REPUBLIC OF KENYA

NIPFN
National Information Platform for Food Security and Nutrition

# AN ANALYSIS OF THE NATIONAL PROGRESS AND HOUSEHOLD CHARACTERISTICS ASSOCIATED WITH STUNTING



## MARCH 2021

Foreign, Commonwealth & Development Office

BILL & MELINDA GATES foundation

# AN ANALYSIS OF THE NATIONAL PROGRESS AND HOUSEHOLD CHARACTERISTICS ASSOCIATED WITH STUNTING

MARCH 2021

Kenya National Bureau of Statistics
National Information Platform for Food Security and Nutrition
P.O BOX 30266-00100
Real Towers, Upper Hill Hospital Road
NAIROBI

Telephone: +254-20-3317583 / 3317612 / 3317623 / 3317622 / 3317588 / 3317586 / 3317651

Mobile: +254 701244533, +254 735004401
Landlines: +254 20 2911000, +254 20 2911001
Fax: +254-20-315977

Office of the Director General
Email: info@knbs.or.ke, directorgeneral@knbs.or.ke
http:// https://www.knbs.or.ke/

ISBN 978-9966-102-26-3

This study and report was produced by the National Information Platform for Food Security and Nutrition (NIPFN) project team operating under the Kenya National Bureau of Statistics (KNBS) and the Kenya Institute of Public Policy Research and Analysis (KIPPRA).

This report was produced with the financial support from the European Union.

The views expressed in this report are those of the authors and do not necessarily represent the views of European Union.

All Rights Reserved Copyright ©
Extracts may be published if the source is duly acknowledged

# Table of Contents


Table of Contents iii
Abbreviation and Acronyms iv
Foreword v
Executive Summary vi
1. Chapter one: Introduction 1
1.1. Background 1
1.2. Objectives 4
1.3. Data and Methods 4
2. Chapter Two: Results and Findings 5
2.1. National Stunting Trends and Rate of Reduction 5
2.2. Findings on the Characteristics Associated with Stunting. 8
2.2.1. Association between Demographics and Stunting 8
2.2.2. Association between Household Socio-Economic Status and Stunting 9
2.2.3. Association between Social Inequalities and Stunting 11
2.3. Strength of Association between Social Inequalities and Childhood Stunting 12
2.3.1. Crude and Adjusted Odds Ratio 13
3. Chapter Three: Interpretation of Results and Discussion 18
3.2. National Stunting Trends and Rate of Reduction: 18
3.3. Association between Stunting and Socio-economic Indicators at Household level 18
3.3.1. Demographic Indicators Associated with Stunting 18
3.3.2. Household Socio-Economic Indicators Associated with Stunting 19
3.3.3. Social Inequalities Associated with Stunting 20
3.4. Limitation of Analysis 22
4. Chapter Four: Conclusion and Recommendations 23
Annexes 25
Annex 1: Glossary 25
Annex 2: Summary of Results 27
References 29

## List of Tables

Table 2.1 World Health Assembly Stunting Target 5
Table 2.2 Average Annual Rate of Reduction for Stunting 6

## List of Figures

Figure 1.1 UNICEF Conceptual Framework of Malnutrition 2
Figure 1.2 Basic Causes in the UNICEF Conceptual Framework of Malnutrition 2
Figure 2.1 Stunting Trends from 1993 to 2014 based on Kenya Demographic and Health Surveys 6
Figure 2.2 Projected Stunting Rates and Targets 6
Figure 2.3 Distribution of Stunting Based on Age-group 8
Figure 2.4 Proportion of Stunting Based on Sex 8
Figure 2.5 Distribution of Stunting based on household size 9
Figure 2.6 Proportion of Stunting Based on Area of Residence 9
Figure 2.7 Proportion of Stunting in Food Poor and Non-Food Poor Households 9
Figure 2.8 Proportion of Stunting in Households Classified as Absolute Poor 10
Figure 2.9 Proportion of Stunting in Households Classified as Hard-core Poor 10
Figure 2.10 Distribution of Stunting Based on Wealth Quintiles 10
Figure 2.11 Proportion of Stunting in Households that Experienced Drought as a Shock 11
Figure 2.12 Proportion of Stunted by Status of Household Sanitation Facility 11
Figure 2.13 Proportion of Stunting Based on Mother's Level Education 12
Figure 2.14 Proportion of Stunting Based on Father's Education Level 12
Figure 2.15 Distribution of Stunting Based on Caregiver's (mother's) Working Pattern 12
Figure 2.16 Crude Odds of Stunting based on area of residence 13
Figure 2.17 Crude Odds of Stunting Based on Household Size 14
Figure 2.18 Adjusted Odds of Stunting Based on Child's Sex 14
Figure 2.19 Adjusted Odds of Stunting Based on Age Cohort 14
Figure 2.20 Crude Odds of Stunting Based on Household Poverty 15
Figure 2.21 Crude Odds of Stunting Based on Drought/Floods as a Shock 15
Figure 2.22 Adjusted Odds of Stunting Based on Wealth Quintiles 16
Figure 2.23 Adjusted Odds of Stunting Based on Absolute Poverty 16
Figure 2.24 Crude Odds of Stunting Based on Mother's Working Pattern 17
Figure 2.25 Adjusted Odds of Stunting Based on Mother's Education Level 17
Figure 2.26 Adjusted Odds of Stunting Based on Sanitation Facilities 17

## Abbreviation and Acronyms

| | |
|---|---|
| AARR | Average Annual Rate of Reduction |
| C4N | Capacity for Nutrition |
| EU | European Union |
| FAO | Food and Agriculture Organization |
| FCDO | Foreign, commonwealth & Development Office |
| PAC | Policy Advisory Committee |
| PMC | Project Management Committee |
| KDHS | Kenya Demographic and Health Survey |
| KIHBS | Kenya Integrated Household Budget Survey |
| KIPPRA | Kenya Institute of Public Policy Research and Analysis |
| KNBS | Kenya National Bureau of statistics |
| NIPFN | National Information Platform for Food Security and Nutrition |
| SD | Standard Deviation |
| UNICEF | United Nations International Children Emergency Fund |
| WHA | World Health Assembly |
| WHO | World Health Organization |

# Foreword

This report builds on findings from the report on the anthropometric trends of under nutrition in Kenya. It focuses specifically on stunting trends and reviews the national progress in stunting reduction among children aged 59 months and below from 1993 to 2014 and compares this against the national and global commitments.

The report goes further to provide an analysis of the socio-economic characteristics at household level that are associated with stunting based on data collected using the Kenya Integrated Household Budget Survey 2015/16.

We wish to acknowledge the contributions of various organizations and individuals who have contributed enormously to the success of this study. Special thanks go to the European Union (EU), The Foreign, Commonwealth & Development Office (FCDO) and Bill and Melinda Gates Foundation, for funding the National Information Platform for Food Security and Nutrition (NIPFN) project which undertook the study. The hard work and dedication of the project team isappreciated for their contribution to the content and authoring of this report.

We thank Kenya National Bureau of statistics (KNBS) and Kenya Institute of Public Policy Research and Analysis (KIPPRA) management and staff for their useful feedback and guidance. In particular, we appreciate the special role played by the NIPFN Project Director, Mr. Robert Nderitu and the Executive Director of KIPPRA, Dr. Rose Ngugi, in providing technical support throughout the process. We are indebted to the Project Management Committee (PMC), the Policy Advisory Committee (PAC) and the Capacity for Nutrition (C4N) for reviewing the report and giving very useful inputs.

**Macdonald G. Obudho, MBS**
**Director General**
**Kenya National Bureau of Statistics**

# Executive Summary

The National Information Platform for Food and Nutrition (NIPFN) aims at informing food and nutrition security policies and programmes through evidence. One of the objectives of NIPFN is to strengthen capacity to track progress in meeting national objectives on malnutrition reduction. In view of this objective, this report presents analysis and findings on stunting – an anthropometric indicator which Kenya tracks through global and national commitments such as the World Health Assembly (WHA), Sustainable Development Goals (SDGs) and Kenya's Big 4 Agenda.

The report responds to two main questions: (1) what is the national progress in stunting reduction between 1993 and 2014 for children aged 0-59 months? If the current stunting performance is sustained, will the nation achieve its national and global targets for 2022 and 2025? (2) Is stunting associated with poverty? If so, what are some of the socio-economic characteristics of households with stunted children?

The report uses data from Kenya Demographic Health Surveys (KDHS) from 1993 to 2014 to respond to the first question while the second question uses data from the Kenya Integrated Household Budget Survey (2015/16).

The key finding from the first question is that: the national rate of stunting among children aged 0-59 months decreased at a rate of 1.6 per cent per annum between 1993 and 2014 with a projected stunting rate of 23.8 per cent by 2025. This rate is against a calculated WHA target of 12.6 per cent by 2025, and the national Big 4 Agenda target of 19.0 per cent by 2022. This means that current efforts need to be enhanced if the 2025 WHA stunting target is to be attained.

For purposes of enhancing efforts for reducing stunting, this analysis reveals some demographic and socio-economic characteristics whose consideration may bolster stunting reduction efforts. With regard to demographics, the sex and age of the child were significant as were the household size and place of residence (rural versus urban). This implies need for programmatic targeting for stunting reduction through: care giving practices tailored to a child's age and evolving development needs; tailor-made rural and urban stunting prevention initiatives; messaging on birth/family planning.

The socio-economic indicators associated with stunting were: wealth quintiles and poverty levels i.e. hardcore, absolute and food poor. While development interventions aimed at improving living standards are likely to be effective in addressing stunting reduction, using poverty levels and number of children under five years of age to target households for community health and nutrition programmes is likely to accelerate desired outcomes both socio-economically and nutritionally.

Education levels of both mother and father, sanitation facilities (improved or unimproved) and the nature of the care-giver's (mother's) employment also had significant association with the occurrence of stunting in children at household level. Interventions aimed at increasing the coverage of improved sanitation are therefore likely to impact on stunting in the long run. In addition, educating the girl child to tertiary level was significantly associated with lower odds of stunting and is therefore likely to impact stunting rates as a medium to long-term development initiative. Finally, the nature of a mother's employment was also a predictor of stunting with increased odds of stunting in children whose mothers had less predictable/stable employment such as seasonal or casual employment.

The implication of these findings need not be considered in isolation but holistically in terms of improving the quality of living through long-term development strategies as well informing the targeting process of households for short and medium term programmatic interventions.

# 1. Chapter one: Introduction
## 1.1. Background

Stunting is an anthropometric indicator that is linked to long-term human development. It is a measure of growth retardation as a result of chronic deprivation in the quantity and quality of diets that is diagnosed by capturing height and age and assessing the same against the height and age from a healthy reference population[1]. It is an important measure of a child's health as it has implications on the child's cognitive and physical development such as early walking[2] . Evidence from longitudinal studies indicate associations between low height-for-age with delayed language and cognitive development at five years of age, and longer-lasting effects such as lower grade attainment at adolescence and reduced chances of formal employment in adulthood[3]. Stunting is attributed to multiple causes such as: inadequate dietary intake, frequent illnesses, poor care-giving practices, and poor environmental conditions, among others. Therefore, its prevention requires concerted and aligned efforts from several actors[4]. Understanding and addressing stunting requires a long-term analysis to identify patterns and trends over time, as well as analysis of the diverse factors that could be associated with its occurrence such as socio-economic factors (Skoufias, et al, 2019)[5].

