Explaining the Decline in Child Stunting in Malawi between 2010 and 2015

Grace Kumchulesi

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Explaining the Decline in Child Stunting in Malawi between 2010 and 2015

By

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Abstract

In 1992, the prevalence of stunting among under five children was 49%. In 2000, 2004 and 2010, the prevalence of stunting remained persistently high at at 48%, 48% and 47%, respectively. However, this dropped dramatically to 37% in 2016, and led to considerable interest in understanding the drivers behind this improvement. Using the UNICEF conceptual framework, data from the 2010 and 2016 Malawi DHSs and Blinder-Oaxaca decomposition technique, this study could explain only 5% of the 10.5% decline in child stunting. This is attributable to improvements in standards of living in 2016, when the level of wealth status in households was observed to have improved. Focusing efforts on wealth creation can potentially reduce child malnutrition in Malawi.

Key Words: Child Malnutrition; Malnutrition Persistence; Decomposition Analysis; Malawi

1. Introduction

For years, malnutrition in Malawi remained persistently high. Between 1992 and 2010, the prevalence of stunting (low height for age – an indicator of growth) among children under the age of five reduced by only two percentage points, from 48.9% to 47.1%) (National Statistical Office [Malawi] and ICF Macro, 1994; National Statistical Office [Malawi] and ICF Macro, 2011). However, a remarkable decline of about 10 percentage points in the prevalence of stunting was registered in the 2015–16 Malawi Demographic and Health Survey (DHS) (National Statistical Office [Malawi] and ICF Macro, 2017). While the literature has pointed at the improved conceptualization of recent nutrition policies as well as multi-sector collaborations, which in part drove the reduction in Malawi's child stunting rates, no study could be found that comprehensively analyses what drives this positive trend, or quantifies the contributions of the various factors that contribute to this progress. Therefore, the primary question this study sets out to ask is: What factors were important in the decline of the prevalence of child stunting in Malawi between 2010 and 2015–16?

The United Nations Children's Fund (UNICEF) conceptual framework of the determinants of nutritional status in young children classifies the factors into immediate causes, underlying causes, and basic causes of undernutrition (UNICEF, 1990). In combination, these factors play a fundamental role in the extent to which households have adequate food security, care, feeding practices, healthy environments, and adequate health services, which are necessary for the proper nutrition of household members. The empirical literature on the determinants of child nutrition suggests that child-level factors such as gender and age of the child are associated with the nutrition outcomes of children. Household-level as well as community-level factors are also important in the determination of child nutrition.

In order to measure the contribution of various factors in the decline in the prevalence of child stunting observed between 2010 and 2015, this study uses regression and decomposition analyses. The study makes two contributions to the empirical literature on malnutrition decline. First, it estimates how much of the decline in the prevalence of stunting between 2010 and 2015–16 can be explained by observable characteristics and how much cannot be explained by observable characteristics. From a policy perspective, the results from this study will inform policy makers about the non-intervention factors that may be driving nutritional change. Understanding the relative importance of the determinants of malnutrition is important for the achievement of the second Sustainable Development Goal (SDG 2) which, among other targets, aims to end all forms of malnutrition by 2030, including achieving the internationally agreed targets on stunting and wasting in children under five.

The rest of the paper is set out as follows: Section 2 presents the literature review, Section 3 is a discussion of the empirical strategy, data, variables used, and descriptive statistics, while Section 4 analyses the empirical results. Section 5 concludes with policy implications.

2. Literature Review

The UNICEF conceptual framework is widely applied to guide most empirical analyses of the determinants of improved child nutrition (UNICEF, 1990). This framework shows how the nutritional status of the young child is related directly to their level of dietary intake and their health status. The quality of these immediate determinants, in turn, is determined by several underlying determinants such as food security status of the household in which the child resides, availability of health services and a healthy local environment – clean water and good sanitation – as well as the quality of care the individual child receives, including feeding practices. The UNICEF framework also links the availability of nutrition resources to a set of basic determinants such as how society is organized in terms of institutional framework and economic structure, as well as political and ideological expectations, which determine how resources are allocated to influence nutritional outcomes. All these components of the UNICEF conceptual framework are important in the determination of policy actions and reforms needed so that the country can succeed in eliminating malnutrition. Understanding the contribution of such factors to the recent decline in child stunting in Malawi is an important area of knowledge, to which this study aims to contribute.

A small body of literature has attempted to understand which of the several potential determinants of nutrition in Malawi that registered improvement in the period 2010–2016 have contributed most to the substantial reduction in stunting. A study conducted by the International Food Policy Research Institute (IFPRI) in 2019 uses logistic regressions on DHS data from 2010 and 2016 to explain how child-level, household and community-level characteristics are related to the stunting status of young children in Malawi (International Food Policy Research Institute, 2019). Among important factors found to be driving the recent reduction in the prevalence of stunted young children is increasing educational attainment and improvements in the nutritional status (proxied by body mass index) of the mother, and pregnant women having prenatal examinations. This finding supports that of Doctor and Nkhana-Salimu (2017) who attributed the slow decline in undernutrition rates among young children in Malawi to mothers' poor nutritional status, which results in significant levels of babies with a low birth weight. The relationship between low birth weight and the risk of stunting was also highlighted by Black et al. (2013).

Kalimbira et al. (2010) assessed the impact of a micronutrient intervention programme on stunting in Malawian preschool children living in rural areas, which was implemented between 1996 and 2004. Although the intervention reduced stunting, it was not effective. At the baseline in 1996, the prevalence of stunting was 60.2%. By 2000, the prevalence of stunting had declined to 50.6% in intervention areas and to 56% in comparison areas. However, the prevalence of stunting did not differ significantly between intervention and comparison areas in 2004 (43% and 45.1%, respectively). This could be explained by the need for better targeting of younger children from rural households, and also the effects of other programmes or interventions in either the same or a neighbouring community.

3. Empirical Strategy

3.1 Regression Analysis

This study aims to explain the change in the proportion of stunted children between 2010 and 2016. In order to measure the contribution of various factors to the decline in the prevalence of child stunting, a Blinder-Oaxaca decomposition method was used to decompose the differences in the prevalence of child stunting between 2010 and 2016 into covariate (also known as explained) and coefficient (unexplained) contributions.

