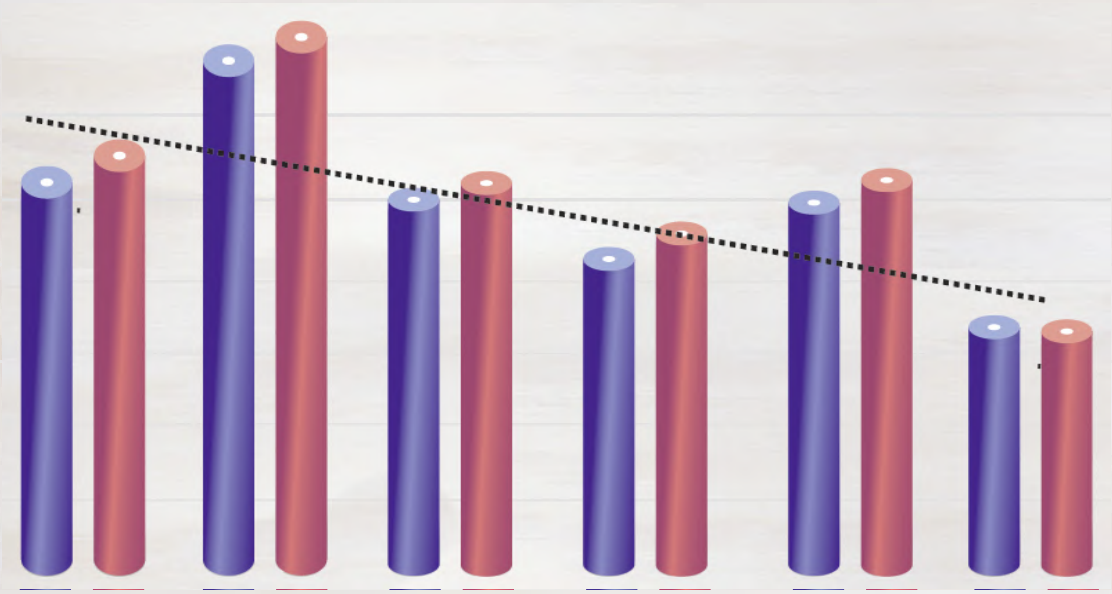
REPUBLIC OF KENYA

NIPFN
National Information Platform for Food Security and Nutrition

An Analysis on Nutritional Anthropometric Trends in Kenya



MARCH 2021

Foreign, Commonwealth & Development Office

BILL & MELINDA GATES foundation

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Foreword

This report provides an analysis of the existing data and information for the anthropometric indicators for children aged below five years for the period between 1993 and 2015. The log- linear regression method was applied to obtain the Average Annual Rate of Reduction (AARR)and the forecasted years. The recalculation of the national indicators from the available data formed a historical trend for the reference population.

The analysis performed follows the international guidelines for the generation of anthropometric indicators (World Health Organization and United Nations Children's Fund, 2019) with aim of: examining performance of the anthropometric nutrition indicators over the period in focus; estimating the Average Annual Reduction Rate (AARR) using the best applicable data; and predicting prevalence of malnutrition for the years 2025 and 2030. This study provides information that will enable policymakers, planners, researchers and program managers to take actions based on credible evidence.

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 is appreciated 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 reportand giving very useful inputs.



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Abbreviation and Acronyms

AARR	Annual Average Rate of Reduction
C4N	Capacity for Nutrition
KDHS	Kenya Demographic and Health Survey
EU	European Union
FCDO	Foreign, Commonwealth & Development Office
HAZ	Height-for-Age Z score
KIHBS	Kenya Integrated Household Budget Survey
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
KNMS	Kenya National Micronutrient Survey
MICS	Multiple Indicator Cluster Survey
MoH	Ministry of Health
MTP III	Medium Term Plan III
NCHS	National Center for Health Statistics
NIPFN	National Information Platform for Food Security and Nutrition
SD	Standard Deviation
SDGs	Sustainable Development Goals
SMART	Standardized Monitoring and Assessment in Relief and Transition
UNICEF	The United Nations Children's Fund
WAZ	Weight-for-Age Z score
WHA	World Health Assembly
WHO	World Health Organisation
WHZ	Weight-for-Height Z score
WMS	Welfare Monitoring Survey

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Executive Summary

This report provides an analysis of the existing data and information for the anthropometric indicators for children aged below five years for the period between 1993 and 2015.

The published information on the anthropometric indicators for children under five years showed a downward trend in both the global and severe stunting; underweight and wasting during the period in focus. In order to compare the anthropometric indicators across surveys, a common survey methodology should be applied. This study did a comparison and noted the following differences; survey target populations and the duration of data collection. It was also observed that different growth reference standards for children were used in calculating the indices.

This study applied recalculated anthropometric indicators using WHO 2006 growth reference standard which resulted in new prevalence rates that are different from the published rates. For instance, the published prevalence for 2005/06 KIHBS changed from 34.7 per cent to 36.8 per cent, while the 2008 KDHS rate changed from 35.3 per cent to 34.4 per cent.

The surveys considered in this study were designed to nutrition data alongside other information. One group collected the nutrition information along with consumption while the other collected nutrition data with other health related information. In an attempt to investigate the differences that may occur due to the effect of collecting nutrition data with these two approaches, a regression model for each category was applied. The results showed that both sets of data have similar downward trends but with different slopes implying the rates of change are different. The variation in slopes is mainly attributable to the target population, duration of data collection and growth reference standards across surveys.

In order to compare the trends of anthropometric indices across surveys, a common age cohort database was constructed by excluding the population aged 0-5 months leaving the 6-59 months as a common age cohort.

The results for this analysis showed that the prevalence of stunting and underweight for children aged 6-59 months were higher than that of 0-59 months, implying that the presence of the stunting and underweight is less in younger children. For example, the results for the 2014 KDHS show that the prevalence of national stunting and underweight for children aged 6-59 months worsened from 26.2 per cent to 28.1 per cent and 10.9 per cent to 11.5 per cent respectively. Surprisingly, the wasting indicator showed a very slight improvement as opposed to the other two indicators. For example, the results for the 1998 KDHS showed that, when the children aged 0-5 months were dropped from the data the wasting prevalence went down from 9.5 per cent to 9.3 per cent. This finding is a subject of further research in this indicator. The recalculated stunting and underweight anthropometric indices by area of residence shows a decline in global stunting prevalence over the period, from a high of 42.9 per cent in rural areas, to a low of 29.3 per cent. Stunting and underweight indices are high in rural areas compared to urban areas.

