities in deprivations</b>	44
7.1 Children aged 0 – 4 years	47
7.2 Children aged 5 – 12 years	49
7.3 Children aged 13 – 17 years	51
<b>8 Monetary poverty versus Deprivations as measures of child well-being in Botswana</b>	52
<b>9 Monetary poverty and Deprivations overlapping</b>	56
<b>10 Deprivations and intergenerational transmission of poverty in botswana</b>	61
10.1 Addressing deprivations of all kinds is important for the economic development of Botswana	61
10.2 Deprivation among children is the main source of the intergenerational transmission of poverty in Botswana.	61
<b>11 References</b>	65
<b>12 Appendices</b>	68
12.1 Measuring child well-being	68
12.2 MODA Methodology	68
12.3 Indicators, Dimensions and deprivation Thresholds	69
12.4 Data	71
<b>12.5 Limitations and Further Research</b>	73
12.5 Limitations and Further Research	73

# List of Tables

<b>Table 1</b>	Average marginal effects of the probit model for poor children, 0-4 years	40
<b>Table 2</b>	Average marginal effects of the probit model for non-poor children, 0-4 years	40
<b>Table 3</b>	Average marginal effects of the probit model for poor children, 5-12 years	42
<b>Table 4</b>	Average marginal effects of the probit model for non-poor children, 5-12 years	42
<b>Table 5</b>	Average marginal effects of the probit model for poor children, 13-17 years	43
<b>Table 6:</b>	Average marginal effects of the probit model for non-poor children, 13-17 years	44
<b>Table 7</b>	Most lagging districts in all considered dimensions	46
<b>Table 8</b>	Deprivation headcount by dimension and by district, children aged 0-4 years	47
<b>Table 9</b>	Deprivation headcount by dimension and district, children aged 5-12 years	49
<b>Table 10</b>	Deprivation headcount by dimension and district, children aged 13-17 years	51
<b>Table 11</b>	Multidimensional deprivation indices (for K=2, 3), by age groups	54
<b>Table 12</b>	Poverty and deprivation overlap for dimension with highest deprivation headcount, by age group	57
<b>Table 13</b>	Dimensions, Indicators and Deprivation Thresholds, for each age group	70

# List of Figures

<b>Figure 1</b>	Selected dimensions by age group	13
<b>Figure 2</b>	Deprivation headcount by indicator and by dimension, children aged 0-4 years	13
<b>Figure 3</b>	Deprivation headcount by dimension and area, children aged 0-4 years	14
<b>Figure 4</b>	Deprivation headcount by dimensions and household's monetary poverty status, children aged 0-4 years	16
<b>Figure 5</b>	Poverty and multidimensional deprivation (K=2) overlap by area, children aged 0-4 years	17
<b>Figure 6</b>	Deprivation headcount by indicator and by dimension, children aged 5-12 years	18
<b>Figure 7</b>	Deprivation headcount by dimension and area, children age 5-12 years	18
<b>Figure 8</b>	Deprivation headcount by dimension and household's head gender, children aged 5-12 years	19
<b>Figure 9</b>	Deprivation headcount by dimension and household having/ not a HIV positive member, children aged 5-12 years	20
<b>Figure 10</b>	Deprivation headcount by dimension and nutrition, children aged 5-12 years	20
<b>Figure 11</b>	Deprivation headcount by dimension and household's monetary poverty status, children aged 5-12 years	21
<b>Figure 12</b>	Deprivation headcount by indicator and by dimension, children age 13-17 years	21
<b>Figure 13</b>	Deprivation headcount by dimension and area, children aged 13-17 years	22
<b>Figure 14</b>	Deprivation headcount by dimension and household's head gender, children aged 13-17 years	23
<b>Figure 15</b>	Deprivation headcount by dimension and nutrition, children aged 13-17 years	23
<b>Figure 16</b>	Deprivation headcount by dimension and household's monetary poverty status, children aged 13-17 years	24
<b>Figure 17</b>	Three-way overlapping for Nutrition, Health and Housing dimensions, children aged 0-4 years	25
<b>Figure 18</b>	Three-way overlapping for Education, Housing and Sanitation dimensions, children aged 5-12 years	26
<b>Figure 19</b>	Three-way overlapping for Education, Housing and Sanitation dimensions, children aged 13-17 years	26

<b>Figure 20</b> Overlap by dimension, children aged 0-4 years	28
<b>Figure 21</b> Three-way overlapping for dimensions Health, Housing and Water for children aged 0-4 years, by profile	29
<b>Figure 22</b> Overlap by dimension, children aged 5-12 years	32
<b>Figure 23</b> Three-way overlapping for dimensions Housing, Sanitation and Water for children aged 5-12 years, by profile	33
<b>Figure 24</b> Three-way overlapping for dimensions Nutrition, Education and Water for children aged 5-12 years	35
<b>Figure 25</b> Overlap by dimension, children aged 13-17 years	36
<b>Figure 26</b> Three-way overlapping for dimensions Education, Housing and Sanitation for children aged 13-17 years, by profile	37
<b>Figure 27</b> Overlap by dimension, children aged 0-4 years	40
<b>Figure 28</b> Overlap by dimension, children aged 5-12 years	41
<b>Figure 29</b> Overlap by dimension, children aged 13-17 years	43
<b>Figure 30</b> Adjusted deprivation headcount ration (K=2) by district, children aged 0-4 years	48
<b>Figure 31</b> Adjusted deprivation headcount ration (K=3) by district, children aged 5-12 years	50
<b>Figure 32</b> Adjusted deprivation headcount ratio (K=3) by district, children aged 13-17 years	52
<b>Figure 33</b> Deprivation headcount for k=1, 2, 3, 4, 5 and 6, children aged 0-17 years	53
<b>Figure 34</b> Distribution of simultaneous deprivations at the national level, by age group	55
<b>Figure 35</b> Poverty and multidimensional deprivation overlap, by age group	56
<b>Figure 36</b> Poverty and multidimensional deprivation (K=2) overlap by area, children aged 0-4 years	58
<b>Figure 37</b> Poverty and multidimensional deprivation (K=2) overlap by area, children aged 5-12 years	58
<b>Figure 38</b> Poverty and multidimensional deprivation (K=2) overlap by area, children aged 13-17 years	59
<b>Figure 39</b> Poverty and multidimensional deprivation (K=2) overlap by area, children aged 0- 17 years	59
<b>Figure 40</b> Poverty and multidimensional deprivation (K=3) overlap by area, children aged 5-12 years	60
<b>Figure 41</b> Poverty and multidimensional deprivation (K=3) overlap by area, children aged 13-17 years	60
<b>Figure 42</b> Deprivation headcounts by dimension and monetary poverty, children aged 0-4 years	62
<b>Figure 43</b> Deprivation headcounts by dimension and monetary poverty, children aged 5-12 years	63
<b>Figure 44</b> Deprivation headcounts by dimension and monetary poverty, children aged 13-17 years	63
<b>Figure 45</b> Deprivation headcount by dimension and three-way overlapping for selected dimensions, children aged 0-4 years	73

# Executive Summary

---

This report provides comprehensive estimates of child poverty in Botswana using both monetary and non-monetary multidimensional measures based on Botswana Core Welfare Indicator Survey (BCWIS) 2009/10. The study uses a methodology proposed by UNICEF which anchors domains of deprivation on the Convention on the Rights of the Child and measures deprivation at the individual child level. The exact dimensions, indicators and thresholds of the deprivations measured in the study were decided by key stakeholders in the country given the country context and subject to data availability.

The report reveals that the level of child poverty measured by multiple deprivations is significantly higher than that measured by monetary poverty. **While 19 percent of the population are poor in monetary terms based on the national poverty datum line (PDL), the monetary poverty rate amongst children under 18 stands significantly higher at 26 percent. The situation of non-monetary aspects of poverty amongst children is even worse. 63 percent of children under 18 live in multidimensional poverty in Botswana, defined as being deprived in at least two dimensions simultaneously. 44 percent of children live in severe multidimensional poverty, defined as being deprived in at least half of the total applicable dimensions simultaneously.**

**A significant number of children, 42.6 percent of the total, are deprived in two or more dimensions yet live in households that are above the poverty line.** They tend to be in rural areas and urban villages, although they still count for a bit more than a quarter of children in cities. As children grow older, they become more likely to fall under this category. This result implies that monetary poverty as a single measure of child well-being in Botswana fails in capturing the broader conditions necessary for overall child development, and that social programmes that target on monetary poverty will have a large exclusion error by missing out a significant number of vulnerable children, particularly adolescents, who are not monetarily poor but deprived in at least two dimensions in Botswana. On the other hand, 5.7 percent of total children live in monetary poverty but are not deprived in at least two dimensions. These children are more likely to be in urban villages than in cities and rural areas. It implies that targeting of social programs based on monetary poverty may have a sizable inclusion error, but significantly smaller compared to the size of the exclusion error that it may have.

**The most vulnerable children are those who experience two or more deprivations and live in households below the monetary poverty line.** This group represents roughly 1 out of 5 (20.7 percent) of all children in Botswana who suffer both severe individual deprivations and live in households that have few resources to access goods and services on their behalf. This group would be the first priority for interventions to address child poverty. Children who live in rural areas and urban villages are four and three times more likely, respectively, than their counterparts in cities to fall under this group.

Another way to present the above percentages is that the likelihood of a child being deprived in at least two dimensions amongst monetarily poor households is 78 percent, while that amongst monetarily non-poor households is also shockingly high at 58 percent. It implies that while an income support approach (either in-kind or cash) to boost household consumption above the PDL can reduce the level of multiple deprivations, it falls far short of eradicating these deprivations. As a matter of fact, still more than half of children will experience multiple deprivations in monetarily non-poor households. It implies that a purely monetary approach is far from sufficient in addressing child poverty. On top of that, an approach specifically addressing the individual deprivations will be needed.

In general, deprived children tend to be in households that are headed by a female, big in size, have at least one member who is HIV positive and/or disabled and live in rural areas whose household head has low educational attainment.

The level of child multiple deprivations is largely driven by the three household level deprivation indicators of Sanitation, Housing and Health. To some extent this result is a statistical artefact, since these dimensions are defined for children of all ages and are household level rather than individual level measures. Nevertheless, they are explicitly mentioned as rights in the CRC, and are themselves instrumental in ensuring children can attain other rights such as health and nutrition, and have the appropriate environment to study and grow.

Deprivations tend to occur together. For example, deprivations in the education, housing and sanitation dimensions overlap to a large extent, and this overlap is felt more intensely by children living in monetarily poor households. In fact, only small percentages of poor children experience one of these dimensions on its own. This suggests a need for comprehensive policy to tackle multidimensional

---

deprivations in those children.

Overall, Northwest, Ghanzi and Central Districts are consistently identified, across all age groups, as the worst districts in terms of multiple deprivations of children as measured by adjusted deprivation headcount rate, which aggregates the prevalence and depth of deprivations. This may provide a basis for geographic targeting for addressing child poverty.

The report concludes that deprivation amongst children is a main source of intergenerational transmission of poverty in Botswana. Children of all ages growing up in monetary poor families are worse off in all aspects of their lives, as measured by single deprivations, than children living in non-poor families.

Child poverty in all its dimensions is part of the Sustainable Development Goals (SDGs) and as such, child poverty estimates from MODA can be used as the national measure to track child poverty over time. The SDG Goal 1.2 explicitly addresses child poverty and countries will be required to define multidimensional child poverty and track its evolution over the next 15 years. This report has constructed child poverty indicators for Botswana based on local conditions and norms which can serve as the SDG baseline for child multidimensional poverty for the country. These indicators could be incorporated into routine reporting from national surveys such as Botswana Core Welfare Indicator Survey as part of Botswana's reporting on Goal 1.2 of the SDGs.

Based on the key findings, the report makes the following recommendations:

- The overall child poverty, both in terms of monetary poverty and multiple deprivations, shall be measured and reported in national poverty reports and SDG monitoring reports;
- The overall child poverty, both in terms of monetary poverty and multiple deprivations, shall be measured, addressed and monitored in key national development plans such as NDP 11 and Vision 2036;
- Individual child deprivations shall be measured, addressed and monitored in relevant sector plans in coordination with other sectors given their overlapping nature;
- Child poverty measures shall be integrated in the targeting of social protection programmes to better address child poverty and the overall poverty in general, given the nature of intergenerational transmission of poverty;
- Specific targeting mechanisms may vary according to locations (rural areas, urban villages and cities) depending on the implications in terms of inclusion and exclusion errors in these locations;
- Social protection programmes that provide in-kind or cash support shall be combined with other elements such as care and counselling to achieve better results for addressing child poverty;
- A geographic targeting focusing on the worst districts namely Northwest, Ghanzi and Central shall be used in addressing child poverty;
- Comprehensive Early Childhood Development shall be promoted nationwide to address child poverty and break the vicious cycle of intergenerational transmission of poverty;

According to the results of the 2009/10 Botswana Core Welfare Indicators Survey, the number of individuals living under the Botswana Poverty Datum Line (PDL) fell from around 31% of the population in 2002/03, to around 21% in 2009/10. While this reduction is significant as an indicator of progress, the challenges of poverty remain severe (Budget Speech 2012).

These include, among others, the 2009 enactment of the Children's Act, the 2008 enactment of the Domestic Violence Act, the development of a National Policy on Orphans and Vulnerable Children, the promotion of the Division of Social Welfare to a Department of Social Services with better resources and coordination to address the needs of vulnerable members of society (including vulnerable children) (Republic of Botswana, 2015).

# 1 INTRODUCTION

---

The Republic of Botswana is a landlocked country in Southern Africa which has come to exemplify one of the few economic success stories in Africa to date. In carrying on this story, it will be necessary for Botswana to address the growing concerns of lingering socioeconomic challenges, which include persistent poverty among its population. The story of poverty in Botswana is complex and multidimensional, with various sub-groups of the population left behind in its path of growth over the last decades despite state policies to ensure equal access to goods and services needed to maintain livelihood. In the process of evaluating policy to address persistent roadblocks in reaching those in need, analysing the situation of children can provide crucial indicators to help better understand the nature of poverty in Botswana – who the poor are, why their poverty persists, and how poverty is intergenerationally transmitted. Botswana’s State Party acceded to the Convention on the Rights of the Child (CRC) in 1995, and numerous other landmark developments supporting the well-being of children have been enacted since then. These developments demonstrate Botswana’s commitment to ensuring the well-being and equality of all children, particularly those who are in the most vulnerable situations, and affirm that the country recognises these as necessary conditions for the continued success of its growth and development.

The children of Botswana carry the heavy duty of being the future individuals who will sustain the social, economic and political successes of the country. Children born in 2014 will be entering Botswana’s labour force as early as 2030. Ensuring that these children are able to contribute to Botswana’s growth path, as well as its ambitions for poverty reduction to graduate from its upper-middle income status, means making important investments today in human capital development. The development of high quality human capital relies on creating the best possible circumstances for children to develop into healthy, productive, and balanced adults. While a wide array of research has confirmed that investments in children are of high value and high returns which are experienced all across society, these investments are especially crucial to be made as early as possible in a child’s life cycle. Any circumstances which inhibit a child’s ability to fully realise its capabilities and functionings are especially dire in the child’s earliest stages of its life, as many such deficiencies can often not be regained or reversed as the child grows older.

The results of the Multiple Overlapping Deprivation Analysis of children in Botswana provides both broad and specific insights into the situation of children in Botswana - it reveals not only which dimensions of well-being children are deprived in, but also how these deprivations might be interrelated (overlap), and how to identify the deprived children. Furthermore, the analysis crucially reveals how overall poverty reduction in Botswana will not solely rely on the reduction of monetary poverty – especially in the case of children – as children living in households that are monetarily poor may not be the same children who are affected by the analysed deprivations. Policies addressing the needs of children therefore require a distinct sensitivity to understanding how ‘poverty’ manifests itself among the children in Botswana, and how ‘deprivation’ of access to necessary goods and services add a critical level of complexity to Botswana’s story of poverty. Understanding the ways in which progress on children in Botswana has been positive, and where there remains room for improvement, can help determine what kind of policy interventions for children’s well-being will bear the most fruit.

Despite leaps in progress across various social sectors in Botswana, issues such as high rates of under-5 mortality, stunting, low birth-weight, and children affected by HIV (directly or living with an affected caretaker) have been of persistent concern. Especially in the earliest months of a child’s life, any deficiencies in areas of nutrition and health mean that the child misses a crucial window of opportunity for the development of their human capital potential. The analysis finds that, for example, among the youngest age group (children age 0-4 years), the highest incidence of deprivation occurs in the nutrition, health, and housing dimensions, with more than one third of children considered undernourished. For an upper-middle-income country like Botswana, such high rates of inadequate nutrition and stunting are difficult to justify. While Botswana’s National Nutrition Strategy addresses adult obesity, plans for monitoring and management of infant nutrition (specifically obesity) is not extended to children<sup>29</sup>. Furthermore, almost half of the children do not have access to quality healthcare facilities, and more than half of the children living in housing which is either overcrowded or lighted with solid fuels. Strategies addressing child health (both access to facilities and minimising exposure to environmental health risks), including under-5 malnutrition, should be coordinated, multi-sectoral efforts which comprehensively

(Sen & Nussbaum, 1993)

A young child who is exposed to health risks in unsanitary living conditions, unsafe water, and inadequate feeding may incur severe effects on its physical and mental development. As the child enters school-age, he/she may already be at a disadvantage in his/her ability to learn and retain information, and these factors could intersect with further disadvantages the child will face in other areas of life as he/she grows older and eventually enters the workforce.

Analysis is based on the data from the Botswana Core Welfare Indicator Survey (BCWIS) 2009/10

## 1 INTRODUCTION

---

address all factors associated with these issues and their potential consequences (mortality among them)<sup>29</sup>. These strategies should also recognise the prevalence of malnutrition among older children, identify whether these are issues of access or information, and address them accordingly. The same recommendations apply to children of older age groups. While the youngest children tend to be the most deprived across all dimensions in comparison to the other two analysed age groups, children 5-12 years old, for example, are also found to be highly deprived in all analysed dimensions, including the health, housing and sanitation dimensions. Although most of Botswana's child-centred nutritional policies tend to have a focus on children under five, the analysis reveals that 16% of children age 5-12 years old are also deprived in terms of their body mass index. Deprivations among all children are more severely experienced in rural areas and villages. Sensitive to the fact that deprivations in different dimensions have intersectional effects (e.g. nutritional and educational outcomes intersect with the environmental health risks posed by access to unimproved water, housing and sanitation facilities), the degree of overlap between deprivation rates in single sectors is also worthy of attention. For example, there is a 31% overlap of children age 13-17 who are deprived in the education, housing, and sanitation dimensions at the same time – this points to a severe incidence of deprivation intensity, and that eliminating any one deprivation of these children will not sufficiently change the story of poverty for that child. As the analysis reveals which deprivations tend to coincide most frequently, we come to find that policies addressing children's deprivations which tend to occur together need to be targeted with coordinated, simultaneous, multi-sectoral policy efforts.

