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Poverty and Malnutrition in Zimbabwe: Findings from Masvingo Province

Angelino Viceisza, Kodjo Aflagah, Jala Abner, Kerlisha Hippolyte

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Executive Summary

In 2017 Zimbabwe ranked 109th of 119 countries in the Global Hunger Index. Widespread poverty, HIV/AIDS, limited employment opportunities, economic instability, and recurrent climate shocks challenge the achievement of food and nutrition security for all. The main purpose of this study is to identify factors that are associated with poverty and child malnutrition in Masvingo Province. Making use of the 2015 Zimbabwe Demographic and Health Survey (ZDHS), the report answers the following questions:

1. What are the characteristics of households (HHs) and individuals with high levels of poverty, low levels of access to food, and high levels of acute and chronic malnutrition?
2. How do the characteristics of HHs and individuals with high levels of poverty and high levels of acute and chronic malnutrition vary geographically across each of the targeted provinces?
3. How do the characteristics of HHs and individuals with high levels of poverty and high levels of acute and chronic malnutrition for each of the targeted provinces compare to HHs and individuals for those indicators that are not target populations (by quintile or that are above -2 z-score for nutrition)?
4. What predictors are highly associated with high levels of poverty and high levels of acute and chronic malnutrition in each of the targeted provinces?

The key findings on poverty and child malnutrition are presented below.

Poverty

The underlying causes of poverty were measured at three levels, the community, household, and individual levels. *Poverty* refers to a HH that is in the bottom quintile of the wealth-index distribution based on ZDHS 2015.

In Masvingo, significant distinctions between poor and non poor households are seen through assets, house materials, and livestock. Non-poor HHs are more likely to own assets than poor HHs, except for two assets related to agriculture: land and axes/hoes. Poor and non-poor HHs differ most in terms of their access to electricity and ownership of mobile phones, pushing trays, chairs, wardrobes, mattresses, and beds. Poor HHs mainly live in houses with mud or bricks walls, leaf roofs, and dung floors. On the other hand, non-poor HHs mainly live in houses with cement walls, asbestos or metal roofs, and cement floors. Non-poor and poor HHs are equally likely to own chickens and rabbits, but non-poor HHs are more likely to own cattle and goats.

Characteristics of the head of household (HHH) distinguish poor and non poor HH. Poor and non-poor HHHs are equally likely to be women and are about the same age. Non-poor HHHs are more likely to be educated. Most HHHs are married; however, poor HHHs are more likely to be divorced. Poor and non-poor HHs have relatively similar structures in terms of size and age composition. Ownership of assets tends to be more predictive of (non)poverty when the HHH is a woman. Moreover, the decrease in poverty due to the HHH's education is more pronounced for women

Access to water, sanitation and hygiene practices are crucial for improved health outcomes. Most poor HHs get their drinking water from tubes / boreholes or unprotected wells and the water comes from

outside the house and their yard. Very few poor HHs have a toilet facility, but the majority of non-poor HHs do.

When comparing rural and urban areas, having access to electricity seems to have a bigger association with (non)poverty in urban areas, while ownership of solar panels has a significant association with (non)poverty only in rural areas. Ownership of beds or pushing trays has a stronger association with (non)poverty for rural HHs, while ownership of agricultural assets is a sign of poverty in rural areas. House materials help distinguish poor from non-poor HHs only in rural areas. The HHH's education is significantly associated with poverty only in rural areas.

When other factors are controlled for, the following remains statistically significantly associated with poverty: ownership of a mobile phone, watch, solar panel, chair, mattress, or bed decreases the likelihood of being poor. Similarly, living in a house with brick walls or owning livestock (such as cattle, horses, or chickens) reduces the likelihood of being poor. Finally, living in a house with a leaf roof or dung floors increases the chance of being poor.

Child malnutrition

In Masvingo, 27 percent of children under the age of five are stunted. Stunting is associated with increased risk of morbidity and mortality. Stunting, reflecting chronic malnutrition among young children, is the prioritized measure for this report. Proper targeting of stunting ensures that one reaches the chronically vulnerable.[1] Thus, stunting captures potentially more serious malnutrition issues.

Three main characteristics can help in determine whether a child will be stunted. They include characteristics of the HH and HHH, parental characteristics, and those of the child.