The study applied the log-linear regression method in generation of the Average Annual Rate of Reduction (AARR) and the forecasted years using KDHS data series. The AARR analysis showed that stunting among children age 0-59 months was significantly reducing at an annual average rate of 1.6 per cent, while underweight was declining at a rate 2.5 per cent. Underweight in rural areas was improving at an annual reduction rate of 2.1 per cent while overweight in urban areas was decreasing at a rate of 3.0 per cent.

The prediction for stunting prevalence in 2025 be about 23.8 per cent against a WHA target of 12.6 per cent and would reduce further to about 22.0 per cent by the year 2030. Similarly, global underweight, wasting and overweight were forecast to about 9.0, 3.6 and 3.1 per cent respectively, by 2025.

The study therefore observed differences in survey estimates due to different target population covered in surveys; the duration of data collection and the use of the child growth reference standards. It also observed the improved AARR for all anthropometric indicators though at slower pace than would be needed to meet the targets at both the national and global levels. Consequently, the study recommends that all methodologies on nutrition data collection be standardized; the investments in the nutrition sector be up scaled to enable the country realize global and national targets; future nutrition surveys be designed to collect representative data at county level and promote the acquisition of the nutritional knowledge in the communities. In addition, some areas of research were established such as factors contributing to high malnutrition prevalence for children aged 6-59 months as compared with children 0-5 months; and the improvement of wasting of children aged 6-59 months as opposed to those aged 0-5 months.

1 Introduction

1.1 Background

The trends in the prevalence of child malnutrition need to be identified and their determinants investigated over time (Masibo, 2013). Household-based surveys such as the Kenya Integrated Household Budget Survey (KIHBS), Kenya Demographic and Health Surveys (KDHS), Multiple Indicator Cluster Surveys (MICS), Welfare Monitoring Survey (WMS) and Standardized Monitoring and Assessment in Relief and Transition (SMART) are important sources of information on child health and nutritional status in Kenya.

In 2012, the World Health Assembly (WHA) Resolution endorsed a comprehensive implementation plan on maternal, infant and young child nutrition, which specified six global nutrition targets for 2025 as presented in appendix Box 1. This decision called upon Member States to begin reporting on most indicators as from 2016 onwards. The 2020 Global Nutrition Report discusses the global data on hunger and malnutrition, informing the monitoring of the nutrition-related targets of the Sustainable Development Goals (SDGs). In particular, the SDG two targets to end all forms of malnutrition by 2030, including achieving the WHA target on stunting and wasting by 2025 are presented in appendix Box 2. The Big Four Agenda targets to reduce malnutrition of children under 5 years by 27 per cent as presented in appendix Box 3.

This report therefore sought to examine trends in the distribution of children's anthropometric status in Kenya and assess progress towards achieving the national and international calls to action to meet the set nutrition targets. The analysis performed follows the international guidelines for the generation of anthropometric indicators.[1]

1.2 Objectives

1.2.1 The Overall Objective

The main objective of the analysis is to examine the anthropometric trends of children under five years of age for the period 1993 to 2015 and predict future behaviour based on observed trends.

1.2.1.1 Specific objectives

i. To examine performance of the anthropometric nutrition indicators over the period in focus;

ii. To estimate the Average Annual Reduction Rate (AARR) using the best applicable data; and

iii. To predict prevalence of malnutrition for the years 2025 and 2030.

1 World Health Organization and United Nations Children's Fund, 2019

1.3 Data and Methods

The analysis in this report made use of secondary data on nutrition that are existing within the country such as KDHS (1993, 1998, 2003, 2008/09, 2014), WMS (1994, 1997), KIHBS (2005/06, 2015/16), and MICS (2000) see appendix A Table 1 for the period in focus. These surveys were sampled from the national master sampling frame in Kenya and are representative at national and rural/urban and some at district/county level. The data collection duration for these surveys ranged from three to twelve months. This study considered the children under five years as the target population.

The calculation of the anthropometric indices is based on the data collected on child's age, sex, height and weight. These indicators are categorized as shown Table 1.3.1. For example, Weight-for-Height (WHZ) was estimated from a combination of the weight for height index values and by sex and expressed as WHZ Z-scores as shown below;

- Severe malnutrition, defined by WHZ < -3 SD and/or existing bilateral oedema,
- Moderate malnutrition, defined by WHZ < -2 SD and >-3 SD and no oedema
- Global malnutrition, defined by WHZ < -2 SD and/or existing bilateral oedema.

Table 1.3.1: Reference Standards for Common Anthropometric Indices

Index	Nutritional problem measured	Indicator
Height-for-age	Severe stunting	HAZ <–3 SD
	Global stunting	HAZ <–2 SD
	Moderate stunting	HAZ >–3 SD and HAZ <–2 SD
Weight-for-age	Severe underweight	WAZ <–3 SD
	Global underweight	WAZ <–2 SD
	Moderate underweight	WAZ >–3 SD and WAZ <–2 SD
Weight-for-Height	Severe wasting	WHZ <–3 SD
	Global wasting	WHZ <–2 SD
	Moderate wasting	WHZ >–3 SD and WHZ <–2 SD
	Overweight	WHZ > 2 SD

Source: (DHSProgram, 2019).

Note: Global stands for prevalence of all children with Z scores below –2, including those with Z scores below –3. That is, combining both the moderate and the severe.