First are separate estimations of the determinants of child nutrition outcomes in 2010 and 2016. Assuming that the nutrition status of child i in household h, y_{ih} is regressed onto a vector of covariates of child nutrition status, x_{ih}, represented by the following binary logit regression model:

$$y_{ih} = x_h^{'} \beta + \varepsilon_h \tag{1}$$

where β is a vector of parameters including a constant, and ε_{ij} is an error term. The dependent variable, y_{ih}, takes the value of 1 if the child is stunted, and zero if not. Although the dependent is a binary variable, we estimate a linear probability model (LPM), which can be consistently estimated by an ordinary least squares (OLS) method. Although estimating a linear probability model when the dependant variable is binary is viewed as unattractive, mainly due to heteroskedasticity and because LPMs can potentially predict probabilities outside the zero–one bounds, estimating a linear probability model is preferable mainly because of its computational simplicity. Above all, a linear probability model is preferable because of the need to predict the conditional mean (or expected value) of stunting, rather than making inferences about individual parameters (Angrist and Pischke, 2009). On that basis, LPM will be adequate, especially in the decomposition analysis.

3.2 Decomposition Analysis

The estimated parameters from Equation 1 are used to conduct a Blinder-Oaxaca decomposition analysis. The Blinder-Oaxaca decomposition technique (independently Blinder, 1973, and Oaxaca, 1973) is widely used to identify and quantify the separate contributions of measurable characteristics to racial and gender differences in outcomes (for example, wage gaps in labour economics). In this study, decomposition analysis enables separation of the effect of the changing coefficients from the changing characteristics on the decline of prevalence of child stunting, widely known as the coefficient effect (or unexplained part) and the characteristic effect (or explained part), respectively.

The "explained" part of the decline is the part that is explained by group differences in the determinants of child stunting, and the unexplained portion is the residual part that cannot be accounted for by such differences in child stunting determinants.

The mean difference of Equation 1 between 2010 and 2016 is equivalent to Equation 2:

$$\bar{y}^{2016} - \bar{y}^{2010} = \beta^{2016} x^{2016} - \beta^{2010} x^{2010} \tag{2}$$

where x^{2016} and x^{2010} are vectors of explanatory variables evaluated at the means for 2016 and 2010, respectively. Therefore, the difference in the prevalence of child stunting between 2016 and 2010 can be thought of as being due in part to: (i) differences in the coefficients $(\beta_k^{2016} - \beta_k^{2010})$, where k is a vector of coefficients, including the intercept; and (ii) differences in characteristics $x's$ and their effects $\beta's$. Estimates of the difference in child stunting between 2010 and 2016 can be obtained by substituting sample means of the $x's$ and estimates of the parameters $\beta's$ in Equation 2.

It is necessary to measure how much of the overall gap or the gap specific to any one of the $x's$ is attributable to differences in the $x's$ (the explained component) rather than differences in the $\beta's$ (the unexplained component). Using the Blinder-Oaxaca decomposition technique, the stunting gap is expressed as follows:

$$y^{2016} - y^{2010} = (x^{2016} - x^{2010})\beta^{2010} + (\beta^{2016} - \beta^{2010})x^{2016} \tag{3a}$$

where the differences in the $x's$ are weighted by the coefficients of the 2010 regression and the differences in the coefficients are weighted by the $x's$ of the 2016 survey. Alternatively, the stunting gap could be expressed as:

$$y^{2016} - y^{2010} = (x^{2016} - x^{2010})\beta^{2016} + (\beta^{2016} - \beta^{2010})x^{2010} \tag{3b}$$

where the differences in the $x's$ are weighted by the coefficients of the 2016 regression and the differences in the coefficients are weighted by the $x's$ of the 2010 survey.

Equations 3a and 3b are both valid in that they equally partition the difference in the prevalence of child stunting between 2010 and 2016 into one part attributable to the fact that children in 2010 have worse $x's$ than children in 2016, and another part attributable to the fact that the 2010 regression has worse coefficients than the 2016 regression.

3.3 Detailed Decomposition Analysis

Equations 3a and 3b only give aggregate measures of the effects of the differences in characteristics and their coefficients between 2010 and 2016. A detailed decomposition helps to account for the contribution of each individual predictor in terms of the characteristic and coefficient effect to the decline in the prevalence of child stunting, according to the relative size of the explanatory variable's impact on child stunting. From the decomposition model in Equation 3a, the contribution that a k^{th} variable $(k = 1.K)$ makes to the explained portion of the total child stunting rate gap is given by:

$$\left(x^{2016} - x^{2010}\right)\beta^{2016} = \left(x^{2016} - x_k^{2010}\right)\beta^{2016} + \left(x_k^{2010} - x^{2010}\right)\beta^{2016} \quad (4a)$$

The analogue to the detailed decomposition of the characteristic effect in Equation 4a when year 2010 coefficients are used in the counterfactuals is given by:

$$\left(x^{2016} - x^{2010}\right)\beta^{2010} = \left(x^{2016} - x_k^{2010}\right)\beta^{2010} + \left(x_k^{2010} - x^{2010}\right)\beta^{2010} \quad (4b)$$

Similarly, a detailed decomposition for the coefficient effect when year 2016 coefficients are used in the counterfactuals is given by Equation 5a, and its analogue for the year 2010 coefficients is given by Equation 5b as follows:

$$\left(\beta^{2016} - \beta^{2010}\right)x^{2016} = \left(\beta^{2016} - \beta_k^{2010}\right)x^{2016} + \left(\beta_k^{2010} - \beta^{2010}\right)x^{2016} \quad (5a)$$

$$\left(\beta^{2016} - \beta^{2010}\right)x^{2010} = \left(\beta^{2016} - \beta_k^{2010}\right)x^{2010} + \left(\beta_k^{2010} - \beta^{2010}\right)x^{2010} \quad (5b)$$

The total sum of the contributions from individual variables to the characteristic (coefficient) effect of the child stunting decline is equal to the total contribution of the characteristic (coefficient) effect from all the variables.

3.4 Data

Malawi DHS datasets from the Integrated Public Use Microdata Series-Demographic Health Surveys (IPUMS-DHS) database of the IDHS project were used (National Statistical Office [Malawi] and ICF Macro, 2019). IPUMS-DHS integrates DHS data across time and space, making it easy to study change, conduct comparative research and merge information across datasets. The main focus of this study is to explain the decline in the prevalence of child stunting between 2010 and 2016, which makes use of the IPUMS-DHS very convenient. The datasets are freely accessible to the public and researchers subject to a prescribed registration and approval process.

