Explaining Urban-Rural Disparity in the Prevalence of Stunting in Ethiopia: A Decomposition Analysis

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Abstract

Background: The persistence of rural-urban disparities in child stunting in developing countries raises an important health policy question - whether basically different nutrition policies and interventions are required in rural and urban areas. Addressing this question requires an enhanced understanding of the main drivers of urban-rural disparities in child stunting. Therefore, the objective of the study was to explore the urban-rural disparity in the prevalence of stunting in Ethiopia.

Method: Data were drawn from the 2016 Ethiopian Demographic and Health Survey. The response variable of the study was stunting. A multivariate decomposition analysis was employed to decompose the urban-rural disparity in the prevalence of stunting into meaningful components.

Result: The decomposition of urban-rural disparity in child stunting into covariates and coefficients effects showed that the former was dominant, with 82.8% of the gap explained by differences in observed child, maternal and household characteristics. A further decomposition showed that differences in household, maternal and child characteristics explained 31.9%, 36.7% and 13.6% of the gap in stunting, respectively. In particular, wealth index and maternal education accounted for a very large proportion of the covariate effects.

Conclusion: To bridge the gap in the prevalence of child stunting between urban and rural areas, policies that promote parental education and maternal and child care should be formulated and implemented. Moreover, interventions should target rural households in the lowest wealth quantile (poorest and poor).

Keywords: *stunting, decomposition analysis, endowments effect, coefficients effect*

1. Background

Achieving and maintaining balanced nutrition is a critical challenge for global health, and improving child nutrition is one of the key components. Since the first five years of life is the peak period of growth and development, an under five child's malnutrition is strongly associated with severe dysfunction, mental retardation and poor ability to work (Mendez and Adair, 1999) which would impose a heavy economic burden on society (Winichagoon and Margetts, 2013). Stunting is an indicator of the devastating result of malnutrition in early childhood and is strongly associated with numerous short term and long term conditions. These conditions include increased morbidity and mortality, delayed growth, poor children's wellbeing and social inequalities and long term educational and economic consequences (Bhutta et al., 2008). Stunting represents poor linear growth during a critical period and is diagnosed as a height for age less than -2 standard deviations from the World Health Organization (WHO) child growth standards median (WHO, 2006).

Globally, child stunting remains a major public health concern with an estimated 149 million children under the age of five years being stunted. Recent data shows that more than half of all stunted under-5 children live in Africa and Asia (52.5%), and the prevalence of under-five stunting in Africa is 30.9%, which is higher than the global average of 23.1%. Sub-Saharan Africa bears one of the highest burdens of under nutrition. In 2016, more than one-third of stunted children (38%) lived in sub-Saharan Africa. However, a more detailed looks into the distribution of under-nutrition within sub-Saharan Africa shows that Eastern Africa (36.7%) has a higher prevalence of stunting compared to the others (UNICEF/WHO/World Bank Group, 2017).

Despite concrete progress made against child stunting in the past decade, Ethiopia remains among countries with the highest number of stunted under-five children in the world. The country has seen a steady reduction in the prevalence of stunting from 58% in 2000 to 38% in 2016, which is an average decline of more than one percent annually. Yet 28% of child deaths in Ethiopia are associated with under-nutrition. In addition, a high prevalence of various forms of malnutrition among vulnerable groups has serious implications for social development and economic growth (UNICEF, 2017).

Child stunting in developing countries has been characterized by large rural-urban disparities over the last few decades. A substantial body of empirical studies shows that the average stunting in urban areas is significantly lower than that in rural areas in a number of developing countries (e.g., Srinivasan et al., 2013). Van de Poel et al. (2007) used Demographic and Health Survey (DHS) data from 47 developing countries to examine whether urban children are really healthier than those in rural areas. Their study revealed that there are considerable rural-urban differences in mean child health outcomes in the countries under consideration. Specifically, they found that over one third of children in rural households are stunted compared to one quarter in urban households globally.