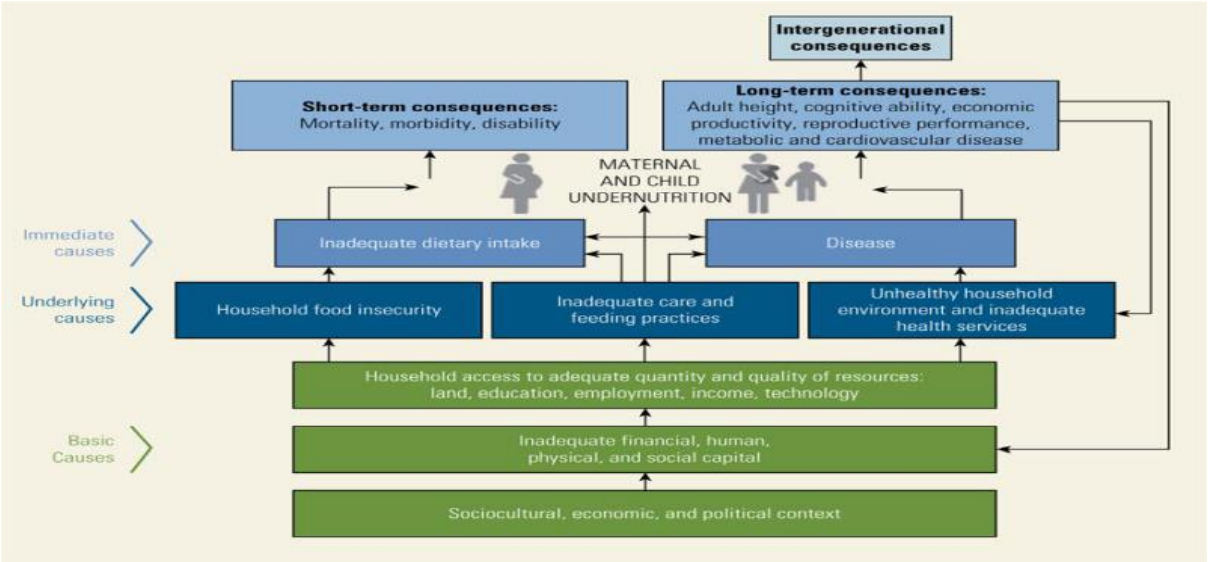
*Poverty reduced from 46.6 per cent in KIHBS 2005/06 to 36.1 per cent in KIHBS 2015/16 while stunting reduced from 37.2 per cent in KIHBS 2005/06 to 26.7 per cent in KIHBS 2005/16.*

One of several findings from the 2015/16 KIHBS was socio-economic improvement marked by a decrease in the proportion of poor people as measured using poverty head count rate. The poverty headcount rate reduced by over 10 percentage points within a 10-year period, i.e. from 46.6 per cent in KIHBS 2005/06 to 36.1 per cent in KIHBS 2015/16. Over the same period, the stunting rate similarly decreased by over 10 percentage points from 37.2[6] per cent in KIHBS 2005/06 to 26.7[7] per cent in KIHBS 2015/16 for children aged 6-59 months. This prompted the question on how poverty and its related inequalities could be associated with malnutrition.

[1] Gebre A, Reddy P.S., Mulugeta A., Sedik Y., and Kahssay M., (2019). *Prevalence of Malnutrition and Associated Factors among Under-Five Children in Pastoral Communities of Afar Regional State, Northeast Ethiopia: A Community-Based Cross-Sectional Study.* Journal of Nutrition and Metabolism, Volume 2019, Article ID 9187609, 13 pages. Available at https://doi.org/10.1155/2019/9187609.
[2] Sudfeld, C. R., McCoy, D. C., Danaei, G., Fink, G., Ezzati, M., Andrews, K. G., et al. (2015). Linear growth and child development in low- and middle-income countries: A meta-analysis. Pediatrics, 135(5), e1266–e1275.
[3] Walker, S. P., Wachs, T. D., Grantham-McGregor, S., Black, M.M., Nelson, C. A., Huffman, S. L., Baker-Henningham, H., Chang, S. M., Hamadani, J. D., Lozoff, B., Gardner, J. M. M., Powell, C. A., Rahman, A., Richter, L. (2011). Inequality in Early Childhood: Risk and Protective Factors for Early Child Development. Lancet 378: 325–38.
[4] Ruel MT and Alderman H. (2013). Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? Lancet 382:536–551.
[5] Skoufias Skoufias, Emmanuel, Katja Vinha, and Ryoko Sato. (2019). *All Hands on Deck: Reducing Stunting through Multisectoral Efforts in Sub-Saharan Africa.* Africa Development Forum series. Washington, DC: World Bank.
[6] Re-analysed KIHBS 2015/16 data
[7] Re-analysed KIHBS 2015/16 data

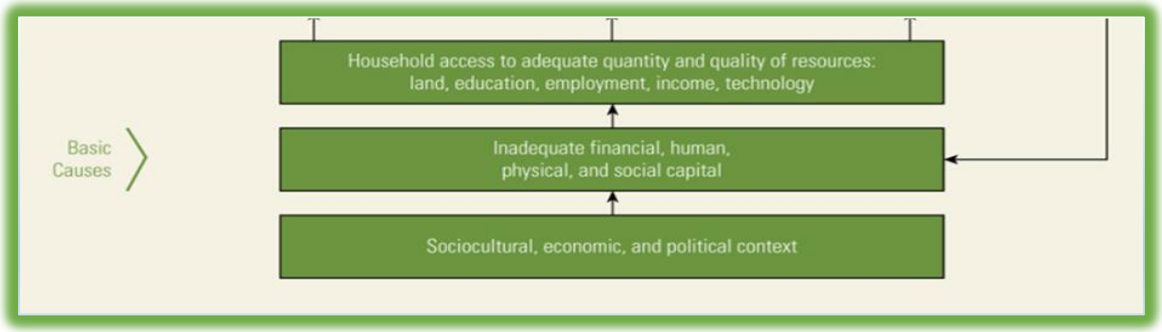
The indicators selected for analysis were influenced by the UNICEF conceptual framework of nutrition as shown in Figure 1.1 and the lancet 2013 series which depict nutrition as an outcome of immediate, underlying and basic causes[8] . Basic determinants such as policies, economy, socio-cultural, geo-political and agro-ecological determinants impact on the underlying determinants such as: environment, care practices, household food security which further impact on immediate determinants such as disease and food intake.

**Figure 1.1 UNICEF Conceptual Framework of Malnutrition**




Source: Black, R. E., R. Laxminarayan, M. Temmerman, and N. Walker, editors. 2016. *Reproductive, Maternal, Newborn, and Child Health. Disease Control Priorities*, third edition, volume 2. Washington, DC: World Bank.

**Figure 1.2 Basic Causes in the UNICEF Conceptual Framework of Malnutrition**




This report specifically looks at basic determinants of undernutrition of the framework. One of the pillars at the basic causes is the sociocultural and economic context. According to FAO[9] (2019), an analysis of the impact of economic context on food and nutrition security needs to extend from macro-economic growth to include measures of income and expenditure

[8] Black, R. E., Victoria, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., et al. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. The Lancet, 382, 427–451.
[9] FAO 2019. The State of Food Security and Nutrition in the World. Safeguarding against economic slowdowns and downturns

and also measures of inequality. To measure income and expenditure, this report used wealth quintiles as well as expenditure-based classifications of poverty: food poor[10], overall poor and hard-core poor, to assess their association with the occurrence with stunting at household level. In view of the impact of unforeseen events on household incomes, the analysis included the impact of recent shocks to the household[11] .

The indicators used to assess inequalities[12] (FAO, 2019) are education levels of both the father and mother; type of sanitation and working patterns of the mother.

In addition, socio-economic and inequality related indicators, this report also considers demographic indicators such as: area of residence, household size, sex and age of the child.

The indicators analysed in this report are therefore grouped into three:

***FAO 2019: State of Food Security and Nutrition in the World***

*Economic improvement in a nation need to assess not just the macro-economic growth but also improved income and expenditure as well declining inequalities*

- Demographic indicators: age and sex of the child, household size, area of residence (rural or urban)
- Household socio-economic indicators: wealth quintile, food poor, overall poor and hard-core poor; any shock, droughts/floods and increase in food prices.
- Inequalities indicators: type of sanitation facility; mothers and father's education and working pattern of mother.

Recognising that the causes of malnutrition, and stunting in particular, are multiple and complex, the findings from this analysis are not exhaustive of the underlying features that contribute to it. The report also does not aim to identify the causes of stunting, rather, it aims at providing a picture of how poverty and its related inequalities are associated with stunting in Kenya.

The report is structured as follows: Chapter 1 provides a background to the study including the conceptual framework that influenced the selection of indicators for analysis, objectives of the analysis, data sources and methods of analysis. Chapter 2 describes the results and findings while Chapter 3 includes interpretation and discussion of the results and a brief

[10] See definition of terms for: food poor, absolute poor and hardcore poor in Annex 1.
[11] See definition of terms for shocks in Annex 1.
[12] FAO 2019. The State of Food Security and Nutrition in the World. Safeguarding against economic slowdowns and downturns

explanation of the limitations of the analysis and Chapter 4 concludes with a summary of results and recommendations.

## 1.2. Objectives

The main questions that prompted the analysis were:

- What is the national progress in reducing stunting between 1993 and 2014 for children aged 0-59 months? If the current stunting performance is sustained will the nation achieve its national and global targets for 2022 and 2025?
- Is stunting associated with poverty and if so, what are some of the common socio-economic characteristics of households with stunted children?

The objectives are:

- Present the national progress and future projection on stunting reduction for children aged 0 - 59[13] months and the Average Annual Rate of Reduction for stunting from 1993 to 2030.
- Present household-level analysis of the socio-economic indicators that are associated with stunted children aged 6-59 months[14].

## 1.3. Data and Methods

The analysis was done using secondary data from existing published reports. The stunting trends and the Average Annual Rate of Reduction (AARR) were generated using data from the Kenya Demographic and Health Survey (KDHS) 1993, 1998, 2003, 2008/09 and 2014. Since the targets applied for stunting reduction apply for children aged 0 – 59 months, KDHS was selected for generating the AARR as its data captures children aged 0 – 59 months. The analyses on the socio-economic characteristics associated with stunting were derived from KIHBS 2015/16 data.

The anthropometric indices on stunting were derived using the current WHO 2006 child growth standards while the stunting prevalence projections were derived using the log linear method and the AARR was calculated using the simple linear regression method. Further, the application of the Pearson Chi-square was applied in establishing the association between stunting and socio-economic characteristics and these were presented as proportions. The variables that were significantly associated with stunting were then subjected to logistic regression models, and thereafter, a multivariable regression model was fitted to examine the socio-economic factors associated with stunting.

[13] Kenya Demographic and Health Surveys provide anthropometric data for children aged 0 -59 months.
[14] Kenya Integrated Household Budget Survey provides anthropometric data for children aged 6 – 59 months.

# Chapter Two: Results and Findings

In this Chapter the findings are presented in two subsections: first is the national stunting trends and the Annual Average Rate of Reduction (AARR) in section 2.1 and second, the association between stunting and demographic and socio-economic indicators in section 2.2.

## 2.1. National Stunting Trends and Rate of Reduction

In 2012, the World Health Assembly (WHA) adopted six indicators: stunting, wasting, anaemia, overweight, low birth weight and breastfeeding, with an aim of tracking progress in reducing negative trends and promoting positive nutrition practices (WHO 2014[15]). Each of the adopted WHA indicators had targets for the year 2025. The stunting target was set as 40 per cent reduction in the number of stunted children by 2025.

Table 2.1 shows the calculation of the stunting target for the 2025 using 2012 as the base year and the projected under-five population for 2012 and 2025. This entails the estimation of stunted children in 2012 by applying the stunting for 2014 to the projected under-five population as at 2012. The stunted children as at 2012 was then subjected to the target of 40 per cent reduction in the number of stunted children by 2025 to arrive at the expected stunted children in 2025. Finally, the targeted stunting rate at 2025 is calculated as the ratio between the stunted children and the projected under-five population as at 2025.

