

Socioeconomic inequalities trends in child health comparing within and between group inequalities: Food insecurity and malnutrition in Zimbabwe

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Abstract

Background Food insecurity and malnutrition in children are pervasive public health concerns in Zimbabwe. Several studies previously done, only identified determinants of food insecurity and malnutrition with very little efforts have been done in assessing related inequalities and decomposing the inequalities across household characteristics in Zimbabwe. This study explored socioeconomic inequalities trends in child health using the decomposition approach to compare within and between group inequalities.

Methods The study used Demographic Health Survey (DHS) data sets of 2010\11 and 2015. Food insecurity in children was determined based on the WHO dietary diversity score. Minimum dietary diversity was defined by a cut- off point of >4 therefore, in this study children with less than 3 of the 13 food groups were defined as food insecure. Malnutrition was assessed using weight for age Z-score, with children whose weight-for-age Z-score below minus two standard deviations (-2 SD) from the median considered malnourished. Concentration indices were computed to understand if malnutrition was dominant among the poor or rich. The study used the Theil index and decomposed the index by population subgroups (geographical clusters and socioeconomic status).

Results Over the study period, malnutrition prevalence increased by 1.03 percentage points (p.p), while food insecurity prevalence decreased by 4.35p.p. Prevalence of malnutrition and food insecurity increased among poor rural children. Theil indices for nutrition status show socioeconomic inequality gaps to have widened, while food security status socioeconomic inequality gaps contracted for the period under review.

Conclusion: Within-group inequalities are driving most of the socioeconomic inequalities in nutritional status and food security status among children in Zimbabwe. To address the socioeconomic inequalities, there is need to tackle the four pillars (availability, accessibility, utilization and stability of food supply) of food and nutrition security.

Background

Malnutrition and food insecurity are major public health problems globally, and mostly dominant in low and middle income countries (LMICs) [1]. An estimate of 1 billion people are reported to be starved and malnourished [2]. About 45% of global deaths among children under five years were attributed to malnutrition [2]. However, literature shows the burden of child malnutrition to be unequally distributed within regions and among countries [1–7].

An estimated one-third of globally malnourished children reside in sub-Saharan Africa (SSA) [7]. Stunting, severe wasting and intrauterine growth retardation have been cited as drivers of under-five mortality, accounting for about 3.1 million deaths global annually [2]. Health economics literature reflects considerable evidence, stating that nutritional and food security status in children heavily relies on socioeconomic factors [8]. Several studies have shown existence of socioeconomic inequalities in child malnutrition against child health determinants (age, sex and birth size of children) [9–12].

The food security framework is a multifaceted concept explaining interactions of food and poverty [13, 14]. Food insecurity can be defined as a state in which people do not possess physical and economic access to sufficient, safe and nutritious food, which satisfies their dietary needs [15]. Food security and nutritional statuses vary widely among children in households. Children from poor households are usually worse off than those from rich households [16]. Child malnutrition and food insecurity are common phenomena in rural inhabitants living in poverty [17].

Zimbabwe is part of Sub-Saharan Africa, situated to the south of Africa. The country is land locked and agriculture and mining sectors are main contributors of its gross domestic product (GDP) [18]. Agriculture is considered the back bone of Zimbabwe's economy providing more than 70% of employment [19], with 2013-14 estimates reflecting a 13% contribution of agriculture to the country's Gross Domestic Product [20].

Surprisingly, Zimbabwe ranked 46 out of 78 listed developing countries on the Hunger Index as of 2013 [21]. On the hunger index ranking, Zimbabwe fell under the "Serious" category with undernourishment cited to be the major driving force for the latter stated

position [19]. Poverty, and inadequate maternal and child care have been cited as the main driving factors of Zimbabwe's food insecurity and malnutrition [22].

The prevalence of stunting in Zimbabwe has been erratic since the mid-1980s'. However, post mid-1980 marginal declines in stunting were reported [23]. The rate of stunting among children accelerated from -0.63% in 2012 to 0.20% in 2016, if this rate is maintained then projections for 2025 would imply that 760 000 children would be expected to be stunted (Figure 2) [23].