Akram et al. (2018) utilized the 2014 DHS data of Bangladesh to examine the prevalence and determinants of stunting among preschool children and its urban-rural disparities. They concluded that disparities exist among urban and rural areas regarding stunting among under-5 children. Srinivasan et al. (2013) used data from DHS of Bangladesh and Nepal to examine rural-urban disparities in child nutrition in these countries. They applied quantile regression-based counterfactual decomposition methods to quantify the contribution of the differences in levels of socio-economic determinants and the differences in the strength of association between socio-economic determinants and child stunting to the observed rural-urban disparities in child stunting. The finding of their study revealed that there are no fundamental differences in the characteristics that determine child stunting in urban and rural areas. Differences in the levels of a limited number of socio-economic characteristics such as maternal education, spouse's education and the wealth index (incorporating household asset ownership and access to drinking water and sanitation) contribute a major share of rural-urban disparities in the lowest quantiles of child nutrition outcomes.

Kumar and Singh (2013) used data from multi-waves of the National Family Health Survey conducted in India between 1992 and 2006 to examine the pattern of rural–urban differentials in childhood malnutrition over time and to identify the factors responsible for the rural-urban gap in childhood malnutrition and quantify their contribution. The result showed a considerable and widening gap in childhood malnutrition across rural-urban residence in the country over the study period. The economic status of households and parental education were the most significant contributors to the rural-urban gap in childhood malnutrition in India. Based on the findings, they concluded that focus should be given to the rural poor in order to reduce the rural-urban gap in childhood malnutrition.

Data from the 2006 multiple indicator cluster survey of Malawi was used by Mussa (2011) to explain the rural-urban malnutrition inequality by using concentration index of the height-for-age z-scores (HAZ) and decomposition approach. The findings of his study revealed that the rural-urban difference in parental education and economic status is a major driver of the malnutrition inequality differential. Sharaf and Rashad (2016) used data from DHS of Egypt, Jordan and Yemen to investigate regional inequalities in child malnutrition. The results of their study showed that the covariates effect is dominant in case of

Yemen, while the coefficients effect is dominant in the case of Jordan. Moreover, income inequality between urban and rural households explains most of the malnutrition gap.

In Ethiopia, stunting among children is higher in rural areas (41%) than in urban areas (26%). Differences in the levels of socio-economic characteristics such as maternal education, spouse's education and the wealth index contribute a major share of rural-urban disparities in child stunting. Differences in the strength of association between socio-economic characteristics and child stunting account for less than a quarter of rural-urban disparities at the lower end of the HAZ score distribution (Hirvonen, 2016; Sebsibe and Yinges, 2015).

Few studies have investigated the urban-rural disparity and related inequality in stunting among under-5 children in Ethiopia (Sebsibe and Yinges, 2015; Hirvonen, 2016). However, the contribution of the driving factors to the stunting variation has not yet been well documented. Specifically, there are no adequate studies that focus on the decomposition of the rural-urban differences based on key socioeconomic variables in Ethiopia. Thus, it is important to generate evidence regarding the determining factors of child stunting separately for urban and rural areas in order to design fundamentally different nutrition policies and interventions that will optimize the improvement in the nutritional status of children in the respective setting. The objective of this study, therefore, was to decompose the rural-urban disparity in the prevalence of stunting and identify the contribution of each of the determinants to urban-rural disparity in stunting in Ethiopia.

2. Materials and Methods

2.1 Data source

The data for this study were obtained from Ethiopia Demography and Health Surveys (EDHS) conducted in 2016. The 2016 EDHS was designed to provide estimates for the health and demographic variables of interest for the following domains: Ethiopia as a whole; urban and rural areas (each as a separate domain); and 11 geographic administrative regions. DHS surveys are one of the most cited databases globally and have been conducted in over 90 countries since 1984. All children included in the survey were below five years of age (CSA and ICF, 2016).