**Table 2.1 World Health Assembly Stunting Target**

| | |
|---|---|
| Under 5 population (2012) [16] | 6,367,544 |
| Number of stunted children as at 2012 (calculated)[17] | 1,655,561 |
| WHA 2025 Target (numbers) (40% less 2012) (calculated) | 993,337 |
| Projected 2025 population of children <5[18] [19] | 7,903,361 |
| Targeted Stunting Rate (per cent) | 12.6 |

In Figure 2.1, stunting trends depict a downward trajectory between 1993 and 2014 based on KDHS series in all surveys except the 2008.

[15] WHO (2014). WHA Global Nutrition Targets 2025: Stunting Policy Brief 1.
[16] Kenya Population and Housing Census (2009). Analytical Report on Population Projection.
[17] Note: for computation of number of stunted children as at 2012, we used the published KDHS 2014 rate (26.0 %).
[18] Kenya Population and Housing Census (2009). Analytical Report on Population Projection.
[19] The projected population was derived from the 2009 census. The projections from the 2019 census are yet to be generated. Once generated, the 2025 projection from 2019 census will apply.

**Figure 2.1 Stunting Trends from 1993 to 2014 based on Kenya Demographic and Health Surveys**

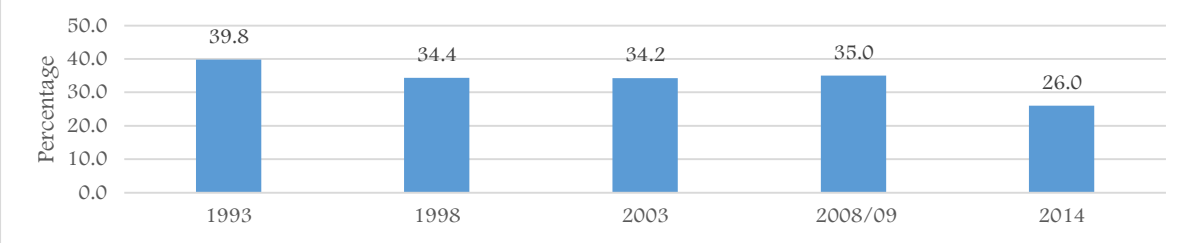


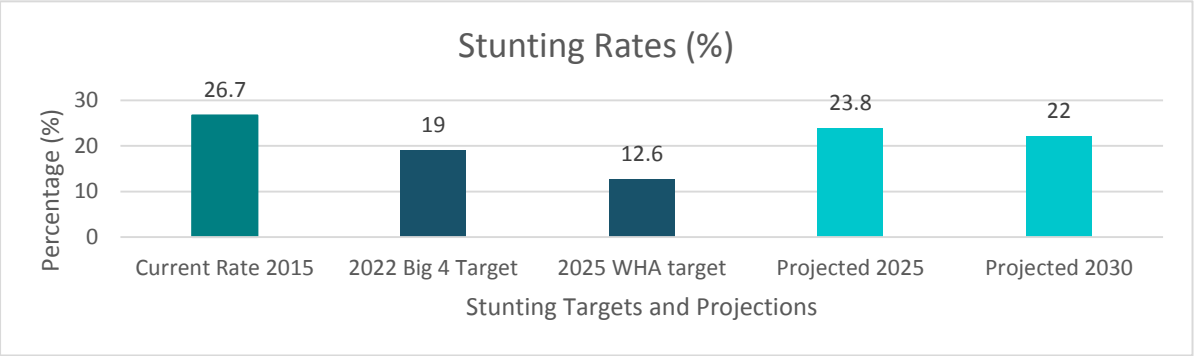

Table 2.2 shows that the rate of reduction for stunting, AARR[20] is 1.6 per cent per year as estimated using the log-linear modelling.

**Table 2.2 Average Annual Rate of Reduction for Stunting**

| Indicator | AARR[21] | p-value |
|---|---|---|
| Stunting | + 1.6 | 0.059 |

Figure 2.2 shows the projected stunting rate for the years 2025 and 2030 and the set targets for the Big 4[22] agenda and the WHA target.

**Figure 2.2 Projected Stunting Rates and Targets**




Stunting trends depict a downward trajectory between 1993 and 2014 (Figure 2.1) with an average annual rate of reduction of 1.6 per cent as shown in Table 2.2. This is a 13.8 per cent drop in terms of the national proportion of stunted children between 1993[24] and 2014. If this rate of reduction is sustained, the national stunting rate in 2025 and 2030 will be 23.8 per cent and 22.0 per cent, respectively as shown in Figure 2.1.

[20] AARR definition and calculation elaborated in Annex 1
[21] AARR calculated using KDHS: 1993, 1998, 2003, 2008/09, and 2014.
[22] Big 4 Agenda stunting target is 27% reduction in stunting as at 2018, the time of signing up to the Big 4 Agenda, bringing it to 19%.
[23] Projected 2025 and 2030 rates were derived from previous KDHS data for children aged 0-59 months.
[24] Re-analysed stunting rate using WHO 2006 child growth standards is 39.8%.

In 2012, Kenya signed up to the World Health Assembly target of reducing by 40 per cent the *number* of stunted children by 2025. The calculated target as shown in Table 2.1 in terms of number of stunted children by 2025 is 993,337, bringing the desired proportion of stunted children by 2025 to 12.6 per cent. In addition, in 2017 the government of Kenya adopted the Big 4 agenda with a target of 27 per cent reduction in the proportion of stunted children. The projected stunting rates shows that with the current rate of reduction, the country may not achieve the targets and this calls for enhancement of the efforts in order to realise these targets.

## 2.1. Findings on the Characteristics Associated with Stunting.

This section presents the results of a chi-square test between stunting and selected household and demographic characteristics reflected as proportions (%), while section 2.3 presents the strength or level of association between household characteristics and stunting using crude and adjusted odds ratios. The interpretation and discussion of the findings in this section are provided in section 2.3 and the summary of the statistical analysis is provided in Table 0.1 in Annex 2.

### 2.2.1. Association between Demographics and Stunting

The demographic factors in this analysis were: the age and sex of the child, area of residence (rural or urban) and household size and each had a positive association with stunting. The age group with the highest stunting proportion is 18 – 23 months with 37.6 per cent being stunted as depicted in Figure 2.3. The male child has a higher proportion of stunting with 29.7 per cent being stunted compared to 24.0 per cent of girls as shown in Figure 2.4. Every increase in household size category was marked by an increase in the proportion of stunted children as shown in Figure 2.5 and households with seven or more members had 31.3 per cent of children being stunted. One in three children in the rural areas is stunted compared to approximately one in five in urban areas as shown in Figure 2.6.

**Figure 2.3 Proportion of Stunting Based on Age-group**

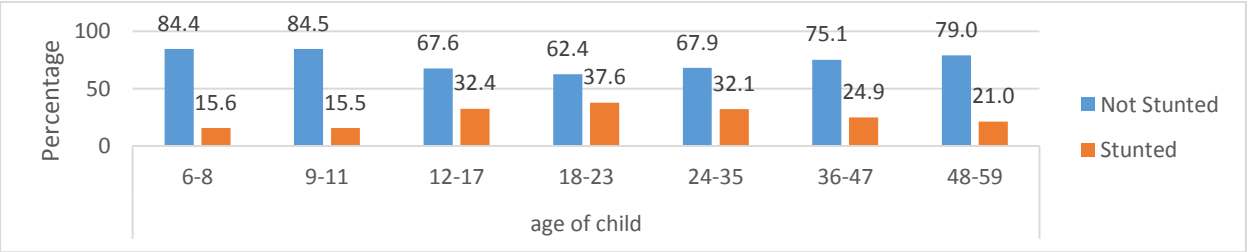



**Figure 2.4 Proportion of Stunting Based on Sex**

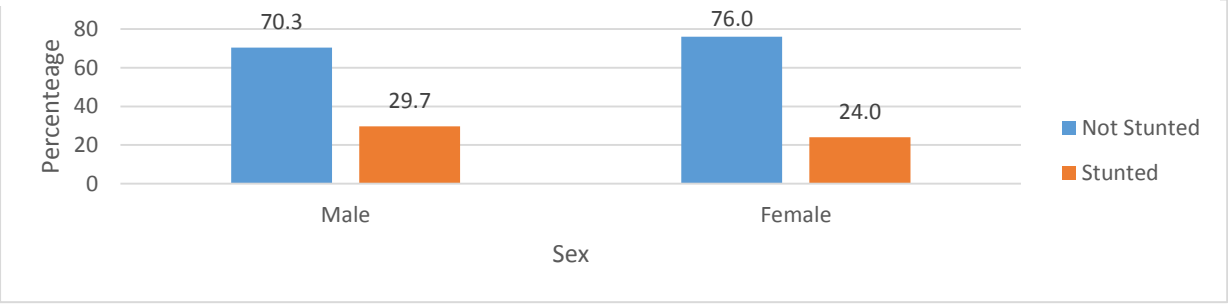


**Figure 2.5 Proportion of Stunting based on household size**

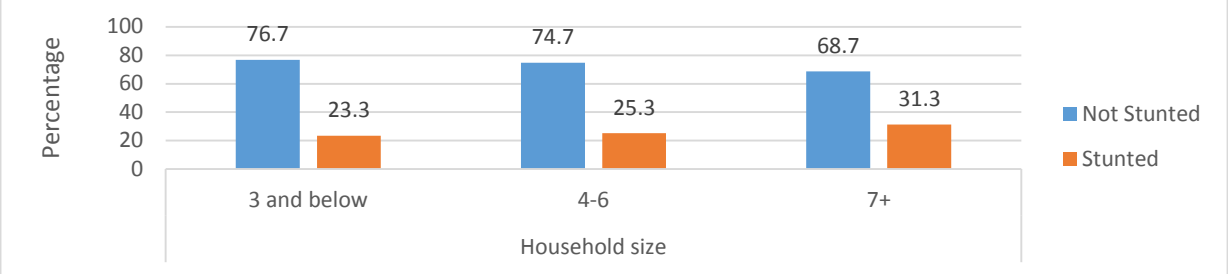
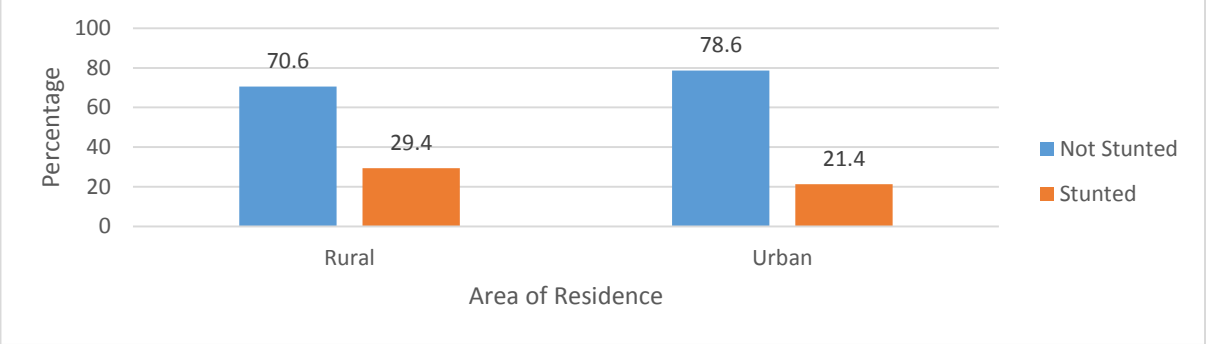



**Figure 2.6 Proportion of Stunting Based on Area of Residence**

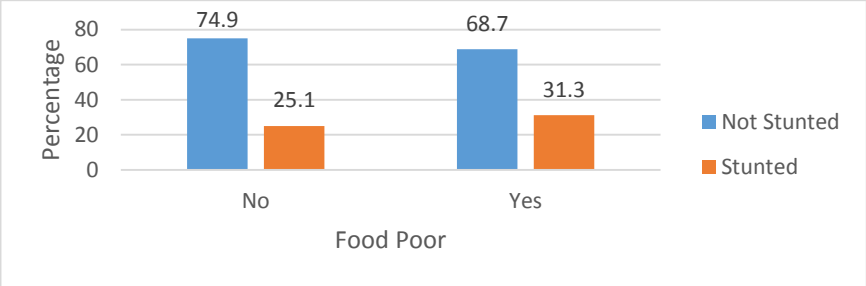



### 2.2.2. Association between Household Socio-Economic Status and Stunting

The socio-economic indicators used in this section to test for association with stunting include; *absolute, food and hard-core poverty* [25]*; household wealth quintiles* and *recent shock to the household* [26] with all of them being positively associated with stunting.