Globally food insecurity and malnutrition are a cause for concern, hence their dominance on the global health agenda. The Sustainable Development Goal (SDG) 2.1 targets to: "End hunger and ensure access by all people, in particular the poor and vulnerable people, including infants, to safe, nutritious and sufficient food all year round by 2030" [24].

Most of the studies done in Zimbabwe on child food insecurity and nutritional status have explored mostly direction of association. There is a need to show how certain socioeconomic attributes contribute to disparities in child food insecurity and malnutrition. This study explores health inequalities in Zimbabwe by investigating the differences in food insecurity and malnutrition within and between groups among children under-five.

Methods

Sources of Data

Zimbabwe Demographic and Health Surveys (ZDHS) of 2010\11 and 2015 were used for analyses. Both data sets had population samples of 2,666 and 2,708 children respectively, aged 0-59 months. For both 2010/11 and 2015, the ZDHS samples were nationally representative. Composed of a sample of more than 11,000 households, the data sets also yielded representative information for most indicators of Zimbabwe for urban and rural areas.

The samples were representative of each of Zimbabwe's ten provinces: Manicaland, Mashonaland Central, Mashonaland East, Mashonaland West, Matabeleland North, Matabeleland South, Midlands, Masvingo, Harare, and Bulawayo. The sampling frame for the 2002 and 2012 population census were used for both data sets.

Outcome variables

Two indicators of food access across children age groups were assessed. The indicators were endorsed by countries represented at the UN Statistical Commission to monitor target 2.1 namely, prevalence of undernourishment (malnourished) and prevalence of severe food insecurity in the population [25].

Food insecurity among the children age groups was determined using the WHO dietary diversity score based on the Infant And Young Child Feeding (IYCF) practices. Dietary diversity is the number of different foods or food groups consumed over a given reference period [26].

For this study 13 food groups were considered, namely food from grains, food from tubers, eggs, meat, pumpkin & carrots, green leafy vegetables, vitamin A fruits, other fruits, liver & heart, fish, (beans, peas, lentils, nuts), other milk products and yogurt. The IYCF tool defines minimum dietary diversity as indicator for food security by a cut- off point of >4 [26], hence in this study children with less than 3 of the 13 food groups were defined as food insecure. Children feeding responses in both surveys solemnly rely on the 24-hour recall method, hence results on food security are prone to recall bias.

Malnutrition was assessed using the child anthropometric measure of weight-for-age. Weight-for-age is a composite index of height-for-age and weight-for-height hence taking account both acute and chronic under-nutrition. Children whose weight-for-age z-score was below minus two standard deviations (-2 SD) from the median were considered malnourished and those above minus two standard deviations (-2 SD) from the median nourished. Chi-square tests were used to assess the difference between food security status; nutritional status and socioeconomic classes, residence status, child age, and other background characteristics.

Socioeconomic status

Socioeconomic status was adapted from the wealth index for households in the original surveys (ZDHS). In both ZDHS's, wealth index was reported as scores based on the number and kinds of consumer goods owned, ranging from a television to a bicycle or a car, plus housing characteristics such as source of drinking water, toilet facilities, and flooring materials.

The latter scores were derived using principal component analysis. National wealth quintiles were compiled by assigning household scores, then each person was ranked in the household population by their score, and lastly the distribution was divided into five equal categories, each with 20 percent of the population in the original studies. For this study socioeconomic status was then re-categorised from 5 (poorer, poor, middle, richer, richest) groups into 3 groups thus poor, middle and rich (Table 1).

Child age

Children's age was recoded into 3 groups based on the South Africa's department of health age definitions [27]. The 3 child age groups were defined as; Neonates (1 day-1 month), Infants (1 month-24 months) and Young children (24 months-59 months) (Table 1).

Mother's education

Zimbabwe's education system is composed of 3 levels; primary education, secondary education and tertiary education [28]. The primary level is a seven-year cycle with an official entry age of six years running from Grade 1 to 7. However, prior to Grade 1 children are enrolled for early childhood education and care (preschool) for a year, but the latter is not formally considered as part of primary education.