2 Results

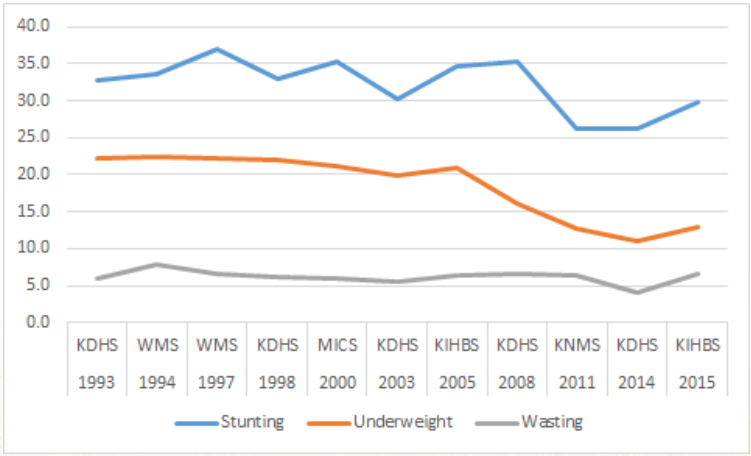
This section presents the results of the published information and the recalculated nutritional indicators. It is divided into three broad sections covering results on national malnutrition trends, second part covers the recalculated indicators at urban and rural residence.

2.1 National Nutrition Indicators Trends

2.1.1 National Trends Performance from the Published Data

The reports from the conducted surveys contains the published data on malnutrition indicators as shown in appendix Table A1. The anthropometric indicators for children under five years showed a downward trend in moderate stunting and underweight as shown in Figure 2.1.1, and appendix Table A6. For example, stunting decreased from 35.3 per cent in 2008 KDHS, to a low of 26.2 per cent in 2014 KDHS, signifying a 9.1 per cent improvement. A comparison of stunting rates between the KDHS and KIHBS surveys in 2014 and 2015/16 shows that there was about 3.7-point difference, KIHBS reporting a higher a rate of 29.9 per cent while the KDHS reported 26.2 per cent. In order to compare the anthropometric indicators across surveys, a common survey methodology should be applied. This study did a comparison and noted the following differences; survey target populations and the duration of data collection. It also was noted that different growth reference standards for children were used in calculating the indices.

Figure 2.1.1: National Trends of Malnutrition Indicators Published Between 1993 and 2016



Note: 1) KDHS – Kenya Demographic and Health Survey; WMS - Welfare Monitoring Survey; MICS - Multiple Indicator Cluster Survey; KIHBS - Kenya Integrated Household Budget Survey; KNMS – Kenya National Micro nutrient Survey

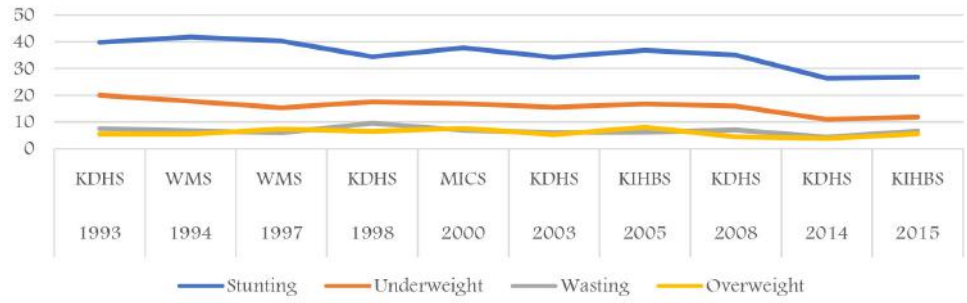
2.1.2 National Trend Based on Recalculated Indicators

For almost three decades, the recommended reference used to construct indicators for wasting, stunting, and underweight has been the National Centre for Health Statistics (NCHS) growth reference. The appropriateness of this reference, which was established on the basis of a sample of formula-fed children residing in a relatively restricted geographic area in the United States. The limitations of this standard has been noted and debated.[2]

In response to the limitations to NCHS standard, WHO established a Working Group on infant growth in 1990, which recommended that international growth standards be developed to replace the existing NCHS. The recommendation was endorsed in 1994 which led to the design and implementation of the study which was conducted between 1997 and 2003 in six countries[3]: Brazil, Ghana, India, Norway, Oman, and the United States. The results of the study were released by WHO in April 2006. The new standards have been in operation since 2006.

The study applied this new standard to the data that had earlier been analysed using the previous standard. Table 2.1.1 and Figure 2.1.2 presents the indicators based on the re-calculated indices using the new standard. The application of the new standard resulted in new prevalence rates that are different from the published rates. For instance, the published prevalence for KIHBS 2005/06 change from 34.7 per cent to 36.8 per cent, while for KDHS 2008 the rate changed from 35.3 per cent to 34.4 per cent. In all cases the application of the new standards ended up in producing different estimate. From Figure 2.1.2, there was a decline in global stunting prevalence over the period, from a high of 41.8 per cent recorded in 1994 Welfare Monitoring Survey, to a low of 26.3 per cent observed in KDHS 2014.

Figure 2.1.2: National Trends Line using Recalculated Malnutrition Indicators



All the anthropometric indices had a downward trend as observed in Figure 2.1.2. Over the period in focus the stunting prevalence dropped from a high of about 40 per cent in 1993 to low of above 25 per cent. Similarly, the underweight prevalence had been oscillating above 10 per cent and below 20 per cent while wasting and overweight was oscillating around 5 per cent.

2 de Onis M, Yip R. The WHO growth chart: Historical considerations and current scientific issues.

3 Garza C, de Onis M

Table 2.1.1: Recalculated Trends Indicators using WHO 2006, for entire survey data[1]