Stunted children are more likely to be boys and have recently experienced a cough or shortness of breath. They are also more likely to: 1) have been below average at birth and 2) not be breastfed anymore. Stunted children are more likely to live in houses with leaf roofs and sand floors, whereas non-stunted children are more likely to live in houses with asbestos roofs. Stunted children are more likely to live in HHs without bed nets; when they do have bed nets, they are less likely to spend the night under such nets. Stunted children are more likely to eat grains, squash, leafy green vegetables, legumes, or solid foods. They are also more likely to live in HHs where the head has no schooling. Non-stunted children are more likely to live in HHs where the head has post-secondary education. Children are also more likely to be stunted when their mother: 1) is the HHH, 2) has no schooling or just primary education, 3) is part of an apostolic sect, 4) is a self-employed farmer, or 5) has experienced emotional violence. They are less likely to be stunted when their father is in a professional or clerical occupation.

In addition, when controlling for additional factors it was found that stunting is significantly associated with gender, health, parent characteristics, and the HH decision-making. Poverty and malnutrition are interlinked in Masvingo It is important to address both the relationship of poverty assets, HH characteristics, and those of the HHH when targeting interventions or programs related to child malnutrition.

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[1] Devereux (2006) discusses chronic and transitory food insecurity in emergency assessment.

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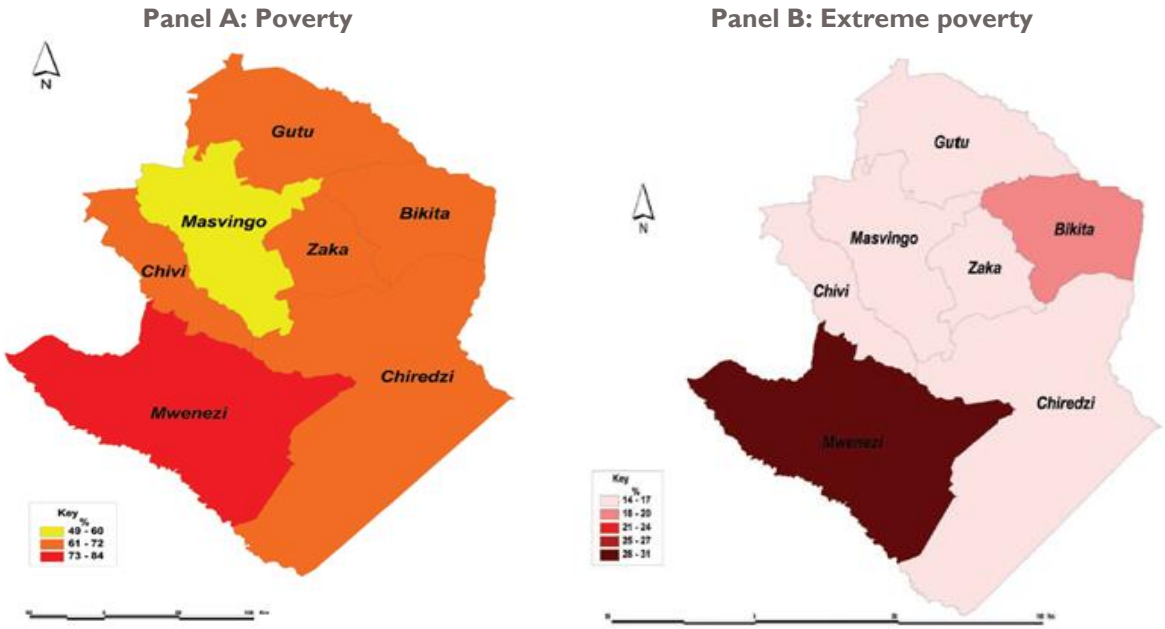
ha	hectare
HH	household
HHH	head of household
OLS	Ordinary Least Squares
pp	percentage point(s)
RQ	research question
SD:	standard deviation
ZDHS	Demographic and Health Survey for Zimbabwe
ZimVAC	Zimbabwe Vulnerability Assessment Committee

1. Background

Masvingo is a province located in southeastern Zimbabwe. According to the 2012 Census, it was ranked fifth by its population size. Masvingo comprises seven districts: Bikita, Chiredzi, Chivi, Gutu, Masvingo, Mwenezi, and Zaka. The province is a commercial center for cattle ranching and agriculture (i.e., grain, cotton, tobacco, fruit, and sugar). There is also gold and asbestos mining in the vicinity. Masvingo is a tourist base due to the presence of several national parks, including Kyle National Park, Mushandike National Park, and Zimbabwe (Bantu: "Stone Dwelling"), or Great Zimbabwe, ruins.