Tertiary education in Zimbabwe covers all universities, technical colleges, polytechnic colleges, teacher's training colleges and other vocational skills training canterers [28]. Mother's education was recoded into 3 categories thus; no education, primary and tertiary educated (Table 1).

Erreygers Normalised Concentration index

The study used Erreygers normalised concentration indices in determining socio-economic inequalities in child nutrition and food security. The study adopted the latter approach as the concentration index approach does not entirely measure inequalities in ordinal health variables [29, 30]. The latter index is expressed as a value of a health variable which would have been assigned to an individual as a function of a socioeconomic category to which the individual belongs [31].

Concentration index is a mathematical derivative of the concentration curve. On the concentration curve, the x-axis represents cumulative proportion of individuals by socioeconomic class starting with the lowest socioeconomic class (*poorest*) and ending with highest socioeconomic class (*richest*), while the y-axis is the cumulative total proportion of health in these individuals [31].

The Concentration curve identifies the existence of socioeconomic inequalities in health sector/outcome variables, and is only sensitive to relative inequality [32]. The bounds of this measure are -1 and 1 with a negative (positive) value representing inequality favouring the worse-off (better-off).

Erreygers normalised index can be expressed algebraically as ;

[Please see the supplementary files section to view the equation.] (1)

Where;

Z_i represents number of individuals in a given population

i denotes the socioeconomic rank of the individual ranging from the richest to the poorest

h represents the health situation of the whole population

Theil index

The study used a generalized entropy measure known as the Theil index, mainly because of its decomposability [33]. This makes it well-suited for estimating the contribution of different groups to total inequality. Unlike other measures of inequalities, the generalised entropy class measures satisfy the five standard criteria for measuring inequalities including the attractive property of being easily decomposable by subgroups. The Theil index is argued to be a measure of inequalities with distinctive properties, hence making it a powerful instrument in analysing patterns and dynamics of inequalities [34].

Generalised Entropy (GE) measures are cited to be based on the idea of divergence between probability distributions derived from information theory [33, 35–37]. Inequality decomposition was done *by* population subgroup to separate total inequality in the distribution into components of inequalities between the selected groups and the remaining within-group inequality.

For this study we used the syntax *ineqdec0*, which is a stripped-down version the syntax *ineqdeco* in Stata version 13.1. The study used *ineqdec0* syntax so as to include zeros and negative incomes in calculations. Theoretically, Theil index ranges from 0 to infinity, with 0 being a state of equal distribution and values greater than 0 representing increasing levels of inequality [38, 39]. Data analysis was done using Stata version 13.1 (Stata Corp, Texas, United States).

Results

Over the period under review, malnutrition prevalence increased by 1.03 percentage points (**p.p**) [2010/11(3.73%);2015(4.76%)] and food insecurity prevalence decreased by 4.34**p.p**. For 2010/11; a greater proportion of malnourished children were poor, rural, boys whose mothers had attained at least secondary and a greater proportion of food insecure children were poor, rural, girls whose mothers had at least attained secondary education (Table 2). While for 2015; both food insecure and malnourished children were reported to be poor, rural, girls whose mothers had at least attained secondary (Table 2).

The Erreygers normalised concentration indices for nutrition status were all negative (pro-poor) for both time periods, translating to poor children less likely to be nutritious (Table 3). However, the Erreygers normalised concentration index for 2010/11 was not statistically significant at 95% confidence interval.

However, Erreygers normalised concentration indices for food security status were positive (pro-rich) for both time periods meaning children from wealthy households were more likely to be food secure (Table 3). For both time periods socioeconomic inequalities appear to be widening for child nutrition and food security status, this is reflected by the increasing Erreygers normalised concentration indices.

Computed concentration curves for nutrition status for both time periods concur with concentration indices (Figure 3a;3b). The curves show that children from low socioeconomic classes were less likely to be nutritious. However, for food security status in 2015, the curve shows that children from wealthy households were more likely to be food secure (Figure 3b). For 2010/11 the concentration curve crossed the 45⁰ line of equality at some points which prompted the computation of the dominance test (Figure 3a).