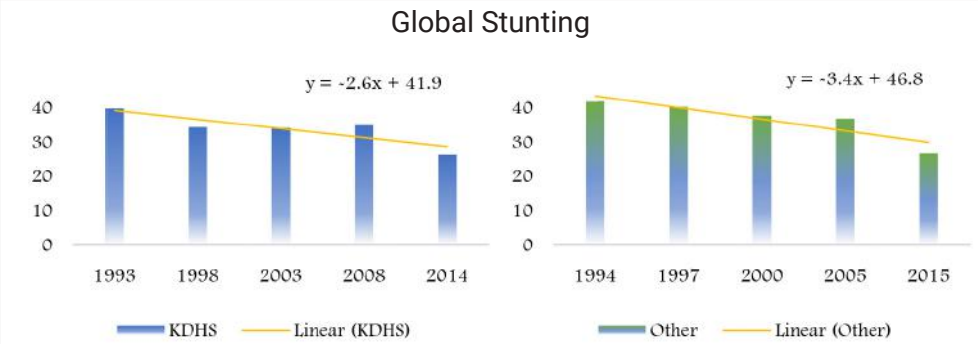
Survey	Stunting		Underweight		Wasting		Overweight
	Global	Severe	Global	Severe	Global	Severe	Global
KDHS 1993	39.8	17.5	20.0	6.8	7.5	2.7	5.4
WMS 1994	41.8	18.9	17.8	5.6	6.6	2.4	5.4
WMS 1997	40.3	18.8	15.3	3.6	5.9	2.0	7.3
KDHS 1998	34.4	16.6	17.5	6.0	9.5	4.0	6.5
MICS 2000	37.7	17.7	16.8	6.5	6.8	2.8	7.6
KDHS 2003	34.2	14.0	15.5	4.6	6.0	2.5	5.2
KIHBS 2005/06	36.8	17.7	16.7	4.9	6.1	2.2	8.0
KDHS 2008	35.0	14.1	15.9	3.8	6.9	2.3	4.4
KDHS 2014	26.3	8.0	10.9	2.5	4.3	1.1	3.8
KIHBS 2015/16	26.7	10.3	11.8	2.5	6.5	2.1	5.5

Note: 1) Global stands for prevalence of all children with Z scores below –2, including those with Z scores below –3. That is, combining both the moderate and the severe. 2) 1 the figures are different from published reports because of either the use WHO 2006 reference population, or the further cleaning of the data. This recalculation does not consider the differences in target population.

2.1.3 Comparison of Anthropometric Indices from surveys with Consumption and Without Consumption

The welfare monitoring and the integrated household budget surveys were designed to collect data on household consumption expenditures integrated with other modules such as nutrition module while the KDHS collects demographics and health data including the nutrition. In an attempt to investigate the differences that may occur due to the effect of collecting nutrition data with household consumption and without consumption, two regression models corresponding to the two groups of data were run and the results showed that both sets of data have similar trends as shown in Figure 2.1.3. The rate of reduction in surveys with household consumption is higher than that of KDHS surveys. As stated earlier, there exist some difference in target population and duration of data collection between the two surveys. KDHS target population is always children aged 0-59 while the other mainly covers children aged 6-59 months with an exception of the MICS. This could partly explain the differences in the rate of reduction.

Figure 2.1.3: Comparison of consumption Surveys versus KDHS



Note: Other represent the surveys that collected household consumption data alongside nutrition data

2.1.4 Comparison of Anthropometric Indices using common age cohorts

In order to compare the indices trends across the surveys, a common age cohort database was constructed by excluding the population aged 0-5 months and therefore leaving the 6-59 months as a common age cohort within the datasets. The recompilation of the anthropometric indices based on this new data is presented in Table 2.1.2 and Figures 2.1.4a, 2.14b and 2.14c. The results depict an upward trend in stunting and underweight prevalence for the surveys that had the 0-5 months' children drop. For example, the results for the 2014 KDHS show that the prevalence of stunting and underweight for children aged 6-59 months were 28.1 per cent as opposed to 26.3 per cent for children aged 0-59 months as shown in Figures 2.1.4a and 2.14b. On the other hand, the wasting prevalence showed a downward trend, showing that the wasting in children 6-59 months is improving as compared to children 0-59 months. For example, the results for the 1998 KDHS showed that the prevalence improved from 9.5 per cent to 9.3 per cent as shown in figure 2.14c.

In general, the trends of malnutrition prevalence for children aged 6-59 months as compared with children 0-59 months depict a worsening situation while the wasting on the other hand shows a slight improvement in the period in focus. This noted phenomena cannot be explained by this study and requires further research.

Table 2.1.2 Recalculated Trend Indicators using WHO, 2006, for children aged 6-59 months

Survey	Global prevalence for the harmonized target population				% change from non-harmonised to harmonised			
	Stunting	Underweight	Wasting	Overweight	Stunting	Underweight	Wasting	Overweight
KDHS 1993	42.5	20.8	7.1	5.0	6.8	4.1	-4.2	-7.5
WMS 1994	42.0	17.8	6.5	5.4	0.2	0.0	-1.2	-0.3
WMS 1997	41.6	15.9	5.8	7.0	2.9	3.4	-2.9	-4.4
KDHS 1998	38.7	19.1	9.3	5.8	12.7	9.2	-2.6	-10.7
MICS 2000	39.4	17.3	6.8	7.3	4.3	3.2	0.1	-4.9
KDHS 2003	37.5	16.6	5.6	4.6	9.5	6.8	-5.1	-12.6
KIHBS 2005	37.2	16.6	6.0	8.1	-	-	-	-
KDHS 2008	37.5	17.1	6.5	4.1	7.1	7.3	-6.4	-8.1
KDHS 2014	28.1	11.5	4.2	3.2	6.8	5.2	-3.1	-14.9
KIHBS 2015	26.7	11.8	6.5	5.5	-	-	-	-

Note: Global stands for prevalence of all children with Z scores below –2, including those with Z scores below –3. That is, combining both the moderate and the severe.

Figure 2.1.4a: Comparison stunting prevalence between children 0-59 and 6-59 in KDHS and MICS

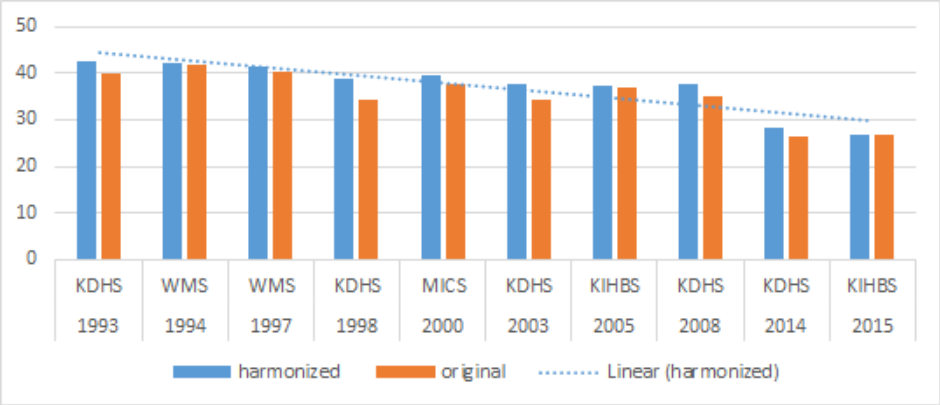


Figure 2.1.5b: Comparison Underweight Prevalence between children 0-59 and 6-59 in KDHS and MICS