Given the wide geographical dispersion of Botswana's population, with certain pockets of the population in peculiar settings (such as towns built around the diamond mining industry), regional differences in terms of children's deprivations are prevalent. Although regional distinctions between sub-groups of children and their incidence of deprivation can further guide targeting efforts, above average deprivation rates are found in most districts for all three age groups. The districts which are most 'lagging' for children of the entire age range (0-17 years) are Kgalagadi North, Kgalagadi South, Ghanzi, Ngamiland West, Ngamiland East, Kweneng West, Ngwaketse West and Barolong . Children in these districts are likely to be deprived in at least one dimension throughout their entire childhood. However, targeting policies on a geographic basis should also be sensitive to the particular deprivations which are the most severe in these districts, and which age groups are the most highly deprived. For example, Orapa does not comparatively lag behind other districts when looking at deprivation incidence among children 5-17 years old; however, all children age 0-4 years old in Orapa qualify as deprived in the nutrition dimension, suggesting a targeted nutrition policy might be most effective in such a case.

In the context of Botswana's impressive rates of monetary poverty reduction over the past decade , it would be important to understand how improvements in household wealth have yielded positive outcomes for child well-being. The distinction between monetary poverty and deprivation is particularly relevant for children, and has justified the development of child-sensitive methods for multidimensional poverty analysis. At the centre of this distinction lies the fact that children are usually not in control of the ways in which household income is spent; especially at the youngest ages are they even capable of making decisions at all, least of all decisions which are in their best interest. Changes in household income therefore do not necessarily translate into changes (improvements) in well-being for the child. Furthermore, a household's monetary poverty status may not be meaningful for determining child well-being, if the necessary services (e.g. school, quality health facilities) are not accessible by the household regardless of their income. This is especially revealed by analysis results at the national level, which find that although 26% of children age 0-17 years are living in monetarily poor households , more than half of children age 0-17 years (63%) are deprived in at least two dimensions of well-being at a time, and around one in three children are deprived in at least three dimensions at a time. More than 25% of children in each analysed age group who are not considered monetarily poor, but are considered deprived.

Not only does this demonstrate the incidence at which children are school, compared likely to be deprived at the national level, but these figures emphasise that these same children experience a severe intensity of deprivations. This multiplicity of deprivations is especially more prevalent among children in rural areas. It is therefore important to recognise that monetary poverty measurement alone is not an effective measure, and that a multidimensional measure, which further profiles sub-groups of children, will provide a more holistically informative perspective for assessing children's well-being in Botswana.

<sup>29</sup> Measured as a weight-to-age ration which is lower than 2 standard deviations from the national median. See Section 7 for more details



## 1 INTRODUCTION

---

The development of human capital in Botswana relies on investments in children's well-being, yet deprivations among children are the main source of intergenerational transmission of poverty in Botswana. The persistence of poverty over several generations is of dire concern, given that systematic efforts to disturb the structural conditions which keep people in the cycle of poverty must be disturbed in order for returns from investments in children to ripple through society. Children of all age groups who are living in monetarily poor families tend to have higher rates of deprivations across all analysed dimensions. More than a quarter of children age 5-12 who are poor are not attending school, compared to their non-poor peers, and more than half of children age 13-17 can be similarly described. These children will be at a severe disadvantage when they enter the labour market, and when they begin interacting with other factors of life which determine their opportunities and household economic outcomes. They will be more likely to pass on these disadvantages to their own children, perpetuating the intergenerational cycle of poverty. While the paper reveals how monetary poverty is not the only determinant of children's deprivations, it needs to be addressed in combination with other sectoral policies to disturb the reproduction of inequality and poverty over multiple deprivations. Most importantly, equity needs to be extended to all children from the very start of their lives, regardless of any of their potentially disadvantageous background characteristics. This can be instituted through inclusive systems, such as Early Childhood Education centres.

In the interest of writing a narrative for Botswana's future which will remain consistent with the country's astounding record of political stability, transformative economic achievements, and progressive society, focus must be placed in those who will be driving this progress – its children. Botswana's population of just over 2 million people is generally young – in 2011, around 40% of the total were under 18 years old. In line with other developing countries, Botswana thereby has the potential to highly benefit from gains to accelerated economic growth from a demographic dividend. Exploiting the economic advantages of such a demographic dividend, however, implies the need to implement "appropriate policies" which provide children equal opportunity and access to quality education, nutrition, health, reproductive health, and minimised exposure to external risk factors.

Following this introduction, this report is structured along nine further sections which aim to explicate the multidimensional nature of children's poverty and deprivations in Botswana. Each section on analysis results is organised by the three age groups at the centre of the study: children age 0-4 years; 5-12 years; and 13-17 years.

These sections are outlined as follows:

### **2. MODA Applicability and Scope**

What is MODA (Multiple Overlapping Deprivation Analysis), and how is it a suitable methodology for analysing the situation of child poverty and deprivation in Botswana?

### **3. Most Common Deprivations**

An overview of the most common deprivations experienced among all children in Botswana.

### **4. Access and Outcome Dimensions: How do they relate?**

Insights into the way in which dimensions which are more relevant to children's access to services, and those which are more indicative of children's actual outcomes of well-being, relate to each other or overlap.

### **5. Links Between Deprivations in Different Dimensions**

Details on the multidimensional nature of children's deprivations in Botswana, and consequent implications on policy.

### **6. Breaking and Connecting Dimensions**

A more in-depth analysis on the relationship between children's deprivations in different dimension, including how links between deprivations differ depending on the monetary poverty status of the child.

According to the results of the 2009/10 Botswana Core Welfare Indicators Survey, the number of individuals living under the Botswana Poverty Datum Line (PDL) fell from around 31% of the population in 2002/03, to around 21% in 2009/10. While this reduction is significant as an indicator of progress, the challenges of poverty remain severe (Budget Speech 2012).

Status of monetary poverty as determined by the PDL.

## 1 INTRODUCTION

---

### 7. Regional Disparities in Deprivations

Insight into how deprivations among children differ according to where they live, and what the most “lagging” districts are.

### 8. Monetary Poverty versus Deprivations as Measures of Child Well-Being

Single-sector and multi-sectoral analyses of children’s deprivations in Botswana help understand the situation of deprivation incidence and intensity for effective targeting. Additional analysis on how monetary poverty fits into this understanding of children’s poverty helps refine these targeting measures.

### 9. Monetary Poverty and Deprivations Overlapping

To what extent are children who are living in monetarily poor households the same groups of children who are considered to be deprived, given a certain threshold of deprivation intensity? To what extent are they not the same children?

### 10. Deprivations and Intergenerational Transmission of Poverty in Botswana

What does the status of children’s deprivation, as well as their status of monetary poverty, mean for the likelihood that their poverty will be transmitted over multiple generations? What are possible systems or investments that can be made which could help to reduce or eliminate multiple deprivations at the same time, to eliminate the possibility of intergenerational poverty transmission?

## 2 MODA APPLICABILITY AND SCOPE

This paper uses the Multiple Overlapping Deprivation Analysis (MODA) methodology to measure multidimensional deprivation among children in Botswana, i.e. those aged 0 -17 years. The Multiple Overlapping Deprivation Analysis (MODA) provides a comprehensive approach to the multidimensional aspects of (child) poverty and deprivation. While using the MODA methodology, the term poverty is being used when referring to children’s well-being gauged by access to financial resources. On the other hand, deprivation refers to child well-being determined by non-monetary indicators. If access to some of these indicators can be secured by access to financial resources, this is not always the case. For instance, access to quality education is essential in a child’s development; if the costs associated with sending the child to school can be borne by the household but that schools are not found within a reasonable distance from that household, the child is deprived in education even if he/ she is not necessarily monetarily poor. MODA intends to analyze child deprivation by identifying deprived children from a multidimensional, according to selected dimensions of child well-being, perspective.

The MODA methodology is designed to be used in a specific country setting using recent and high quality survey data, even though a special application of the methodology has been used to produce results comparable across countries . 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 that is most relevant to the country context on the extent and characteristics of child deprivations and the profiles of the children suffering from deprivations in a particular country.

See UNICEF Botswana Statistics. Available at [http://www.unicef.org/infobycountry/botswana\\_statistics.html](http://www.unicef.org/infobycountry/botswana_statistics.html) (Statistics Botswana, 2011)

## 2 MODA APPLICABILITY AND SCOPE

---

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; 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.

The authors would like to thank the representatives of UNICEF Botswana for their support, useful comments and suggestions and broader collaboration throughout the research exercise. As mentioned above, the National MODA (N-MODA) aims at producing results of particular relevance to the country being studied. Therefore, the authors would like to acknowledge the valuable contribution of its local partners from the Office of the President, Statistics Botswana, the University of Botswana, and their local partner, the Botswana Institute for Development Policy Analysis (BIDPA), as well as all the participants from the different meetings and workshops, for ensuring this study was sensitive to national values and objectives concerning the development of children in Botswana

### 2.1 INDICATOR AND DIMENSION SELECTION

The analysis of multiple and overlapping deprivations is based on indicators, dimensions, deprivation thresholds, and age groups, which were selected following data-driven feasibility assessments, discourse with national partners, and consideration of internationally-agreed definitions of the essential rights and needs of the child. The final selection reflects the opinions of the key country stakeholders, national standards, research interests and data availability. For Botswana, the dimensions, indicators, and thresholds were chosen by local stakeholders and finalised during a workshop hosted by BIDPA. For each age group, dimensions, indicators and thresholds are detailed in the annex (Table 13).

Children in a particular age group are assessed on the basis of a deprivation threshold for each indicators making up a set of dimensions. In each dimension, a combination of indicators and respective their thresholds determine the level of deprivation of the child in that dimension. By the union approach, children are determined to be deprived in a dimension if they are deprived in at least one of the dimensions' indicators.

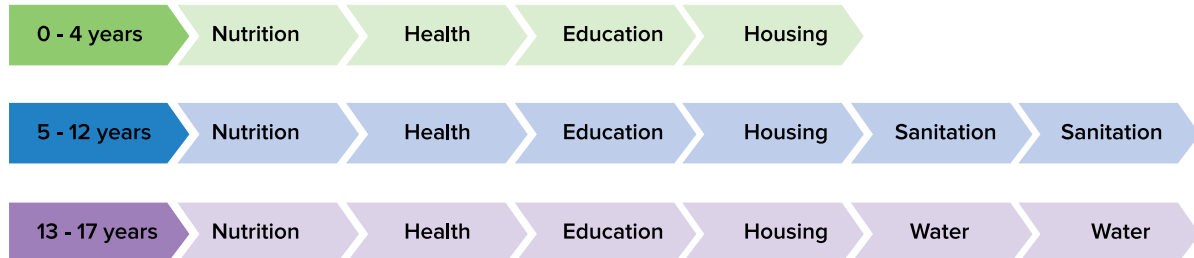
Some dimensions may not apply to the entire child population for reasons including empirical consistency and data constraints. For instance, the Education dimension only covers school-aged children (ages 6-17), while the Sanitation dimension only covered children to which the constituting indicator, and therefore the dimension, was applicable to (i.e. children aged 5-17 years). The dimensions Health, Water and Housing are based on household-unit data and therefore apply to all age groups. Figure 1 below illustrates the dimensions used in carrying out the N-MODA analysis for children in Botswana. For children of the first age group (those aged 0-4 years), four dimensions were selected while six dimensions were used for the children constituting the two other age groups. Differences between the dimensions used include the addition of the Health and Sanitation dimensions for the age groups 2 and 3. While the two age groups might share some dimensions (e.g. Nutrition), their deprivation in these dimensions is measured differently, using different sets of indicators depending on their age (See Table 13 for more details).

See MODA web portal for cross-country MODA (CC-MODA) results:  
[http://www.devinfolive.info/ccmoda/index.php/pages/about\\_moda](http://www.devinfolive.info/ccmoda/index.php/pages/about_moda)

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.

## 2 MODA APPLICABILITY AND SCOPE

Figure 1 Selected dimensions by age group

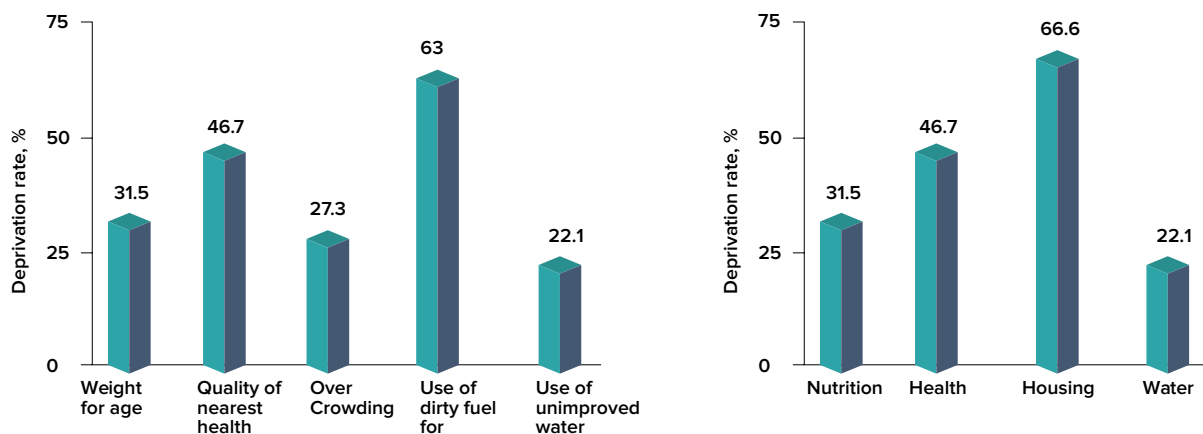


## 3 MOST COMMON DEPRIVATIONS

### 3.1 CHILDREN AGED 0 – 4 YEARS

For the youngest age group assessed (age 0 – 4 years) the three most severe dimensions are nutrition, health and housing conditions (Figure 2). With a headcount of 31.5% for the first dimension, almost one out of three children has a weight-to-age ratio lower than 2 standard deviations from the median value of the reference population. The use of the weight-to-age indicator shows how being underfed is a serious problem within the age group. The scope of this deprivation is however not temporary or limited to children up to 4 years old. The nutrition deprivation during that crucial life phase is determinative since any lag in development and growth tends to have lasting effects and in the worst case scenario, be permanent. The health dimension is measured by the “quality of the nearest health facility” indicator and shows how nearly half of the children (46.7%) between 0 and 4 years old are deprived of access to qualitative health facilities.

Figure 2 Deprivation headcount by indicator and by dimension, children aged 0-4 years

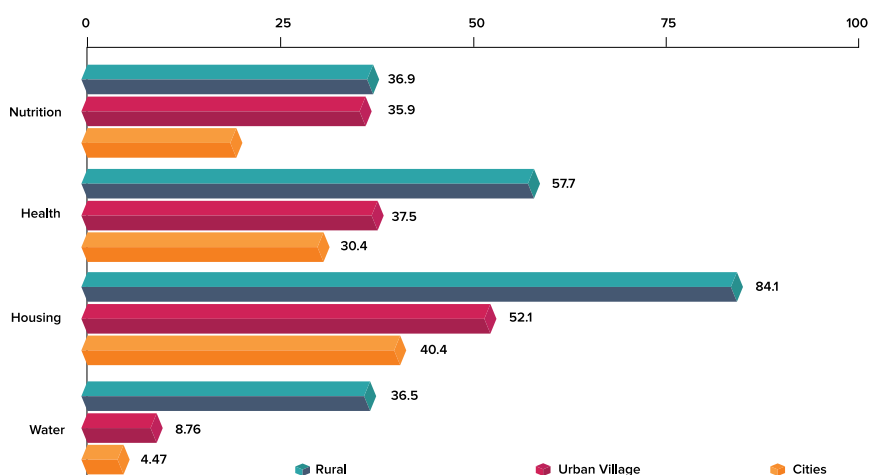


### 3 MOST COMMON DEPRIVATIONS

The dimension that hits most of the children of this group (per headcount) is an unsatisfying housing condition. Composed out of the indicators “use of dirty fuel for lighting” and “overcrowding” indicators, the housing analysis shows how two out of three (66.6%) children have to deal with an inadequate state of housing and are accordingly considered deprived of sufficient housing conditions. Most of the children faced with poor housing conditions, are exposed to hazardous and dirty fuels for lighting (headcount of 63% of total amount of children within the group) as shown in the figure above.

Above-mentioned conclusions hold for the age group in general. There are however notable differences in the degree of deprivations depending on the (geographical) profile of the children. Regarding the three deprivations, children tend to be overall worst off in rural areas. In cities the deprivation rates show a large improvement vis-à-vis the rural areas. However, that does not take the city-areas off the hook for further improvement but the situation is less pressing. The deprivation state of urban villages is ranked between rural areas and cities. Whether the deprivation situation approximates those of the cities or rural areas, depends on the dimension.

**Figure 3 Deprivation headcount by dimension and area, children aged 0-4 years**



We see how housing deprivation has the highest headcount in all areas (Figure 3). With a headcount of 84.1%, few children in rural areas are non-deprived for the housing dimension. This headcount drops to 40.4% in cities, which still amounts to a too high number of children. In urban villages nearly half of the children (52.1%) have to deal with poor housing.

The stringency of the other dimensions depends on the living area. For rural children we conclude that next to housing, a large share of children are deprived of health (57.7%) and nutrition (36.9%), but closely followed by water deprivation (36.5%). For urban village children, the situation for housing (52.1% deprivation) and health (37.5%) improves considerably, although still ranked as the first and second threat to optimal development. With regards to nutrition, the situation is not substantially better for urban village children than for rural children (35.9% in urban villages and 36.9% in rural regions). That finding suggests that the problem of nutrition in Botswana among children age 0-4 is one that is geographically pervasive throughout the country and not related to a geographical determinant. The most severe health, housing and water conditions (in terms of high headcount) however are foremost a rural problem.