Test of dominance between nutrition_status2010_11 concentration curve and the 45⁰ degree line showed non-dominance of the concentration curve (Table 4). Cumulative quintile shares for Nutrition_status_2010_11 shows that the poorest 20 percent children accounted for only 20.7% of nutritious children (Table 4). P-values of income share indicate that nutritional status shares were not significantly different from the nutritional status shares for all quintiles (Table 4).

Decomposition by residence

The study focused on two household characteristics in assessing income inequalities thus, location of the household and socioeconomic status/class. Socioeconomic inequalities among regions and socioeconomic classes within a country can be attributed as the driving force inducing uneven progress of economic development across regions [40].

The bigger proportion of children resided in the rural areas and also accounted for the greatest income share (Table 5). There were insignificant variances between income share and population share, thus making the two geographical clusters (urban & rural) comparable (Table 5).

Table 6 shows contracting socioeconomic inequality gaps for food security for both time periods in both geographical clusters. However, socioeconomic inequalities in food insecurity were more dominant in the rural areas as it recorded Theil indices higher than in the urban for food security. For nutritional status socioeconomic inequalities appear to have widened in the urban areas while in the rural areas the gaps contracted. Theil indices in the urban increased while in the rural areas the indices decreased (Table 6).

Decomposed results of food security by residence for 2010/11 reflect that about 1.6% of the income inequalities can be explained by the child's residence status (Table 7). With more than 98% of socioeconomic inequalities explained by within group income fluctuations (Table 7). Decomposed results for 2015, shows that 2.5% of income inequalities were explained by the child's residence status, while more than 97% explained by within group income fluctuations (Table 7).

For nutrition in 2010/11 over 96% of income inequalities were explained by within group income variability and about 4% explained by child's residence status (Table 7). While in 2015 within group income variations explained over 92% of income inequalities, with about 7% explained the child residence status (Table 7). Therefore, food security's within group income variations can explain 97.5%-98.4% of income inequalities, while where the child resides can explain 1.6%-2.5% income inequalities.

Decomposition by socio-economics status

For food security in both time periods the lowest socioeconomic class accounted for the biggest population share, however the latter also accounted for the second least proportion of income share (Table 8). Table 6 shows contracting socioeconomic inequality gaps among the poor for food security status and nutritional status for the period under review. However, for the wealthy class socioeconomic inequality gaps appeared to have contracted for food security status and widening for nutritional status (Table 6).

Table 7 results show that when decomposed by socioeconomic status for food security 95.7%-97.2% of income inequalities are explained by within group income variations and 2.8%-4.3% income inequalities explained by the socioeconomic group to which the child belongs. For nutrition 94.3%-96.4% income inequalities can be explained by within income group income variations and 3.6%-5.7% income inequalities can be explained by which socioeconomic class the child belongs (Table 7).

Discussion

We have found that, in 2010/11 and 2015 in Zimbabwe, children from the lowest socioeconomic class recorded highest prevalence of food insecure and malnourishment prevalence. Child malnutrition is a widespread phenomenon, particularly in rural areas, where most of the inhabitants live in poverty often characterised with food insecurity [17].

Several factors influence food insecurity and malnutrition among households. Food insecurity and malnutrition in children is mainly driven by chronic poverty, failed policies, physical and natural constraints [41]. Widespread poverty, poor infant and young child care practices, and low dietary diversity have been cited to be among key structural drivers of hunger and malnutrition in Zimbabwe [19]. The latter arguments concurred with our findings as the greater proportions of malnourished and food insecure children resided in the rural areas and the latter also reported prevalence's of food insecurity.

Literature has argued geographic location to be an important determinant of malnutrition, citing stunting to be worse among rural than urban children [22]. A study done in South Africa among under five children reported malnutrition to be highly concentrated in the poorest regions [42, 43]. This was also true in our study, as malnutrition and food insecurity were also more prevalent among rural children belonging to the lowest socioeconomic class.