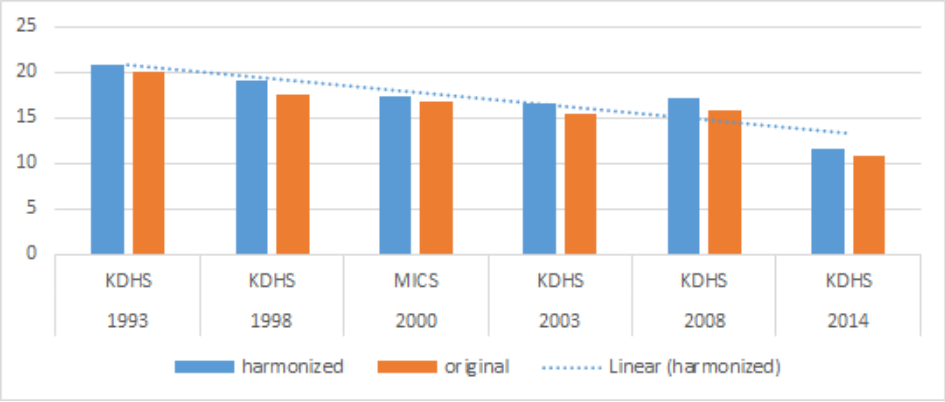
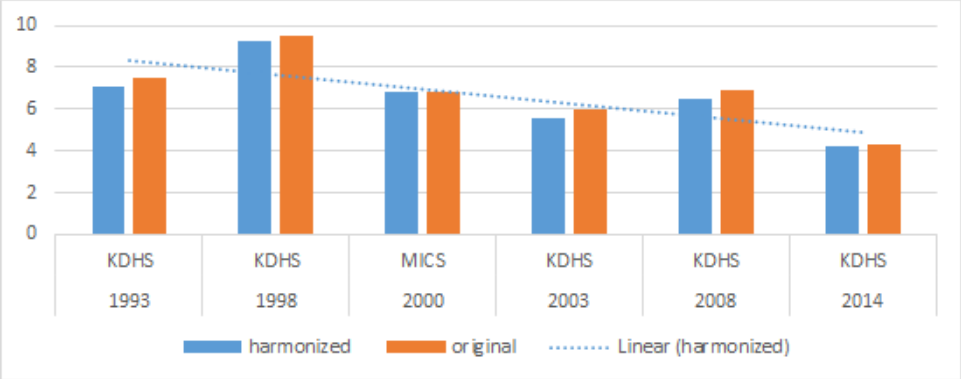


Figure 2.1.6c: Comparison Wasting Prevalence between children 0-59 and 6-59 in KDHS and MICS



2.1.5 Average Annual Rate of Reduction of Malnutrition Prevalence

In order to improve the malnutrition, the WHA endorsed six global targets to identify priority areas for action, inspire ambition at the country level and develop accountability frameworks[4]. Kenya is among the countries that endorsed the targets and is committed to monitoring progress on achieving the targets based on the available data. The progress on targets is monitored by calculating an average relative percentage change in prevalence of an indicator using a metric called the average annual rate of reduction (AARR). The AARR is the average relative per cent decrease per year in prevalence or rate. Thus, a positive sign indicates reduction or downward trend, while a negative sign indicates increase, or upward trend.

The global targets to monitor the progress are derived using the available data for children aged 0-59 months. This study therefore utilized the KDHS data series due to the fact that it was the series with information for children aged 0-59 months in the country.

The recalculated anthropometric indices using the KDHS were used in determining the AARR for each indicator based on a log-linear regression (exponential growth model) as described in the United Nations Children's Fund technical note[5] for the prediction of malnutrition prevalence.

The results of AARR are shown in Table 2.1.3. The analysis shows that the stunting prevalence was reducing at a rate of 1.6 per cent, while underweight was declining at 2.5 per cent per annum. The prevalence of wasting did not change significantly as reflected in Figure 2.1.4. The AARR for overweight insignificantly reduced at 2.1 while wasting declined at 2.7 per cent.

Table 2.1.3: AARR for Global Prevalence using KDHS surveys

Indicator	AARR	p-value
Stunting	1.6	0.059
Underweight	2.5	0.022
Wasting	2.7	0.124
Overweight	2.1	0.072

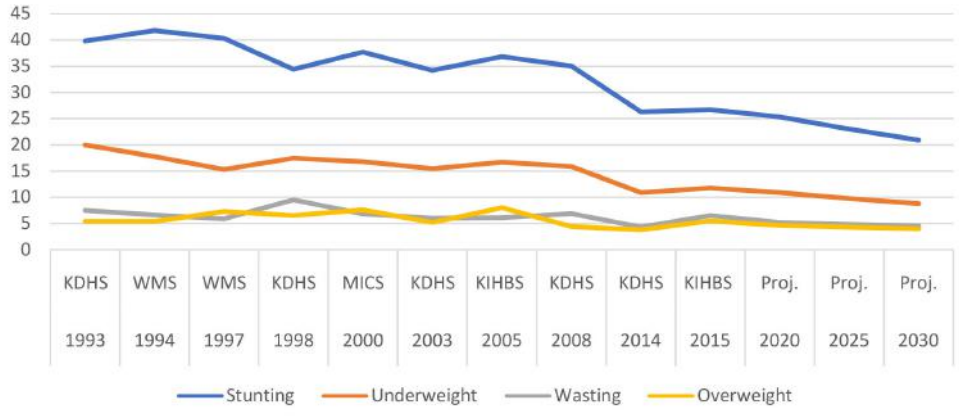
If existent factors during the focus period remain constant, the analysis predicts that by 2025, global stunting for children aged 0-59 months would be about 23.8 per cent as shown in Table 2.1.4 against a calculated WHA target of 12.6 per cent (see Appendix A4), and would reduce further to about 22.0 per cent by 2030. Similarly, global underweight, wasting and overweight were forecasted to about 9.0, 3.6 and 3.1 per cent, respectively, by 2025 as shown in Table 2.1.5 and Figure 2.1.4.