About 31 per cent of children in households classified as food poor were stunted compared to 25.1 per cent in non-food poor households; 31.6 per cent of children in households classified as absolute poor were stunted compared to 23.9 per cent in households not classified as absolute poor and finally, 35.7 per cent of children in households classified as hard-core poor were stunted compared to 26.0 percent in households not classified as hard-core poor.

**Figure 2.7 Proportion of Stunting in Food Poor and Non-Food Poor Households**




[25] See definition of terms in Annex 1
[26] See definition of terms in Annex 1

**Figure 2.8 Proportion of Stunting in Households Classified as Absolute Poor**

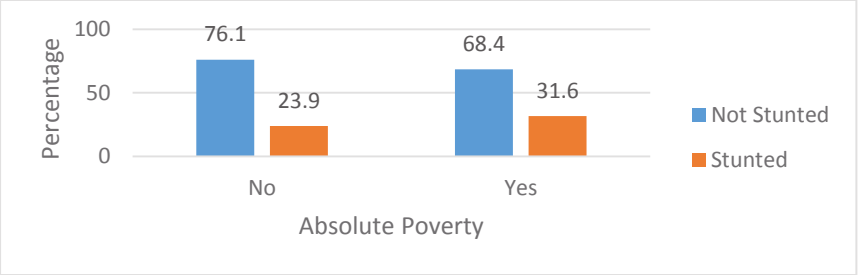
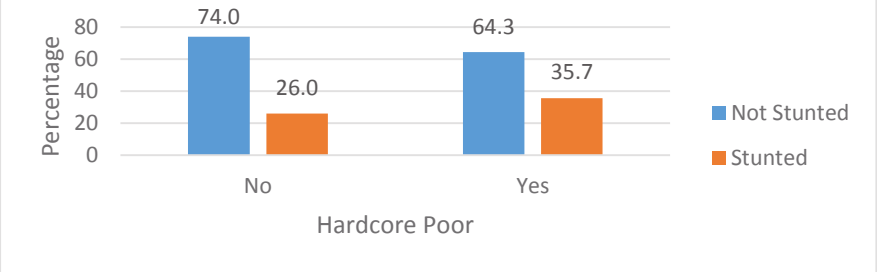
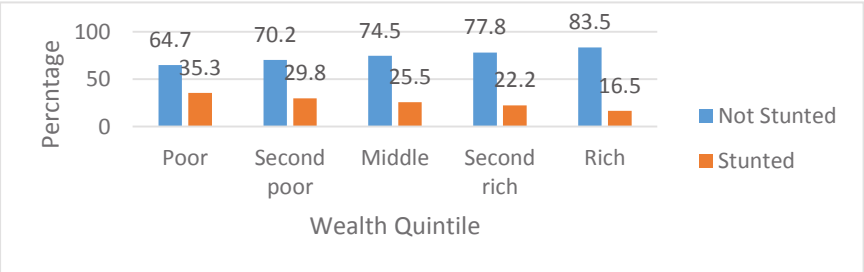



**Figure 2.9 Proportion of Stunting in Households Classified as Hard-core Poor**




The proportion of stunted children decreased with each increase in wealth quintile. Children in households classified as poor had the highest proportion of stunted children (35.3%) while only 16 per cent of children in households of the highest wealth quintile were stunted as shown Figure 2.10.

**Figure 2.10 Proportion of Stunting Based on Wealth Quintiles**




The proportion of stunting in children was slightly higher in households that had experienced drought or flood as a recent shock to the household as shown in Figure 2.11. The relationship between increase in food prices as a recent shock to the household and any other form of household shock were not significantly associated with stunting.

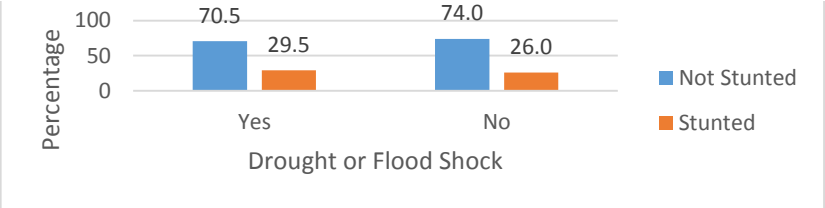
***SOCIO-ECONOMIC INDICATORS ASSOCIATED WITH STUNTING.***

*Poverty: 31.3 per cent of children in households classified as food poor are stunted; 31.6 per cent of children in households classified as absolute poor are stunted and 35.7 per cent of children in households classified as hard-core poor are stunted.*

*Wealth quintile: 58 per cent of stunted children are based in Households that are in the bottom two wealth quintiles.*

*Shocks: About 30 per cent of children in a household that had experienced floods or drought as a shock were stunted.*

**Figure 2.11 Proportion of Stunting in Households that Experienced Drought as a Shock**

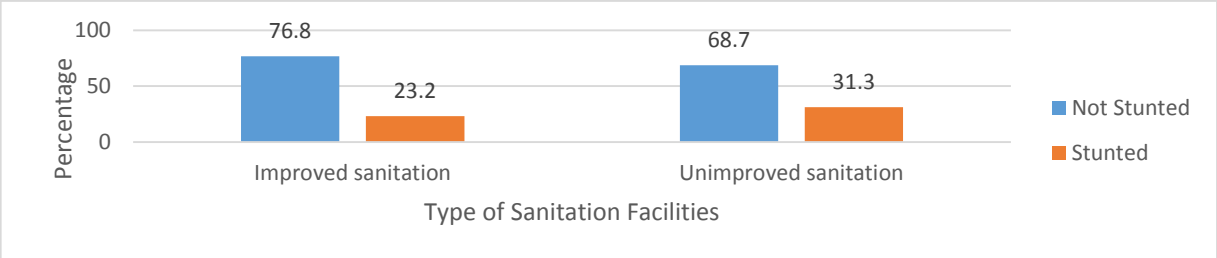



### 2.2.3. Association between Social Inequalities and Stunting

In order to measure the association between inequality and stunting in children aged five years and below, the following indicators were used: type of sanitation facility; mother's and father's education levels and the nature of a mother's working pattern.

About 31 per cent of children in households with unimproved sanitation were stunted compared to 23.2 per cent in households with improved sanitation as depicted in Figure 2.12.

**Figure 2.12 Proportion of Stunted by Status of Household Sanitation Facility**




The extent of stunting in children was higher in households where the mother and/or father had low education levels. In particular, households where a mother had no education, 30.3 per cent of children were stunted compared to 13.1 per cent in households where the mother had tertiary education as shown in Figure 2.13. The households where the father had no education, 31.1 per cent of children were stunted compared to 16.7 in households where a father had tertiary education as shown in Figure 2.14.

**Figure 2.13 Proportion of Stunting Based on Mother's Level Education**[27]

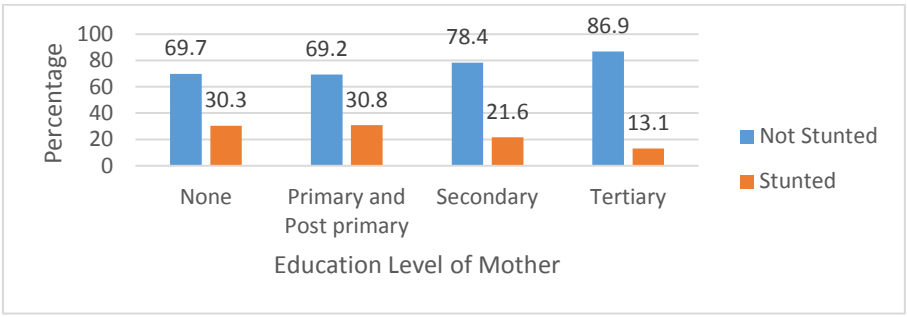
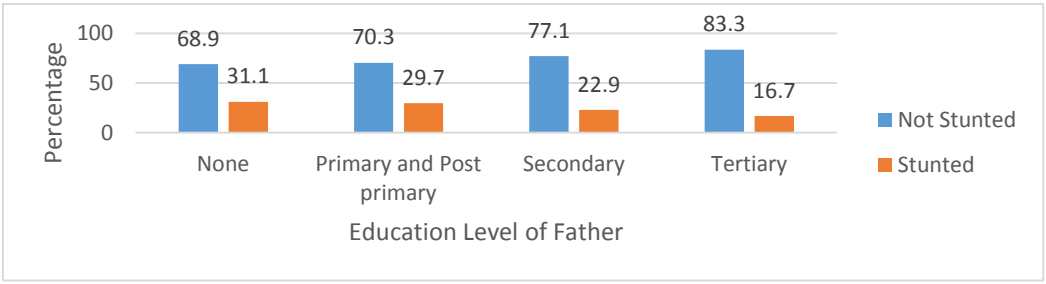
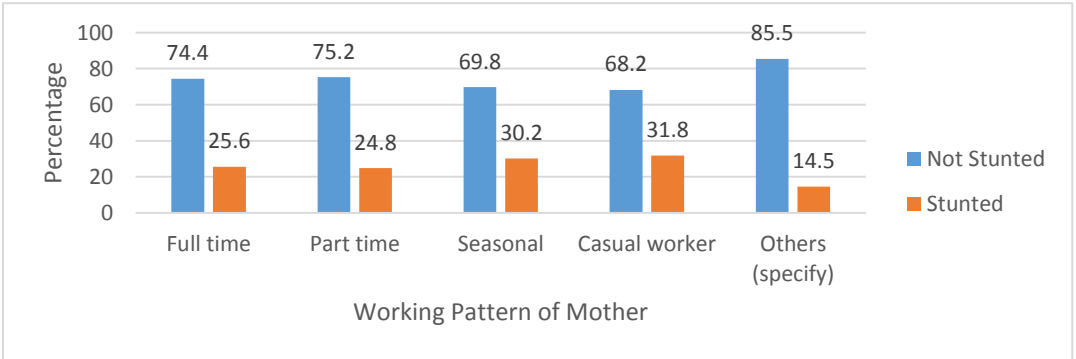



**Figure 2.14 Proportion of Stunting Based on Father's Education Level**




The working pattern of a mother was associated with stunting as shown in Figure 2.15. In households where a mother was engaged in casual employment, 31.8 percent of children were stunted while in households where the mother is in full time employment, 25.6 per cent of children were stunted.

**Figure 2.15 Distribution of Stunting Based on Caregiver's (mother's) Working Pattern**




[27] The category primary and post-primary in Figures 2.13 and 2.14 combined respondents who had: completed primary school and attended but didn't complete primary school. It also includes respondents with post-primary education which refers to respondents with vocational training but without any secondary school or tertiary training

## 2.2. Strength of Association between Social Inequalities and Childhood Stunting

This section presents the strength of association between stunting and the selected indicators using the logistic regression model. Bivariate analysis was applied first followed by the multivariate logistic regression analysis and the findings presented as odds ratio. The findings on the association of household socio-economic characteristics of stunting are presented in this section as both crude and adjusted odds. Adjusted odds would be useful in informing long-term planning for stunting prevention while crude odds would be a useful measure in guiding programmatic interventions as a predictor of households likely to have stunted children, thus, a useful measure for household targeting.