Decomposed results of this study showed within group income variations to be a strong indicators of explaining socioeconomic inequalities, the latter findings also concur with results of a study done in Poland [40]. More recently, a study used Shapley decomposition to estimate the relative contributions of circumstances and analysed patterns of inequalities in health relative to nutrition outcomes among children under five in Tunisia [44]. The findings reported that parents' education, parental wealth, and place of residence as the key factors influencing inequalities in child health [45]. This was also true for our findings on as decomposed results showed socioeconomic status and place of residence as key attributes explaining the child inequalities.

Policy recommendations

Availability, accessibility, utilization and stability of food supply are the four pillars of food and nutrition security [46]. Zimbabwe launched the Food and Nutrition Security Policy with 8 commitments in 2013 [46, 47]. There is need to strengthen the capacity of broad-based agricultural development as argued in commitment 2 and 5, so as to ensure food and nutrition security due to availability and easy access to food.

Even though land is abundantly available in Zimbabwe, the Draft Agricultural Policy Framework cited agriculture output to be continuously declining [47]. There is need for an Agricultural policy, that is coordinated by multiple stakeholders, however with government spear heading the agricultural projects.

Community discussion done by the Department of Nutrition showed that most members of the communities lacked knowledge of nutrients in their agricultural produce [46], which eventually yields severe lack of diversity in consumed foods. Farming communities can be availed with community meetings spearheaded by local agro-assistants and representatives from the Department of Nutrition.

Conclusion

Food insecurity and malnutrition among children in Zimbabwe exists. The study showed that food insecurity and malnutrition in children is more dominant among poor children residing in the rural areas. To address the socioeconomic inequalities, there is need to tackle the four pillars (availability, accessibility, utilization and stability of food supply) of food and nutrition security. However, it can be deduced that Zimbabwe has a strong policy space for attaining food security and improving nutrition in children.

Abbreviations

DHS- Demographic Health Survey

GDP-Gross Domestic Product

GE- Generalised entropy (GE)

IYCF- Infant and Young Child Feeding

SD- Standard Deviation

SDG- Sustainable Development Goals

UN-United Nations

WFP- World Food Programme

WHO- World Health Organisation

ZimVac- Zimbabwe Vulnerability Assessment Committee

Declarations

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Availability of data and materials

All data sets are publicly available on the Demographic Health Survey website and can be accessed upon request from the Demographic Health Survey team.

Authors' contributions

ATL designed the study, wrote the paper, analysed results, reviewed the paper and submitted it for publication; SA reviewed the paper in preparation for publication, KZN reviewed the paper in preparation for publication, JA reviewed the paper in preparation for publication and OA designed the study and reviewed the paper in preparation for publication.

Ethics approval and consent to participate

No ethical approval was sought as the parent studies DHS were cleared on ethics also this is a secondary data analysis hence data sets are publicly available.

Competing interests

No competing interests between the authors

Consent for publication

Consent from all co-authors was obtained.

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Tables

Description of variables

x	Recorded as; 0 male and 1 female
age groups	Recoded as: 0 neonate (1day-1month), 1 infant (1month-24months) and 2 young child (24months-59months)
education	Recoded as; 0 no education, 1 primary, tertiary educated
socioeconomic index	Recoded into 3 categories as; 0 Poor (poorer & poorest), 1 Middle, 2 Rich (richer & richest)
residential location	Recoded 1 for urban and 2 for rural location

Sample distribution and prevalence of malnutrition and food insecurity among children aged 0-59 months by Residence, Socioeconomic status, Mothers' Education, Child age for Zimbabwe 2010/11 & 2015