These data are nationally representative. Although these surveys are independent, they can be used to tell an intertemporal story explaining the decline in child stunting over the period. The surveys were generally designed to provide information on, among other things, early childhood mortality as well as various indicators of maternal and child health and nutrition. The samples are sufficiently large to allow for estimates of certain indicators to be produced for the country as a whole, by rural-urban residence, by region, as well as at district level. All analyses in this study use sampling weights to capture population estimates.

Both the 2010 and 2015–16 DHS used the sampling framework of the Malawi Population and Housing Census conducted in 2008, which was provided by the National Statistical Office and was designed to produce estimates for key health indicators for all 28 districts in addition to estimates for national, regional, and rural-urban domains National Statistical Office [Malawi] and ICF Macro, 2011). The 2010 DHS covered a total of 27,000 households, involving 24,000 female respondents aged between 15 and 49, and 7,000 male respondents aged between 15 and 54. In the 2015–16 DHS, a total of 26,361 households were successfully interviewed, of which 24,562 women and 7,478 men.

A household questionnaire was also used to record height and weight measurements for eligible children aged 0–59 months. Child height was measured and transformed to a Z-score value using the World Health Organization (WHO) recommended US National Center for Health Statistics sample as the reference (World Health Organization, 1995). In this study, the child height-for-age Z-scores (HAZ) are used as the indicator of child nutrition status. Stunting, defined as HAZ less than two standard deviations of the WHO International Reference Standard, is commonly used as an indicator of chronic nutritional deficiency that rarely can be reversed during the growth of children, with severe consequences for their health, learning, and ultimately future earning opportunities. HAZ scores were computed using the 2006 WHO growth standards. We use the child as the unit of analysis, and in each year restrict it to children under the age of five. There are 4,489 children in this age group in the 2010 sample and 4,293 in 2016. These are the observations used in the decomposition analysis. The next section provides a descriptive picture of child stunting from 1992 to 2010.

3.5 Descriptive Statistics of the Dependent Variable

Table 1 reports the trends in the means of height-for-age Z-scores and percentages of stunted children in 1992, 2000, 2004, 2010 and 2016. The results show a declining trend in stunting between 1992 and 2016, from 52% to 35%, respectively. However, the decline is most remarkable between 2010 and 2016, where the prevalence of stunting in children under five declined by about 10 percentage points from 47% in 2010. The trend is similar among both male and female children, although the prevalence is higher among male children in all the years compared to their female counterparts. The results from the two sample tests of proportions (not shown) also indicate that the differences between proportions are statistically insignificant between 1992, 2000 and 2004, but are statistically significant at a 1-per-cent level of significance between

2004 and 2010, and between 2010 and 2016.

The means of the height-for-age Z-scores tell a similar story to the child stunting prevalence rates. Stunting declines marginally in 1992, 2000 and 2004, and dramatically in 2010 and 2016. For all children under the age of five, the mean Z-score increases from -2.02 in 1992 to -1.51 in 2016, an increase of 25%. Between 2010 and 2016, the mean Z-score increased by 13%. The results seem to suggest that the survey-to-survey differentials for stunting in 1992, 2000 and 2004 are small, but jump remarkably in 2010 and 2016, indicating that the persistence of stunting and underweight problems were intense in the first three survey years.

Table 1: Trends in mean HAZ scores and child stunting in Malawi, 1992–2015

	All		Boys		Girls	
Year	HAZ	Stunting (%)	HAZ	Stunting (%)	HAZ	Stunting (%)
1992	-2.02	52	-2.13	55	-1.90	49
2000	-1.98	52	-2.07	54	-1.89	50
2004	-1.98	53	-2.09	56	-1.86	49
2010	-1.78	47	-1.90	50	-1.65	43
2016	-1.51	35	-1.57	37	1.45	34

Source: Author's calculations using data from 1992, 2000, 2004, 2010 and 2016 Malawi DHSs

Figure 1 shows the kernel density plots which estimate the empirical distribution of child stunting in Malawi in 2010 and 2016, in order to get a better sense of changes in the prevalence of child stunting. Stunted children are defined as those whose height-for-age Z-scores are less than 2.0. The 2016 plots are below the plots for the other years for high levels of malnutrition (Z-scores≤-2), while the opposite holds for low levels of malnutrition (Z-scores≥-2). This implies that there is a higher chance of finding stunted children in in 2010 than in 2016, indicating that there is a significant drop in the prevalence of stunting in children under the age of five from 2010 to 2016. Figures 2 and 3 illustrate these time period changes by area of residence (rural and urban residence, respectively). Although the reduction in the share of children who are stunted between 2010 and 2016 is visible in children residing in both rural and urban areas, it is more apparent in children residing in rural areas than in their urban counterparts. IFPRI (2019) also observed a significant drop in the prevalence of stunting in young children when differentiated between those aged 0 to 23 months and 23 to 60 months, with the drop in the prevalence of child stunting more pronounced in the younger age range.

Figure 1: Distribution of HAZ scores in children aged 0 to 59 months in 2010 and 2016 in Malawi

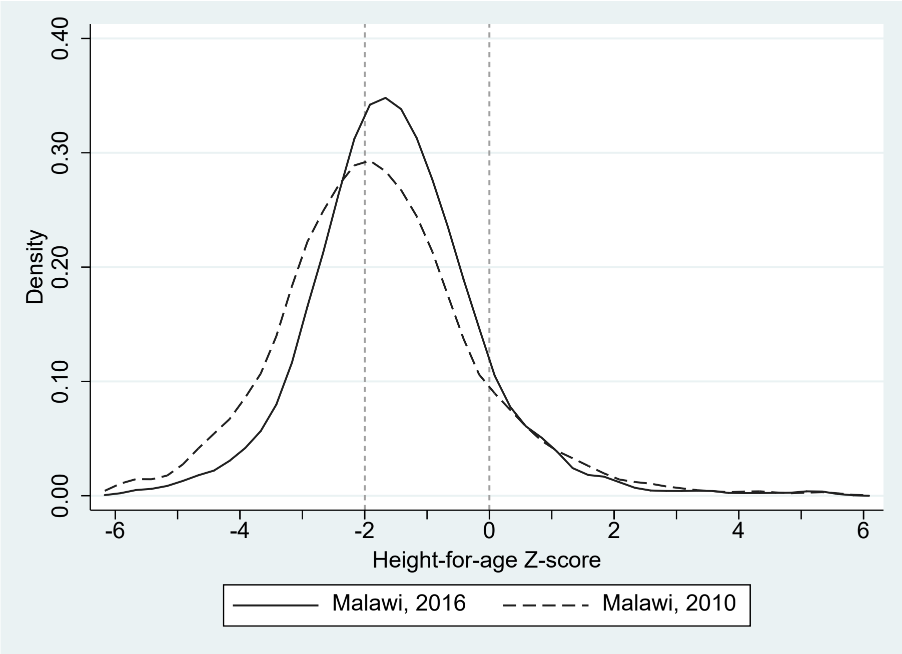


Figure 2: Distribution of HAZ scores in children aged 0 to 59 months in 2010 and 2016 in Rural Malawi