According to the 2015 Poverty Atlas (Figure 1), all districts have a poverty prevalence of more than 50 percent. Bikita has the highest at 72.1 percent, and its residents primarily work at the Sugar Cane Estate and the Mashava Mine. The prevalence of poverty in Masvingo seems to partly be linked to limited rainfall, which in turn hinders agriculture and livestock production and impacts food security.

Figure 1. Poverty and extreme poverty in Masvingo



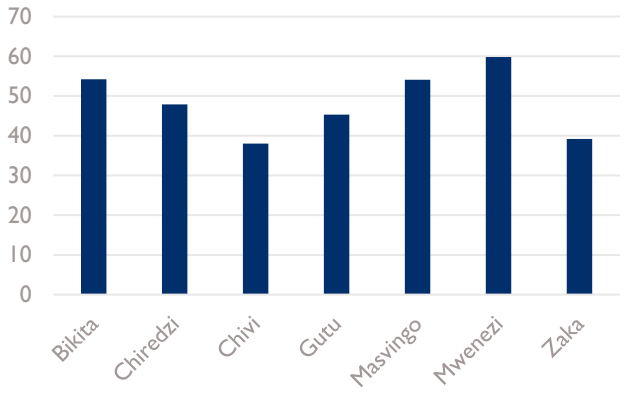
Source: Zimbabwe Poverty Atlas (ZIMSTAT et al, 2015)..

Additionaly, during the 2019 lean season, Zimbabwe Vulnerability Assessment Committee (ZIMVAC) found that 48.4 percent of the households in Masvingo were food insecure. Figure 2, shows the breakdown of food insecure household in each of the districts. Indeed, Masvingo province registered a rate of stunting of 27 percent, same level as the overall stunting rate in the country.

The complex interrelationship between the poverty-related causes and consequences of child malnutrition can be explained by the conceptual framework developed by the United Nations Children's Fund (UNICEF 1990). These include includes immediate causes (inadequate dietary intake; lack of care; and disease), underlying causes (inadequate access to food, care for mothers and children and health services; and an unhealthy environment) as well as the basic causes (inadequate education, formal and

non-formal institutions, political and ideological superstructures and economic structures and a lack of potential resources). These immediate, underlying, and basic causes are now all recognized and defined as dimensions of poverty. Therefore, looking at the most significant associations from household (HH), head of household (HHH) and child characteristics can identify potential risk factors.

Figure 2. Food insecurity in Masvingo province's districts



Source: ZimVAC, 2019.

This report will assess the prevalence and potential determinants of poverty and child malnutrition in the province of Masvingo based on the Demographic and Health Survey for Zimbabwe (ZDHS 2015). These findings are intended to help inform future targeting of social programs by USAID: in particular, initiatives intended to reduce poverty and food insecurity.

II. Poverty in Masvingo

For the purpose of this analysis, "*poverty*" refers to a HH that is in the bottom quintile of the wealth-index distribution based on ZDHS 2015. The wealth index is defined at the national level, but the bottom quintile is within province. As such, 20 percent of HHs within the province are by definition poor.

A review of the literature on potential determinants of poverty suggests three types of characteristics that may be associated with HH poverty: 1) characteristics of the HH (including those of the HHH); 2) characteristics of individuals in the HH; and 3) characteristics of the place of residence.[2] Due to limitations of the ZDHS data, it was infeasible to include characteristics of the sub-province level[3]. Instead, the analysis will conclude with a brief disaggregation by rural versus urban areas.