Cities have the tendency to offer the youngest children the best development chances, more than rural areas and urban villages

The WHO Child Growth Standards, launched on April 2006, is used for reference in calculating nutrition indicators. The WHO Child Growth Standards replace the NCHS/WHO international reference for the analysis of nutritional surveys. See <http://www.who.int/nutgrowthdb/about/en/>

### 3 MOST COMMON DEPRIVATIONS

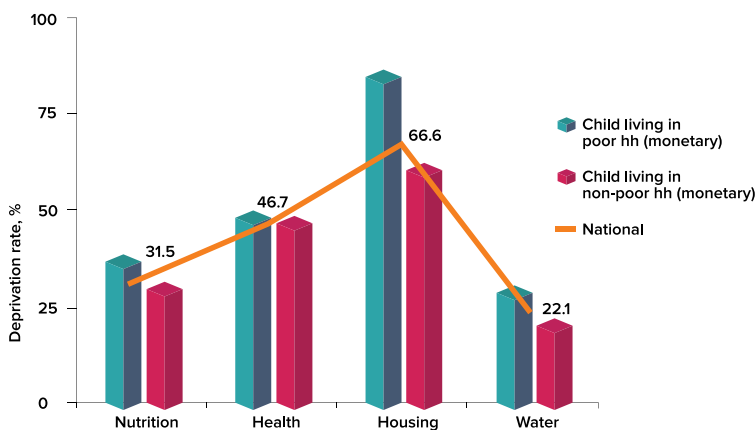
do. Housing deprivation is considerably less present in cities but still affects 40.4% of the children. In the city housing deprivation is followed by health (30.4%) and nutrition deprivation (19.2%).

In general deprivations and their relative importance are similar for rural, urban village and city children, age 0 – 4 years, with housing deprivation as the ubiquitous ‘leading’ deprivation. The global situation shown in Figure 1, however, somewhat hides how water deprivation should be still a serious concern in rural areas but less so in the other two geographical areas.

The collected data allows us to analyze the deprivations in relation to household’s characteristics. Deprivation in the housing and health dimensions significantly increases with the increase in household size, with those living in households of two to three members being the least deprived. However, deprivation in the nutrition dimension seems to significantly decrease with every additional member of the household and with children living in households of two members being the most deprived in nutrition. The gender of the household head also matters for differences between children in the health, housing and nutrition dimensions, with children living in male-headed households being slightly more likely to be deprived in the health dimension (1 percentage point difference), and children living in female-headed households being much more likely to be deprived in the housing dimension (8.6 percentage point difference) and modestly more deprived of nutrition (33.1% for households with a female head versus 29.2% with a male head). Children living in households with at least one member who is HIV positive are significantly more likely to be deprived in the housing dimension than children not living in a household with a member who is HIV positive.

Using monetary poverty of the household as an indication for the deprivation rate is useful for some dimensions but is not without flaws. Children living in monetarily poor households are significantly more likely to be deprived in the nutrition, housing, and water dimensions (Figure 4). No significant differences are found for children deprived in health between those living in monetarily poor or non-poor households, suggesting that health is a problem that goes beyond monetary poverty and several other commonly analyzed distinguishing background characteristics of children. Recommendations for targeting children with deprivation age 0-4 years would include addressing the problem of child health at the national level, addressing deprivation in all dimensions with a focus on children living in rural areas and urban villages.

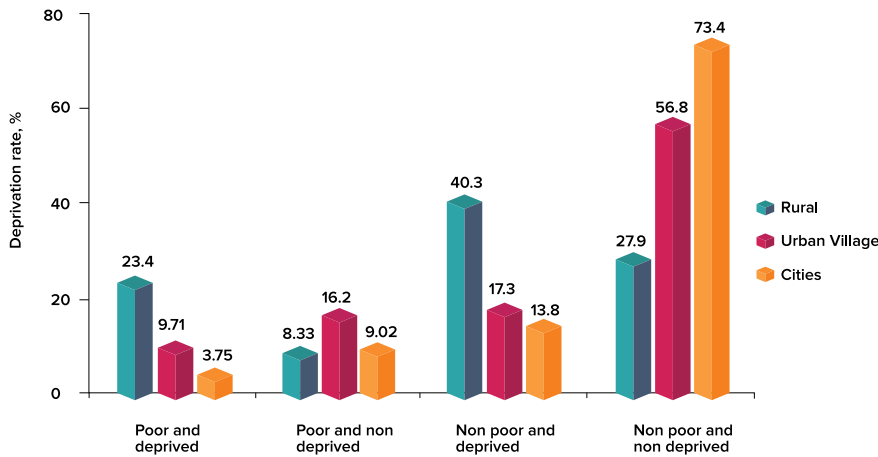
**Figure 4 Deprivation headcount by dimensions and household’s monetary poverty status, children aged 0-4 years**



On the other hand, if we break down the relationship between monetary poverty and multidimensional deprivation into the type of residence, we see how 40.3% of the children in rural areas are not considered (monetary) poor but still are deprived in at least 2 dimensions (Figure 5). The discrepancy between monetary poverty and deprivation (i.e. non poor and deprived) diminishes when children grow up in an urban village of the city, but continues to be of importance.

### 3 MOST COMMON DEPRIVATIONS

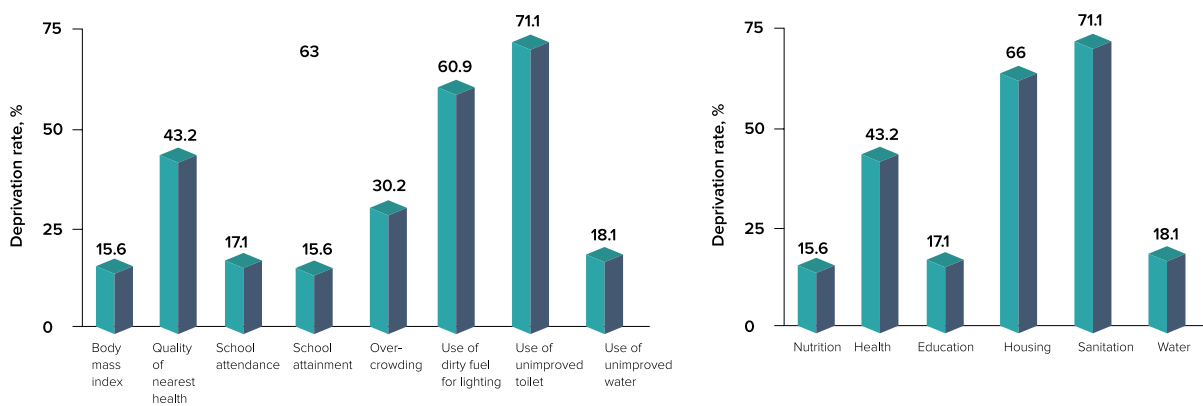
Figure 5 Poverty and multidimensional deprivation (K=2) overlap by area, children aged 0-4 years



### 3.2 CHILDREN AGED 5 – 12 YEARS

For children aged 5-12 years, the three most common deprivations faced are in the health (43.2%), housing (66%), and sanitation (71.1%) dimensions (Figure 6). Similar to the youngest age group, deprivation in the health dimension is entirely driven by deprivation in the “quality of the nearest health facility” indicator. Deprivation in the housing dimension is driven mainly by the “use of dirty fuel for lighting” indicator. With nearly two out of every three children deprived in the housing dimension the two age groups (age 0 - 4 and age 5 - 12) are very similar. Deprivation in the sanitation dimension is entirely driven by the use of the “unimproved toilet facility” indicator, with nearly five out of every seven children deprived. The high deprivation rates in these three dimensions are a certain cause for concern. Although deprivation rates are lower for the nutrition, education, and water dimensions, they still hover around one in every six children being deprived in areas which are crucial at this stage of their life cycle.

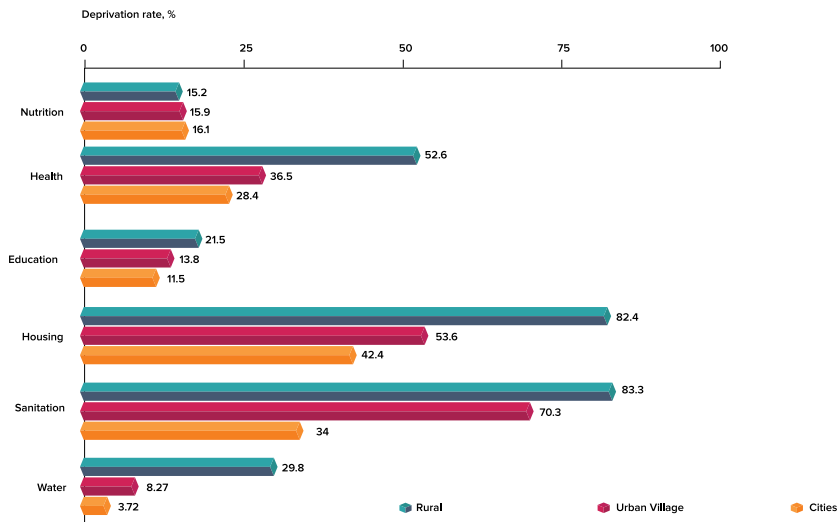
Figure 6 Deprivation headcount by indicator and by dimension, children aged 5-12 years



### 3 MOST COMMON DEPRIVATIONS

Again we can distinguish differences related to the geographical area (rural, urban village or city) the child is raised in. Overall the tendency is comparable to the findings for the youngest age group. Children living in rural areas are significantly most highly deprived in all dimensions except the nutrition dimension (Figure 7) followed by children living in urban villages. Children living in cities are the least deprived. This suggests the need for policies addressing children’s deprivations taking into account their geographical location. Similar to the youngest age group, there are no significant differences between children deprived in nutrition and living in different geographical locations, suggesting nutrition is again a pervasive issue throughout the population. However, nutrition, along with all other dimensions, show significant differences when profiling children by their region.

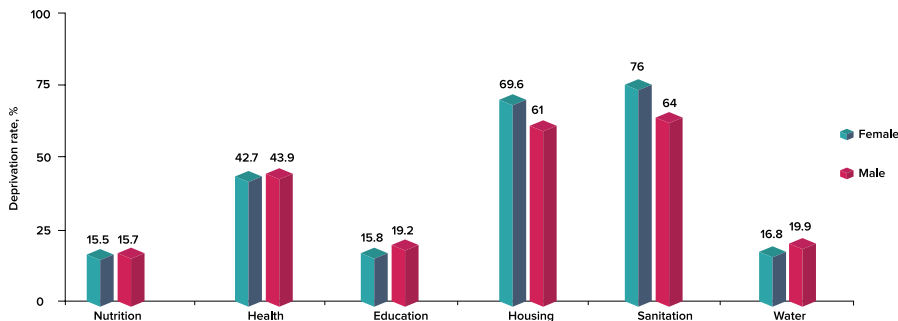
Figure 7 Deprivation headcount by dimension and area, children age 5-12 years



Further profiling children by their household characteristics shows the following findings:

Children living in female-headed households are significantly more likely to be deprived in housing and sanitation dimensions, whereas children living in male-headed households are significantly more likely to be deprived in the education and water dimensions (Figure 8).

Figure 8 Deprivation headcount by dimension and household’s head gender, children aged 5-12 years



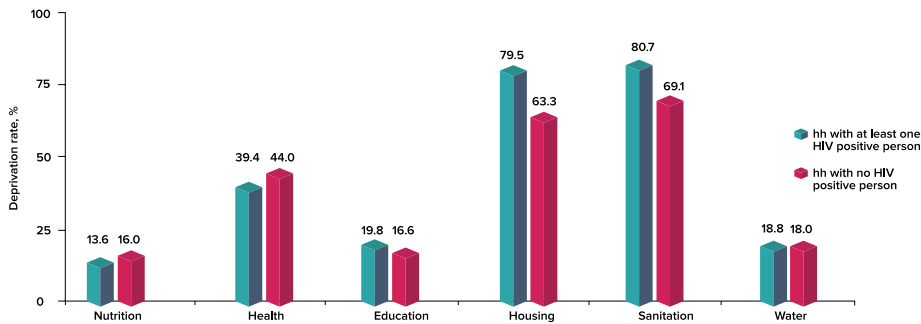


### 3 MOST COMMON DEPRIVATIONS

The influence of the household size for children aged 5 – 12 years does not differ greatly from the youngest group. Generally, deprivation rates tend to increase together with the increase of number of household members. Only for the nutrition dimension the influence of household size is less distinct, as it also is the case for the youngest age group.

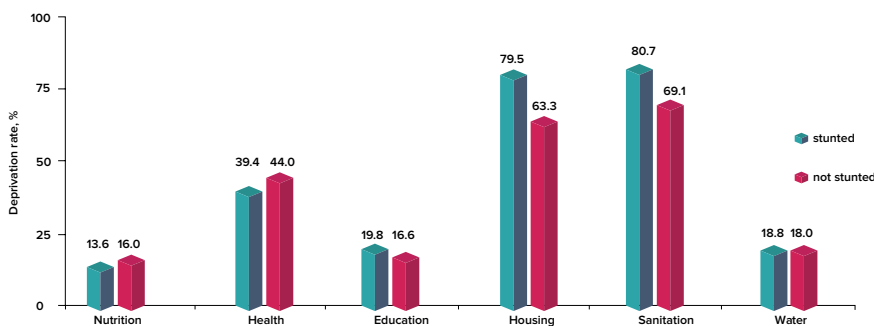
The presence of a household member who is HIV positive means that children aged 5-12 years are significantly more likely to be deprived in housing and sanitation dimensions. However, deprivations for the health dimension are lower for children living in a household with at least one HIV positive person; the differences in deprivations for the health dimension are statistically significant when children are categorized using this profiling variable (Figure 9).

**Figure 9 Deprivation headcount by dimension and household having/ not a HIV positive member, children aged 5-12 years**



Profiling children by their stunting status does not appear to make a difference between children deprived in any of the analyzed dimensions except for the education dimension. Here children are slightly more likely to be deprived in education if they are stunted. Stunting severely inhibits a child’s ability to learn and succeed in school, and is the likely product of a combination of deprivations. (Figure 10)

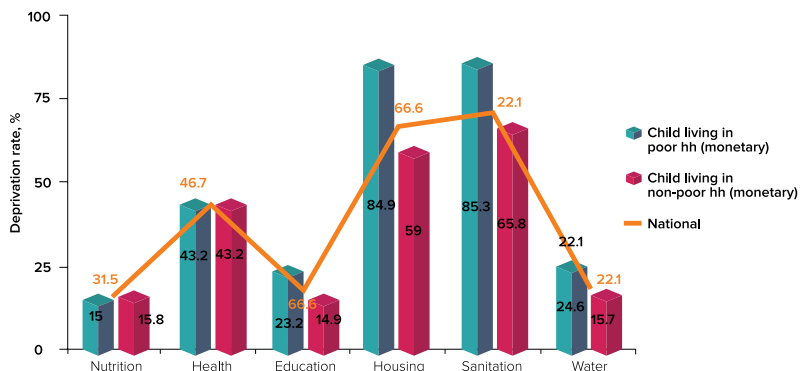
**Figure 10 Deprivation headcount by dimension and nutrition, children aged 5-12 years**



Similar to the previous age group, children living in monetarily poor households are more likely to be deprived in all dimensions except for health (Figure 11). Also nutrition does not seem to be under high influence of the poverty status as the difference between deprivation for the poor and non-poor is not statistically significant.

### 3 MOST COMMON DEPRIVATIONS

Figure 11 Deprivation headcount by dimension and household's monetary poverty status, children aged 5-12 years



### 3.3 CHILDREN AGED 13 – 17 YEARS

The three most common deprivations among children aged 13-17 years are in the housing (58.6%), education (48.4%), and sanitation dimensions (67.1%) (Figure 12). The headcount numbers are very similar to those for the younger groups.

Figure 12 Deprivation headcount by indicator and by dimension, children age 13-17 years

The same indicators are used for almost every dimension (only literacy is added as an indicator for education) and the importance of many deprivations does not change considerably when children grow older. The analysis illustrates nonetheless how education deprivation becomes more stringent once children pass the age of 12. Whereas it affected about one out of six children between 5 and 12 years old, education deprivation affects almost half of the age 13 – 17 population. As Figure 12 points out, the high education deprivation number is mostly due to poor school attainment. The high headcount for that indicator suggests that nearly half of children of this age group have not attained the expected level of education for their current age.

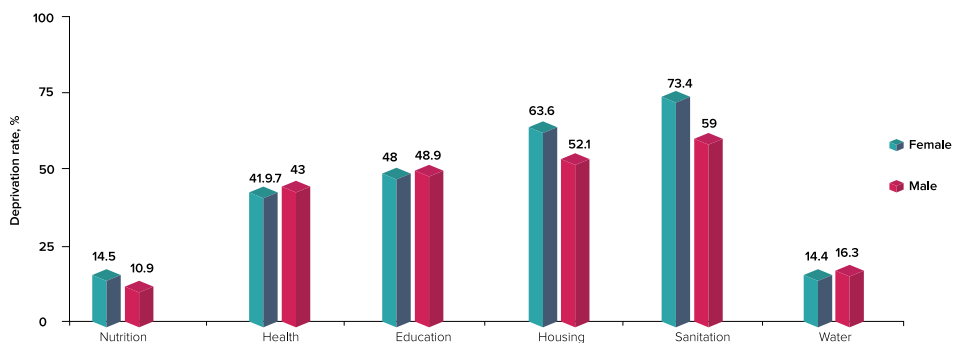
Once again the same tendency can be found when we compare children growing up in a rural environment, in an urban village and those growing up in a city (Figure 13). For all dimensions chances for children are especially restricted in rural areas. In general, in urban villages children tend to be better off but their chances are still inferior to those of children raised in cities. For all but nutrition the differences are very distinct.

### 3 MOST COMMON DEPRIVATIONS

Figure 13 Deprivation headcount by dimension and area, children aged 13-17 years

When taking into account other characteristics of the children and their households we can come to additional conclusions. Like it is also the case with the younger group, female headed households have the tendency to exhibit higher housing and sanitation deprivations. For the first time we also see how a female as head increases nutrition deprivation numbers for this oldest age group. But unlike the younger group the influence of the gender of the household head on the deprivation rates of water and education is not as clear.