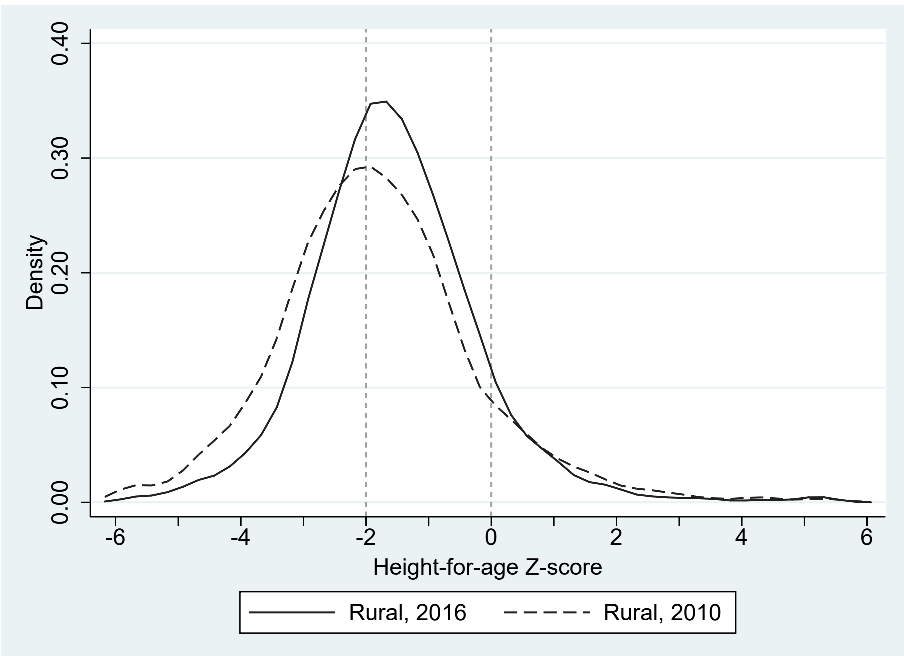
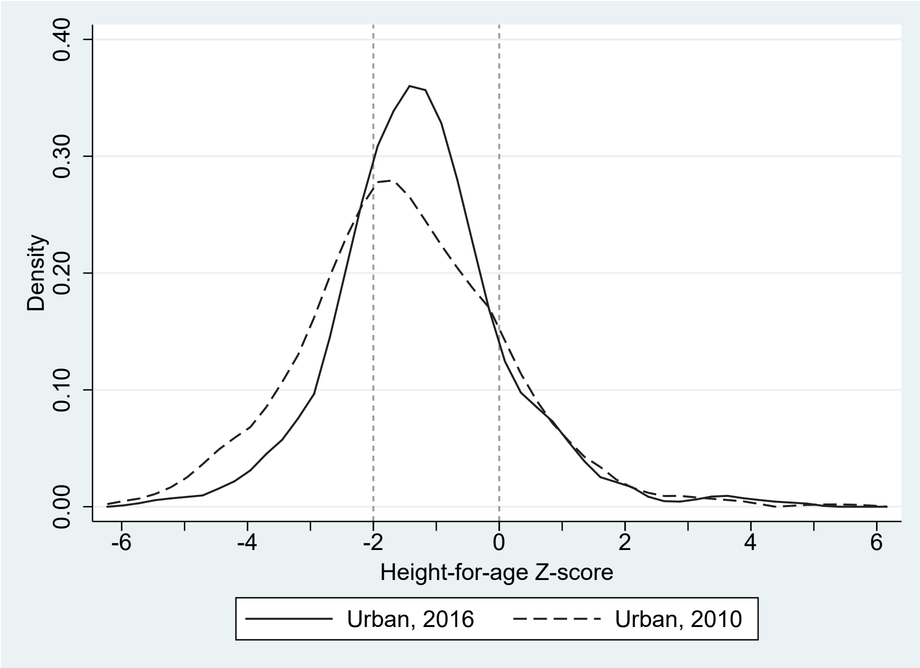


Figure 3: Distribution of HAZ scores in children aged 0 to 59 months in 2010 and 2016 in urban Malawi



A Kolmogorov-Smirnov test for equality of child HAZ score distributions for 2010 and 2016 shows that the distributions of HAZ-scores for the 2010 and 2016 surveys do not have the same distribution functions as indicated by a p-value of 0.00. This implies that the distributional differences as depicted by the kernel plots are statistically significant. This suggests that the likelihood of observing a stunted child in 2010 is indeed different from that in 2016.

3.6 Descriptive Statistics of Explanatory Variables

Table 2 presents descriptive statistics of explanatory variables used to predict child stunting in the 2010 and 2016 DHSs. The set of covariates includes child, household, and local environment characteristics. In both years, the statistics do not show much variation in the attributes of children. There is a nearly equal distribution of boys and girls in both years. About 60% of the children are at least 24 months old in both years. The rest are distributed in the under 6 months (about 10%), between 6 and 11 months (23%) and between 18 and 24 months (about 10%) age of child dummy categories. Most of the children live in households headed by males (at least 80% in both years). In all years, the majority of the children's mothers have incomplete primary schooling, followed by no education (at least 70%). Only about 5% of the mothers have at least a secondary education. Similarly, the majority of fathers have incomplete primary education (56% and 43% in 2010 and 2016, respectively). The majority (89% in 2010 and 93% in 2016) of households in which the children live use pit latrines for sanitation needs, while the proportion of households with no toilet reduced from 0.1 in 2010 to 0.05 in 2016. The proportion of households with a flush toilet increased from 1% in 2010 to around 2% in 2016. The proportion of households who had protected sources of drinking water jumped from 78% in 2010 to 86% in 2016. In both years, the samples are predominantly rural, represented by at least an 85% share. The Northern region has a representation of 11% of children in both 2010 and 2016, the Central region has 46% and 44%, respectively, and the Southern region has 45% of and 43%, respectively. The majority of children in both years are from the Chewa ethnic group (about 40 per cent).