2.2 Outcome and explanatory variables

Stunting represents poor linear growth during a critical period and is diagnosed as a height-for-age of more than two standard deviations below the WHO Child Growth Standards median (WHO, 2006). In this study, this response variable was explored in two different ways. Firstly, the study used stunting as a binary variable that indicated whether or not the child was stunted (i.e., two standard deviations or more below the mean of the WHO reference population). Secondly, the study used HAZ scores in their continuous form to model as well as measure the contribution of various predictor variables to the urban-rural disparity in stunting following the works of O'Donnell et al. (2008).

The explanatory variables included in this study are based on related literature including the report on the causes and consequences of stunted growth published by the World Health Organization (WHO, 2017) and the widely applied UNICEF framework (UNICEF, 1998) outlining the causes of stunting with some modification. Moreover, the determinants of child stunting were obtained from similar studies reviewed above, taking data availability into consideration. The study used children's characteristics (age of child, sex of child and size of child at birth), maternal characteristics (place of delivery, partner's/husband education level, maternal education status and maternal working status) and household characteristics (wealth index) as determinant factors. Postnatal care service utilization and ANC are excluded in the entire analysis due to missing values.

2.3 Methods of data analysis

All analyses were done taking into account the complex design of the survey. Thus, all estimates reported were based on the weighted sample (n = 9588). The weighting was done to adjust for the inequality in sampling probability due to the over representation of small regional states (CSA and ICF, 2016). STATA version 14 was used for data management and analysis.

Simple linear regression analysis was used to identify the candidate predictor variables for the multivariable analysis of urban-rural disparity in stunting. The gap in stunting between the urban and rural groups was decomposed into its contributing factors following the Blinder-Oaxaca decomposition approach, specifically the multivariate decomposition for linear regression models. This approach enables the decomposition of the rural-urban differences in stunting into two components: one that is explained by differences in the level of the determinants (covariate effects), and another component that is explained by differences in the effect of the determinants on child stunting status (coefficient effects). The method developed by Blinder (1973) and Oaxaca (1973), and generalized by Neumark (1988) and Oaxaca and Ransom (1994), allows the decomposition of outcome variables between two groups into a part that is explained by differences in observed characteristics and a part attributable to differences in the estimated coefficients.

2.4 Multivariate decomposition

The Blinder–Oaxaca decomposition is a statistical method that explains the difference in the means of a dependent variable between two groups by decomposing the gap into a part that is due to differences in the mean values of independent variables within the groups, on the one hand, and group differences in the effects of independent variables, on the other hand (Oaxaca and Ransom, 1994). In this study, such decomposition allows us to decompose rural-urban differences in child stunting into covariate and coefficients effects as well as to quantify the contribution of individual explanatory variables to rural-urban differences via these effects.

Assuming that the outcome variable (Y) is explained by k predictor variables ($x_1, x_2, \cdots, x_k$) in the linear regression model, the mean predicted outcome for group g can be expressed as follows:

$$\bar{Y}^g = \beta_0^g + \sum_{j=1}^{k} \beta_j^g \bar{x}_j^g \ , \ g = 1, 2 \quad \ldots\ldots (1)$$

where $\bar{x}_j^g$ is the mean value of j^{th} predictor in group g and β_j^g is the corresponding regression coefficient, $g = 1, 2$, $j = 1, 2, \cdots, k$. Thus, the mean difference in outcome between the two groups (in our case, the urban-rural gap in the mean stunting) is given by:

$$\Delta\bar{Y} = \bar{Y}^1 - \bar{Y}^2 = (\beta_0^1 - \beta_0^2) + \sum_{j=1}^{k} (\beta_j^1 \bar{x}_j^1 - \beta_j^2 \bar{x}_j^2) \quad \ldots\ldots (2)$$