Characteristics	Prevalence of malnutrition %		% Difference	Prevalence of food insecurity %		% Difference
	2010/11	2015		2010/11	2015	
	54.42	49.01	-5.41	49.70	48.44	-1.26
	45.58	50.99	5.41	50.30	51.56	1.26
P-value	0.003	0.336		0.082	0.006	
Food Wealth Index						
	46.56	56.16	9.6	51.75	53.75	2
	20.19	20.33	0.14	19.03	18.41	-0.62
	33.26	23.51	-9.75	29.22	27.84	-1.38
P-value	0.0008	0.000		0.000	0.005	
Education						
	1.47	1.34	-0.13	1.32	1.53	0.21
	27.17	32.87	5.7	36.82	36.43	-0.39
P-value	0.337	0.388		0.614	0.349	
	1.18	3.52	-2.34	5.03	7.12	-2.09
	90.62	88.80	1.82	70.22	65.43	4.79
Children	8.20	7.65	0.55	24.75	27.44	-2.69
P-value	1.474	1.875		1.789	1.887	
	27.70	17.47	-10.23	21.06	20.56	-0.5
	72.30	82.53	10.23	78.94	79.44	0.5
P-value	0.0003	0.000		0.000	0.001	

Note: Sample size and overall prevalence: for 2010/11; 2,714 children; overall malnutrition prevalence [3.73%]; overall food insecurity prevalence [78.29%]; Sample size and overall prevalence: for 2015; 2,835 children; overall malnutrition prevalence [4.76%]; overall food insecurity prevalence [73.95%]

Erreygers Normalised Concentration indices for nutrition status and food security status

Food Security Status			
Period	Erreygers Normalised Concentration Index	Standard Error	P-value
2010-11	0.1610	0.0181	0.000
2015	0.2093	0.0191	0.000
Percentage difference	0.0483 ↑		
Nutritional Status			
Period	Erreygers Normalised Concentration Index	Standard Error	P-value
2010-11	-0.0028	0.0084	0.737
2015	-0.0264	0.0094	0.005
Percentage difference	0.0236 ↑		

Note: Sample size for 2010/11 is 2,714 children, Sample size for 2015 is 2,835 children

Test of dominance between Nutrition_status2010_11 concentration curve and 45 degree equality line

<i>le</i>	<i>Significance level</i>	<i>Number points</i>
on_status2010_11	5%	19

inance

ative quintile shares for Nutrition_status_2010_11 reported with the output

<i>le</i>	<i>Standard Error</i>	<i>Cumulative share (%)</i>	<i>Difference from population share p-value</i>	<i>Difference from income share p-value</i>
	3.973	20.7	0.869	0.000
	4.759	38.5%	0.754	0.000
	4.877	55.1%	0.317	0.000
	3.320	88.1%	0.014	0.000

Population share and household income share of subgroups for food security and nutritional status distinguished by residence; 2010/11 & 2015

Food Security							
2010/11				2015			
Population share	Mean	Relative mean	Income share	Population share	Mean	Relative mean	Income share
0.2415	0.30	1.47	0.3555	0.3198	0.37	1.45	0.4629
0.7585	0.16	0.85	0.6445	0.6802	0.20	0.79	0.5371
Nutritional Status							
2010/11				2015			
Population share	Mean	Relative mean	Income share	Population share	Mean	Relative mean	Income share
0.2415	0.31	1.00	0.2407	0.3198	0.03	0.66	0.2114
0.7585	0.04	1.00	0.7593	0.6802	0.05	1.16	0.7886

Theil indices for subgroups for food security status and nutritional status distinguished by residence and socioeconomic classes

Theil index decomposed by residence						
Food security status				Nutritional status		
2010/11	2015			2010/11	2015	
Theil index [GE (2)]	Theil index [GE (2)]	Absolute difference		Theil index [GE (2)]	Theil index [GE (2)]	Absolute difference
1.1465	0.8364	-0.3101		12.0385	16.1539	4.1154
2.3524	1.9495	-0.4029		11.9878	9.0000	-2.9878
Theil index decomposed by socioeconomic status						
Food security status				Nutritional status		
2010/11	2015			2010/11	2015	
Theil index [GE (2)]	Theil index [GE (2)]	Absolute difference		Theil index [GE (2)]	Theil index [GE (2)]	Absolute difference
3.1453	2.2854	-0.8599		11.3636	8.3134	-3.0502
1.4222	1.6900	0.2678		14.7647	9.4546	-5.3101
1.3025	0.9034	-0.3991		11.6667	15.5147	3.8480