Table 2: Descriptive statistics of explanatory variables, 2010 and 2016

		2010	2016	
	Mean	**SD**	**Mean**	**SD**
Child characteristics				
Under 6 months (reference)	.075	.26	.1	.3
6 to 18 months	.23	.42	.23	.42
19 to 23 months	.12	.33	.086	.28
24 to 59 months	.59	.49	.6	.49
Female (reference)	.51	.5	.52	.5
Male	.49	.5	.48	.5
Not a twin (reference)	97	.17	.97	.17
Twin	.031	.17	.03	.17
Education of the mother				
None (reference)	.17	.37	.13	.34
Incomplete primary	.6	.49	.58	.49
Primary	.088	.28	.086	.28
Incomplete secondary	.096	.29	.13	.34
Secondary	.047	.21	.055	.23
Tertiary	.0048	.069	.02	.14
Education of the father				
None (reference)	.099	.3	.1	.3
Incomplete primary	.56	.5	.43	.49
Primary	.077	.27	.14	.34
Incomplete secondary	.25	.43	.16	.37
Secondary	0	0	.13	.34
Tertiary	.02	.14	.041	.2
Wealth status of the household				
Poorest (Reference)	.18	.38	.21	.41
Poorer	.23	.42	.25	.43
Middle	.22	.42	.2	.4
Richer	.18	.39	.19	.39
Richest	.19	.39	.16	.37
Water and sanitation				
Piped	.22	.42	.19	.39
Protected	.56	.5	.67	.47
Flush	.013	.11	.023	.15
Pit latrine	.89	.32	.93	.26

No toilet	.1	.3	.052	.22
Area of residence				
Urban (reference)	.15	.36	.13	.33
Rural	.85	.36	.87 .33	
Region				
North (reference)	.11	.31	.11	.31
Central	.46	.5	.44	.5
South	.43	.5	.45	.5
Ethnicity				
Chewa (reference)	.4	.49	.36	.48
Tumbuka	.086	.28	.086	.28
Lomwe	.14	.35	.18	.38
Yao	.13	.33	.16	.36
Sena	.076	.26	.063	.24
Ngoni	.11	.32	.12	.32
Observations		**4489**		**4293**

4. Estimation Results

4.1 Regression Results

The first step in the empirical analysis involves an analysis of the determinants of child stunting in 2010 and 2016. The empirical literature shows that variables capturing child, household, and local environment characteristics explain variation in child height. Tables 3 reports the coefficient estimates from the ordinary least squares regressions of child stunting for the 2010 and 2016 survey years. The estimates for the LPM and the logit model are presented in Appendix 1, and the interpretation of the marginal effects does not change the interpretations for the OLS regression.

Table 3: Determinants of child stunting in Malawi, 2010 and 2016

	2010		2016	
Child characteristics				
6 to 18 months	-0.642***	(0.121)	-0.200**	(0.098)
19 to 23 months	-1.410***	(0.129)	-0.595***	(0.114)
24 to 59 months	-1.340***	(0.109)	-0.720***	(0.091)
Male child	-0.307***	(0.060)	-0.068	(0.050)
Twin	-1.007***	(0.145)	-0.752***	(0.114)
Mother's education				
Incomplete primary	0.055	(0.097)	0.067	(0.083)
Primary	0.067	(0.129)	0.084	(0.113)
Incomplete secondary	0.148	(0.135)	0.123	(0.107)
Secondary	0.016	(0.178)	0.233	(0.146)
Tertiary	0.192	(0.354)	0.409*	(0.220)
Father's education				
Incomplete Primary	-0.094	(0.126)	0.010	0.091)
Primary	-0.197	(0.153)	-0.130	(0.107)
Incomplete secondary	-0.028	(0.139)	0.105	(0.106)
Secondary	0.000	(.)	0.118	(0.117)
Tertiary	-0.207	(0.218)	0.341**	(0.162)
Female head	0.027	(0.124)	-0.049	(0.067)

Wealth status of the household				
Poorest				
Poorer	0.163	(0.099)	0.136*	(0.075)
Middle	0.136	(0.097)	0.240***	(0.080)
Richer	0.239**	(0.100)	0.369***	(0.090)
Richest	0.390***	(0.126)	0.472***	(0.105)
Water and sanitation				
Protected well	0.138	(0.088)	0.071	(0.075)
Unprotected well	0.007	(0.111)	0.177	(0.116)
Surface water	0.000	(.)	0.000	(.)
Other	0.000	(.)	0.000	(.)
Pit latrine	-0.938***	(0.242)	-0.426**	(0.187)
No toilet	-0.909***	(0.263)	-0.415**	(0.209)
Rural	-0.081	(0.116)	0.060	(0.097)
Central	-0.098	(0.111)	0.019	(0.084)
South	-0.029	(0.127)	-0.063	(0.102)
Ethnicity				
Tumbuka	-0.192	(0.121)	-0.024	(0.106)
Lomwe	-0.063	(0.103)	0.239***	(0.093)
Yao	-0.156	(0.114)	0.128	(0.088)
Sena	0.010	(0.121)	0.539***	(0.147)
Ngoni	0.154	(0.105)	0.108	(0.086)
Constant	0.341	(0.327)	-1.070***	(0.254)
Observations		**4182**		**4049**

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Looking at the 2010 and 2016 regressions, it can be seen that the 2016 regression is associated with more significant impacts, especially household socioeconomic characteristics. The higher income households, and those with higher education for mothers and fathers, are correlated with lower stunting in 2016. Child-specific variables are significant in both 2010 and 2016, although the negative impact on child stunting is larger in 2010. The gender of the child is statistically significant at a 1% level of significance in 2010, but not in 2016. However, the effect is negative in both years, implying that being a male child decreases the value of the HAZ score compared to being a female child. This suggests that there is a positive association between being a male child and stunting, compared to a female child. This is in line with earlier evidence in Africa (for example Chirwa and Ngalawa, 2008; Garrett and Ruel, 1999 and Glick and Sahn, 1998). In the literature, it is widely agreed that boys are biologically more vulnerable to malnutrition than girls and are more likely to be stunted if the underlying determinants of nutrition are less favourable.