### 2.2.1. Crude and Adjusted Odds Ratio

#### *2.2.1.1. Demographics*

The results from the bivariate analysis showed that all four demographic indicators were associated with stunting while the multivariate analysis showed that two of the four demographic indicators: age and sex of the child, were associated with stunting after controlling for other confounding factors.

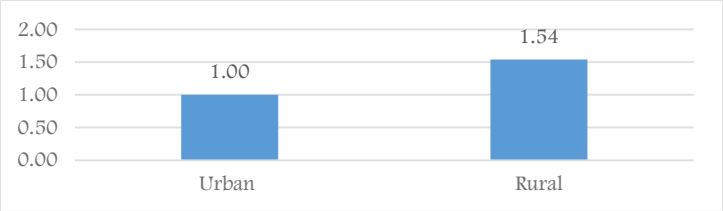
**Crude Odds:**

A child living in rural set up was 54 per cent (p<0.000) more likely to be stunted than a child living in an urban area as represented in as shown in Figure 2.16.

***CRUDE ODDS:***

*Residence: A child in a rural area has a 54 per cent increased chance of being stunted than a child in an urban area.*

**Figure 2.16 Crude Odds of Stunting based on area of residence**

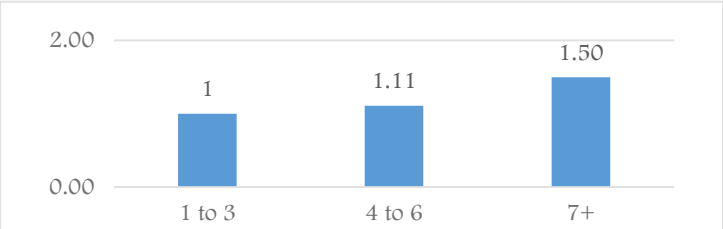



A Child who resides in a household with seven or more members had a 50 per cent (p<0.000) higher chance of being stunted compared to children from households with 3 or less individuals as shown in Figure 2.17.

***CRUDE ODDS:***

*Household size: A child in a household with 7 or more members is 50 per cent more likely to be stunted than a child from a household with 3 or less members*

**Figure 2.17 Crude Odds of Stunting Based on Household size**



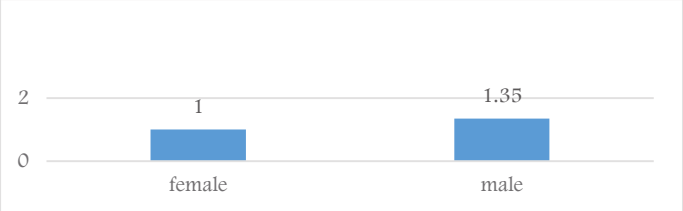

**Adjusted Odds:**

Figure 2.18 shows that a child's sex was associated with stunting with a male child being 35 per cent (p<0.000) more likely to be stunted compared to a female child.

***ADJUSTED ODDS:***

*Sex: A male child has 35% increased chances of being stunted than a female child.*

**Figure 2.18 Adjusted Odds of Stunting Based on Child's Sex**




A child's age group was also associated with stunting with children in the age brackets of 12-17; 18-23 and 24-35 months having 2.7, 3.6 and 2.8 higher odds (p<0.00) of being stunted respectively, compared to children in the reference group of 6-8 months as shown in Figure 2.19. This could be indicative of increased physiological vulnerability; poor complementary feeding practices; increased incidence of illness; socio-emotional engagement; or care practices in general within these cohorts.

***ADJUSTED ODDS:***

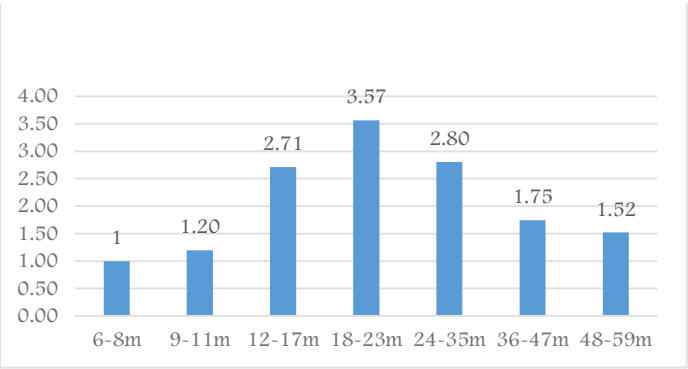
*Age: Compared to a child that is 6-8 months of age a child that is:*

*12-17 months was more than 2 and ½ times more likely to be stunted.*

*18-23 months was more than 3 and ½ times more likely to be stunted.*

*24-35 months was more than 2 and ½ times more likely to be stunted.*

**Figure 2.19 Adjusted Odds of Stunting Based on Age Cohort**




### 2.2.1.2. Socio-economic Indicators

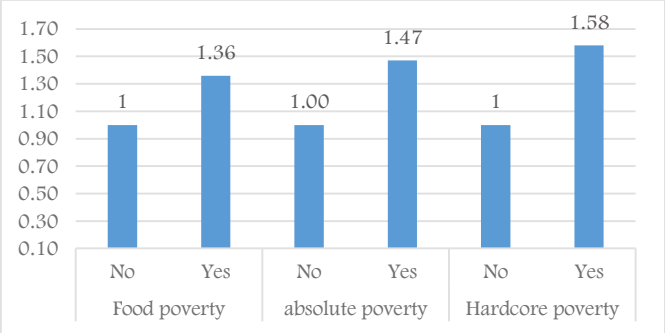
The bivariate analysis depicted that wealth quintiles and expenditure-based indicators of poverty: food poverty, absolute poverty and hard-core poverty were all associated with

stunting. Multivariate analysis showed that wealth quintile and absolute poverty were both associated with stunting after controlling for confounding factors.

**Crude Odds:**

As shown Figure 2.20 a child residing in a household classified as food poor, absolute poor and hard-core poor had 36 per cent, 47 per cent and 58 per cent increased chances of being stunted compared to a child in a household not classified as food poor, absolute poor or hard-core poor respectively (p<0.000).

**Figure 2.20 Crude Odds of Stunting Based on Household Poverty**




*CRUDE ODDS:*

**Poverty:** *A child in a household classified as:*

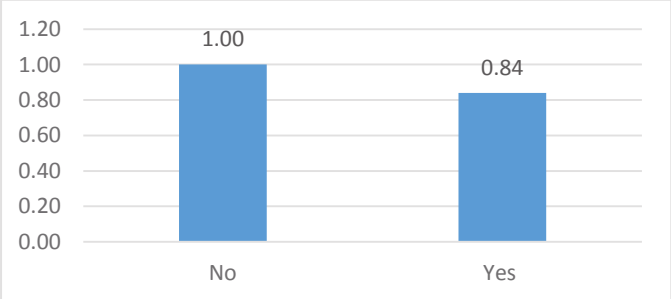
***Food poor** has 36 per cent increased chance of being stunted;*

***Absolute poor** has 47 per cent increased chance of being stunted;*

***Hard-core poor** has 58 per cent increased chance of being stunted*

One surprising finding in Figure 2.21 was that presence of drought/floods as a household shock was associated with about 16 per cent reduced chances of a household having a stunted child (p=0.011). This might be attributed to early warning and response mechanisms and social safety nets, but would need further investigation.

**Figure 2.21 Crude Odds of Stunting Based on Drought/Floods as Shock**




*CRUDE ODDS:*

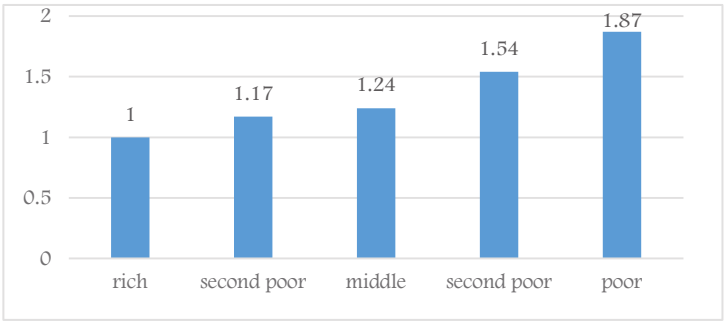
***Drought/Flood:** a child in a household that had experienced drought/flood as a shock had 16% reduced chances of being stunted than a child in a household that had not experienced drought or flood as a household shock.*

**Adjusted Odds:**

After controlling for confounding factors, wealth quintiles had a strong association with stunting. The odds for stunting amongst children decreased with every increase in wealth quintile as shown in Figure 2.22. A child from a family in the lowest wealth quintile was 87

per cent more likely to be stunted than a child from a family in the highest wealth quintile (p=0.001).

**Figure 2.22 Adjusted Odds of Stunting Based on Wealth Quintiles**

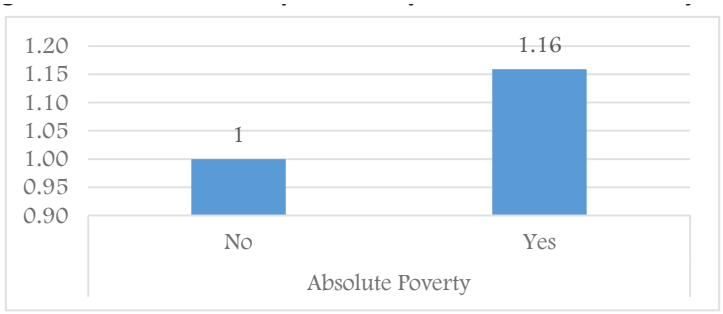



***ADJUSTED ODDS***

***Wealth Quintiles:*** *A child in the lowest wealth quintile has 87 per cent increased chances of being stunted than a child in the highest wealth quintile.*

There was also a moderate level of association between absolute poverty and stunting as shown in Figure 2.23. After controlling for other variables, children from families classified as absolute poor had 16 per cent (p=0.079), higher odds of stunting than children from households that were not' absolute poor.

**Figure 2.23 Adjusted Odds of Stunting Based on Absolute Poverty**




***ADJUSTED ODDS***

***Poverty:*** *A child based in a household classified as absolute poor has 16 per cent increased chances of being stunted.*

### 2.2.1.3. Social Inequalities

The type of sanitation facility; mother's and father's education levels as well as the mother's working type of work were found to be associated with stunting. The multivariate analysis revealed a strong association between a mother's education level with child stunting and a modest association between types of sanitation facilities.

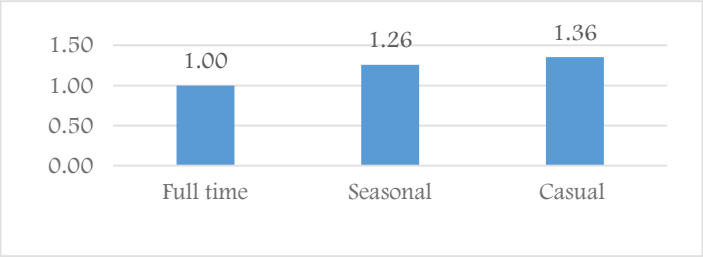
**Crude Odds:**

A child whose mother was either a seasonal or casual worker was 26 per cent and 36 per cent, respectively

***CRUDE ODDS:***
***Mother's employment:*** *compared to a child whose mother is in full time employment:*
*A child whose mother is employed as a casual has 36 per cent increased chances of being stunted.*
*A child whose mother is in seasonal employment has 26 per cent increased chances of being stunted.*

(p=0.019), more likely to be stunted than a child whose mother had a full time job as shown in figure 2.24. This could mean that in households with stunted children, mothers had less predictable/stable livelihood. It could also imply that her working patterns affect ability to offer care practices, and provide nutritious food to the child.