Decomposition of the Theil indices by residence and socioeconomic classes for food security status and nutritional status

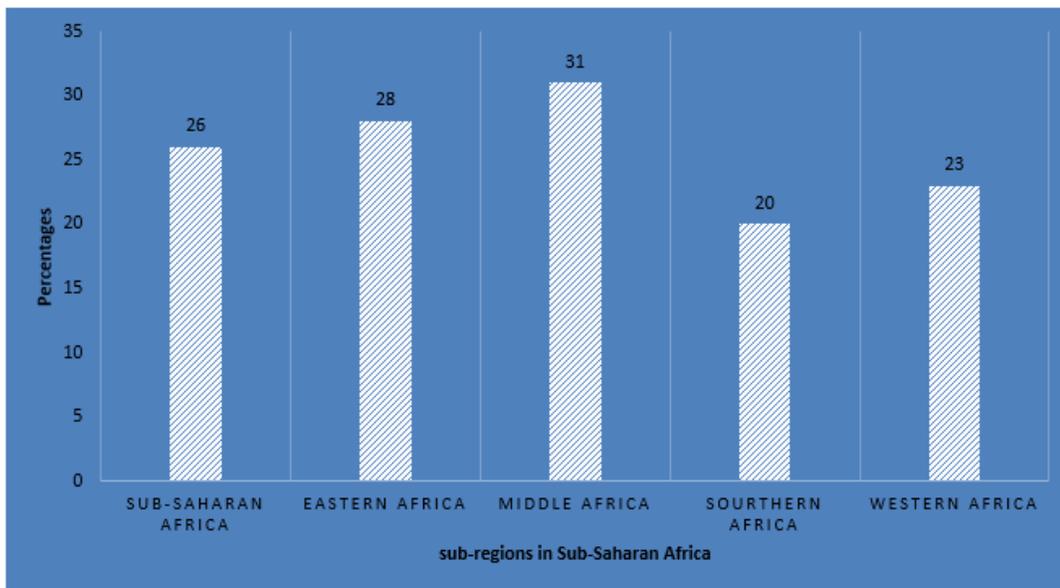
Overall, within and between group inequalities by residence							
Food security status				Nutritional status			
2010/11		2015		2010/11		2015	
Theil index [GE (2)]	Contribution	Theil index [GE (2)]	Contribution	Theil index [GE (2)]	Contribution	Theil index [GE (2)]	Contribution
1.9237	100%	1.4343	100%	12.0000	100%	10.5081	100%
1.8882	98.4%	1.3872	97.5%	12.0000	96.4%	10.4811	92.7%
0.0355	1.6%	0.0471	2.5%	0.0000	3.6%	0.0270	7.3%
Overall, within and between group inequalities by socioeconomic classes							
Food security status				Nutritional status			
2010/11		2015		2010/11		2015	
Theil index [GE (2)]	Contribution	Theil index [GE (2)]	Contribution	Theil index [GE (2)]	Contribution	Theil index [GE (2)]	Contribution
1.9237	100%	1.4343	100%	12.0000	100%	10.5081	100%
1.8708	97.2%	1.3840	95.7%	11.9960	94.3	10.4741	96.4%
0.0530	2.8%	0.0502	4.3%	0.0040	5.7%	0.0341	3.6%

Population share and household income share of subgroups for food security and nutrition distinguished by socio-economic classes; 2010/11 & 2015

Food Security Status								
Economic class	2010/11				2015			
	Population share	Mean	Relative mean	Income share	Population share	Mean	Relative mean	Income share
	0.4833	0.14	0.67	0.3214	0.4361	0.18	0.69	0.3029
	0.1922	0.26	1.26	0.2424	0.1617	0.23	0.88	0.1429
	0.3244	0.28	1.34	0.4363	0.4021	0.36	1.34	0.5543
Nutritional Status								
Economic class	2010/11				2015			
	Population share	Mean	Relative mean	Income share	Population share	Mean	Relative mean	Income share
	0.4833	0.04	1.05	0.5093	0.4361	0.06	0.55	0.5447
	0.1922	0.03	0.82	0.1574	0.1617	0.05	0.18	0.1789
	0.3244	0.04	1.03	0.3333	0.4021	0.03	0.28	0.2764