The age of a child is a categorical dummy variable. The reference category is less than 6 months old. The results are as expected in both years and show that the age of the child is an important determinant of stunting. In both models, all age dummy categories are statistically significant, at least at a 5% level of significance. The effect is negative, meaning that compared to children who are less than 6 months old, the values of the HAZ score are decreased for those children who are at least 6 months old. This suggests the age of a child is positively associated with stunting. The magnitude of the positive effect begins to decrease with age, suggesting that there is some critical age beyond which a child's nutrition status improves as the child grows older. Chirwa and Ngalawa (2008) estimate the critical age for stunting at 43 months.

Being a twin is also statistically significant for the stunting status of a child. In both years, being a twin decreases the values of the HAZ score, indicating that there is a positive association between twins and stunting, relative to unpaired children. This is an indication that children who are born as twins are more likely to be stunted.

In both years, education of the parents does not significantly predict child stunting, as expected, especially that of the mother. The reference category is no education. Although not statistically significant, education of the mother has a positive effect on the size of HAZ scores, indicating that a mother's education increases the size of the HAZ score, and hence negatively predicts stunting in children. For mothers with higher levels of education, the magnitude of the effect is higher. This suggests that children whose parents have at least a secondary education are better nourished compared to children whose mothers do not have an education. From the results, there appears to be no difference in the effect of education of those parents with no education and those with only primary education. (Makoka, 2013) found similar results for maternal education in Malawi, Tanzania and Zimbabwe. He estimated that the threshold level of maternal education above which it significantly improves child stunting and being underweight is 9 years of schooling in Malawi and 11 years of schooling in Tanzania and Zimbabwe, all of which are in the secondary school education category.

The reference category for the wealth status of the household is poorest. The wealth clusters all have positive coefficients in both years, indicating that compared to being in the category of the poorest household, children who reside in the households categorized otherwise are likely to be better nourished and have better nutrition status outcomes, as measured by height for age.

Selected indicators of water and sanitation conditions were also considered. Children that live in households that use pit latrines and those that have no toilets are associated with being stunted. Although the country is doing reasonably well in providing access to clean water and improved sanitation services, there is still room for improvement. The 2015–16 DHS shows that 51.8% of households in Malawi have their own improved toilet facility.

Compared to living in an urban area, residing in a rural area decreases the size of the HAZ score. This implies that children who reside in urban areas are better nourished than those living in rural areas. However, this is only true for the 2010 survey. Similarly, with Northern region as the reference dummy category for region, the negative coefficient in the South and Central region dummy categories in 2010 suggests that children who live in these regions are more likely to be stunted than children who live in the Northern region. Looking closely at the 2010 model, we observe that the negative magnitude of the effect is larger for the Southern region in 2010, and larger for the Central region in 2016.

Ethnicity also plays a significant role in predicting nutrition of a child. In 2016, being from the Lomwe and Sena ethnic groups is negatively associated with being stunted.

4.2 Decomposition Results

The main objective of this study is to decompose the change in the prevalence of child stunting between 2010 and 2016 into two groups: one that is due to the change in the distribution of covariates, and a second that is due to the change in the relationship between child stunting and covariates. From the descriptive statistics, it is observed that there are few changes in the means of a number of covariates between 2010 and 2016. The prevalence of stunted children in the analytical data in the 2010 dataset was 46.8%, while the prevalence of stunted children in the 2016 dataset was 36.3%. The difference of 10.5% in the prevalence of stunted children in the two years is what this paper seeks to explain by considering differences in the levels of potential determinants of child stunting and differences in the effects of the determinants between the two years. The findings from the Blinder-Oaxaca decomposition analysis are presented in Table 4.

Overall, differences in levels of determinants account for 4.76% of the difference in stunting prevalence between the two survey years. The detailed decomposition analysis draws attention to wealth status of the household and age of the child, for which differences in levels matter for the prevalence of child stunting in a survey year. Notably, it was observed that the level of wealth status in a household more significantly lowered child stunting in 2016 than in 2010. This result can be used as evidence to guide policy intervention to improve the wealth status of households.

For those significant factors whose levels are not prone to change, most notably ethnicity, the results reinforce arguments for greater attention to ensuring that messages on good nutrition practices are compatible with the beliefs and attitudes of ethnic groups. Improved nutrition within such ethnic groups should remain a central element of nutrition programmes in Malawi.

Table 4: Decomposition of child stunting between 2010 and 2016

	stunted	
Overall decomposition		
2010	0.468***	(0.010)
2016	0.363***	(0.009)
Difference	0.105***	(0.014)
Characteristics	0.005	(0.008)
Coefficients	0.087***	(0.015)
Interaction	0.013	(0.011)
Characteristic effect		
Child characteristics		

6 to 18 months	0.000	(0.001)
19 to 23 months	0.008***	(0.002)
24 to 59 months	-0.003	(0.002)
Male child	0.000	(0.000)
Twin	-0.000	(0.001)
Mother's education		
Incomplete primary	-0.001	(0.001)
Primary	-0.000	(0.000)
Incomplete secondary	0.002	(0.001)
Secondary	0.000	(0.001)
Tertiary	0.002	(0.001)
Father's education		
Incomplete primary	-0.001	(0.004)
Primary	-0.002	(0.003)
Incomplete secondary	-0.001	(0.004)
Secondary	0.007	(0.006)
Tertiary	0.001	(0.001)
Gender of household head		
Female head	-0.001	(0.002)
Wealth status of the household		
Poorer	0.001	(0.001)
Middle	-0.002*	(0.001)
Richer	0.000	(0.002)
Richest	-0.007**	(0.003)
Water and sanitation		
Protected well	0.000	(0.003)
Unprotected well	-0.002	(0.003)
Surface water	0.000	(.)
Other	0.000	(.)
Pit latrine	-0.000	(0.002)
No toilet	0.000	(0.004)
Area of residence		
Rural	0.000	(0.001)
Region		
Central	0.001	(0.001)
South	-0.002	(0.001)
Ethnicity		
Tumbuka	0.000	(0.000)
Lomwe	0.003*	(0.001)
Yao	0.001	(0.001)
Sena	-0.001	(0.001)
Ngoni	0.000	(0.000)
--		
Coefficients effect		
Child characteristics		
6 to 18 months	0.025***	(0.009)
19 to 23 months	0.016***	(0.004)