Figure 14 Deprivation headcount by dimension and household's head gender, children aged 13-17 years



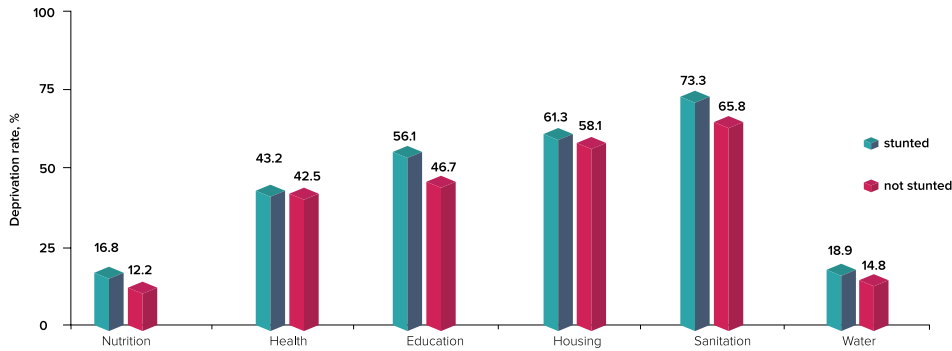
The household size has globally still the same effect on deprivation rates, i.e. larger households mean higher deprivation rates. This conclusion still holds for this oldest group. This tendency however only is pronounced from 5 or more members. Until 4 members the influence of the household size on deprivation rates is less evident.

When taking into the account the presence of an HIV positive person in the household we see an increase in education (47% to 56.4%), housing (55.1% to 78.4%) and sanitation (64.5% to 82.1%) deprivation. Health deprivation decreases slightly when at least one HIV positive person is part of the household (43% to 39.2%).

Stunted children between the age of 13 and 17 are more likely to be deprived in nutrition, education, and sanitation (Figure 15). For other dimensions the correlation is also positive but less distinct.

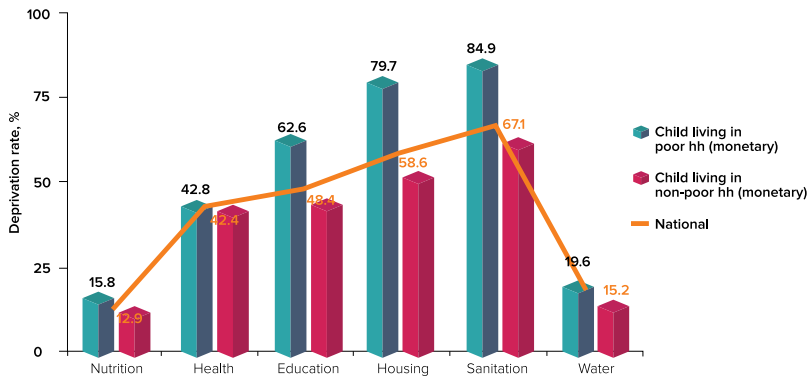
### 3 MOST COMMON DEPRIVATIONS

Figure 15 Deprivation headcount by dimension and nutrition, children aged 13-17 years



The influence of monetary poverty on the deprivation rate seems to be fairly invariable over the different age groups. Children living in monetarily poor households are more likely to be deprived in all dimensions except for health (Figure 16). In comparison with the younger group, nutrition deprivation for children between 13 and 17 years old reacts slightly more to monetary poverty. Together with the growing concern over education deprivation for this age group, monetary poverty happens to be more influential for this kind of deprivations next to the lasting and severe influence on housing and sanitation.

Figure 16 Deprivation headcount by dimension and household's monetary poverty status, children aged 13-17 years



In general and for all children it holds that housing is a serious threat for prosperous development from the moment a child is born until it reaches adulthood. From the moment they reach the age of 5 years, the sanitation deprivation poses an additional but not less serious threat. The relative importance of other deprivation dimensions depend upon the age group considered. The importance of education for development increases together with the age of the child. Unfortunately we see from the results how the deprivation from education increases when the child grows older.

Where dimensions, like health, sanitation, housing, and water focus on the child's access to services and instruments crucial to their well-being, other dimensions like education and nutrition are more linked to the child's outcome. Access dimensions such as the above contribute to outcome dimensions in that they form the environment and conditions in which a child's successful achievement of outcome (such as in educational attainment or nutrition status) might be assessed. A child's access to safe water and quality health services are crucial to his/her ability to stay and succeed in school. Given the way in which these different dimensions are interrelated, the analysis further seeks to reveal the ways in which deprivations in these dimensions overlap.

# 4 ACCESS AND OUTCOMES DIMENSIONS. HOW DO THEY RELATE?

Where dimensions, like health, sanitation, housing, and water focus on the child’s access to services and instruments crucial to their well-being, other dimensions like education and nutrition are more linked to the child’s outcome. Access dimensions such as the above contribute to outcome dimensions in that they form the environment and conditions in which a child’s successful achievement of outcome (such as in educational attainment or nutrition status) might be assessed. A child’s access to safe water and quality health services are crucial to his/her ability to stay and succeed in school. Given the way in which these different dimensions are interrelated, the analysis further seeks to reveal the ways in which deprivations in these dimensions overlap.

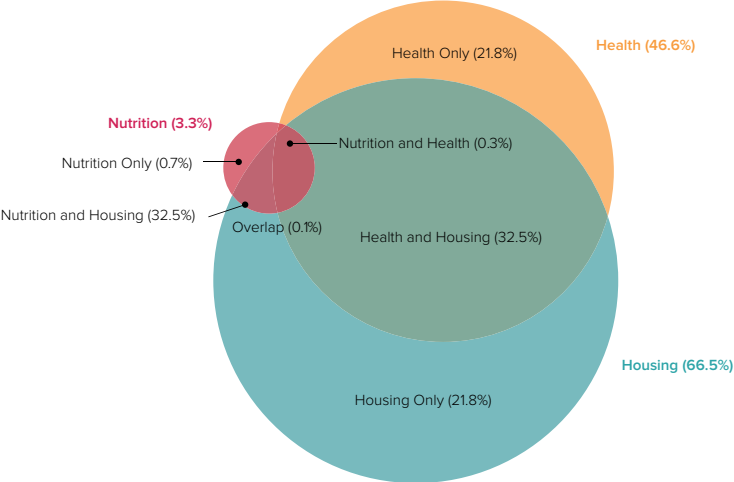
## 4.1 CHILDREN AGED 0-4 YEARS

For children aged 0 to 4 years in Botswana, the Venn diagram below illustrates the three-way overlaps between health, housing (access dimensions) and nutrition (outcome dimensions) dimensions. It can be seen in Figure 17 that deprivations in the nutrition dimension, to a larger extent, occur simultaneously with deprivations in health and housing. In fact, if 3.3% of the children of this age group are deprived in nutrition, 0.7% of them are deprived only for that dimension.

The larger access/ outcome dimensions overlap, in this case, occurs for the nutrition and housing dimensions as illustrated below.

**Figure 17 Three-way overlapping for Nutrition, Health and Housing dimensions, children aged 0-4 years**

**Non - Deprived (19.7%)**



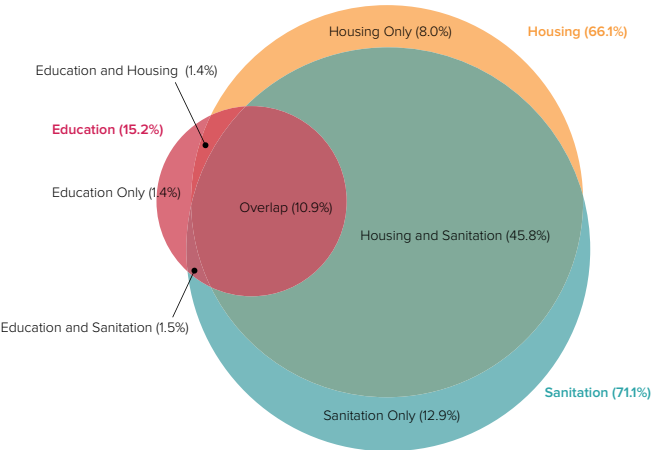
## 4.2 CHILDREN AGED 5-12 YEARS

In the Figure 18 below, for children age 5-12 years, the overlap between the headcount ratio of children deprived in housing, sanitation, and education is 11%. Whereas the overlap between education and housing only, or education and sanitation only, is rather small, the overlap between all three deprivations shows that around one in every ten children aged 5-12 years are deprived in sanitation, housing, and education at the same time. However, it is interesting to note that deprivations in education (the outcome dimension) occurs simultaneously with deprivation in at least one of the two other access dimension (housing and sanitation). In fact, if 15.2% of children aged 5-12 years are deprived in education, only 1.4% of the age group is deprived only for this dimension (for this selected combination of three dimensions).

**4 ACCESS AND OUTCOMES DIMENSIONS. HOW DO THEY RELATE?**

**Figure 18 Three-way overlapping for Education, Housing and Sanitation dimensions, children aged 5-12 years**

**Non - Deprived (18.2%)**

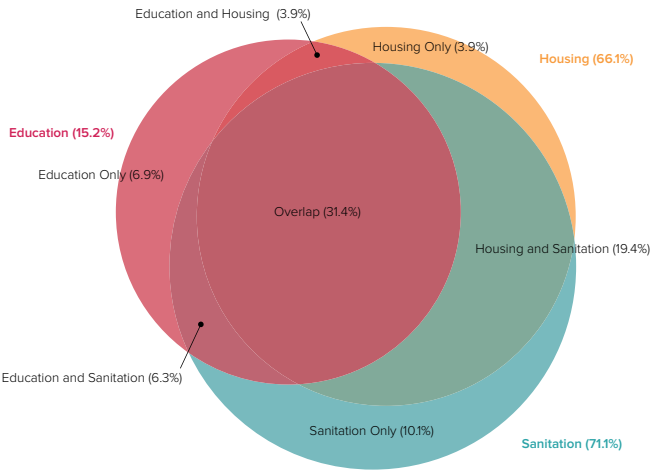


**4.3 CHILDREN AGED 13-17 YEARS**

For the third age group, deprivations in the outcome dimension (education) are seen to be higher, in terms of headcount. However, similar to the previous age group, most of the children deprived in education are also deprived in at least one of the two other selected access dimensions (housing and sanitation), with 6.9% deprived in education only (compared to a 48.5% deprivation rate for education) 15.

**Figure 19 Three-way overlapping for Education, Housing and Sanitation dimensions, children aged 13-17 years**

**Non - Deprived (18.2%)**



Differences in deprivation headcounts, by dimension, depending on the type of analysis (simple, overlapping or multiple deprivation analyses) are explained in subsection 12.4, as an annex to the main text.

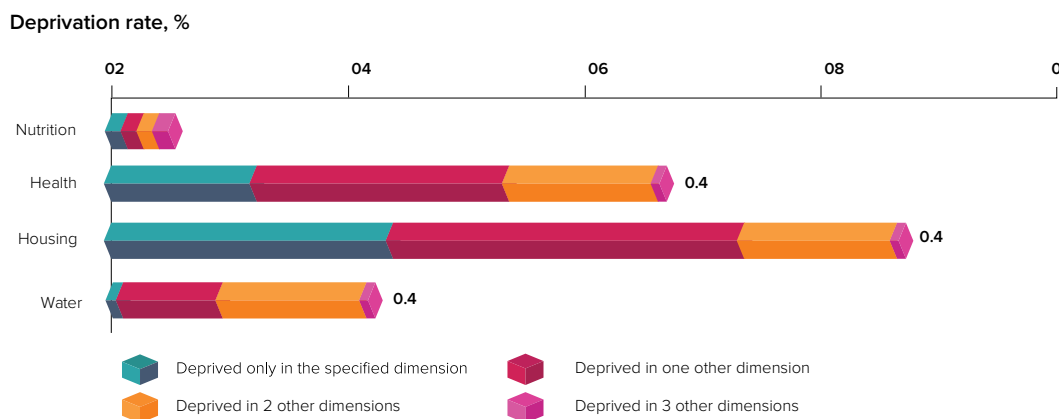
# 5 LINKS BETWEEN DEPRIVATIONS IN DIFFERENT DIMENSIONS

The analysis of multiple overlapping deprivations in Botswana reveals that for most children who are deprived, deprivations tend to occur in multiple deprivations at the same time. Certain types of deprivations tend to occur together, suggesting that they must be targeted simultaneously to address the overall issue of children’s deprivations in Botswana.

## 5.1 CHILDREN AGED 0-4 YEARS

Figure 20 below shows that for children age 0-4 years who are deprived in housing, around 30% are also deprived in at least one other dimension. 24% are deprived in only the housing dimension, while 13% are deprived in at least 2 other dimensions. For those children who are deprived in health, only 12.3% are deprived only in the health dimension, while 21% are deprived in at least one other dimension.

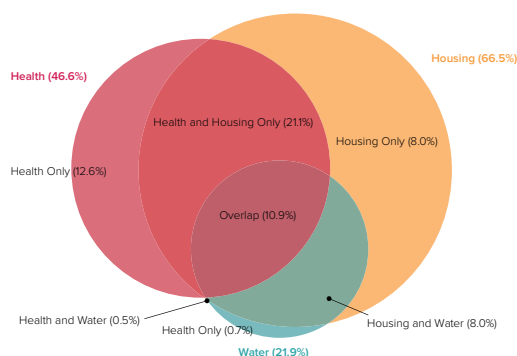
Figure 20 Overlap by dimension, children aged 0-4 years



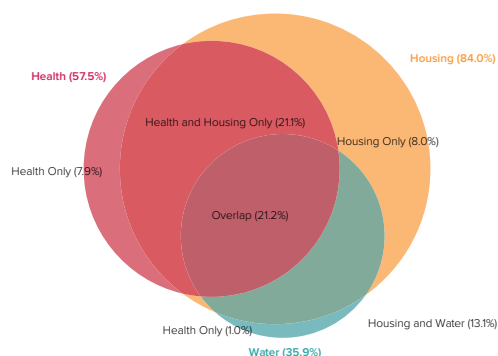
There are substantial overlaps between deprivation in the health, housing and water dimensions, and these are illustrated by way of Venn diagrams (Figure 21). There are, however, marked differences when it comes to how the deprivations in those dimensions overlap for children with different profiles. As shown in the set of Venn diagrams below, overlaps occur more frequently among children age 0-4 living in rural areas, and who are living in monetarily poor households.

Figure 21 Three-way overlapping for dimensions Health, Housing and Water for children aged 0-4 years, by profile

Non - deprived (19.7%)

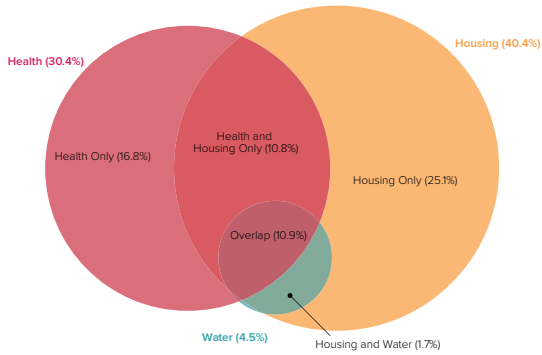


Non - deprived (6.4%)

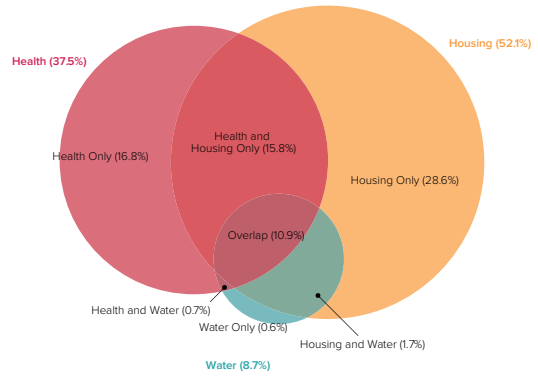


## 5 LINKS BETWEEN DEPRIVATIONS IN DIFFERENT DIMENSIONS

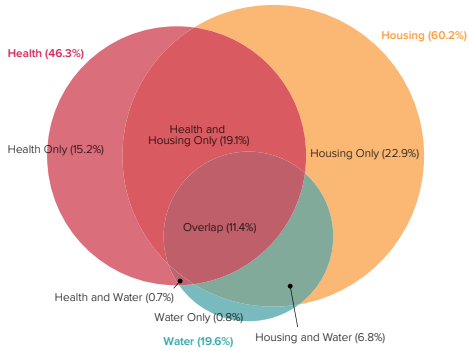
Non - deprived (42.8%)



Non - deprived (29.2%)



Non - deprived (23.2%)



Non - deprived (9.5%)

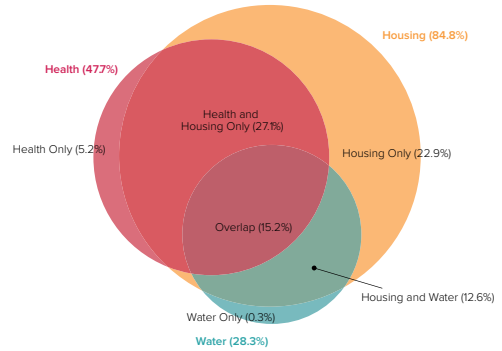
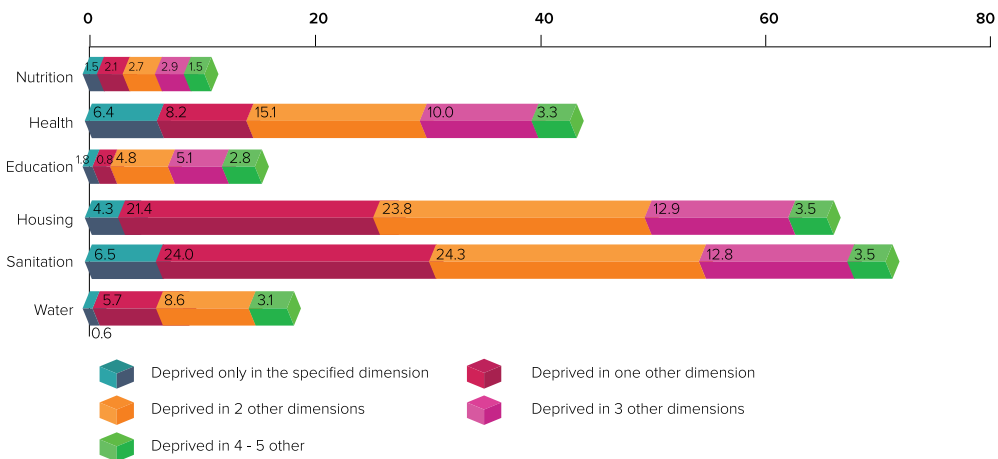