The equation for Group 1 can be reformulated from the perspective of Group 2 as follows:

$$\begin{aligned}
\bar{Y}^1 &= \beta_0^1 + \sum_{j=1}^{k} \beta_j^1 \bar{x}_j^1 \\
&= \beta_0^1 + \sum_{j=1}^{k} [\beta_j^2 + (\beta_j^1 - \beta_j^2)][\bar{x}_j^2 + (\bar{x}_j^1 - \bar{x}_j^2)] \\
&= \beta_0^1 + \sum_{j=1}^{k} \beta_j^2 \bar{x}_j^2 + \sum_{j=1}^{k} \beta_j^2 (\bar{x}_j^1 - \bar{x}_j^2) + \sum_{j=1}^{k} \bar{x}_j^2 (\beta_j^1 - \beta_j^2) + \sum_{j=1}^{k} (\bar{x}_j^1 - \bar{x}_j^2)(\beta_j^1 - \beta_j^2) \\
&= \beta_0^1 + \sum_{j=1}^{k} \beta_j^2 \bar{x}_j^2 + \sum_{j=1}^{k} \beta_j^2 \Delta\bar{x}_j + \sum_{j=1}^{k} \bar{x}_j^2 \Delta\beta_j + \sum_{j=1}^{k} \Delta\bar{x}_j \Delta\beta_j \quad \ldots\ldots (3)
\end{aligned}$$

where $\Delta\bar{x}_j = (\bar{x}_j^1 - \bar{x}_j^2)$ and $\Delta\beta_j = (\beta_j^1 - \beta_j^2)$. We then insert Eq. 3 into Eq. 2 to decompose the mean difference in the outcome into four components:

$$\begin{aligned}
\Delta\bar{Y} &= (\beta_0^1 - \beta_0^2) + \sum_{j=1}^{k} \beta_j^2 \Delta\bar{x}_j + \sum_{j=1}^{k} \bar{x}_j^2 \Delta\beta_j + \sum_{j=1}^{k} \Delta\bar{x}_j \Delta\beta_j \\
&= B + E + C + EC \quad \ldots\ldots (4)
\end{aligned}$$

The decomposition shown in Eq. 4 is formulated from the perspective of Group 2, when Group 1 is selected as the reference. The first component (B) is attributed to the effects of unobservable variables not taken into account (i.e., not included in the model). The second component (E) is a portion of the difference that is explained by group differences in the level of observable explanatory variables. This portion is known as "endowments effect". The third component (C) is a portion of the difference caused by the differential effect of the observable variables on the outcome across the two comparison groups. It cannot be explained by the level of observable explanatory variables (unexplained component). This portion of the difference is known as "coefficients effect". The fourth component (EC) involves an interaction due to simultaneous effect of differences in endowments and coefficients.

3. Results

3.1 Background characteristics

Data on a total of 9588 weighted cases of under-five children were utilized for the present analysis (1048 and 8540 from urban and rural areas of Ethiopia, respectively). In this study, we found that the overall prevalence of stunting in Ethiopia was 37.4%, which is higher than the global prevalence (21.9%). Disaggregated by place of residence, the rural prevalence was 39.1%, while that in urban areas was 23.6%.

Table 1 presents the percentage distribution of child, maternal and household related characteristics disaggregated by place of residence. The proportion of small sized children at birth in rural areas was about 27%, while that in urban areas was one in five (19.2%). In rural areas, more than two-third (68.9%) of the mothers had no formal schooling and those having secondary and above level of education was just 3.5%. The respective figures were 24.0% and 42.6% for mothers residing in urban areas. We observe a similar pattern for partner's education. In urban areas, the proportion of mothers with age less than 20 years at first birth was about 45%, while that in rural areas was 66.4%. As to the number of ANC visits, 40.2% of mothers in rural areas made no visit, while the percentage of those who made four or more visits was 28.5%. The respective figures were 10.2% and 63.0% for mothers residing in urban areas. We don't see that much urban-rural differential in household wealth status.

3.2 Differentials of stunting

The prevalence of stunting across selected child characteristics by place of residence is shown in Table 2. We can observe that there is a significant urban-rural differential in the prevalence of stunting in favour of urban areas across all child characteristics considered. The prevalence of stunting showed a progressive increase across the age of the child in both areas. In urban areas, children with small size at birth exhibited a higher rate of stunting (33.4%) than otherwise (21.8%). Though the prevalence of stunting is higher than urban areas, the difference in the risk of stunting between small sized births (43.9%) and non-small sized births (37.3%) in rural areas is considerably lower.