24 to 59 months	0.100***	(0.023)
Male child	0.028**	(0.013)
Twin	-0.000	(0.002)
Mother's education		
Incomplete primary	0.004	(0.024)
Primary	-0.001	(0.005)
Incomplete secondary	0.001	(0.008)
Secondary	-0.001	(0.005)
Tertiary	0.000	(0.003)
Father's education		
Incomplete primary	0.024	(0.020)
Primary	0.006	(0.008)
Incomplete secondary	0.010	(0.009)
Secondary	0.007	(0.006)
Tertiary	0.003	(0.004)
Gender of household head		
Female head	-0.005	(0.007)
Wealth status of the household		
Poorer	0.001	(0.010)
Middle	0.004	(0.008)
Richer	0.011	(0.008)
Richest	0.005	(0.009)
Water and sanitation		
Protected well	-0.034	(0.028)
Unprotected well	0.000	(0.005)
Surface water	0.000	(.)
Other	0.000	(.)
Pit latrine	0.111	(0.099)
No toilet	0.006	(0.006)
Area of residence		
Rural	0.036	(0.045)
Region		
Central	0.002	(0.021)
South	-0.018	(0.024)
Ethnicity		
Tumbuka	0.001	(0.005)
Lomwe	0.014*	(0.008)
Yao	0.019**	(0.008)
Sena	0.006	(0.004)
Ngoni	-0.002	(0.005)
Constant	-0.294**	(0.138)
--		
Interaction		
Child characteristics		
6 to 18 months	0.000	(0.001)
19 to 23 months	0.007***	(0.003)
24 to 59 months	-0.003	(0.002)
Male child	0.000	(0.001)
Twin	0.000	(0.000)
Mother's education		
Incomplete		

primary	0.000	(0.001)
Primary	-0.000	(0.000)
Incomplete secondary	-0.000	(0.002)
Secondary	0.000	(0.001)
Tertiary	-0.000	(0.002)
Father's education		
Incomplete primary	0.008	(0.006)
Primary	-0.003	(0.004)
Incomplete secondary	0.006	(0.005)
Secondary	-0.007	(0.006)
Tertiary	-0.002	(0.002)
Gender of household head		
Female head	0.003	(0.004)
Wealth status of the household		
Poorer	-0.000	(0.001)
Middle	0.000	(0.001)
Richer	-0.000	(0.001)
Richest	0.001	(0.002)
Water and sanitation		
Protected well	0.006	(0.005)
Unprotected well	0.000	(0.004)
Surface water	0.000	(.)
Other	0.000	(.)
Pit latrine	-0.004	(0.004)
No toilet	0.006	(0.005)
Area of residence		
Rural	-0.001	(0.001)
Region		
Central	0.000	(0.001)
South	0.001	(0.001)
Ethnicity		
Tumbuka	0.000	(0.000)
Lomwe	-0.003	(0.002)
Yao	-0.004**	(0.002)
Sena	0.001	(0.001)
Ngoni	0.000	(0.000)
Observation		**8210**

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

5. Conclusion and policy implications

This study started with the premise that the prevalence of stunting among children under the age of five remained persistently high in the 1992, 2000 and 2004 DHS survey years, although some improvement started to become evident in 2010. Between 2010 and 2016, the decline in stunting was remarkable. Using the Blinder-Oaxaca decomposition technique, the study could explain only 5% of the 10.5% decline in child stunting. This was attributable to improvements in standards of living in 2016, where the level of wealth status in households was observed to have improved. Unsurprisingly, very few changes were observed in the means of the majority of the explanatory variables over the two years. This means that focusing efforts on improving standards of living in households can potentially reduce child malnutrition, which is important as Malawi looks for actions that will enable it to reach zero hunger and malnutrition by 2030. These can include investing in job creation efforts such as building skills, supporting small and medium enterprises, and identifying the various roles that the private sector in Malawi can play in agricultural value-addition and marketing and in improved nutrition.

References

Angrist, J.D., and J. Piskhe. 2009. "Mostly Harmless Econometrics: An Empiricist's Companion". Princeton University Press. New Jersey.

Black, R.E., C.G. Victora, S.P. Walker, Z.A. Bhutta, P. Christian, M. de Onis, M. Ezzati, S. Grantham-McGregor, J. Katz, R. Martorell, R. Uauy and the Maternal and Child Nutrition Study Group. 2013. "Maternal and child undernutrition and overweight in low-income and middle-income countries". The Lancet, 382(9890): 427–51.

Blinder, S. 1973. "Wage Discrimination; Reduced Form and Structural Estimates," Journal of Human Resources, 8(4), 436-455.Chirwa, E. and H. Ngalawa. 2008. "Determinants of child nutrition in Malawi". South African Journal of Economics, 76(4): 628–40.

Doctor, H.V., and S. Nkhana-Salimu. 2017. "Trends and Determinants of Child Growth Indicators in Malawi and Implications for the Sustainable Development Goals". AIMS Public Health, 4(6): 590–614.

Garrett, J.L. and M.T Ruel. 1999. "Are determinants of rural and urban food security and nutritional status different? Some insights from Mozambique". World Development, 27(11): 1955–75.

Glick, P. and D. Sahn. 1998. "Maternal labour supply and child nutrition in West Africa". Oxford Bulletin of Economics and Statistics, 60(3): 325–55.

International Food Policy Research Institute. 2019. "Zero Hunger and Malnutrition Strategic Review". International Food Policy Research Institute. Washington DC.

Kalimbira, A.A, C. MacDonald and J.R. Simpson. 2010. "The impact of an integrated community-based micronutrient and health programme on stunting in Malawian preschool children". Public Health Nutrition, 13(5): 720–9.

Makoka, D. 2013. "The impact of maternal education in child nutrition: Evidence from Malawi, Tanzania and Zimbabwe". DHS Working Papers No 84. The Demographic and Health Surveys Program. Rockville, Maryland, USA.

National Statistical Office [Malawi] and ICF Macro, 1994. Malawi Demographic and Health Survey 1992. Calverton, Maryland, USA.

National Statistical Office [Malawi] and ICF Macro, 2011. Malawi Demographic and Health Survey 2010. Calverton, Maryland, USA.