Figure 22 Overlap by dimension, children aged 5-12 years

Deprivation Rate, %

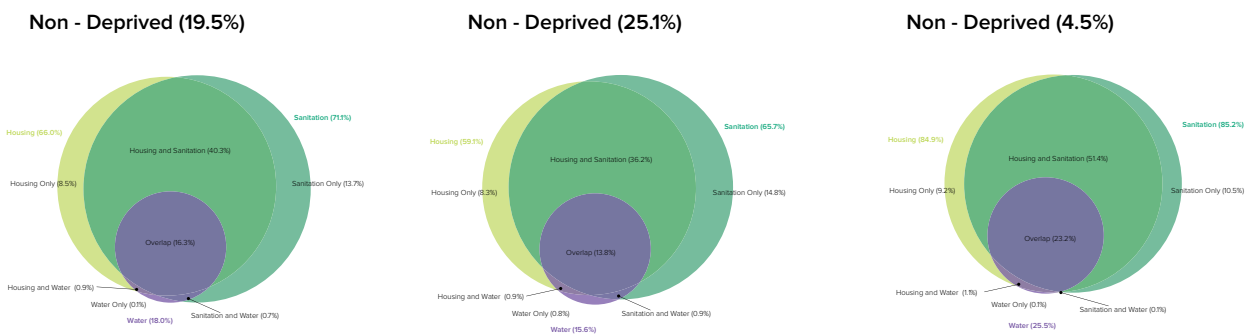




## 5 LINKS BETWEEN DEPRIVATIONS IN DIFFERENT DIMENSIONS

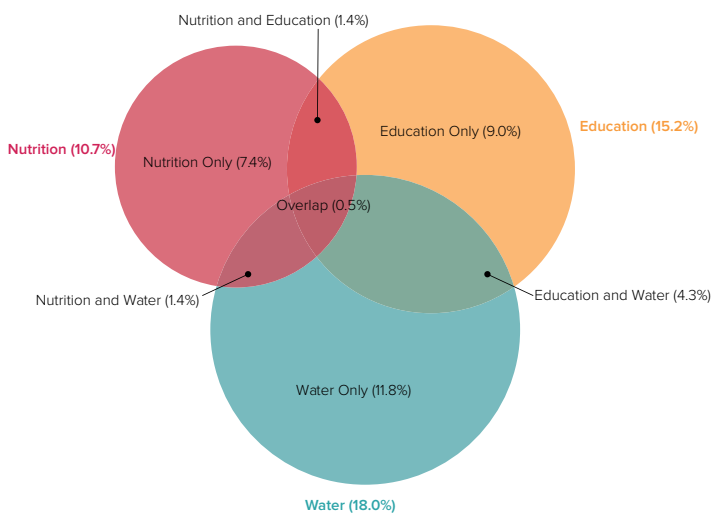
Deprivations in the three household-level dimensions (sanitation, water, and housing) tend to occur together. This is shown in the Venn diagrams below (Figure 23) where the circles representing each dimension overlap to a very large extent. However, the overlap between these three dimensions is greater for children of monetarily poor households than it is for those from non-poor households. In comparison, there is very little overlap between deprivation in the nutrition, water, and education dimensions (Figure 24), suggesting that for this combination of dimension deprivations in each of the constituting dimension tend to occur in isolation.

**Figure 23 Three-way overlapping for dimensions Housing, Sanitation and Water for children aged 5-12 years, by profile**



**Figure 24 Three-way overlapping for dimensions Nutrition, Education and Water for children aged 5-12 years**

**Non - Deprived (64.2%)**



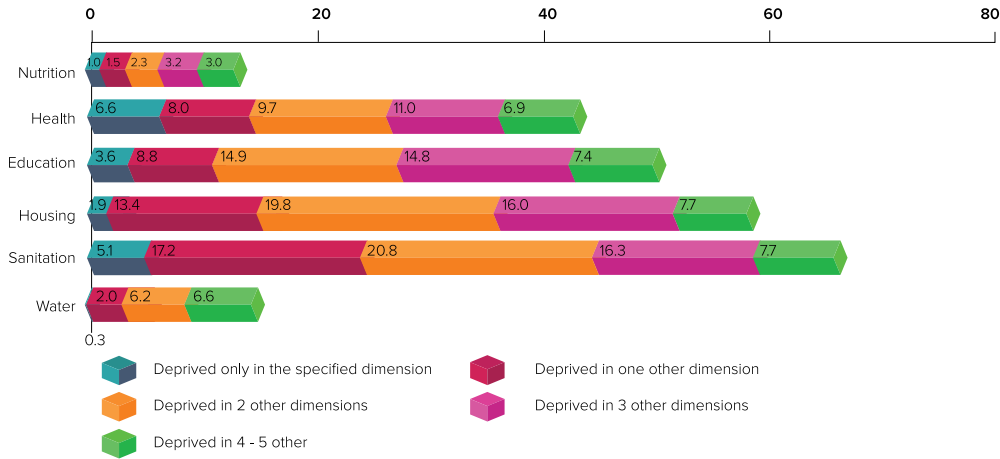
### 5.3 CHILDREN AGED 13-17 YEARS

For children age 13-17 years, Figure 25 below shows that for children deprived in any of the dimensions, only a very small percentage are deprived only in the specified dimension. The majority of these children are being simultaneously deprived in at least one, and mostly two to three additional dimensions.

## 5 LINKS BETWEEN DEPRIVATIONS IN DIFFERENT DIMENSIONS

Figure 25 Overlap by dimension, children aged 13-17 years

Deprivation Rate, %

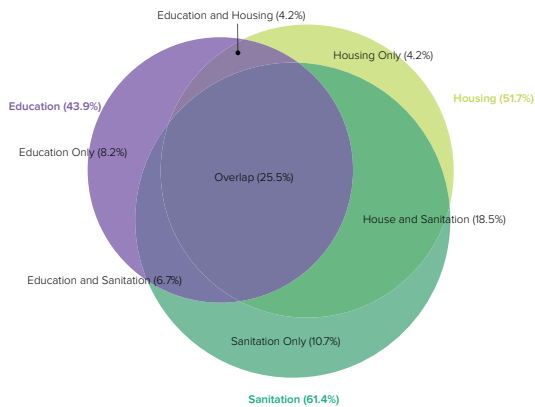


Deprivation in the education, housing and sanitation dimensions tend to occur together, and this overlap is felt more intensely by children living in monetarily poor households. In fact, only small percentages of poor children experience one of these dimensions on its own. This suggests a need for comprehensive policy to tackle multidimensional deprivations in those children. These observations are illustrated by way of Venn diagrams in the figure below.

Figure 26 Three-way overlapping for dimensions Education, Housing and Sanitation for children aged 13-17 years, by profile

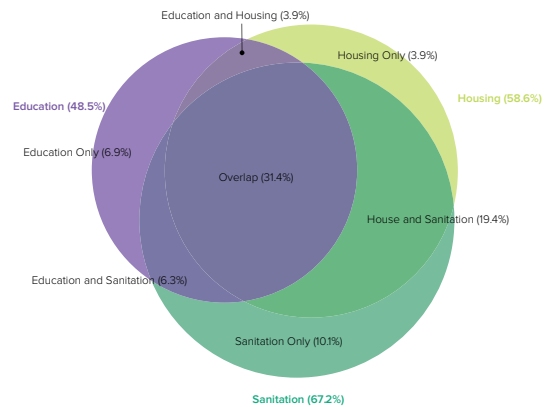
### National

Non - deprived (22.7%)



### Non-poor households

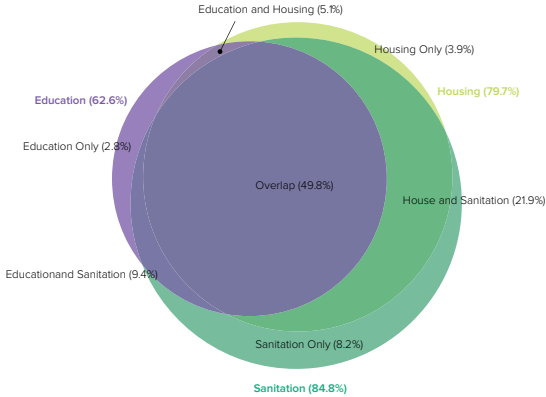
Non - deprived (18.2%)



**5 LINKS BETWEEN DEPRIVATIONS IN DIFFERENT DIMENSIONS**

**Poor households**

Non - deprived (4.3%)



**6 BREAKING AND CONNECTING DIMENSIONS**

The MODA analysis points out that it is important to study not only the dimensions in which the child is deprived but also focus on the overlap between the dimensions. This is because having different policies to deal with deprivation level in each standalone dimension can be costly and fail in targeting the most vulnerable children (those who are multidimensionally deprived). Ultimately, the proportion of children deprived in only a specified dimension, in one other dimension, in two other dimensions, in three other dimensions and so on are calculated for each of the age group below.

Coupled with the above and to dig further into the likelihood of being deprived in one particular dimension, if the children are deprived in another dimension, a probit model is estimated for the different combinations of dimensions for each age group and for both the poor and non-poor children. The aim of carrying out this additional analysis is to determine any links between deprivations in the different dimensions under study.

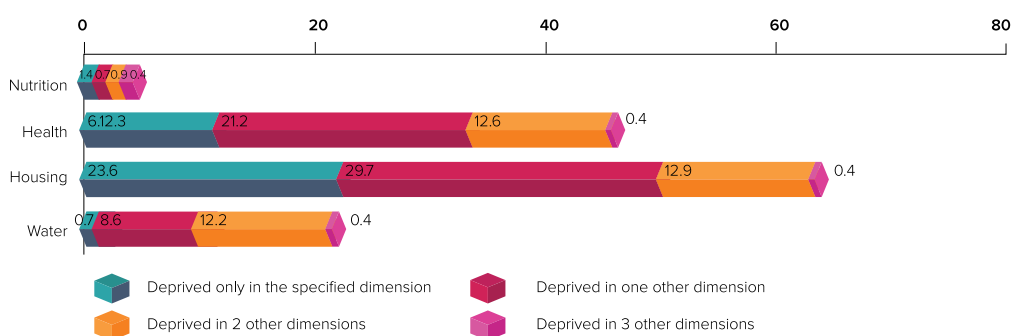
**6.1 CHILDREN AGED 0 – 4 YEARS**

For the youngest age group, it is noted that of children aged 0 to 4 years deprived for the nutrition dimension only 1.4% are deprived only for that dimension<sup>15</sup>. There are also only a small proportion of children multidimensionally deprived if nutrition is one of the dimension in which they are deprived. The results for the housing dimension are striking with around 23.6% of the children deprived only in the housing dimension. At the same time, most of the children deprived in the housing dimension tend to be deprived in more dimensions other than housing. Almost the same finding is found for the health dimension with 21.2%, 12.6% and 0.4% of the children deprived in 1, 2 and 3 other dimensions respectively. In terms of policy recommendation, if measures are put into place to deal with the state of housing, 23.6% of the children will be non-deprived while 29.7% will be deprived in only one instead of two dimensions.

## 6 BREAKING AND CONNECTING DIMENSIONS

Figure 27 Overlap by dimension, children aged 0-4 years

Deprivation Rate, %



In an attempt to determine possible relationships between deprivations in the dimensions under study, the average marginal effect was determined. The analysis was carried out for both the poor and non-poor children in an attempt to find out whether the links between deprivations in the different dimensions differ based on the monetary poverty status of the child. The asterisk (\*) implies that the relationship is significant at 5% level of significance.

Table 1 Average marginal effects of the probit model for poor children, 0-4 years

	Pr(Nutrition)	Pr(Health)	Pr(Housing)	Pr(Water)
<b>Nutrition</b>	-	-0.061	0.144	-0.107
<b>Health</b>	-0.011	-	0.059*	0.063*
<b>Housing</b>	0.048	0.126*	-	0.409*
<b>Water</b>	-0.025	0.079*	0.232*	-

Table 2 Average marginal effects of the probit model for non-poor children, 0-4 years

	Pr(Nutrition)	Pr(Health)	Pr(Housing)	Pr(Water)
<b>Nutrition</b>	-	-0.069	0.000	0.000
<b>Health</b>	-0.008	-	0.065*	0.051*
<b>Housing</b>	0.000	0.074*	-	0.307*
<b>Water</b>	0.000	0.099*	0.509*	-

With the exception of the nutrition dimension, there seems to be a strong link between the different dimensions for this age group for both the poor and non-poor children. A child deprived in nutrition is not necessarily likely to be deprived in the other dimensions.

It is interesting to note that poor children who are deprived in the housing dimension are 12% more likely to be deprived in the health dimension compared to those who are not deprived in the housing dimension. For the non-poor children, this percentage is much less with 7% of the non-poor children being more likely to be deprived in the health dimension if they are deprived in the housing dimension.

Also, the poor children who are deprived in the housing dimension are 40% more likely to be deprived in the water dimension while it only 30% for non-poor children. Similarly, the poor children deprived in the water dimension are much more likely (23%) to be deprived in the housing dimension in contrast to the non-poor children (only 5%).

## 6 BREAKING AND CONNECTING DIMENSIONS

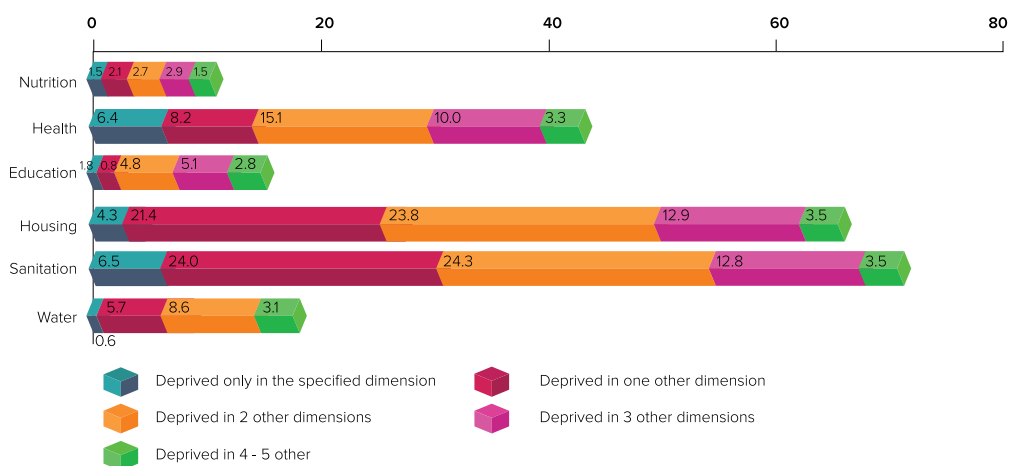
Both poor and non-poor children are more likely to be deprived in the health dimension if they are deprived in the water dimension. Same results are observed for the relationship between housing and water dimension.

### 6.2 CHILDREN AGED 5– RENYEARS

The sanitation dimension grabs attention for this age group with a deprivation level of approximately 70%. However, only 6.5% of the children are deprived only for the sanitation dimension while 64.5% of them are deprived in at least one other dimension. The problem of sanitation having to do with “the use of improved toilet” should be addressed through policies simultaneously targeting some or all of the other dimensions. As with the previous age group, the overlap of housing with the other dimensions is quite significant. Nutrition, measured by Body Mass Index (BMI) of the child, manifest itself as a relatively more serious problem for this age group compared to the younger children. Although, only 1.5% of the children face problems only in nutrition, around 10.5% of the children are deprived in nutrition and at least one other dimension. This can pose important threat to the health status of the child of the future.

Figure 28 Overlap by dimension, children aged 5-12 years

Deprivation Rate, %



The following table indicates the average marginal effects of the probit model for poor and non-poor children age 5-12. The asterisk (\*) implies that the relationship is significant at 5% level of significance.

Table 3 Average marginal effects of the probit model for poor children, 5-12 years

	Pr(Nutrition)	Pr(Health)	Pr(Education)	Pr(Housing)	Pr(Sanitation)	Pr(Water)
<b>Nutrition</b>	0.036	0.063	-0.032	0.020	-0.034	
<b>Health</b>	0.012		0.005	0.024	0.010	0.083*
<b>Education</b>	0.034	0.007		0.053*	0.041	0.109*
<b>Housing</b>	-0.020	0.049	0.076*		0.133*	0.467*
<b>Sanitation</b>	0.019	0.019	0.058	0.131*		0.167*
<b>Water</b>	-0.020	0.120*	0.100*	0.311*	0.114*	

## 6 BREAKING AND CONNECTING DIMENSIONS

Table 4 Average marginal effects of the probit model for non-poor children, 5-12 years

	Pr(Nutrition)	Pr(Health)	Pr(Education)	Pr(Housing)	Pr(Sanitation)	Pr(Water)
Nutrition		-0.002	0.025	0.002	-0.005	0.001
Health	-0.001		-0.001	-0.003	0.031*	0.038*
Education	0.021	-0.004		0.100*	0.021	0.078*
Housing	0.000	-0.004	0.060*		0.342*	0.196*
Sanitation	-0.005	0.043*	0.015	0.361*		0.152*
Water	0.004	0.087*	0.081*	0.329*	0.223*	

For this age group as well, nutrition does not seem to be related to the other dimensions for all the children. Non-poor children deprived in sanitation or water dimension are more likely to be deprived in the health dimension. Poor children are 12% more likely to be deprived in the health dimension if they are deprived in the water dimension.

All children in this age group are more likely to be deprived in the education dimension if they are deprived in the housing or water dimension.