Figures

Prevalence of child food insecurity across sub-regions in Sub-Saharan Africa

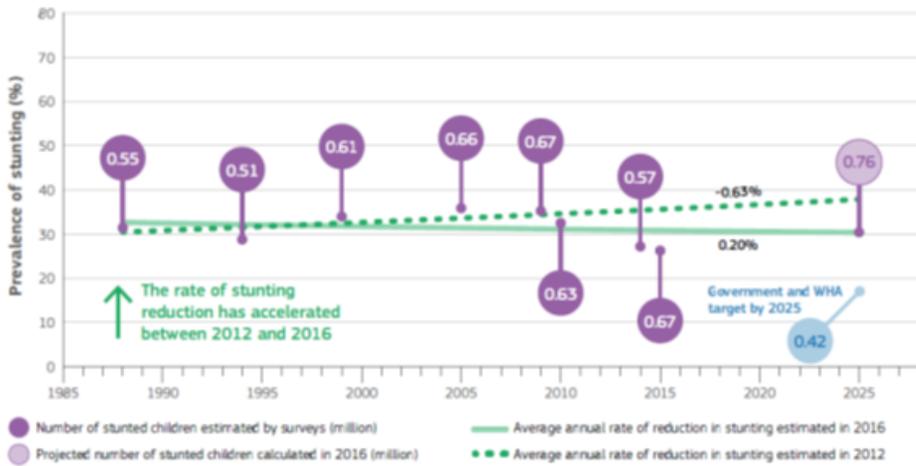


Source: FAO, *Voices of the Hungry Project*, 2016.

Figure 1

Prevalence of child food insecurity across sub-regions in Sub-Saharan Africa; Source: [48]

Trend, projection and targets in the prevalence and number of children (under-five) stunted for Zimbabwe



Source: (European Commission, 2017)

Figure 2

Trend, projection and targets in the prevalence and number of children (under-five) stunted for Zimbabwe; Source: [23]

Concentration curves for food security and malnutrition for 2010/11 and 2015

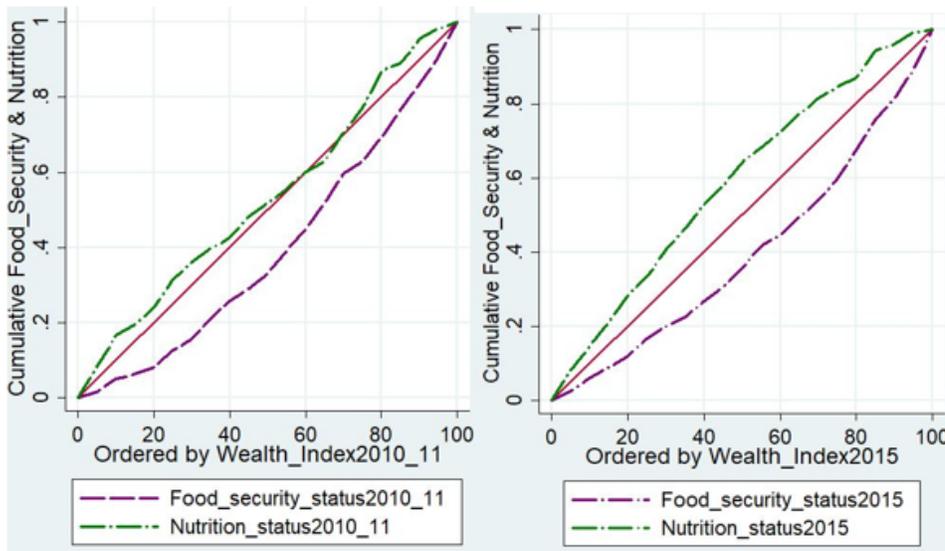


Figure 3

Concentration curves for food security and malnutrition for 2010/11 and 2015

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Equation.docx](#)