National Statistical Office [Malawi] and ICF Macro, 2017. Malawi Demographic and Health Survey 2015-16. Calverton, Maryland, USA

National Statistical Office [Malawi] and ICF Macro. Malawi Demographic and Health Survey 2010 [Dataset]. Data Extract from MWIR61.SAV, MWHR61.SAV, MWKR61.SAV, MWBR61.SAV, MWMR61.SAV, and MWPR61.SAV. IPUMS Demographic and Health Surveys (IPUMS DHS), version 7, IPUMS and ICF [Distributors]. Accessed from http://idhsdata.org on 18 March, 2019.

National Statistical Office (NSO) [Malawi] and ICF. Malawi Demographic and Health Survey 2015-16 [Dataset]. Data Extract from MWIR7H.SAV, MWHR7H.SAV, MWKR7H.SAV, MWBR7H.SAV, MWMR7H.SAV, and MWPR7H.SAV. IPUMS Demographic and Health Surveys (IPUMS DHS), version 7, IPUMS and ICF [Distributors]. Accessed from http://idhsdata.org on 18 March, 2019.

Oaxaca, R. 1973. “Male Female Wage Differentials in Urban Labour Markets,” International Economic Review, 14(3), 693-709.

World Health Organization. 1995. “The Use and Interpretation of Anthropometry. WHO Technical Report” Series 854. World Health Organization. Geneva.

Appendix 1

Table A1: Linear probability model regression of determinants of child stunting, 2010 and 2016

	2010		2016	
Child characteristics				
6 to 18 months	0.154***	(0.029)	0.045	(0.030)
19 to 23 months	0.395***	(0.033)	0.206***	(0.038)
24 to 59 months	0.327***	(0.027)	0.161***	(0.027)
Male child	0.075***	(0.019)	0.016	(0.018)
Twin	0.272***	(0.044)	0.278***	(0.051)
Mother's education				
Incomplete primary	-0.042	(0.028)	-0.049	(0.030)
Primary	-0.039	(0.039)	-0.027	(0.043)
Incomplete secondary	-0.037	(0.043)	-0.046	(0.039)
Secondary	-0.093	(0.059)	-0.077	(0.055)
Tertiary	-0.098	(0.120)	-0.107	(0.079)
Father's education				
Incomplete primary	0.050	(0.033)	-0.008	(0.033)
Primary	0.076*	(0.044)	0.035	(0.040)
Incomplete secondary	0.047	(0.039)	-0.015	(0.039)
Secondary	0.000	(.)	-0.052	(0.042)
Tertiary	0.013	(0.080)	-0.060	(0.067)
Gender of household head				
Female head	-0.021	(0.033)	0.008	(0.024)
Wealth status of the household				
Poorer	-0.053*	(0.029)	-0.057**	(0.028)
Middle	-0.081***	(0.030)	-0.102***	(0.029)
Richer	-0.086***	(0.032)	-0.147***	(0.031)
Richest	-0.182***	(0.039)	-0.211***	(0.038)
Water and sanitation				
Protected well	-0.051*	(0.030)	-0.003	(0.027)
Unprotected well	-0.022	(0.036)	-0.022	(0.039)
Surface water	0.000	(.)	0.000	(.)
Other	0.000	(.)	0.000	(.)
Pit latrine	0.121	(0.084)	0.002	(0.066)
No toilet	0.127	(0.089)	0.002	(0.079)
Area of residence				

Rural	0.026	(0.038)	-0.016	(0.036)
Region				
Central	0.043	(0.033)	0.038	(0.033)
South	0.028	(0.038)	0.068*	(0.038)
Ethnicity				
Tumbuka	0.066	(0.041)	0.051	(0.040)
Lomwe	0.011	(0.034)	-0.068**	(0.031)
Yao	0.074**	(0.035)	-0.041	(0.030)
Sena	-0.002	(0.042)	-0.097**	(0.041)
Ngoni	-0.039	(0.032)	-0.019	(0.030)
Constant	0.070	(0.104)	0.364***	(0.091)
Observations		**4171**		**4039**

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table A2: Logit regression of determinants of child stunting

	2010		2016	
Child characteristics				
6 to 18 months	0.850***	(0.174)	0.045	(0.030)
19 to 23 months	1.881***	(0.185)	0.206***	(0.038)
24 to 59 months	1.597***	(0.166)	0.161***	(0.027)
Male child	0.330***	(0.083)	0.016	(0.018)
Twin	1.330***	(0.248)	0.278***	(0.051)
Mother's education				
Incomplete primary	-0.180	(0.119)	-0.049	(0.030)
Primary	-0.166	(0.173)	-0.027	(0.043)
Incomplete secondary	-0.156	(0.191)	-0.046	(0.039)
Secondary	-0.416	(0.281)	-0.077	(0.055)
Tertiary	-0.691	(0.889)	-0.107	(0.079)
Father's education				
Incomplete primary	0.221	(0.145)	-0.008	(0.033)
Primary	0.336*	(0.189)	0.035	(0.040)
Incomplete secondary	0.206	(0.170)	-0.015	(0.039)
Secondary	0.000	(.)	-0.052	(0.042)
Tertiary	0.048	(0.401)	-0.060	(0.067)
Gender of household head				
Female head	-0.090	(0.146)	0.008	(0.024)
Wealth status of the household				
Poorer	-0.230*	(0.128)	-0.057**	(0.028)
Middle	-0.359***	(0.130)	-0.102***	(0.029)
Richer	-0.378***	(0.140)	-0.147***	(0.031)
Richest	-0.808***	(0.178)	-0.211***	(0.038)
Water and sanitation				
Protected well	-0.233*	(0.131)	-0.003	(0.027)
Unprotected well	-0.105	(0.157)	-0.022	(0.039)
Surface water	0.000	(.)	0.000	(.)

Other	0.000	(.)	0.000	(.)
Pit latrine	0.619	(0.496)	0.002	(0.066)
No toilet	0.640	(0.513)	0.002	(0.079)
Area of residence				
Rural	0.121	(0.172)	-0.016	(0.036)
Regions				
Central	0.198	(0.151)	0.038	(0.033)
South	0.126	(0.173)	0.068*	(0.038)
Ethnicity				
Tumbuka	0.294	(0.184)	0.051	(0.040)
Lomwe	0.044	(0.150)	-0.068**	(0.031)
Yao	0.331**	(0.156)	-0.041	(0.030)
Sena	-0.010	(0.184)	-0.097**	(0.041)
Ngoni	-0.171	(0.141)	-0.019	(0.030)
Constant	-2.150***	(0.580)	0.364***	(0.091)
Observations		**4171**		**4039**

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

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