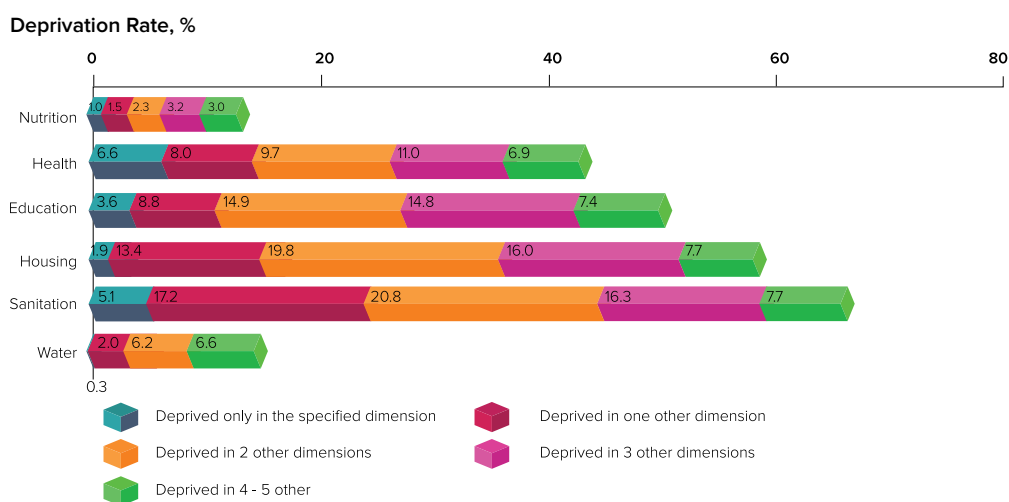
It is also to be noted that children deprived in education, sanitation or water dimension are more likely to be deprived in the housing dimension. While both the poor and the non-poor children deprived in housing and water dimension are more likely to be deprived in sanitation, only the poor children deprived in health are more likely to be deprived in sanitation.

A child, in this age group, is also more likely to be deprived in the water dimension if he/she is deprived in any of the other dimensions with the exception of nutrition.

### 6.3 CHILDREN AGED 13 – 17 YEARS

A very small proportion of children, aged between 13 and 17 years, are deprived in only one dimension. The majority of them tend to be deprived in 2-4 dimensions. There are bigger proportions of children who are deprived in the education dimension than the children between 5 and 12 years old. As with the other two age groups, almost none of the children are deprived in only water. In fact, deprivation in the water dimension is most of the time associated with deprivations in other dimensions.

Figure 29 Overlap by dimension, children aged 13-17 years



## 6 BREAKING AND CONNECTING DIMENSIONS

The following table indicates the average marginal effects of the probit model for poor and non-poor children age 13-17. The asterisk (\*) implies that the relationship is significant at 5% level of significance.

Table 5 Average marginal effects of the probit model for poor children, 13-17 years

	Pr(Nutrition)	Pr(Health)	Pr(Education)	Pr(Housing)	Pr(Sanitation)	Pr(Water)
<b>Nutrition</b>		0.043	0.072	0.007	-0.030	0.050
<b>Health</b>	0.020		0.028	0.031	0.002	0.092*
<b>Education</b>	0.040	0.030		0.134*	0.036	0.084*
<b>Housing</b>	0.004	0.046	0.215*		0.178*	0.283*
<b>Sanitation</b>	-0.031	-0.004	0.058	0.207*		0.172*
<b>Water</b>	0.044	0.158*	0.131*	0.269*	0.149*	

Table 6: Average marginal effects of the probit model for non-poor children, 13-17 years

	Pr(Nutrition)	Pr(Health)	Pr(Education)	Pr(Housing)	Pr(Sanitation)	Pr(Water)
<b>Nutrition</b>		-0.046	0.013	0.020	0.002	0.047*
<b>Health</b>	-0.017		0.020	-0.016	0.007	0.062*
<b>Education</b>	0.006	0.022		0.118*	0.078*	0.079*
<b>Housing</b>	0.013	-0.019	0.148*		0.359*	0.170*
<b>Sanitation</b>	0.003	0.013	0.101*	0.369*		0.121*
<b>Water</b>	0.042*	0.147*	0.192*	0.306*	0.188*	

All the children deprived in housing and water dimension are more likely to be deprived in the education dimension. The poor children are more likely to be deprived in the education dimension if they are deprived in the sanitation dimension. Children deprived in the education, sanitation or water dimension are more likely to be deprived for the housing dimension. Simultaneously, all children deprived in the housing or water dimension are more likely to be deprived in the sanitation dimension. Poor children are more likely to be deprived in the education dimension if they are deprived in the sanitation dimension. Both poor and non-poor children deprived in the water dimension are 15% more likely to be deprived in the health dimension.

For this age group also, it is observed that both poor and non-poor children are more likely to be deprived in the water dimension if they are deprived in any of the other dimensions with the exception of the nutrition dimension.

## 7 REGIONAL DISPARITIES IN DEPRIVATIONS

Listing most "lagging" districts offers a useful insight in regional deprivation differences. In Table 7 we consider a district "lagging" when children suffer from substantial and multidimensional deprivation. Table 7 collects all those so called most lagging districts for each different age group. 19 districts can be identified in Botswana where at least one age group is seriously deprived.

## 7 REGIONAL DISPARITIES IN DEPRIVATIONS

---

In the first age group (0-4 years) children of 15 districts out of 26 tend to be more deprived than children of other districts in the country. The complete list can be found in the first column of Table 7. The Orapa-region is somewhat a remarkable region. This district tends to perform above average for all age groups and all dimensions. Nonetheless it is considered as “lagging” because it has a headcount of 100% of the youngest children deprived for nutrition (Table 2). The nutrition situation remains insufficient also for the next age group (Table 3), although it becomes less excessive (33.9% compared to an average of 15.6%).

Of all those 15 districts 4 of them show an above average deprivation rate for all 4 dimensions for the youngest age group. These districts are Ngamiland West, North East, Central Tutume and Ngwaketse West. One should be careful however and not exaggerate the importance of that. None of the three first districts mentioned has an exorbitantly high deprivation rate for any dimension. Ngwaketse West is an exception. Its overall performance is poor but even more so in the dimensions health (deprivation rate of 69.8%) and housing (deprivation rate of 96.5%).

For the age group 5-12 seventeen districts are considered lagging. Since the total amount of districts is 26 we can conclude that deprivation is not strictly related with a few districts but rather a nationwide problem in this age group. Some regions do stand out though for a specific reason. Ghanzi, Ngamiland West, Central Tutume, Central Mahalapye, Kweneng West and Barolong display an above average deprivation rate for 5 out of 6 dimensions (Table 9). Ngwaketse West even scores poorly on all six dimensions with a 95.2% headcount of children deprived of appropriate housing.

Deprivation within the oldest age group is mostly focused in 11 out of the 26 districts. Of these districts 5 of them have a relatively high deprivation rate for 5 or even 6 dimensions: Ghanzi, Ngamiland West, Kweneng West, Ngwaketse West and Barolong. As Table 10 shows, children in these districts are often heavily deprived more than one dimension. Often the threat to sufficient development chances is formed out of a combination of health, education, housing, sanitation and water deprivation.

Taking a picture of the global children population there are 8 districts that are considered lagging for a child from birth until adulthood. These districts are: Kgalagadi North, Kgalagadi South, Ghanzi, Ngamiland West, Ngamiland East, Kweneng West, Ngwaketse West and Barolong. It is safe to state that children in these districts are deprived throughout their entire childhood. It would be however a mistake to conclude that these eight regions are the most deprived. We have seen that some district offer a very poor raising environment for one age group but is not considered a lagging district for another age group. A policy based on geographical targeting is favourable but should take into account a combination of both the number of age groups affected AND the importance of regional deprivation rates within one particular age group. For instance Orapa scores very badly on the nutrition dimension within the first age group. Since the district is not reported as lagging for the other two age groups Orapa could stay under the radar when designing policy actions. However all children in this analysis between 0 and 4 years old are considered deprived in Orapa. A policy action to improve nutrition in that district could make a substantial difference.



## 7 REGIONAL DISPARITIES IN DEPRIVATIONS

Table 7 Most lagging districts in all considered dimensions

0-4 Years	5-12 Years	13-17 Years
Kgalagadi North	Kgalagadi North	Kgalagadi North
Kgalagadi South	Kgalagadi South	Kgalagadi South
Ghanzi	Ghanzi	Ghanzi
Chobe	Chobe	
Ngamiland West	Ngamiland West	Ngamiland West
Ngamiland East	Ngamiland East	Ngamiland East
North East	North East	
Central Tutume	Central Tutume	
Central Boteti	Central Boteti	
Central Bobonong	Central Bobonong	
	Central Mahalapye	
Central Serowe/palapye	Central Serowe/palapye	
		Kgatlang
Kweneng West	Kweneng West	Kweneng West
	Kweneng East	Kweneng East
Ngwaketse West	Ngwaketse West	Ngwaketse West
Barolong	Barolong	Barolong
	Southern	Southern
Orapa (Only For Nutrition)		

### 7.1 CHILDREN AGED 0 – 14 YEARS

Table 8 Deprivation headcount by dimension and by district, children aged 0-4 years

	NUTRITION*avg. 31.5%	HEALTH *avg. 46.7%	HOUSING *avg. 66.6%	WATER *avg. 22.1%
Kgalagadi North	50.9	61	78.9	2.95
Kgalagadi South	11.1	51.6	93.1	7.19
Ghanzi	29.6	53.3	70.3	36.3
Chobe	39.2	47.9	53.8	0
Ngamiland West	14.1	53.1	81.8	30.2
Ngamiland East	36.7	48.9	70.6	32.3
North East	44.2	54.5	84.2	36
Central Tutume	44.6	54.6	72	36
Central Boteti	50.4	41.4	82.7	37.3
Central Bobonong	66	38.2	68	21.3
Central Mahalapye	28	51.9	72	25.8
Central Serowe/palapye	46.7	44.6	68.8	26.9
Kgatlang	23.6	44.8	54.8	11.6
Kweneng West	0	52.9	92.2	21.6
Kweneng East	36.7	48.6	66.3	21.8
South East	11.6	33.4	33.1	6.83
Ngwaketse West	33.3	69.8	96.5	27.4
Barolong	22.6	52.5	82.5	18.1
Southern	29.7	55	69	20.2
Sowa Town	0	0	47.1	0
Jwaneng	0	40.3	38.3	6.04
Orapa	100	4.21	0	0
Selibe Phikwe	45.2	36.8	48.4	6.9
Lobatse	0	11.8	43.9	5.46
Francistown	21.3	34.4	51.2	8.77
Gaborone	16.1	31.1	33.5	1.16

## 7 REGIONAL DISPARITIES IN DEPRIVATIONS

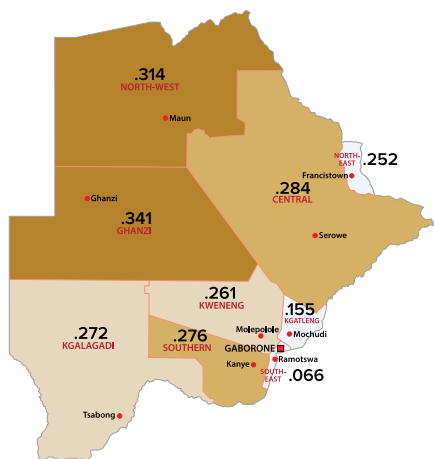


Figure 30 provides a summary of what has been previously detailed for children aged 0 to 4 years, based on their geographical location. In fact, the children from the broader districts of North-West (Ngamiland) and Ghanzi are found to have the highest adjusted deprivation headcounts and are therefore the most multidimensionally deprived, in terms of incidence and intensity of deprivations. We can also see that the South-East and Kgatleng regions are the least deprived one according to the adjusted deprivation headcount index.

### 7.2 CHILDREN AGED 5 – 12 YEARS

Table 9 Deprivation headcount by dimension and district, children aged 5-12 years

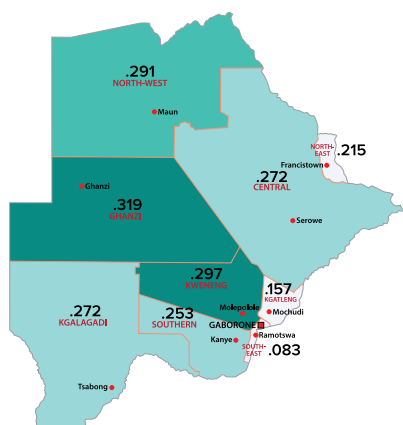
	NUTRITION avg. 15.6%	HEALTH avg. 43.2%	EDUCATION avg. 17.2%	HOUSING avg. 66%	SANITATION avg. 71.1%	WATER avg. 18.1%
Kgalagadi North	13.2	55.6	21.6	81.6	85.3	3.96
Kgalagadi South	20.8	45	14.2	82	75.5	3.81
Ghanzi	8.98	52	34	79.6	75.4	33.1
Chobe	7.83	37.6	15.5	49.1	77.6	3.99
Ngamiland West	11.6	48.7	26.3	81	91.4	34.8
Ngamiland East	10.6	37.3	14.2	70.2	74.9	21.7
North East	14.2	43.2	16.3	79.8	91.5	30.6
Central Tutume	14.3	53.3	23	74	78.4	28.5
Central Boteti	14.2	39	17.6	77.6	78.1	31.6
Central Bobonong	13.5	38.5	15.3	72.6	74.8	15
Central Mahalapye	17.4	44.4	16.9	74.6	84.5	23
Central Serowe/Palapye	11.9	41.8	16.1	68.7	76.9	22.9
Kgatlung	10.8	46	13.6	54.5	63.9	9.34
Kweneng West	14.4	48.6	25.5	92.9	91.2	24
Kweneng East	22.7	49.9	18.8	62.1	70.2	22.4
South East	17.6	36.4	13.8	34.3	63.4	6.6
Ngwaketse West	19	48.6	20.5	95.2	87.6	23.5
Barolong	16.1	53.6	17.4	79.1	75.4	14
Southern	17.1	44.6	15.4	64.9	81.6	10.1
Sowa Town	5.43	0	4.53	42.7	0	0
Jwaneng	9.67	26	15.2	28.8	7.93	1.5
Orapa	33.9	16	8.67	0	0	0
Selibe Phikwe	16.8	24.4	10.9	49.2	54.7	2.27
Lobatse	30.8	21.5	18.7	32.5	45.7	2.42
Francistown	11.3	28	10.4	55.8	36.2	8.77
Gaborone	14.9	32.7	10.8	37.4	28.8	1.77

Ngamiland-East, Ngamiland-West and Chobe constitute the North-West region

Gaborone, Lobatse and South-East constitute the South-East region

## 7 REGIONAL DISPARITIES IN DEPRIVATIONS

Figure 31 Adjusted deprivation headcount ratio (K=3) by district, children aged 5-12 years



According to Figure 31, we can observe that for children aged 5 to 12 years, those of the South-East and Kgatleng regions have the lowest adjusted deprivation headcounts. Children from Ghanzi are still those with highest multidimensional deprivations, both in terms of incidence and intensity, but closely followed, this time, by children aged 5 to 12 years and from the Kweneng region.

### 7.3 CHILDREN AGED 13 – 17 YEARS

Table 10 Deprivation headcount by dimension and district, children aged 13-17 years

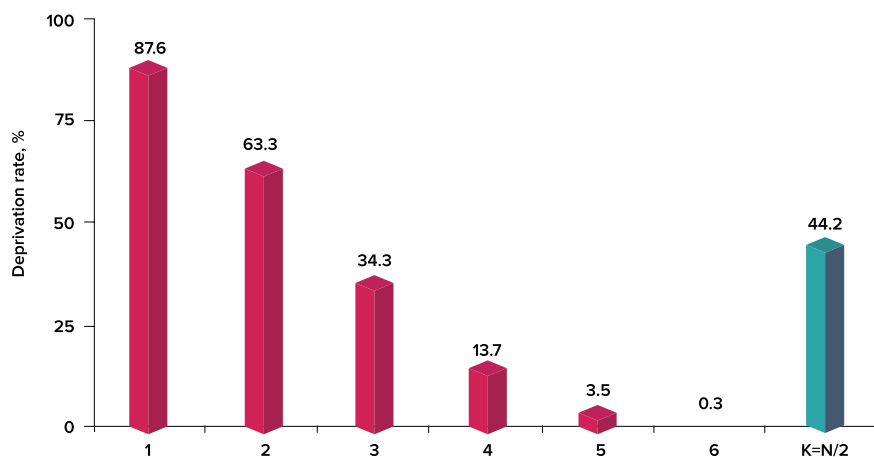
	NUTRITION avg. 15.6%	HEALTH avg. 43.2%	EDUCATION avg. 17.2%	HOUSING avg. 66%	SANITATION avg. 71.1%	WATER avg. 18.1%
Kgalagadi North	9.61	56.7	54.8	73.6	77	14.2
Kgalagadi South	12.1	45.7	57.9	82.9	73.2	4.16
Ghanzi	16.9	58.9	66.4	37.3	76.9	42.5
Chobe	0	51.8	63.5	44.2	73.7	0
Ngamiland West	14.9	50.5	73.7	83.2	95.2	38.9
Ngamiland East	13.5	40.1	54.3	59.5	77.1	13.5
North East	15.9	57	57	78.3	85.1	32.9
Central Tutume	17.5	45.8	57.5	64.8	78.1	24.4
Central Boteti	14.6	34.1	57	77.2	77	20.6
Central Bobonong	12.3	36.4	54.4	68.7	81.3	19.9
Central Mahalapye	13.6	43.8	57.5	65.2	76.4	20.8
Central Serowe/Palapye	11.1	40.6	47.7	60.3	73.9	13.8
Kgatleng	15.1	46	42.5	46.9	63.7	7.84
Kweneng West	15.2	49.1	66.5	89.8	96.8	29.9
Kweneng East	11.8	45.6	46.3	51	61.4	9.62
South East	10.4	29.3	39.2	44.2	57.7	9.17
Ngwaketse West	8.42	58.7	64.2	84.2	78.2	47.3
Barolong	15.9	50.7	49.1	78.3	84.6	12.9
Southern	10.1	46.5	39.4	57.7	75.6	12.2
Sowa Town	31.1	0	68.5	58.5	0	0
Jwaneng	12	12.7	42.3	43.3	11.7	2.31
Orapa	4.06	14.7	26.6	0	0	0
Selibe Phikwe	12.5	31.7	26.7	52	54	3.34
Lobatse	7.38	14.5	24.1	42.3	46.7	1.4
Francistown	12.9	28.1	38.7	44.4	35.5	9.38
Gaborone	11.1	40.4	29.5	34.7	25.3	1.41

Gaborone, Lobatse and South-East constitute the South-East region



## 8 MONETARY POVERTY VERSUS DEPRIVATIONS AS MEASURES OF CHILD WELL-BEING IN BOTSWANA

Figure 33 Deprivation headcount for k=1, 2, 3, 4, 5, 6 and k=N/2 , children aged 0-17 years



The essence of the MODA methodology has to do with providing a deprivation analysis for the dimensions applicable for children of different ages based on the life-cycle approach. The latter is based on the thought that the needs of a child vary and evolve throughout his/her life. It is therefore important to dig further into multidimensional deprivations in an attempt to understand the deprivations faced by children in each age group studied. Table 11 provides multidimensional deprivation indices by age groups using a threshold  $K=N/2$  for all the age groups.