The analysis of poverty in Masvingo is based on a sample of 1,071 households. For simplicity, this number is not included in the tables that follow. Moreover, only the main tables are presented in this document.[4]

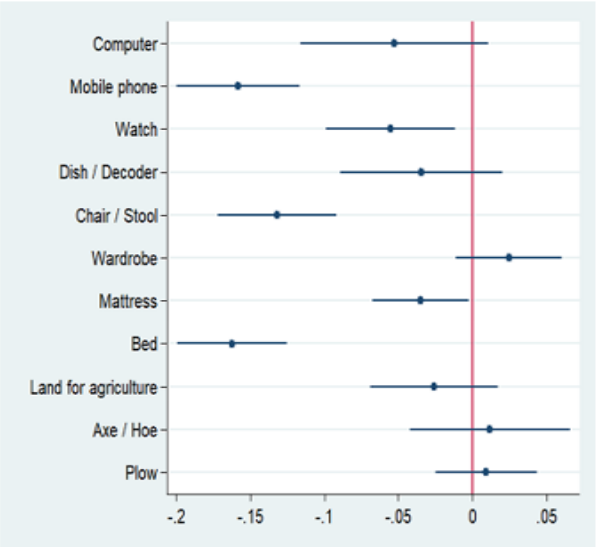
Comparing poor and non-poor HHs

Distribution of assets and house materials

[2] For brevity, the full list of literature (and references) consulted has been omitted from this report and is part of a separate technical appendix.
[3] See appendix included in this report for more details.
4 Other tables can be generated based on the source statistical code (i.e., Stata .do files) available from FFP or from the authors upon request.

Factors that are associated to household characteristics play a significant role in determining poverty. Table 1 first compares the distribution of assets across poor and non-poor HHs. Then, it compares the incidence of poverty across HHs with and HHs without a particular asset. In other words, the second set of statistics can be thought of as a "pivot," so we mainly focus on the first. Finally, the last column of the table tests whether the incidence of poverty is statistically significantly different across HHs with and HHs without a given asset. Accordingly, it presents the p-value of a t-test for the equality of poverty incidence.

Figure 3. Key predictors of povery in Masvingo: Asset Ownership



Source: Authors' calculations

Focusing on the first set of statistics, it can be noted that poor HHs tend to be less likely than non-poor HHs to own most types of assets. Based on the percentage-point difference, poor and non-poor HHs differ mostly in their ownership of (1) mobile phones, (2) pushing trays, (3) chairs, (4) wardrobes, (5) mattresses, and (6) beds. For example, 92 percent of non-poor HHs have a mobile phone, while 64 percent of poor HHs have one. Moreover, only 15 percent of poor HHs have a bed compared to 76 percent of non-poor HHs. In Figure 3, assets more likely to be owned by non-poor households are shown to the left of the vertical line. Assets more likely to be owned by poor households are shown to the right of the vertical line.

Agriculture is the backbone of the Zimbabwean economy, contributing to about 17 percent of GDP (FAO, 2019), and represents the main source of livelihoods for the population. Consequently, a favorable performance in the agricultural sector contributes to household resilience, poverty reduction, and food security. About 29 percent of men and 13 percent of women in Masvingo are employed in the agricultural sector, yet there is a larger proportion of men and women working in sales and services. The sales and services occupation can still account to the agriculture sector as they may be selling agriculture outputs or livestock formally or informally at markets.

Poor HHs *are* more likely than non-poor HHs to own agricultural assets. For example, 85 percent of poor HHs have access to land for agriculture while 80 percent of non-poor HHs do; and land size seems to be larger for poor HHs (2.97 ha) than non-poor HHs (2.46 ha). Meanwhile, 93 percent of poor HHs own axes or hoes compared to 91 percent of non-poor HHs. This is consistent with broader evidence suggesting that poor HHs in Zimbabwe are more likely to be engaged with (subsistence) agriculture (e.g., Zimbabwe National Statistics Agency and ICF International 2016, p. 53, Table 3.7.1).