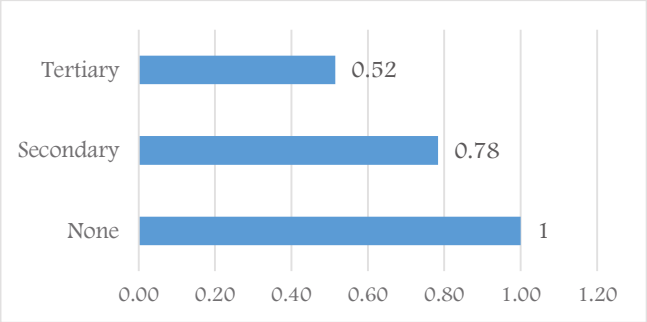
**Figure 2.24 Crude Odds of Stunting Based on Mother's Working Pattern**




**Adjusted Odds Ratio:**

A mother's level of education had strong statistical association with stunting. A child whose mother had tertiary education was 48 per cent less likely to be stunted compared to a child whose mother had no education after controlling for confounding other factors as shown in Figure 2.25.

**Figure 2.25 Adjusted Odds of Stunting Based on Mother's Education Level**

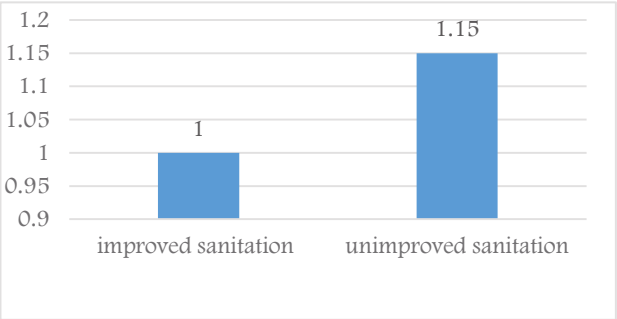



***ADJUSTED ODDS***

***Poverty:*** *A child based in a household classified as absolute poor has 16 per cent increased chances of being stunted.*

Unimproved sanitation was found to have a moderate level of association with stunting after controlling for the other variables in the model as shown in Figure 2.25. Children from families with unimproved sanitation were 15 per cent (p=0.065) more likely to be stunted compared to children from families with improved sanitation.

**Figure 2.26 Adjusted Odds of Stunting Based on Sanitation Facilities**




***ADJUSTED ODDS:***

***Sanitation Facilities:*** *A child in a household without improved sanitation facilities has 15 per cent increased chances of being stunted compared to a child in a household with improved sanitation.*

# Chapter Three: Interpretation of Results and Discussion

## 3.1. National Stunting Trends and Rate of Reduction:

The analysis in section 2.1 showed a downward trend in the national stunting rate for children aged 0 – 59 months between 1993 and 2014 using the KDHS data series. This progress, though positive, needs to be viewed against the likelihood to attain the national and global agreed targets such as the *Big 4 Agen*da and *WHA* target. The projected stunting rate for 2025 is 23.8 per cent against the *Big 4 Agenda* target of 19.0 per cent by 2022 and WHA target of 12.6 per cent by 2025.

This means that the country may not attain its target if the current trends are maintained, thus, increased efforts are needed to heighten investments towards stunting reduction. Further analysis into the factors that contributed to reduction by 2014 could provide insights of areas the government can prioritise for increased investment.

## 3.2. Association between Stunting and Socio-economic Indicators at Household level

Crude odds are indicative of the types of households to target, for instance, households classified as food poor, absolute poor or hard-core poor. Adjusted odds are indicative of long-term development agenda that are likely to affect stunting in a causative manner, for instance educating the girl child to tertiary level.

### 3.2.1. Demographic Indicators Associated with Stunting

Based on crude odds, being based in a rural area increased the chances or odds of being stunted by 54 per cent ($p<0.000$). In the Lancet 2013, children from rural areas had 1.45 times higher chances of being stunted than those in urban areas[28]. However, when controlled for other factors, the area of residence did not emerge as a variable associated with stunting. The implication of these findings is that programmes that target households with or likely to have stunted children should target rural areas to inform mapping and programme targeting.

Children residing in households with 7 or more members had 50 per cent ($p<0.000$) increased chances of being stunted based on bivariate analysis. In Bangladesh, the impact of household size on stunting was a combination of birth intervals and birth order. Every additional child after the second child had a lower height-for-age standard deviation value of between 0.03

[28] Black, R. E., Victoria, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., et al. (2013). *Maternal and child undernutrition and overweight in low-income and middle-income countries.* The Lancet, 382, 427–451.

and 0.04, while every extra year between one birth and the subsequent increased the height-for-age for the next child by 0.03[29]. This would require a set of health messages at community-level including birth planning and control as increased household size is associated with increased chances of stunting.

A higher proportion of stunted children were male, and being male increased the odds of a child being stunted by 33 per cent even after controlling for confounding factors ($p<0.000$). This is in tandem with other studies that identified higher odds of stunting in boys than in girls[30]. In an analysis of 81 countries summarised in the lancet 2013 series, the prevalence of stunting was 1.14 times higher in boys than in girls[31]. Out of all the children aged 18-23 months, 37.6 per cent were stunted and after controlling for confounding factors, a child aged 18-23 months was 3.5 times ($p<0.000$) more likely to be stunted than a child aged 6-8 months. This implies that certain vulnerabilities are at play as children reach the stage of interacting with their environment independently. Given the strength of association between sex and age of a child with stunting, interventions that emphasize care giving practices, optimal feeding and other vulnerabilities associated with a child that is increasingly interacting with their environment would have a significant impact on stunting. In addition, other interventions aimed at improving socio-economic well-being (e.g. increased women's employment) should be mindful of engaging mothers whose children are in the lower age cohorts in a manner that does not decrease the mother's engagement with the child. This calls for a balancing of policies and legal provisions for instance, as stipulated in the Breastfeeding Mother's Bill 2019.

### 3.2.2. Household Socio-Economic Indicators Associated with Stunting

In households classified as food, absolute or hard-core poor, about 1 out of 3 children are stunted. Crude odds revealed that being in food, absolute or hard-core poor households increases the chances of a child being stunted by 36, 47 and 58 per cent ($p<0.000$) respectively. This means that household expenditure would be a useful tool for targeting households for interventions that are aimed at preventing stunting. After controlling for confounding factors, a child based in a household classified as absolute poor had a 16 per cent ($p=0.079$) increased chance of being stunted than a child that was not based in a

[29] Headey, Derek & Hoddinott, John & Ali, Disha & Tesfaye, Roman & Dereje, Mekdim. (2015). the Other Asian Enigma: Explaining the Rapid Reduction of Undernutrition in Bangladesh. World Development, Volume 66, pp 749 – 761.
[30] Headey, Derek & Hoddinott, John & Ali, Disha & Tesfaye, Roman & Dereje, Mekdim. (2015). the Other Asian Enigma: Explaining the Rapid Reduction of Undernutrition in Bangladesh. World Development, Volume 66, pp 749 – 761
[31] Black, R. E., Victoria, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., et al. (2013). *Maternal and child undernutrition and overweight in low-income and middle-income countries.* The Lancet, 382, 427–451.

household classified as absolute poor, implying a stronger causative association between household income and stunting.

Children based in households which had experienced drought/floods as a recent shock had 16 per cent (p=0.011) reduced chances of being stunted. This could be because of consistent interventions carried out within regions that experience adverse weather conditions such as hunger safety nets, livestock destocking, resilient livelihood initiatives and climate adaptation initiatives.

The analysis showed that wealth quintiles had a strong association with stunting. The children residing in households which belong the lowest and second lowest quintiles had 87 (p=0.001) and 54 per cent (p=0.003), increased chances of being stunted compared to the children in the highest wealth quintile. This is in tandem with the Lancet 2013 series, which identified wealth inequalities as a key driver behind stunting outcomes. In an analysis of over 79 countries, stunting amongst children from the poorest wealth quintiles was 2.47 times higher than in children from the richest quintile[32] compared to 3.33 times found in this study.

With regard to programming, nutrition strategies and interventions can be included within government programmes that aim to improve socio-economic well-being of households to maximise impact on nutrition outcomes e.g. layering nutrition interventions to socio-economic empowerment strategies.

### 3.2.3. Social Inequalities Associated with Stunting

A child whose mother had tertiary education was 48 per cent (p=0.002) less likely to be stunted than a child whose mother had no education. This implies that initiatives aimed at increasing the education-level of girls need to aim for higher education as the attainment of such a goal is likely to have multiple outcomes for instance on the economy of the nation through improved labour-force and even on improved child health outcomes. In Bangladesh, every extra year of both paternal and maternal education had a positive impact on the child's height-for-age indicator. In a household where both parents had completed secondary school, the child's height-for-age was up to 0.5 standard deviation higher than for the child where both parents had not attended school[33]. In Nepal, maternal education had a larger effect than paternal education. A child whose mother had completed primary school had had a 0.17 increase in HAZ than the child of a mother with no formal education and a child whose

[32] Black, R. E., Victoria, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., et al. (2013). *Maternal and child undernutrition and overweight in low-income and middle-income countries.* The Lancet, 382, 427–451.
[33] Headey, Derek & Hoddinott, John & Ali, Disha & Tesfaye, Roman & Dereje, Mekdim. (2015). the Other Asian Enigma: Explaining the Rapid Reduction of Undernutrition in Bangladesh. World Development, Volume 66, pp 749 – 761.

mother had completed secondary education had 0.34 HAZ increase than a child whose mother had no formal education[34].

A household with unimproved sanitation increased the chances of a child being stunted by 16 per cent (p=0.065) after controlling for confounding factors. In Nepal, a reduction in open defecation contributed to a 2.2 per cent reduction in the national stunting rates between 2001 and 2011[35]. Given the increased odds of stunting in households with unimproved sanitation, interventions aimed at stunting reduction could consider increased coverage of improved sanitation facilities especially in rural areas and in informal settlements of urban areas.

Mother's working pattern increased the chances of a child being stunted, as a mother in seasonal employment had 26 per cent (p=0.007) increased chances of having a stunted child compared to a mother in full time employment, while a mother employed as a casual had 36 per cent (p=0.019) increased chances of being stunted. This could imply that mothers in seasonal or casual employment have less predictable livelihoods, and this could affect the quality and quantity of diets administered to children. In terms of proportions, about 25.6% of women in full time employment had stunted children. This could mean that, despite women being engaged in economic activities, the level of economic empowerment could still be below the amount required for provision of diets of acceptable in quantity and quality. In addition, while employment provides economic empowerment, it can also decrease the amount of time a mother spends with her child, limiting the opportunity for offering positive infant feeding care and monitoring the health and growth of the child. The need for optimal infant care is critical to preventing stunting. Workplace policies can be designed in a way to provide increased flexibility to mothers with children aged 24 months and below to increase the opportunity for optimal caregiving.

In summary, several indicators showed varied association with stunting at household level. Demographic indicators provide an indication of where and to whom programmatic interventions can be targeted. The socio-economic and social inequality indicators provide an indication of the strategic initiatives the government can prioritise. Nutrition interventions can also include nutrition messages and behaviour change messages within broader socio-economic initiatives such as initiatives that aim to increase the use of improved sanitation facilities.

[34] Headey, Derek & Hoddinott, John. (2015). *Understanding the Rapid Reduction of Undernutrition in Nepal, 2001-2011*. IFPRI Discussion Paper 01384.
[35] Headey, Derek & Hoddinott, John. (2015). *Understanding the Rapid Reduction of Undernutrition in Nepal, 2001-2011*. IFPRI Discussion Paper 01384.