Table 1: Percent distribution of child, maternal and household related characteristics by place of residence, EDHS 2016

Variable	Category	Place of residence		
		Urban (n = 1048)	Rural (n = 8540)	Total (n = 9588)
Child age (in months)	<6	12.02	11.23	11.32
	6-11	13.05	10.41	10.70
	12-23	20.74	19.78	19.88
	24-59	54.19	58.58	58.10
Child's sex	Male	51.88	50.93	51.03
	Female	48.12	49.07	48.97
Size of baby at birth	Small	19.15	26.77	25.94
	Otherwise	80.85	73.23	74.06
Age at first birth	20+	55.05	33.60	36.27
	<20	44.95	66.40	63.73
Maternal education	No education	24.00	68.88	63.29
	Primary	33.46	27.63	28.35
	Secondary+	42.55	3.49	8.36
Household wealth	Poorest	22.02	20.58	20.76
	Poor	19.77	22.03	21.75
	Middle	23.48	20.71	21.06
	Richer	19.76	19.02	19.11
	Richest	14.97	17.66	17.32
Number of ANC visits*	None	10.20	40.20	36.40
	1 to 3	26.80	32.20	31.50
	4 and above	63.00	28.50	32.10
Partner's education*	No education	16.96	51.06	46.94
	Primary	30.26	40.59	39.35
	Secondary	25.90	6.30	8.67
	Tertiary	26.88	2.05	5.05

* These characteristics have missing observations

The prevalence of stunting among home delivered babies in both areas is nearly the same. However, health facility delivery had a differential impact on stunting in urban areas (20.7%) and rural areas (34.8%). The analysis also revealed that birth order had no observable influence over stunting in rural areas. In contrast, children of higher birth order were highly affected by stunting in urban areas as compared to those with smaller birth orders.

Table 2: Prevalence of stunting by child characteristics and place of residence, EDHS 2016

Variable	Category	Place of residence		P-value
		Rural	Urban	
Child age (in months)	<6	0.141	0.079	0.055
	6-11	0.171	0.092	0.019**
	12-23	0.413	0.268	0.000**
	24-59	0.470	0.293	0.000**
Child's sex	Male	0.407	0.259	0.000**
	Female	0.376	0.220	0.000**
Size of baby at birth	Small	0.439	0.334	0.004**
	Otherwise	0.373	0.218	0.000**
Birth order	First	0.378	0.225	0.000**
	2-3	0.382	0.206	0.000**
	4-5	0.404	0.311	0.018**
	6+	0.400	0.319	0.098
Place of delivery	Home	0.405	0.370	0.309
	Health facility	0.348	0.207	0.000**
Overall prevalence		**0.391**	**0.236**	**0.000****

**Significant difference between urban and rural areas at the 5% level

Table A1 (in the annex) pertains to the prevalence of child stunting across maternal characteristics disaggregated by place of residence. Again we can observe that there is a significant urban-rural differential in the prevalence of stunting. The difference in the prevalence of stunting between children born to teenage mothers and non-teenage mothers in urban areas was relatively higher (27.1% versus 21.6%) as compared to their rural counterparts (40.1% versus 37.4%). Maternal education greatly benefited children in that the likelihood of being stunted reduces with the level of maternal education in both areas. Partner's education has also shown a positive influence on the likelihood of stunting as shown in the progressive decline of the rate of stunting with an increase in the level of education. Number of ANC visits during pregnancy does have a sizeable influence over the likelihood of stunting in both residences, and this is more so for children in rural areas. In other words, higher number of ANC visits during pregnancy is associated with a lower prevalence of child stunting.