It can be observed that 43.7% of the children constituting the first age group are multidimensionally deprived. In terms of intensity of the deprivation, the figures indicate that those same children are deprived in 57.8% of all the dimensions studied for this age group, translating into deprivations in 2.3 dimensions on average. For children of the two other age groups, multidimensional deprivation headcount are found to be 42% and 47.7% for 5-12 and 13-17 years old children respectively. However, while children aged 5 to 12 years suffer an intensity of deprivation of 58.1% (of all dimensions studied for this age group), multidimensionally deprived children aged 13 to 17 years are, on average, deprived in 61.5% of the total dimensions studied.

Table 11 Multidimensional deprivation indices (for  $K=N/2$ ), by age groups

Age group	Number of deprivations ( $K=N/2$ )	Deprivation headcount (H) %	Average intensity across the deprived (A) in %	Average intensity across the deprived (A)
0-4 years	2-4 deprivations	43.7	57.8	2.31
5-12 years	3-6 deprivations	42	58.1	3.5
13-17 years	3-6 deprivations	47.7	61.5	3.7

Figure 34 reveals that the majority of children in all age groups experience at least one deprivation at a time. Close to one in every three children in all age groups experiences at least two deprivations at a time. A small percentage of children in all three age groups experience all deprivations relevant for their age group at the same time; however, for children age 0-4, nearly one in ten children experience three out of four possible deprivations for their age group. Children in their earliest years are the most vulnerable to such deprivation severity, and face an ambiguous future potential for growth and development if their crucial needs are not met.

Describing  $K=N/2$ :

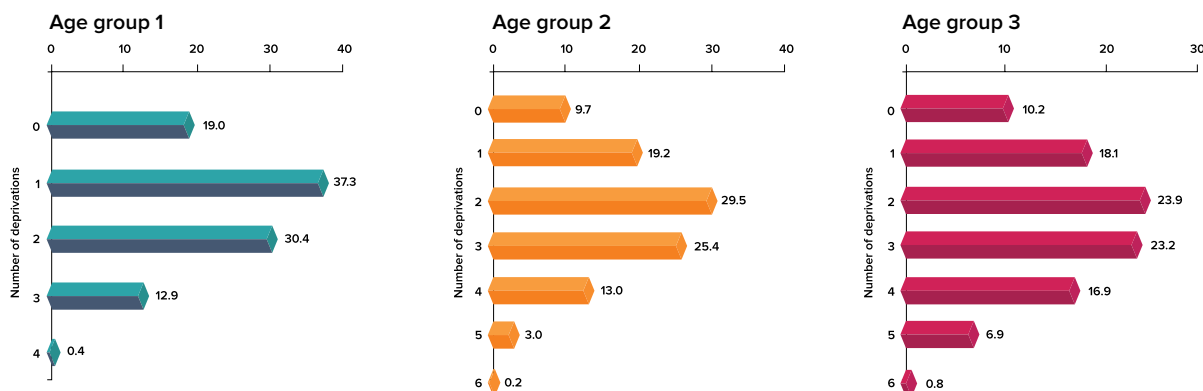
N=Total number of dimensions used for each child in this study

K= The threshold used to determine whether a child is multidimensionally deprived or not. For example  $K=2$  means that a child is considered to be deprived if he/she is deprived in at least 2 dimensions.

$K=N/2$  implies that a child is considered multidimensionally deprived if the latter is deprived in at least 50% of the total number of dimensions used.

## 8 MONETARY POVERTY VERSUS DEPRIVATIONS AS MEASURES OF CHILD WELL-BEING IN BOTSWANA

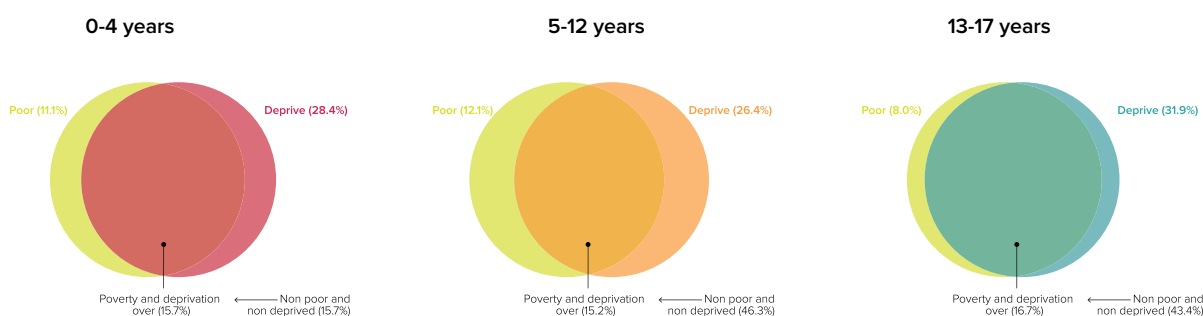
Figure 34 Distribution of simultaneous deprivations at the national level, by age group



## 9 MONETARY POVERTY AND DEPRIVATIONS OVERLAPPING

Figure 35 illustrates poverty and multidimensional deprivation overlaps by age groups. The poverty and deprivation overlaps are around 16% for all children as shown below. However, a striking observation is that, for each age group, there are more than 25% of the children who are NOT poor but deprived. Therefore, poverty as a single measure of child well-being in Botswana fails in capturing the broader conditions necessary for overall child development. If the ultimate goal is to address children's vulnerability as defined by deprivations, a monetary poverty approach leads to a big inclusion error and an even bigger exclusion error.

Figure 35 Poverty and multidimensional deprivation overlap, by age group



In the same line, Table 12 shows the overlap between poverty and deprivation in selected dimensions. The poverty and deprivation overlap are around 22% of children of each age group as shown below. Interestingly 44.7%, 47.8% and 46.5% of children aged 0-4 years, 5-12 years and 13-17 years were found to be deprived in the stated dimension without being poor. This indicates that a large proportion of children not in poverty suffer from not being provided with their basic needs for Housing and Sanitation. Focusing efforts on eradicating monetary poverty in Botswana would fail to capture these children who are suffering but who do not fall below the poverty line.

## 9 MONETARY POVERTY AND DEPRIVATIONS OVERLAPPING

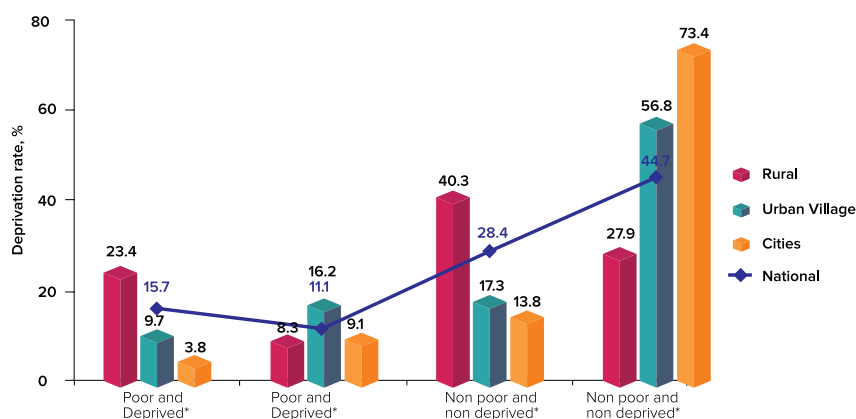
Table 12 Poverty and deprivation overlap for dimension with highest deprivation headcount, by age group

Age group	Dimension	Poor and deprived	Poor only	Deprived only	Non-poor and non-deprived
0-4 years	Housing	21.9%	3.9%	44.7%	29.5%
5-12 years	Sanitation	23.2%	4.0%	47.8%	24.9%
13-17 years	Sanitation	20.6%	3.7%	46.5%	29.2%

From the arguments above we can conclude that in Botswana, monetary poverty, on its own, is not a good indicator of deprivations faced by children in the country. By disaggregating figures from Figure 35 we obtain the graphs as shown in

Figure 36, Error! Reference source not found. and Figure 41. To make the analysis richer, poverty and multidimensional deprivation overlaps have also been calculated by residence area using K=2 as threshold for children aged 5-17 and for the total child population (See Figure 37, Figure 38 and Figure 39 Poverty and multidimensional deprivation (K=2) overlap by area, children aged 0- 17 years). Similar trends can be observed for each age group where poverty and multidimensional deprivation overlaps tend to be higher in rural areas than in urban villages and cities. However when it comes to children who are poor but non deprived, the highest overlap percentages are found in urban villages. On the other hand, significantly larger proportions of children living in rural areas are found to be deprived even though they are not poor. Finally the majority of children from cities and urban villages (to a lesser extent) are found to suffer neither from monetary poverty nor deprivations. These observations are valid for the two multidimensional deprivation threshold used (K=2 and 3) and for all the age groups studied; they give an indication of the poverty and deprivation profiles of children living in different areas of Botswana.

Figure 36 Poverty and multidimensional deprivation (K=2) overlap by area, children aged 0-4 years



For age group1 K=2, while for the two other age groups K=3.

## 9 MONETARY POVERTY AND DEPRIVATIONS OVERLAPPING

Figure 37 Poverty and multidimensional deprivation (K=2) overlap by area, children aged 5-12 years

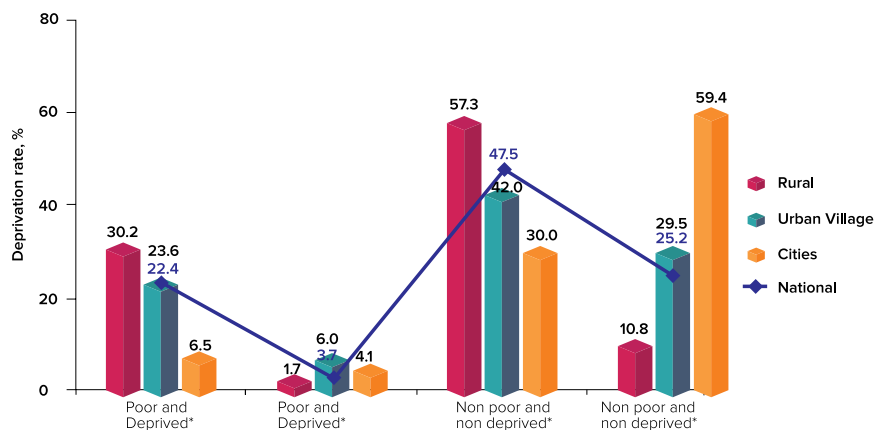


Figure 38 Poverty and multidimensional deprivation (K=2) overlap by area, children aged 13-17 years

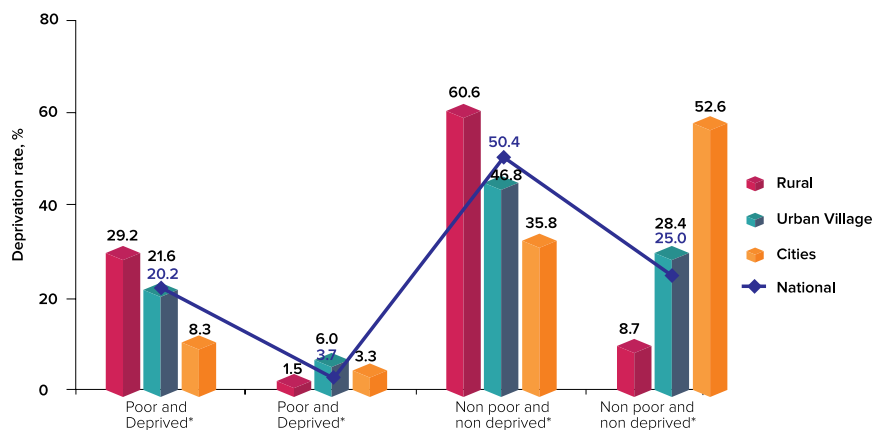
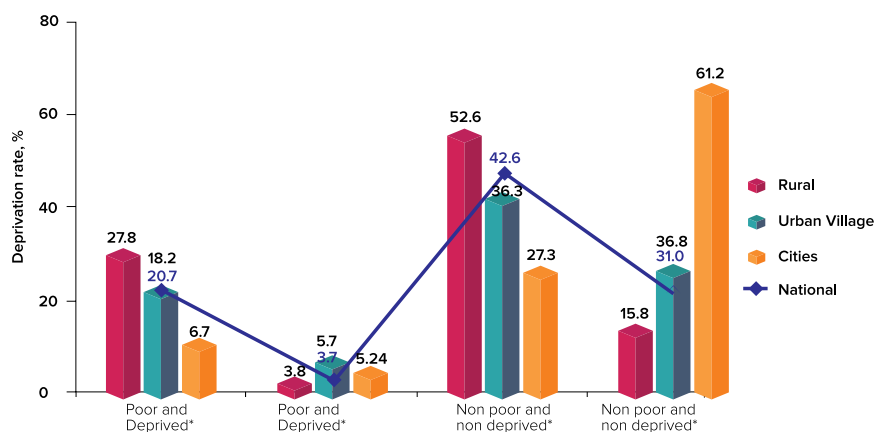


Figure 39 Poverty and multidimensional deprivation (K=2) overlap by area, children aged 0- 17 years



See Figures 36, 37 and 38.



## 9 MONETARY POVERTY AND DEPRIVATIONS OVERLAPPING

Figure 40 Poverty and multidimensional deprivation (K=3) overlap by area, children aged 5-12 years

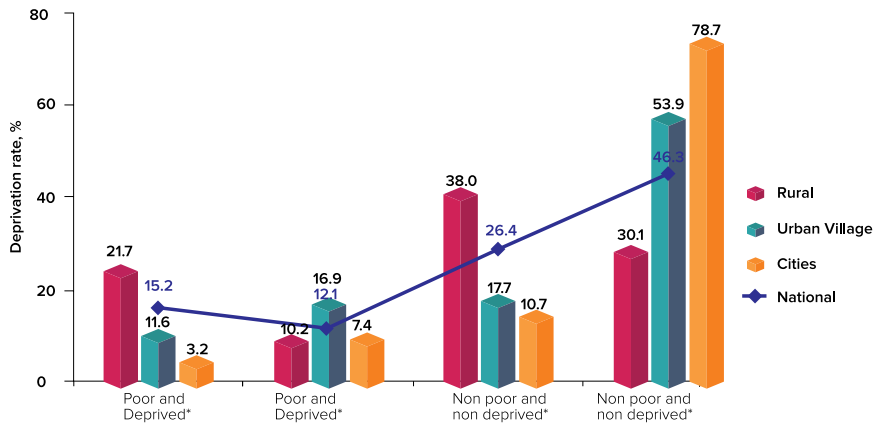
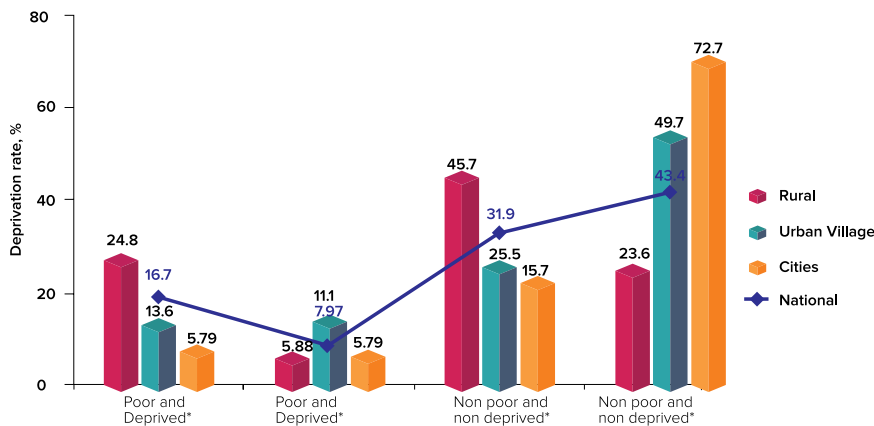


Figure 41 Poverty and multidimensional deprivation (K=3) overlap by area, children aged 13-17 years



# 10 DEPRIVATIONS AND INTERGENERATIONAL TRANSMISSION OF POVERTY IN BOTSWANA

## 10.1 ADDRESSING DEPRIVATIONS OF ALL KINDS IS IMPORTANT FOR THE ECONOMIC DEVELOPMENT OF BOTSWANA

The children of Botswana are of crucial importance for its future. The population of Botswana is an important asset to its economy. The development of human capital will be an important contributory factor to economic growth in the near and distant future while the quality of available human capital will be one of the critical determinants of economic success. The Multiple Overlapping Deprivation Analysis (MODA) depicting the situation of children in Botswana, is like a “room with a view” on the future of the developments in human capital for the Botswana economy. It provides also insights in the equalities and inequities that exist in the

---

Botswana, allowing to identify and to locate the most disadvantaged children and thus complementing the equity analysis provided by other analyses.

Children who are 10 years old today will be the labour force as soon as 2023; the new-born babies of 2014 are the workers of 2030 when, if things go well, Botswana will have developed further into a high middle-income- or a high-income economy. This means that taking care of the 10 years old, the new-borns and all the other children and adolescents today, is important for guaranteeing that Botswana is prepared for a competitive environment wherein technological innovations will have to be built on the solid ground of home-grown technical and managerial skills.