The findings from this study provides opportunity to consider a broader set of factors that impact on nutrition outcomes, with an aim of broadening the interventions, policy and programmatic approach to prevent malnutrition.

### 3.3. Limitation of Analysis

One of the limitations of the analysis is inability to explore other inequality-related factors such as health indicators. The analysis in this report, the analysis did not fully explore the impact pathways of the factors associated with stunting and therefore do not explain the probable contribution of those factors on stunting. For instance, the analysis revealed that engaging a woman in seasonal or casual employment increases the odds of her child being stunted, but did not explain how or why e.g. stunting odds increase due to unstable or unpredictable income, thus, reduced ability to provide quality diets. In order for the findings of this report to influence actions that would contribute to further stunting reduction, additional research is needed to explore the impact pathway leading to the outcome of stunting, and therefore, a possible pathway for its prevention.

# Chapter Four: Conclusion and Recommendations

Despite Kenya making progress in stunting reduction between 1993 and 2014, the nation is unlikely to meet the national big 4 Agenda target of reducing stunting to 19 per cent or the global WHA stunting target of 12.6 per cent by 2025

This calls for enhanced by reviewing key drivers of stunting reduction. One of the likely contributors to stunting reduction during the period under review is improved national socio-economic well-being. Statistical analyses demonstrated strong association between wealth quintiles and stunting. Every increase in wealth quintiles was marked both by reduced proportion and reduced odds of stunting. In addition, being based in a household classified as absolute poor increased the chances of a child being stunted by 16 per cent. This calls for long-term fiscal planning to improve the living standards of all Kenyans.

In light of the need to target national resources, specific initiatives that can be prioritised for medium term interventions include: an increase in both the number and proportion of girls attaining tertiary education as tertiary education in girls reduced the odds of stunting by 52 per cent. Other initiatives include socio-economic empowerment since children whose mothers had less stable/less predictable forms of employment had increased odds of stunting. The socio-economic empowerment needs to allow mothers meet the time demands of caregiving. This is because both the proportion and odds of stunting in children peaked at the 18 – 24 months' age cohort, the age at which infants are increasingly interacting with their environment.

The findings also have implications on the type of programmatic interventions to prioritise. Programmes that enhance current government efforts in improving family and environmental health are likely to impact on stunting reduction. Examples include interventions on family size control and programmes to improve latrine coverage. Households with 7 plus members had 50 per cent increased odds of having a stunted child, implying a need for health messages on fertility control; while use of unimproved sanitation increased the odds of stunting by 16 per cent (Adjusted OR, p=0.065).

Specific recommendations include:

**Programme targeting:**

1. Many of the issues that influence stunting in a causative manner are likely to be found in rural areas and a significant proportion of stunted children in Kenya are located in rural areas. Resource and programme targeting that carefully consider rural-urban divide need

to be enhanced. With regard to information systems and surveys, initiatives aimed at generating and availing disaggregated should be enhanced to inform how stunting is characterised in urban areas e.g. data from informal settlements in urban areas.

2. There is need to enhance community-level health messaging on birth planning and control as increased household size is associated with increased chances of stunting.
3. There is need to implement at scale community-level health interventions that emphasize care giving practices, optimal feeding and addressing vulnerabilities associated with a child that is increasingly interacting with their environment.
4. Intensified initiatives to increase latrine coverage especially in rural areas and in urban informal settlements.

**Long-term socio-economic strategies:**

5. Policy makers and programme planners can enhance the use of household expenditure (food-poor, absolute poor and hardcore poor) as a potential tool for household targeting of interventions that are aimed at preventing stunting.
6. Wealth quintiles was a strong predictor of child stunting. There is need to implement at scale nutrition strategies within government programmes that aim to improve socio-economic well-being of households e.g. cash transfer.
7. There is need to advance initiatives aimed at increasing the education-level of girls. The initiatives that are likely to impact on stunting are those that aim for tertiary education. The attainment of such a goal is likely to have multiple outcomes, for instance, on the economy of the nation through improved labour-force as well as improved child health outcomes.

**Regulatory recommendations:**

8. The government's current regulatory framework for workplace support of mothers needs to be advanced to ensure women's employment opportunities increase their socio-economic capabilities in a manner that does not negatively impact on the amount of time spent with children especially for children under five years of age.

A limitation to this analyses is that it did not consider certain causes of malnutrition at the immediate and underlying levels such as health seeking behaviour and diseases. In order to design national and sub-national plans aimed at decisive stunting reduction, underlying contributors to stunting need to be considered exhaustively.

**Annexes**

## Annex 1: Glossary:

*Average Annual Rate of Reduction (AARR)* is the average relative percent decrease per year in prevalence or rate. AARR is a statistic that quantifies the rate of change of prevalence from a baseline year to the current year of interest. It is estimated using simple linear regression method by regressing the natural logarithm of the prevalence of the indicator at different time points against time (year). Source:WHO.https://www.who.int/nutrition/gtt_aarr.pdf.

*Big 4 Agenda:* One of the Big Four agenda items is to: "guarantee 100 per cent Food and Nutrition Security to all Kenyans by 2022. This includes a 26 per cent reduction in malnutrition among children under five years of age; 50 per cent reduction in the number of food insecure Kenyans. 47 per cent reduction in cost of food as a % of income; 34 per cent increase in the average daily income of farmers.

*Poverty:* based on KIHBS 2015/16, poverty is calculated using the cost of basic needs (CBN). This is the monetary cost required to obtain a food basket that provides an average of 2250 Kcal per adult per day, as well as the costs required to meet non-food-related consumption needs. (KIHBS 2015/16 – Basic Report on Well-Being in Kenya).

> *Food Poverty:* refers to households and/or individuals whose monthly expenditure for food consumption per adult is less than KSh 1,954 in rural and peri-urban areas, and less than KSh 2,551 in core-urban areas. (Economic Survey 2018).
>
> *Absolute Poverty:* refers to households and/or individuals whose monthly consumption expenditure per adult is less than KSh 3,252 in rural and peri-urban areas, and less than KSh 5,995 in core-urban areas. (Economic Survey 2018).
>
> *Hardcore Poverty:* refers to households and individuals whose monthly adult equivalent total food and non-food consumption expenditure per person is less than KSh 1,954 in rural and peri-urban areas, and less than KSh 2,551 in core-urban areas. (Economic Survey 2018).

*Shock:* A shock is an event that may trigger a decline in the well-being of an individual, a community, a region, or even a nation. The 2015/15 KIHBS analysed shocks which occurred during the 5-year period preceding the survey and had a negative impact on household's economic status or welfare (KIHBS 2015/16 – Basic Report).

*World Health Assembly Nutrition Targets*: In 2012, WHO member states signed up to global commitments for geared to improve Maternal Infant and Young Child Nutrition practices by

2025. These include: a 40 per cent reduction in the number of stunted children; 50 per cent reduction of anaemia in women of reproductive age; a 30 per cent reduction in low birth weight; no increase in childhood overweight; increase the rate of exclusive breastfeeding in the first 6 months up to at least 50 per cent and reduce and maintain childhood wasting to less than 5%.

.*Odds Ratio (OR)* represents the odds that an outcome will occur given a particular exposure. *Crude odds* represent the probability of occurrence for a known outcome based on exposure to a certain variable but does not account for other confounding factors.

*Adjusted Odds* ratio on the other hand is the probability of the occurrence of a certain outcome based on exposure to a certain variable after controlling for other confounding factors.

## Annex 2: Summary of Results

Table 0.1 Relationship between Stunting and Household Characteristics

| | | Not stunted | | Stunted | | Chi | P-value |
|---|---|---|---|---|---|---|---|
| | | % (col) | N | % (col) | N | | |
| **Demographics** | | | | | | | |
| Residence | Rural | 65.8 | 2,253,852 | 75.1 | 935,059 | 25.198 | 0.000 |
| | Urban | 34.2 | 1,169,953 | 24.9 | 309,529 | | |
| Age Group | 6-8 | 5.1 | 175,076 | 2.6 | 32,335 | 213.79 | 0.000 |
| | 9-11 | 6.0 | 206,849 | 3.0 | 37,939 | | |
| | 12-17 | 10.1 | 347,327 | 13.2 | 166,288 | | |
| | 18-23 | 9.2 | 315,299 | 15.1 | 190,175 | | |
| | 24-35 | 20.5 | 701,042 | 26.3 | 330,704 | | |
| | 36-47 | 24.7 | 845,087 | 22.2 | 279,814 | | |
| | 48-59 | 24.3 | 833,871 | 17.6 | 222,226 | | |
| Household size | 1-3 | 15.4 | 526,700 | 12.7 | 160,391 | 47.62 | 0.000 |
| | 4-6 | 55 | 1,884,795 | 50.6 | 636,748 | | |
| | 7+ | 29.6 | 1,013,054 | 36.7 | 462,340 | | |
| Sex of Child | Male | 48.5 | 1,660,571 | 55.4 | 689,065 | 18.795 | 0.000 |
| | Female | 51.5 | 1,763,693 | 44.6 | 555,064 | | |
| **Poverty** | | | | | | | |
| Food Poor | No | 73.8 | 2,527,636 | 67.0 | 833,369 | 19.834 | 0.000 |
| | Yes | 26.2 | 895,757 | 33.0 | 410,516 | | |
| Absolute Poor | No | 67.3 | 2,304,346 | 57.0 | 709,173 | 38.579 | 0.000 |
| | Yes | 32.7 | 1,119,007 | 43.0 | 534,751 | | |
| Hard-core Poor | No | 92.7 | 3,173,973 | 88.4 | 1,100,155 | 22.275 | 0.000 |
| | Yes | 7.3 | 249,042 | 11.6 | 144,109 | | |
| Wealth quintiles | Poor | 22.8 | 782,478 | 33.9 | 427,141 | 210.13 | 0.000 |
| | Second poor | 20.5 | 700,338 | 23.6 | 296,754 | | |
| | Middle | 19.4 | 663,064 | 18.1 | 227,487 | | |
| | Second rich | 18.5 | 632,350 | 14.3 | 179,925 | | |
| | Rich | 18.9 | 646,321 | 10.2 | 128,173 | | |
| Any shock to HOUSEHOLD | No | 33.3 | 1,141,135 | 33.2 | 412,492 | 0.008 | 0.92890 |
| | Yes | 66.7 | 2,282,319 | 66.8 | 831,333 | | |
| Drought as shock | No | 74.6 | 2,552,592 | 70.8 | 880,864 | 6.064 | 0.01390 |
| | Yes | 25.4 | 870,741 | 29.2 | 363,081 | | |
| Increase in food prices as shock | No | 74.1 | 2,535,962 | 72.0 | 895,402 | 1.773 | 0.18310 |
| | Yes | 25.9 | 886,999 | 28.0 | 348,914 | | |
| **Inequality** | | | | | | | |
| Improved sanitation | No | 43.6 | 1,493,015 | 54.1 | 672,416 | 39.139 | 0.00000 |
| | Yes | 56.4 | 1,930,717 | 45.9 | 571,130 | | |
| Education level of Mother | None | 14.9 | 509,441 | 17.6 | 221,277 | 169.612 | 0.000 |
| | Primary & Post primary | 48.5 | 1,660,895 | 58.7 | 739,357 | | |
| | Secondary | 25.5 | 872,869 | 19.1 | 241,140 | | |
| | Tertiary | 11.1 | 381,345 | 4.6 | 57,704 | | |
| Household Head Education level | None | 15.5 | 529,300 | 19 | 239,095 | 113.088 | 0.000 |
| | Primary an Post primary | 47.6 | 1,628,422 | 54.6 | 688,216 | | |
| | Secondary | 23.7 | 810,799 | 19.1 | 240,854 | | |
| | Tertiary | 13.3 | 456,030 | 7.3 | 91,314 | | |
| Working patterns | Fulltime | 58.2 | 1,549,650 | 54.3 | 532,323 | 30.733 | 0.002 |
| | Partime | 11.7 | 310,802 | 10.5 | 102,400 | | |
| | Seasonal | 19.3 | 513,303 | 22.6 | 221,914 | | |
| | Casual worker | 9.4 | 251,199 | 11.9 | 116,905 | | |
| | Others | 0.2 | 4,807 | 0.2 | 1,660 | | |