4 WHA World summit
5 UNICEF, 2007

Table 2.1.4: Log-linear Prediction of Malnutrition Status, using KDHS surveys

Indicator	Projected Years			2025 Targets
	2020	2025	2030	
Stunting	25.8	23.8	22.0	WHA target of 12.6 (Appendix Table A4)
Underweight	10.2	9.0	7.9	
Wasting	4.2	3.6	3.2	Reduce and maintain childhood wasting to less than five per cent
Overweight	3.5	3.1	2.8	No increase in childhood overweight

Figure 2.1.7: Projected Global Indicators at National Level

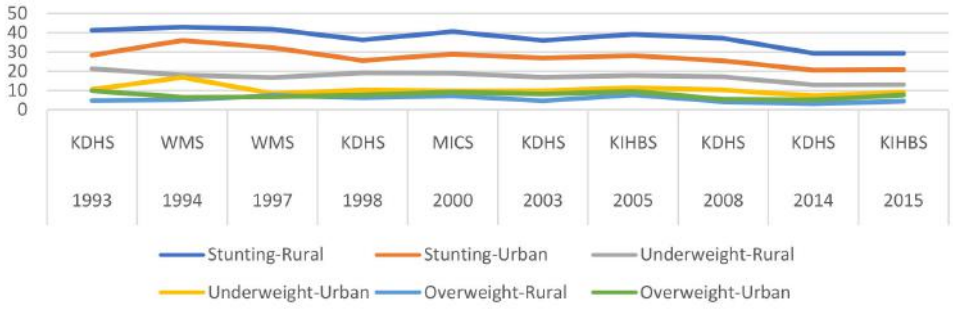


Note: Global stands for prevalence of all children with Z scores below –2, including those with Z scores below –3. That is, combining both the moderate and the severe. Proj. Stands for projected

2.2 Recalculated Trends by Area of Residence

Figure 2.2.1 present the recalculated stunting and underweight by area of residence. Overall, there was a decline in global stunting prevalence over the period, from a high of 42.9 per cent recorded in 1994 Welfare Monitoring Survey in rural areas, to a low of 29.3 per cent observed in KDHS 2014 as shown appendix A7. Consistently, stunting and underweight have` been high in rural areas than in urban areas. However, Overweight is higher in urban areas than in rural areas.

Figure 2.2.1: Global Indicators at Area of Residence



Note: Global stands for prevalence of all children with Z scores below –2, including those with Z scores below –3. That is, combining both the moderate and the severe.

The overall annual reduction rate for global stunting in rural and urban areas was 1.3 and 1.2 per cent, respectively, both improving slightly as shown in Table 2.2.1. Underweight in rural areas has been improving significantly at an annual rate of 2.1 per cent while overweight in urban areas has been decreasing significantly at a rate of 3.0 per cent.

Table 2.2.1: AARR for Global Prevalence by Residence

	Stunting		Underweight		Wasting		Overweight	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
AARR	1.3	1.2	2.1	1.5	2.7	1.7	2.5	3.0
p value	0.063	0.064	0.013	0.114	0.112	0.417	0.101	0.020

3 Conclusions and Recommendations

In the past three decades, Kenya managed to conduct ten national surveys that did collect data on nutrition. These datasets on the other hand are also rich in other indicators alongside the nutrition indicators. Anthropometric indicators among the under-five have shown a downward trend during this period.

The study observed differences in survey estimates due to different target population covered in surveys; data quality issues; the duration of data collection (which may lead to different seasons) and the use of the child growth reference standards.

The application of the new child growth reference population standards in the study revealed new prevalence rates that are different from the published data. In all cases there was a decline in moderate malnutrition prevalence over the period confirming the earlier observed trends from the published information.

In the harmonized target population of children aged 6-59 months the recalculated anthropometric indices showed that the prevalence of stunting and underweight was higher than the previous results, showing the presence of the stunting and underweight is less in younger children than the older ones but relatively the same for wasting.

Study to be undertaken to establish why malnutrition prevalence for children aged 6-59 months as compared with children 0-59 months depict a worsening situation while the wasting on the other hand shows a slight improvement in the period in focus.

The AARR analysis showed that the stunting prevalence was reducing at a rate of 1.6; underweight at 2.5; wasting at 2.7 and overweight at 2.1 per cent per annum. If the condition remains as per the focus period, it is expected that by 2025 the global stunting would be 23.8 per cent while expected WHA target would stand at 12.6 per cent. This is projected to reduce further to 22.0 per cent in 2030. Similarly, global underweight, wasting and overweight were forecasted to about 9.0, 3.6 and 3.1 per cent respectively, by 2025.

The overall annual reduction rate for global stunting in rural and urban areas was 1.3 and 1.2 per cent, respectively, both improving slightly. Underweight in rural areas has improved significantly at an annual rate of 2.1 per cent while overweight in urban areas has decreased significantly at a rate of 3.0 per cent.

The study therefore recommends the following policy interventions;

1) The methodologies of undertaking future nutrition surveys should be harmonized as a best practice and for easy of comparison.
2) The investments in the nutrition sector should be up scaled if the country is to realize global and national malnutrition targets.
3) Nutrition is a devolved function implying that future surveys should be designed to collect data to report indicators at this level.
4) Overweight is more pronounced in an urban than rural areas that calls for further research and enhancement of interventions in this area
5) There is need to promote the acquisition of the nutritional knowledge in the communities.

Appendices

Data and Methodology

Table A1: KNBS Surveys and Respective Reference Standard in Computation of Published Indicators

Survey	Reference standard	Target population (age in months)	Data collection time frame
Demographic and Health Survey (1993)	NCHS	0-59	6 months
Welfare Monitoring Survey 2 (1994)	NCHS	6-59	3 months
Welfare Monitoring Survey 3 (1997)	NCHS	6-59	3 months
Demographic and Health Survey (1998)	NCHS	0-59	6 months
Multiple Indicator Cluster Survey (2000)	NCHS	0-59	3 months
Demographic and Health Survey (2003)	NCHS	0-59	6 months
Integrated Household Budget Survey 1 (2005)	NCHS	6-59	12 months
Demographic and Health Survey (2008)	NCHS	0-59	6 months
Demographic and Health Survey (2014)	WHO, 2006	0-59	6 months
Integrated Household Budget Survey 2 (2015)	WHO, 2006	6-59	12 months

Note: KIHBS data collection covered all the seasons of the year, but differs with the other surveys in terms of population target group.