The prevalence of stunting for selected household characteristics disaggregated by place of residence is shown in Table A2. Even though there is a significant urban-rural differential, sex of the household head does not seem to have a sizeable influence over the likelihood of stunting. We also observe a progressive decline in the prevalence of stunting with an advance in household wealth in both urban and rural areas. However, the urban-rural differential is significant only for households with poor wealth status. Regionwise, a significant urban-rural differential in the prevalence of stunting was observed in Amhara and Oromia regions. In urban areas, the highest prevalence of stunting was in Amhara region (38.3%) and the least was in Oromia (11.5%). The highest prevalence in rural areas was recorded in Dire Dawa, followed by Amhara region, while the least was in Somali region.

3.3 Decomposition analysis

The urban-rural gap in the prevalence of stunting is decomposed into endowments and coefficients effects. The results of the decomposition analysis are displayed in Table 3. We can observe that there is a significant urban-rural disparity in the prevalence of stunting (p-value < 0.001). The multivariate decomposition also revealed that a significant proportion of the gap in stunting (11.3%) is explained by endowments effects (82.8% of the total). The balance is accounted for by differential effects of observable variables (characteristics) on the prevalence of stunting across urban and rural areas. Since the decomposition result for the coefficients effects is not significant, however, the focus of our discussion is on endowments effects.

Table 3: Multivariate decomposition analysis result for gap in prevalence of stunting between rural and urban children, EDHS 2016

Contribution	Value	P-value	95% Conf. Interval		%
			LL	UL	
Endowments	11.3	0.000	5.5	17.1	82.8
Coefficients	2.4	0.500	-4.5	9.2	17.2
Difference in prevalence of stunting (Rural-Urban)	13.7	0.000	9.9	17.5	100

LL=Lower limit, UL=Upper limit

The detailed results of decomposition analysis are displayed in Table 4. We can observe that compositional differences in child and maternal characteristics accounted for 13.6% and 36.7% of the gap in the prevalence of stunting between rural and urban children, respectively. Differences in educational achievement of rural and urban women were the prime maternal related characteristic that contributed to 26.7% of the gap in stunting. Trailing behind maternal education, differences in partner's education (7.1%) and BMI of mothers (6.3%) also contributed to the gap in the prevalence of stunting across the two areas. Child age composition (7.9%) and differences in the birth order of urban-rural children (3.7%) are the child related characteristics that would result in the reduction of the gap in the prevalence of stunting in the two residences.

Table 4: Detailed multivariate decomposition of stunting - endowments effects, EDHS 2016

Variables and categories	Coef.	P-Value	95% CI		%
			LL	UL	
Child related characteristics					**13.6**
Child age (in months)					**7.9**
<6	0.076	0.000	0.053	0.099	0.555
6-11	0.434	0.000	0.294	0.574	3.171
12-23	-0.155	0.000	-0.194	-0.116	-1.133
24-59	0.727	0.000	0.611	0.843	5.316
Birth order					**3.7**
First	0.219	0.495	-0.409	0.846	1.597
2-3	-0.007	0.966	-0.338	0.324	-0.053
4-5	-0.024	0.844	-0.262	0.214	-0.175
6+	0.322	0.349	-0.352	0.995	2.351
Female children	-0.055	0.003	-0.091	-0.019	**-0.402**
Small size births	0.536	0.000	0.320	0.752	**3.918**
Facility delivery	-0.216	0.841	-2.324	1.892	**-1.578**
Maternal characteristics					**36.7**
Age at first birth	0.041	0.906	-0.647	0.729	**0.302**
Maternal education					**26.7**
None	1.535	0.066	-0.104	3.173	11.218
Primary	-0.191	0.140	-0.444	0.062	-1.395
Secondary+	2.305	0.055	-0.046	4.657	16.855
Maternal age					**1.0**
15-24	0.148	0.086	-0.021	0.316	1.079
25-34	0.118	0.326	-0.117	0.352	0.859
35+	-0.132	0.212	-0.339	0.075	-0.964
Religion of the mother					**-4.7**
Christian	0.110	0.795	-0.722	0.943	0.808
Muslim	-0.853	0.027	-1.608	-0.098	-6.237
Others	0.102	0.174	-0.045	0.248	0.743
BMI of the mother					**6.3**
Underweight	0.120	0.721	-0.539	0.780	0.880
Normal	0.074	0.781	-0.451	0.600	0.544
Overweight	0.901	0.124	-0.247	2.049	6.588
Obese	-0.233	0.607	-1.124	0.657	-1.707
Partner's education					**7.1**
None	0.711	0.224	-0.435	1.858	5.200
Primary	-0.117	0.532	-0.484	0.250	-0.856
Secondary	-0.374	0.435	-1.314	0.565	-2.736
Tertiary	0.756	0.440	-1.162	2.674	5.529
Household characteristics					**31.9**
Household wealth					**31.9**
Poorest	0.624	0.023	0.087	1.160	4.559
Poor	0.913	0.007	0.249	1.578	6.678
Middle	-0.063	0.839	-0.665	0.540	-0.458
Richer	-0.395	0.094	-0.857	0.067	-2.885
Richest	3.280	0.118	-0.834	7.395	23.981