Table 0.2: Crude and Adjusted Logistic Regression of Socio-Economic Factors At Household Level Associated With Stunting

| Characteristics | Crude OR | Lower CI | Upper CI | p-value | Adj OR | Lower CI | Upper CI | p-value |
|---|---|---|---|---|---|---|---|---|
| **Residence** | | | | | | | | |
| Rural | 1 | | | | 1 | | | |
| Urban | 0.652 | 0.542 | 0.783 | 0.000 | 0.851 | 0.685 | 1.057 | 0.145 |
| **Sex** | | | | | | | | |
| Male | 1 | | | | 1 | | | |
| Female | 0.750 | 0.657 | 0.855 | 0.000 | 0.736 | 0.637 | 0.850 | 0.000* |
| **Age groups** | | | | | | | | |
| 6-8 | 1 | | | | 1 | | | |
| 9-11 | 0.993 | 0.616 | 1.601 | 0.977 | 1.197 | 0.691 | 2.076 | 0.52 |
| 12-17 | 2.592 | 1.767 | 3.803 | 0.000 | 2.710 | 1.767 | 4.156 | 0.000 |
| 18-23 | 3.266 | 2.194 | 4.861 | 0.000 | 3.566 | 2.291 | 5.550 | 0.000 |
| 24-35 | 2.554 | 1.778 | 3.669 | 0.000 | 2.804 | 1.864 | 4.220 | 0.000 |
| 36-47 | 1.792 | 1.234 | 2.605 | 0.002 | 1.746 | 1.150 | 2.651 | 0.009 |
| 48-59 | 1.442 | 0.999 | 2.0833 | 0.050 | 1.522 | 1.006 | 2.302 | 0.047 |
| **Household size** | | | | | | | | |
| 1-3 | 1 | | | | 1 | | | |
| 4-6 | 1.109 | 0.889 | 1.385 | 0.359 | 0.939 | 0.730 | 1.207 | 0.622 |
| 7+ | 1.499 | 1.199 | 1.873 | 0.000 | 1.066 | 0.823 | 1.380 | 0.630 |
| **Food Poverty** | | | | | | | | |
| No | 1 | | | | n/a | n/a | n/a | n/a |
| Yes | 1.359 | 1.191 | 1.551 | 0.000 | n/a | n/a | n/a | n/a |
| **Absolute Poverty** | | | | | | | | |
| No | 1 | | | | 1 | | | |
| Yes | 1.471 | 1.290 | 1.676 | 0.000 | 1.159 | 0.983 | 1.368 | 0.079 |
| **Hardcore Poverty** | | | | | | | | |
| No | 1 | | | | 1 | | | |
| Yes | 1.580 | 1.323 | 1.887 | 0.000 | 1.098 | 0.855 | 1.410 | 0.463 |
| **Wealth Quintiles** | | | | | | | | |
| Poor | 1 | | | | 1 | | | |
| Second Poor | 0.776 | 0.667 | 0.903 | 0.001 | 0.824 | 0.686 | 0.990 | 0.039 |
| Middle | 0.628 | 0.532 | 0.742 | 0.000 | 0.664 | 0.543 | 0.813 | 0.000 |
| Second rich | 0.521 | 0.407 | 0.668 | 0.000 | 0.626 | 0.462 | 0.849 | 0.003 |
| Rich | 0.363 | 0.276 | 0.479 | 0.000 | 0.536 | 0.376 | 0.764 | 0.001 |
| **Marital status** | | | | | | | | |
| Monogamous married | 1 | | | | 1 | | | |
| Polygamous married | 1.355 | 1.130 | 1.626 | 0.001 | 1.120 | 0.892 | 1.407 | 0.329 |
| Living together | 1.936 | 0.860 | 4.357 | 0.110 | 1.986 | 0.730 | 5.399 | 0.179 |
| Separated | 1.049 | 0.763 | 1.444 | 0.767 | 1.000 | 0.701 | 1.426 | 0.999 |
| Divorced | 1.580 | 0.922 | 2.708 | 0.096 | 1.216 | 0.681 | 2.171 | 0.508 |
| Widow or Widower | 1.223 | 0.840 | 1.780 | 0.293 | 1.149 | 0.754 | 1.749 | 0.519 |
| Never married | 1.102 | 0.861 | 1.410 | 0.440 | 0.983 | 0.723 | 1.335 | 0.911 |
| **Mothers' education level** | | | | | | | | |
| None | 1 | | | | 1 | | | |
| Primary & Post primary | 1.025 | 0.881 | 1.193 | 0.751 | 1.201 | 0.951 | 1.517 | 0.124 |
| Secondary | 0.636 | 0.516 | 0.783 | 0.000 | 0.784 | 0.588 | 1.045 | 0.097 |
| Tertiary | 0.348 | 0.250 | 0.486 | 0.000 | 0.515 | 0.336 | 0.791 | 0.002* |
| **Mothers' work pattern** | | | | | | | | |
| Full time | 1 | | | | 1 | | | |
| Part time | 0.959 | 0.769 | 1.197 | 0.712 | 0.868 | 0.694 | 1.085 | 0.213 |
| Seasonal | 1.259 | 1.065 | 1.488 | 0.007 | 1.029 | 0.867 | 1.222 | 0.744 |
| Casual | 1.355 | 1.051 | 1.746 | 0.019 | 1.180 | 0.910 | 1.530 | 0.212 |
| Others | 1.005 | 0.239 | 4.219 | 0.995 | 0.758 | 0.180 | 3.198 | 0.706 |
| **HOUSEHOLD Education level** | | | | | | | | |
| None | 1 | | | | | | | |
| Primary & post-primary | 0.936 | 0.804 | 1.088 | 0.388 | n/a | n/a | n/a | n/a |
| Secondary | 0.658 | 0.539 | 0.802 | 0.000 | n/a | n/a | n/a | n/a |
| Tertiary | 0.443 | 0.323 | 0.609 | 0.000 | n/a | n/a | n/a | n/a |
| **Improved Sanitation** | | | | | | | | |
| No | 1 | | | | 1 | | | |
| Yes | 0.664 | 0.581 | 0.758 | 0.000 | 1.148 | 0.991 | 1.331 | 0.065 |
| **Unimproved sanitation** | | | | | | | | |
| No | 1 | | | | n/a | n/a | n/a | n/a |
| Yes | 1.510 | 1.321 | 1.725 | 0.000 | n/a | n/a | n/a | n/a |
| **Drought/Flood shock** | | | | | | | | |
| No | 1 | | | | 1 | | | |
| Yes | 0.840 | 0.735 | 0.961 | 0.011 | 0.985 | 0.847 | 1.146 | 0.844 |

**References**

Black, R. E., Victoria, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., et al. (2013). *Maternal and child undernutrition and overweight in low-income and middle-income countries.* The Lancet, 382, 427–451.

Gebre A, Reddy P.S., Mulugeta A., Sedik Y., and Kahssay M., (2019). *Prevalence of Malnutrition and Associated Factors among Under-Five Children in Pastoral Communities of Afar Regional State, Northeast Ethiopia: A Community-Based Cross-Sectional Study.* Journal of Nutrition and Metabolism, Volume 2019, Article ID 9187609, 13 pages. Available at https://doi.org/10.1155/2019/9187609.

Government of Kenya (2015). *Kenya Demographic and Health Survey* 2014.

Government of Kenya (2018). *Transforming Lives: Advancing Socio-Economic Development through the "Big Four".* Third Medium Term Plan 2018 – 2022.

Headey, Derek & Hoddinott, John & Ali, Disha & Tesfaye, Roman & Dereje, Mekdim. (2015). *The Other Asian Enigma: Explaining the Rapid Reduction of Undernutrition in Bangladesh.* World Development, Volume 66, pp 749 – 761.

Headey, Derek & Hoddinott, John. (2015). *Understanding the Rapid Reduction of Undernutrition in Nepal, 2001-2011*. IFPRI Discussion Paper 01384.

Hoddinott J, Maluccio JA, Behrman JR, Flores R, Martorell R. Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults. Lancet 2008;371:411–6. International Food Policy Research Institute, (2015). Global Nutrition Report 2015: Actions and Accountability to Advance Nutrition and Sustainable Development. Washington, DC.

Kenya National Bureau of Statistics (2012). *Analytical Report on Population Projections* Based on the 2009 Kenya Population and Housing Census.

Kenya National Bureau of Statistics (2018). *Basic Report,* Based on the 2015/16 Kenya integrated Household Budget Survey (KIHBS).

Kenya National Bureau of Statistics (2018). *Basic Report on Well-Being in Kenya,* Based on the 2015/16 Kenya integrated Household Budget Survey (KIHBS).

Kenya National Bureau of Statistics (2018). *Labour Force Basic Report* Based on the 2015/16 Kenya integrated Household Budget Survey (KIHBS).

Kenya National Bureau of Statistics (2019). *Kenya Population and Housing Census.* Volume 1, Population By County and Sub-County.

Krishna A., Oh J., Lee J. K., Lee H. Y., Perkins J. M., Heo J., Ro Y. S., and Subramanian S. V. (2015). *Short-term and long-term associations between household wealth and physical growth: a cross-comparative analysis of children from four low- and middle-income countries*. Global Health Action, Vol. 8: pp 1 – 13. Available at http://dx.doi.org/10.3402/gha.v8.26523

Ruel MT and Alderman H. (2013). *Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition?* Lancet 382:536–551.

Skoufias, Emmanuel, Katja Vinha, and Ryoko Sato. (2019). *All Hands on Deck: Reducing Stunting through Multisectoral Efforts in Sub-Saharan Africa.* Africa Development Forum series. Washington, DC: World Bank.

Sudfeld, C. R., McCoy, D. C., Danaei, G., Fink, G., Ezzati, M., Andrews, K. G., et al. (2015). Linear growth and child development in low- and middle-income countries: A meta-analysis. Pediatrics, 135(5), e1266–e1275.

Victora CG, de Onis M, Hallal PC, Blo¨ ssner M, Shrimpton R. Worldwide timing of growth faltering: revisiting implications for interventions. Pediatrics 2010;125:e473–80.

Walker, S. P., Wachs, T. D., Grantham-McGregor, S., Black, M.M., Nelson, C. A., Huffman, S. L., Baker-Henningham, H., Chang, S. M., Hamadani, J. D., Lozoff, B., Gardner, J. M. M., Powell, C. A., Rahman, A., Richter, L. (2011). *Inequality in Early Childhood: Risk and Protective Factors for Early Child Development.* Lancet 378 : 325–38.

WHO (2014). *WHA Global Nutrition Targets 2025: Stunting Policy Brief 1.*

Kenya National Bureau of Statistics
National Information Platform for Food Security and Nutrition
P.O BOX 30266-00100
Real Towers, Upper Hill Hospital Road
NAIROBI

Telephone: +254-20-3317583 / 3317612 / 3317623 / 3317622 / 3317588 / 3317586 / 3317651

Mobile: +254 701244533, +254 735004401
Landlines: +254 20 2911000, +254 20 2911001
Fax: +254-20-315977

Office of the Director General
Email: info@knbs.or.ke, directorgeneral@knbs.or.ke
http:// https://www.knbs.or.ke/

ISBN 978-9966-102-26-3