Table A2: Sample Design for selected KNBS Surveys

Survey	Weight type	Interviewed households	Coverage	Source
Demographic and Health Survey (1993)	Normalized[6]	7,950	National, Province, Rural/Urban	Report[7]
Welfare Monitoring Survey 2 (1994)	Raw[8]	10,880	National, Province, Districts, Rural/Urban	Report
Welfare Monitoring Survey 3 (1997)	Raw	10,755	National, Province, Districts, Rural/Urban	Report
Demographic and Health Survey (1998)	Normalized	9,465	National, Province, Rural/Urban	Report[9]
Multiple Indicator Cluster Survey (2000)	Raw	8,993	National, Province, Districts, Rural/Urban	Report
Demographic and Health Survey (2003)	Normalized	8,561	National, Province, Rural/Urban	Report[10]
Integrated Household Budget Survey 1 (2005)	Raw	13,158	National, Province, Districts, Rural/Urban	Report
Demographic and Health Survey (2008)	Normalized	9,057	National, Province, Rural/Urban	Report[11]
Demographic and Health Survey (2014)	Normalized	36,430	National, County, Rural/Urban	Report[12]
Integrated Household Budget Survey 2 (2015)	Raw	21,773	National, County, Rural/Urban	Report[13]

Note: KIHBS data collection covered all the seasons of the year, but differs with the other surveys in terms of population target group.

6 Normalized weights sum to the sample size. With normalized weights in the analyses, the estimates of means, and proportions are correct. The estimates of standard errors are correct given a simple random sample or stratified sample.

7 National scope, excluding Samburu and Turkana in Rift Valley Province and Isiolo and Marsabit in Eastern Province. (National Council for Population and Development (NCPD) et al., 1994)

8 The raw weight is the inverse of the product of the probabilities of selection at each stage. Estimates of means, proportions and standard errors obtained using raw weights will be based on the population size, not the sample size.

9 National scope, excluding Samburu and Turkana in Rift Valley Province and Isiolo and Marsabit in Eastern Province. (National Council for Population and Development - NCPD/Kenya et al., 1999)

10 Entire country (Kenya National Bureau of Statistics (KNBS) et al., 2004)

11 Entire country (Kenya National Bureau of Statistics - KNBS et al., 2010)

12 Entire country (Kenya National Bureau of Statistics et al., 2015)

13 Entire county (Kenya National Bureau of Statistics (KNBS), 2018)

Table A3: Unweighted Number of Children per Survey and by Age Groups

Survey (Year)	Child age groups							TOTAL
	0-5	6-11	12-17	18-23	24-35	36-47	48-59	
Demographic and Health Survey (1993)	471	573	524	512	1,016	1,071	927	5,094
Welfare Monitoring Survey 2 (1994)	0	870	910	865	2,004	2,025	1,755	8,441
Welfare Monitoring Survey 3 (1997)	214	732	728	715	1,321	1,266	1,244	6,220
Demographic and Health Survey (1998)	505	566	557	519	962	0	0	3,109
Multiple Indicator Cluster Survey (2000)	415	690	805	633	1,368	1,377	1,215	6,503
Demographic and Health Survey (2003)	610	613	585	485	990	1,015	891	5,189
Integrated Household Budget Survey 1 (2005)	0	837	964	708	1,770	1,734	1,610	7,624
Demographic and Health Survey (2008)	594	646	547	544	1,106	1,025	1,028	5,490
Demographic and Health Survey (2014)	1,819	2,054	2,124	1,831	3,859	3,920	3,630	19,237
Integrated Household Budget Survey 2 (2015)	0	972	1,090	982	2,247	2,261	2,242	9,794

Table A4: World Health Assembly Stunting Target

Under 5 population (2012)[14]	6,193,763
Number of stunted children as at 2012 (calculated)	1,653,735
WHA 2025 Target (numbers) (40% less 2012) (calculated)	992,241
Projected 2025 population of children <5[15]	7,903,361
Targeted Stunting Rate Per cent (2025) (calculated)	12.6

Note: Number of stunted children in 2012 was calculated based on computed rate of stunting (26.7 per cent) from 2015/16 KIHBS data

Table A5: Average Annual Reduction Rate (AARR) using entire survey data

Indicator		**AARR**	**Lower limit**	**Upper limit**	**p-value**
Stunting	Global	1.9	1.1	2.6	0.000
	Severe	3.1	1.7	4.6	0.001
Underweight	Global	2.1	1.2	3.0	0.001
	Severe	3.9	1.8	5.9	0.003
Wasting	Global	1.3	-0.5	3.1	0.127
	Severe	2.6	-0.2	5.2	0.065
Overweight	Global	1.4	-0.9	3.6	0.206

Note: Global stands for prevalence of all children with Z scores below –2, including those with Z scores below –3. That is, combining both the moderate and the severe.

14 Kenya Population and Housing Census (2009). Analytical Report on Population Projection.

15 Kenya Population and Housing Census (2009). Analytical Report on Population Projection.

Table A6: National Trends of Malnutrition Indicators Published Between 1993 and 2015

Year	Survey	Stunting	Underweight	Wasting	Overweight
1993	Demographic and Health Survey	32.7	22.3	5.9	
1994	Welfare Monitoring Survey 2	33.6	22.5	7.8	
1997	Welfare Monitoring Survey 3	36.9	22.3	6.5	
1998	Demographic and Health Survey	33.0	22.1	6.1	
2000	Multiple Indicator Cluster Survey	35.3	21.2	6.0	
2003	Demographic and Health Survey	30.3	19.9	5.6	
2005	Kenya Integrated Household Budget Survey 1	34.7	20.9	6.3	
2008	Demographic and Health Survey	35.3	16.1	6.7	4.7
2011	Kenya National Micronutrient Survey	26.3	12.7	6.3	
2014	Demographic and Health Survey	26.2	11.0	4.0	4.1
2015	Kenya Integrated Household Budget Survey 2	29.9	13.0	6.7	