CI=Confidence Interval, LL=Lower Limit, UL=Upper Limit

Had rural women received secondary and higher education at the same rate as urban women, the urban-rural disparity in the prevalence of child stunting would have decreased by about 16.9%. Moreover, had the proportion of rural women with no education is reduced to that of urban women, the urban-rural disparity would decrease by 11.2%. Concerning wealth status, raising the wealth of the poorest and poor rural households to the level of their urban counterparts would decrease the urban-rural disparity in the prevalence of stunting by 4.6% and 6.7%, respectively. Reducing the incidence of small size births in rural areas to the level in urban areas would decrease the stunting gap by 3.9%. Regarding child age, if rural children aged 6-11 and 24–59 were introduced with nutritional supplementary food to the same degree as urban children, the urban-rural stunting gap would be expected to decrease by 3.2% and 5.3%, respectively. The negative contribution of religious composition of women implies that removing the rural-urban difference in this covariate widens the disparity.

4. Discussion

The study employed descriptive statistics, test of equality of proportions and multivariate decomposition data analysis to explore the urban-rural disparity in the prevalence of stunting among under-five children in Ethiopia based on 2016 EDHS data. The descriptive analysis showed that rural mothers are less educated, have less educated partner, have less employment opportunity and have lower access to ANC during pregnancy as compared to their counterparts in urban areas. The results of the study also showed a considerably higher proportion of teenage mothers in rural areas than urban areas.

This study found that the risk of stunting increased along with increase in the age of a child in both areas. A significant difference in the urban-rural divide was found for children of age 6-59 months, but not for those less than six months of age. This could be due to the inappropriate and late introduction of quality nutritional supplementary food as the age of the child increases in particular in rural areas (Dasgupta et al., 2014). Recent studies also reported similar finding in Bangladesh (Mostafa, 2011), Madagascar (Rakotomanana et al., 2017) and Malawi (Ntenda and Chuang, 2018).

The study revealed that the prevalence of stunting is relatively higher for children with small size at birth as well as children from teenage mothers, with a significant urban-rural differential in both cases. A study by Wemakor et al. (2018) also found that children of teenage mothers are at least three times more likely to be stunted compared to those of adult mothers. Moreover, health facility delivery had a significant differential impact on stunting in urban and rural areas.

The study found that child stunting is inversely related to mothers' level of education with a significant urban-rural differential for all categories of maternal education considered in favour of urban areas. The same was true for partner's education. As educated mothers have better knowledge of child health and nutrition, they are more conscious of their children's health and look after them better. This is supported by previous finding from Kenya (Abuya et al., 2012) and South Asia (Krishna et al., 2017). The descriptive analysis also indicated a progressive decline in the prevalence of stunting with an increase in household wealth in both urban and rural areas. However, the urban-rural differential is significant only for households with poor wealth status.