In the development of the future human capital in Botswana, education is of crucial importance. However, the developments are not fully encouraging; still an important number of primary school age children (17%) do not attend school and a notable percentage of those attending are leaving school without a diploma or a certificate. Participation in secondary education is far from complete and is diminished by high dropout rates at higher grades. This is true for boys and girls, and especially true for children from poorer families (see below). School attainment is problematic for a number of children between 5 and 12 years and even strikingly bad for young people older than 12 years: almost 42 % leave school without a diploma or a certificate. This is a threat to the growth aspirations of Botswana and equally important, it may lead to social instability: large numbers of badly trained young people in a growing economy, will lead to feelings of exclusion and superfluity; at the individual level adolescents and young adults will think that they did not have the opportunity to grow to their full potential. The latter is not only an economic loss, but also it also impedes social inclusion of all young people in the development and the future prosperity of Botswana.

## **10.2 DEPRIVATION AMONG CHILDREN IS THE MAIN SOURCE OF THE INTERGENERATIONAL TRANSMISSION OF POVERTY IN BOTSWANA.**

Children of all ages growing up in monetary poor families are worse off in all aspects of their lives than children living in non-poor families in Botswana ; their living conditions in terms of housing quality and the access the health services and safe and clean water are worse or a lot worse than the living conditions of non-poor children. Especially the older children in poor families are also nourished less well. Stunting and wasting levels are unacceptably high for a middle-income country like Botswana. All these issues are important to be addressed for the children being nowadays deprived, but equally important is the fact that the current deprivations will lead to a reproduction of the inequality and the poverty and thus to the intergenerational transmission of poverty. From the MODA study it can be seen that children living in poorer families are doing far worse at school than their peers growing up in better circumstances: almost a quarter of the primary school age children are NOT attending school (against 14.9 percent of the non-poor children). For the secondary school these percentages are alarming: nearly 63 (or 2 out 3 children) growing up in poor families are not attending school or leaving school without a degree. This means that the children of poorer families are less prepared for being successful on the labour market.

## 10 DEPRIVATIONS AND INTERGENERATIONAL TRANSMISSION OF POVERTY IN BOTSWANA

Figure 42 Deprivation headcounts by dimension and monetary poverty, children aged 0-4 years

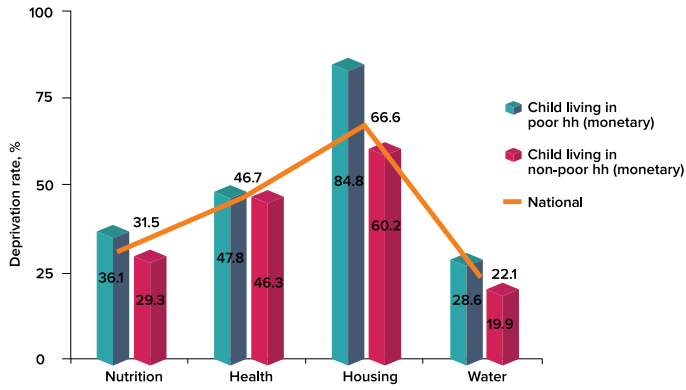


Figure 43 Deprivation headcounts by dimension and monetary poverty, children aged 5-12 years

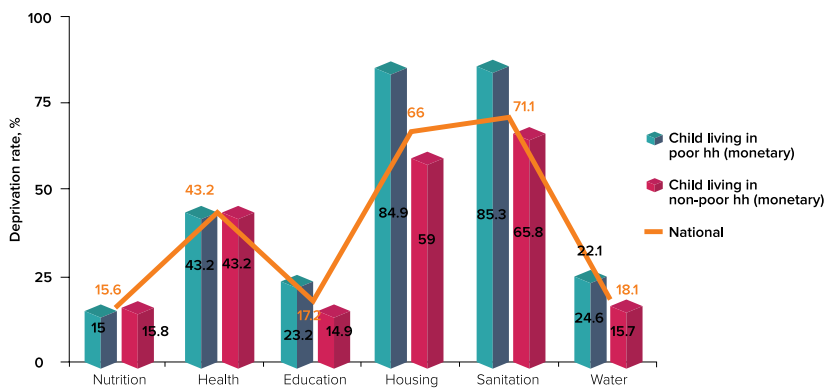
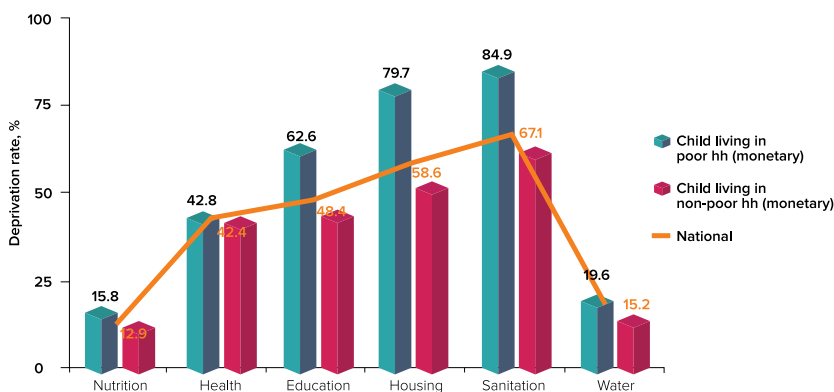


Figure 44 Deprivation headcounts by dimension and monetary poverty, children aged 13-17 years



## **10 DEPRIVATIONS AND INTERGENERATIONAL TRANSMISSION OF POVERTY IN BOTSWANA**

---

Research in countries like Botswana points out that children of poorer families are not just dropping out of school earlier, they are disadvantaged since birth or even more correctly since conception: their mothers have more troublesome pregnancies (resulting often in lower birth weight), the children are less frequently breastfed and provided with a less healthy diet afterwards, they do not get the care they need when they are ill and they are subject to more potentially life-threatening dangers when growing up because they are much more exposed to violence, they have less access to clean water and to adequate sanitation. These are not just a health hazard or an incentive to leave school early; it goes a lot deeper; recent neuro-psychological research illustrates that it hampers the full development of the so-called “executive functions” (inhibitory control, working memory and creative cognition). These executive functions are not just important to be successful in learning and at school, but also to be successful in social and economic life as a whole. Impaired executive functions lead to lower success in jobs, lower salaries, less stable relationships, more inclination to criminal activities and dangerous habit formation such as substance abuse (alcohol, drugs, medication). Making children’s life more equitable from the very start onwards is crucial in this respect.

In that context it is very important to pay attention to Early Childhood Education (ECE). ECD deserves serious policy attention since pre-school activities are known to contribute significantly to the level of school readiness of children and is a powerful tool in bridging the school attainment gaps between poorer children and children growing up in wealthier families. The activities typical for good ECD centres are all very important for children as these activities prepare them for school and even more importantly, they make them understand that it can be fun to learn and thus motivate them for seeking learning activities at older ages. Moreover, research has been convincingly pointed to the importance of pre-school activities not only for boosting success at school at higher ages, but also for narrowing the gap between children of poorer families and children of wealthier backgrounds.

There are strong arguments to direct the efforts of Botswana to a massive investment in pre-school centres in addition to combating social factors such as discrimination, violence in schools and negative social norms in the family related to the education of children. In economic terms, this investment is crucial for preparing the labour force for sustained high levels of economic growth; in social terms, this investment is most probably the best value-for-money in helping children to develop to their potential at older ages. Moreover, it will close the equity gap between children born in poor families compared to children born in non-poor households and thus will contribute substantially to more equity in Botswana. Public policy in this respect should be directed towards a heavy and large-scale investment in setting up early childhood day-care centres and towards installing an incentive system for parents and carers to send their children to these centres. When organised in a smart way, these centres can additionally reduce youth unemployment either by organising a public works programme for teachers and young child carers or by setting up a volunteer scheme for young adults to engage in an active contribution to the development of Botswana.

## **11 REFERENCES**

Alkire, S., Foster, J. (2007). ‘Counting and Multidimensional Poverty Measurements’, OPHI Working Paper No. 7, 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.

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

See Diamond (2012), Miyake (2013)

See i.e. Heckman J., (2008), Schools, Skills and Synapses, Economic Inquiry, 46(3): pp. 289 – 324.

- 
- 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.
- 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.
- 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.
- Gordon, D., Nandy, S., Pantazis, C., Pemberton, S., Townsend, P. (2003), *The Distribution of Child Poverty in the Developing World*, University of Bristol.
- Heckman J., (2008), Schools, Skills and Synapses, *Economic Inquiry*, 46(3); pp. 289 – 324.
- De Neubourg, C., M. de Milliano, I. Plavgo, (2014), 'Lost in Dimensions', Office of Research Working Paper, UNICEF Office of Research, Florence.
- De Neubourg, C., Bradshaw, J., Chzhen, Y., Main, G., Martorano, B., Menchini, L. (2012), 'Child Deprivation, Multidimensional Poverty and Monetary Poverty in Europe', Innocenti Working Paper 2012-02, UNICEF Innocenti Research Centre, Florence.
- 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.
- Notten, G. (2008), 'Multidimensional Poverty in the Republic of Congo: Being Poor Simultaneously in Many Ways', BWPI Working Paper 65. Brooks World Poverty Institute.
- Powis, Kathleen M., Lei, Q., Chinyanga, Y., Khan, N., Tumbare, E., an Widenfelt, E., Makhema, J., Shapiro, R. (2015) 'Determinants of Malnutrition among Children under 5 Years of Age in Five Health Districts in Botswana'.
- Ravallion, M. (1998), 'Poverty Comparisons: A Guide to Concepts and Methods', Living Standards Measurement Study Working Paper No. 88, World Bank: Washington, D.C.
- Roche, J. M. (2009), *Child Poverty Measurement in Bangladesh: Improving upon existing measures*, OPHI, University of Oxford.
- 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., & Nussbaum, M. (1993). *Capability and Well-being*. In *The Quality of Life* (pp. 30–53). Oxford: Clarendon Press.
- Statistics Botswana. (2011). *Population and Housing Census 2011, Analytical Report*. Gaborone: Statistics Botswana.
- 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.
- UNICEF (2000), *Poverty Reduction Begins with Children*. UNICEF, New York.

## 11 REFERENCES

---

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.

# 12 APPENDICES

## 12.1 MEASURING CHILD WELL-BEING

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 (2014) 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. 2012), 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. 2012). 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

## 12.2 MODA METHODOLOGY

This paper uses the Multiple Overlapping Deprivation Analysis (MODA) methodology to measure multidimensional deprivation among children in Botswana, i.e. those aged 0 -17 years. 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, 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 wellbeing. 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.

### **12.3 INDICATORS, DIMENSIONS AND DEPRIVATION THRESHOLDS**

The analysis of multiple and overlapping deprivations is based on indicators, dimensions, deprivation thresholds, and age groups, which were decided following data-driven feasibility assessments, discourse with national partners, and consideration of internationally-agreed definitions of the essential rights and needs of the child. The table below provides a list of the indicators and dimensions selected together with thresholds used to categorise children as deprived or non-deprived.

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. (2014), Lost in Dimensions, Office of Research Working Paper WP-2014-No. 04, UNICEF Office of Research, Florence.

## 12 APPENDICES

Table 13 Dimensions, Indicators and Deprivation Thresholds, for each age group

Dimension	Indicator	Age group	Threshold Deprived if..
Nutrition	Weight-for-age	0-4 years	under/ overweight (weight for age (WHO standard)) , i.e. (-2SD from median of reference population).
	Body mass index	5-17 years	under/ overweight (using BMI), i.e. (-2SD from median of reference population).
Health	Problematic nearest health facility	0- 17years	the nearest health facility has the following problems: facility is too far, facility is not clean or in poor condition, few trained professionals on staff, staff frequently absent, lack of drugs, does not offer all services, limited hours open
Education	School attendance	6-12 years	child of 6-11 years is not attending school, if school is open and if child is not sick; Or not attending school or training of any type for child 12-17 years if junior secondary or training of any type was not completed by age 15.
		13-17 years	
	School attainment	6-12 years 13-15 years	child is not in primary (6-12years) or junior secondary (13-15years) or more than 2 grades behind for age.
	Literacy	15-17 years	child did not finish junior secondary school or attend/ complete training of any type and is not able to read whole sentence and solve calculation
Housing	Overcrowding	0-17 years	more than 3 people per sleeping room (UN HABITAT) (Children under 5 are given a weight of 0.5)
	Fuel for lighting	0-17 years	household mainly uses 'dirty fuel' for lighting purposes. Clean fuels include electricity, solar power, gas (LPG), bio gas Dirty fuels include wood, paraffin, candle, paraffin/candle, cow dung, coal, charcoal, crop waste
Sanitation	Toilet facility	5-17 years	household usually uses unimproved toilet facility (pit latrine, flush communal toilet, VIP communal, Pit latrine communal, neighbours toilet, none)
Water	Water supply	0-17 years	household's main source of water supply is unimproved (bouser/tanker, well, borehole, river/stream, dam/pan, rain water tank, spring water) and if improved drinking water source is more than 30 minutes (WHO).

### 12.4 DATA

In order to conduct a MODA analysis, use is usually made of MICS or DHS data sets where a large number of child specific variables, especially for the children under 5 years, are available. For carrying out the research exercise for children in Botswana, using the N-MODA methodology, the Botswana Core Welfare Indicator Survey (BCWIS) 2009/10 was used. In the case of household budget surveys such as BCWIS, most of the variables are at household levels such that most of the indicators and dimensions (with the exception of nutrition and education) were computed at household level and imputed to the children living in that household. There



## 12 APPENDICES

---

was very little information on the children at the individual level. Nonetheless, one of the most important advantages of using the BCWIS in the case of Botswana is that it had information on monetary poverty. This has enabled an overlap analysis of monetary poverty and poverty based on the level of deprivation. Furthermore, the BCWIS 2009/10 is a relatively out-dated data set although there has not been major socioeconomic boom, crisis or any situation of instability since then.

Like in all data surveys, missing values prevailed for the majority of variables. In most cases, the number of missing values was quite small. Some indicators chosen by the local stakeholders where percentages of missing values were significant were dropped at the very first stage of the study. However, missing values sometimes arise due to the choice of indicators essential in gauging child well-being in Botswana. For instance, the first two education indicators, school attendance and school attainment, were relevant only for children aged 6 to 17 years and 6 to 15 years respectively. We therefore assigned missing values for the two indicators for children aged 5 and for the “school attainment” indicator for children aged 16 and 17 years. This resulted in ‘creation’ of missing values, for the sake of empirical consistency, for part of the children in these two age groups (children aged 5 to 12 years and children aged 13 to 17 years).

Furthermore, the nutrition indicators for children where the absolute values of some variables (for example weight and height measurement) were biologically implausible were recoded as missing values. The amount of children with biologically implausible weight and height measurements being important, the resulting missing values were relatively higher (than for other variables).

The missing values were treated in accordance to the MODA methodology – they were treated as missing values in the single deprivation analysis, while the children with missing observations for some indicators and dimensions were considered as being non-deprived for the overlapping and multiple deprivation analysis. The resulting disparities created by the difference in treatment of missing values can be explained by the formula used to calculate deprivation headcounts.

Deprivation headcounts are calculated, in the MODA analysis, using the formula below:

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

where

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

$q_{j,r}$  - number of deprived children in dimension  $j$  of the reference population  $r$ ;

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

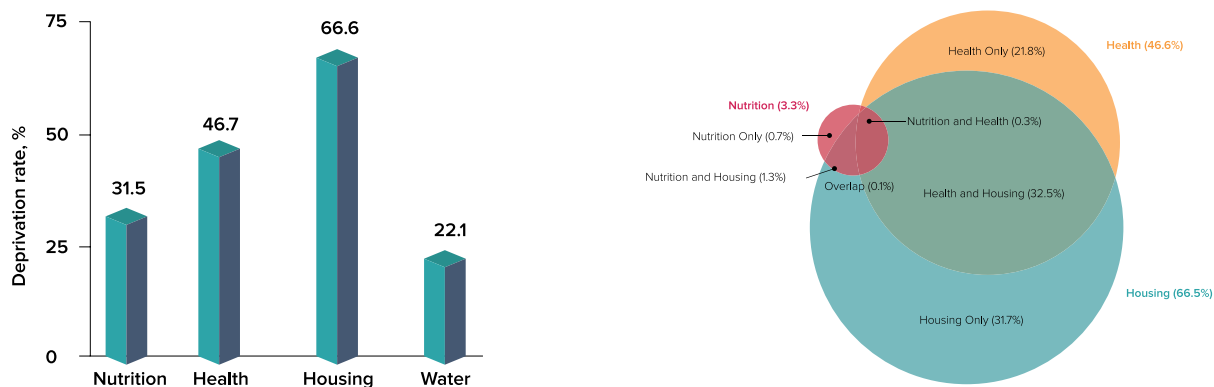
As mentioned above, within the single deprivation analysis, missing values on particular indicators and dimensions remain missing. As a consequence, children with missing information will be excluded from the calculation (both from the numerator and denominator) of the deprivation headcount ratio. In overlapping and multiple deprivation analyses, however, children with missing values are considered as non-deprived<sup>29</sup> are to be included in the reference population. A direct consequence of this treatment of missing values is, observed slight differences in deprivation headcounts calculated in the different type of analyses (simple, overlapping and multiple) constituting the MODA. For example, deprivation headcounts by dimension, as calculated to produce the following two graphs, differ. As seen below, the differences for the nutrition dimension tend to be more important, this is explained by large missing values giving rise to bigger changes in reference populations when carrying out different types of analyses.

In the case of weight and heights measurements, the WHO standards for children weight and height were used to determine biologically implausible values.

This has been done to ensure the sample of children was the same for deprivations in each dimension, therefore allowing overlapping and multidimensional analyses that made sense. For further details about the treatment of missing values, see De Neubourg, C., M. de Milliano, I. Plavgo, (2012), ‘Step-by-step guidelines to the Multiple Overlapping Deprivation Analysis (MODA)’, Office of Research Working Paper, UNICEF Office of Research, Florence.

## 12 APPENDICES

Figure 45 Deprivation headcount by dimension and three-way overlapping for selected dimensions, children aged 0-4 years



### 12.5 LIMITATIONS AND FURTHER RESEARCH

An obstacle to addressing all the concerns highlighted in this report is the limitations in the collection of data itself. As any evidence-base analysis such as this one relies on the accuracy, representativeness and completeness of data to effectively guide policy, this analysis acknowledges the possibility of under-identification of malnourished children, inconsistencies (thus invalidities) in the recording of anthropometric data, as well as the lack of recognition of unregistered children. This suggests the possibility that more children than are officially recognised here are affected by (multiple) deprivations, and emphasises the extra methodical precision which future such studies should employ.