Table A7: Recalculated Trends of Malnutrition Indicators by Area of Residence

Year	Survey Name	Residence	Stunting		Underweight		Wasting		Overweight
			Global	Severe	Global	Severe	Global	Severe	
1993	Demographic and Health Survey	Rural	41.2	18.2	21.2	7.3	7.8	2.8	4.8
		Urban	28.3	12.1	10.6	2.9	4.9	2.0	9.8
1994	Welfare Monitoring Survey 2	Rural	42.9	19.3	18.0	5.6	6.5	2.4	5.2
		Urban	35.9	16.8	16.8	5.3	7.2	2.5	6.6
1997	Welfare Monitoring Survey 3	Rural	41.8	19.9	16.6	4.0	5.9	2.1	7.4
		Urban	32.2	12.9	8.5	1.2	6.3	1.2	6.7
1998	Demographic and Health Survey	Rural	36.3	18.5	19.1	6.4	9.8	3.9	6.3
		Urban	25.5	8.5	10.3	4.3	8.3	4.5	7.7
2000	Multiple Indicator Cluster Survey	Rural	40.6	19.3	19.0	7.5	7.7	3.1	7.2
		Urban	28.9	12.9	9.9	3.3	4.2	2.0	9.1
2003	Demographic and Health Survey	Rural	35.9	14.6	16.8	5.0	6.2	2.7	4.6
		Urban	26.8	11.2	9.8	2.9	5.1	1.6	8.2
2005	Integrated Household Budget Survey 1	Rural	39.2	19.0	17.8	5.2	6.1	2.3	7.8
		Urban	28.1	12.9	11.4	3.2	5.6	1.3	9.5
2008	Demographic and Health Survey	Rural	37.1	15.2	17.1	4.3	7.1	2.4	4.2
		Urban	25.4	8.9	10.3	1.8	6.0	1.8	5.5
2014	Demographic and Health Survey	Rural	29.3	9.3	12.9	2.9	4.6	1.1	3.1
		Urban	20.6	5.8	7.2	1.7	3.8	1.0	5.2
2015	Integrated Household Budget Survey 2	Rural	29.3	10.9	13.1	2.8	6.7	2.3	4.5
		Urban	20.9	8.9	9.1	2.0	6.1	1.7	7.6

Box 1: About the WHA 2025 Global Targets

These global targets were endorsed for improving maternal, infant and young child nutrition in the 2012 World Health Assembly Resolution 65.6. The targets are vital for identifying priority areas for action and catalysing global change. The set of six core global nutrition targets aim to, by 2025:

- achieve a 40% reduction in the number of children under-5 who are stunted (low height-for-age)
- achieve a 50% reduction of anaemia in women of reproductive age;
- achieve a 30% reduction in low birth weight;
- ensure that there is no increase in childhood overweight;
- increase the rate of exclusive breastfeeding in the first 6 months up to at least 50%;
- reduce and maintain childhood wasting to less than 5% (low weight-for-height)

Box 2: Sustainable Development Goals Targets

The Sustainable Development Goals (SDGs) are a universal call to action to end poverty, protect the planet and improve the lives and prospects of everyone, everywhere. The 17 Goals were adopted by all UN Member States in 2015, as part of the 2030 Agenda for Sustainable Development which set out a 15-year plan to achieve the Goals.

In particular, SDG 2 (end hunger, achieve food security and improved nutrition and promote sustainable agriculture) and SDG 3 (ensure healthy lives and promote wellbeing for all at all ages).

- 2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.
- 2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons.
- 3.2 By 2030, end preventable deaths of new-borns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births.

Box 3: Third Medium Term Plan and the Big Four Agenda

When H.E. President Uhuru Kenyatta conceptualized the Big Four; food security, affordable housing, manufacturing and affordable healthcare for all, he did so directly relating to Kenya's Vision 2030, which is currently being implemented through the Third Medium Term Plan (MTP III). The MTP III therefore is driven by the Big Four Agenda, implemented on the foundations that have been put in place during the First and Second Medium Terms Plans.

The key food security and nutrition metrics are:

- 27% reduction in under 5 Malnutrition
- 47% reduction in the cost of food as a % of income
- 34% increase in the average daily income of farmers
- 50% reduction in the number of food insecure Kenyans

Glossary of selected terms

Average Annual Rate of Reduction (AARR): The average relative Per cent 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.

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% reduction in the number of children under-5 who are stunted; 50% reduction of anaemia in women of reproductive age; a 30% 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% and reduce and maintain childhood wasting to less than 5%.

Z-score: The deviation of an individual's value from the median value of a reference population, divided by the standard deviation of the reference population (or transformed to normal distribution).

Indicator name	Definition		
	Numerator	Denominator	Colloquial definition
Stunting	Number of under-fives falling below minus 2 standard deviations (moderate and severe) and minus 3 standard deviations (severe) from the median height-for-age of the reference* population	Children under 5 years of age in the surveyed population	Stunting refers to a child who is too short for his or her age. Stunting can affect physical and cognitive function. In severe cases the devastating effects of stunting can last a lifetime and even affect the next generation.
Wasting	Number of under-fives falling below minus 2 standard deviations (moderate and severe) and minus 3 standard deviations (severe) from the median ***weight-for-height*** of the reference* population	Children under 5 years of age in the surveyed population	Wasting refers to a child who is too thin for his or her height. Wasting is the result of recent rapid weight loss or the failure to gain weight. A child who is moderately or severely wasted has an increased risk of death, but treatment is possible.
Overweight	Number of under-fives ***above*** 2 standard deviations from the median ***weight-for-height*** of the reference* population	Children under 5 years of age in the surveyed population	Overweight refers to a child whose weight is excess based on his/her reference height[16]. This form of malnutrition results from energy intakes from food and beverages that exceed children's energy requirements. Overweight increases the risk of diet-related non-communicable diseases later in life.

*The reference population is based on the WHO Child Growth Standards, 2006
Source: ("Malnutrition in Children," 2020)

16 The overweight index commonly reported on is weight for height, but overweight can also refer to weight for age.

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