The multivariate decomposition analysis revealed that a significant portion of the urban-rural gap in stunting is explained by compositional (endowments) effects (82.8%), while the difference in the effect of the coefficients (coefficients effect) explains about 17.2% of the gap. However, the latter was not found to be significant. Disaggregated by groups, 36.7%, 31.9% and 13.6% of children's stunting gaps between rural and urban areas is explained by maternal, household and child characteristics, respectively. These results are more or less consistent with the findings of previous studies in Bangladesh and Nepal (Srinivasan et al., 2013), in Ethiopia (Sebsibe and Yinges, 2015) and in Egypt, Jordan and Yemen (Sharaf and Rashad, 2016). The covariates which were found to have a significant contribution to the urban-rural disparity in the prevalence of stunting were household wealth, maternal education, size of baby at birth, child's age and religious affiliation.

5. Conclusion and recommendations

The methodology employed in this paper allowed us to decompose urban-rural differences in child stunting into covariate and coefficient effects, and further enabled us to quantify the contribution of individual explanatory variables to urban-rural disparity in the prevalence of stunting. The findings from this study confirmed the existence of a significant urban-rural divide in child stunting in Ethiopia. The decomposition of rural-urban gap in child stunting into covariates and coefficients effects showed that the former was dominant. Thus, urban-rural disparities in child stunting are primarily attributable to the difference in levels of critical determinants. Wealth index and maternal education accounted for a very large proportion of the covariate effects. The quantification of the contribution of individual socio-economic determinants to urban-rural disparities can be used to assess the returns to different types of interventions.

To narrow the urban-rural disparities in child stunting, public health interventions need to focus principally on bridging gaps in the identified socioeconomic endowments. Specifically, we recommend the following:

- Policies that promote parental education and maternal and child care should be formulated and implemented.
- Interventions should target rural households in the lowest wealth quantile (poorest and poor)

- Supplementation programmes that consider age differences should be devised so that rural children can get a diversified diet with essential nutrients after six months of age
- Further studies should be conducted to identify and explore other determinants of inequality in stunting among under-five children in the country

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Annex

Table A1: Prevalence of stunting by maternal characteristics and place of residence, EDHS 2016

Variable	Categories	Place of residence		P-value
		Rural	Urban	
Age at first birth	20+	0.374	0.216	0.000**
	<20	0.401	0.271	0.000**
Maternal education	No education	0.410	0.330	0.022**
	Primary	0.364	0.252	0.000**
	Secondary+	0.253	0.162	0.008**
Current age of mother	15-24	0.362	0.256	0.007**
	25-34	0.394	0.228	0.000**
	35+	0.418	0.255	0.000**
Number of ANC visits	None	0.371	0.401	0.001**
	1 to 3	0.256	0.391	0.044**
	4 and above	0.212	0.345	0.108
Religion	Christian	0.391	0.216	0.000**
	Muslim	0.391	0.274	0.001**
	Others	0.445	0.375	0.809
BMI of Mothers	Underweight	0.413	0.364	0.369
	Normal	0.389	0.260	0.000**
	Overweight	0.309	0.145	0.000**
	Obese	0.250	0.148	0.252
Partner’s education	No education	0.418	0.361	0.192
	Primary	0.369	0.263	0.001**
	Secondary	0.334	0.213	0.002**
	Tertiary	0.283	0.144	0.002**

Table A2: Prevalence of stunting by household characteristics and place of residence, EDHS 2016

Variable	Categories	Place of residence		P-value
		Rural	Urban	
Sex of household head	Female	0.383	0.256	0.001**
	Male	0.394	0.233	0.000**
Region	Tigray	0.409	0.338	0.211
	Afar	0.446	0.360	0.603
	Amhara	0.476	0.383	0.014**
	Oromia	0.371	0.115	0.000**
	Somali	0.277	0.255	0.783
	Benishangul-Gumuz	0.447	0.333	0.590
	SNNPR	0.390	0.329	0.172
	Gambella	0.280	0.203	0.718
	Harari	0.365	0.215	0.561
	Addis Ababa	NA	0.146	NA
	Dire Dawa	0.515	0.259	0.173
Household wealth	Poorest	0.406	0.456	0.193
	Poor	0.436	0.342	0.020**
	Middle	0.375	0.316	0.107
	Richer	0.337	0.312	0.520
	Richest	0.297	0.217	0.059