Table 1. HH assets and poverty in Masvingo

Has …	Distribution among			Poverty incidence among		
	All	Non-poor	Poor	HH without	HH with	p
Bank account	18.62	23.02	1.07	24.34	1.15	0.00
	(1.35)	(1.63)	(0.63)	(1.63)	(0.68)	
Car / truck	8.36	10.46	0.00	21.85	0.00	0.00
	(0.96)	(1.19)	(0.00)	(1.48)	(0.00)	
Computer	6.82	8.53	0.00	21.49	0.00	0.00
	(0.92)	(1.14)	(0.00)	(1.45)	(0.00)	
Electricity	22.09	26.64	3.90	24.70	3.54	0.00
	(1.43)	(1.72)	(1.05)	(1.68)	(0.96)	
Mobile phone	86.69	92.48	63.58	54.80	14.69	0.00
	(1.15)	(1.00)	(3.65)	(4.61)	(1.31)	
Watch	11.34	13.94	0.99	22.36	1.74	0.00
	(1.13)	(1.38)	(0.55)	(1.52)	(0.98)	
Solar panel	50.18	54.16	34.29	26.42	13.68	0.00
	(1.72)	(1.92)	(3.63)	(2.14)	(1.66)	
Dish / Decoder	17.38	21.73	0.00	24.24	0.00	0.00
	(1.36)	(1.64)	(0.00)	(1.61)	(0.00)	
Washing machine	1.32	1.54	0.45	20.20	6.87	0.07
	(0.33)	(0.39)	(0.45)	(1.38)	(6.61)	
Borehole	2.86	3.42	0.60	20.49	4.24	0.00
	(0.60)	(0.74)	(0.60)	(1.40)	(4.16)	
Chair / Stool	86.52	91.35	67.20	48.71	15.55	0.00
	(1.13)	(1.05)	(3.50)	(4.48)	(1.36)	
Wardrobe	39.96	49.46	2.04	32.67	1.02	0.00
	(1.68)	(1.92)	(0.83)	(2.09)	(0.42)	
Mattress	46.59	56.17	8.37	34.36	3.60	0.00
	(1.72)	(1.90)	(1.98)	(2.23)	(0.87)	
Bed	64.05	76.23	15.42	47.12	4.82	0.00
	(1.65)	(1.65)	(2.65)	(2.88)	(0.87)	
Bed nets for sleeping	59.59	62.30	48.77	25.39	16.39	0.00
	(1.67)	(1.84)	(3.82)	(2.31)	(1.66)	
Pushing tray	34.91	41.75	7.59	28.43	4.36	0.00
	(1.63)	(1.89)	(1.78)	(1.93)	(1.03)	
Land for agriculture	81.20	80.15	85.35	15.60	21.05	0.08
	(1.32)	(1.52)	(2.51)	(2.65)	(1.57)	
Land size	2.57	2.46	2.97			0.05
	(0.11)	(0.12)	(0.22)			
Animal-drawn cart	23.40	26.85	9.59	23.63	8.21	0.00
	(1.46)	(1.71)	(2.34)	(1.66)	(2.02)	
Axe / Hoe	91.02	90.52	93.04	15.53	20.47	0.20
	(0.94)	(1.10)	(1.65)	(3.55)	(1.46)	
Plow	50.65	53.97	37.36	25.41	14.77	0.00
	(1.72)	(1.92)	(3.74)	(2.10)	(1.75)	

Notes: All statistics in this table are percentages except for the last column. The numbers in parentheses are the standard errors for the estimation of the proportion/averages. The last column presents the p-value of the test for equality of poverty incidence for HHs with and without the characteristic in question.
Source: Authors' calculations.

Table 2 presents the distribution of housing materials. Poor and non-poor HHs live in houses built from different materials. Relative to the non-poor, poor HHs are more likely to live in houses with mud or brick walls (48 or 36 percent), leaf roofs (90 percent), and dung floors (72 percent). On the other hand, relative to the poor, non-poor HHs are more likely to live in houses with cement walls (62 percent), asbestos or metal roofs (48 or 29 percent), and cement floors (77 percent).

Table 2. House materials and poverty in Masvingo

	Distribution among			Poverty incidence among		
	All	Non-poor	Poor	HH without	HH with	p
Brick walls	26.58	24.22	36.01	17.45	27.13	0.00
	(1.51)	(1.66)	(3.59)	(1.55)	(2.86)	
Mud walls	18.85	11.57	47.89	12.86	50.88	0.00
	(1.37)	(1.26)	(3.83)	(1.23)	(4.08)	
Cement walls	51.08	62.35	6.04	38.46	2.37	0.00
	(1.72)	(1.88)	(1.45)	(2.42)	(0.57)	
Other types of walls	3.49	1.85	10.06	18.66	57.68	0.00
	(0.67)	(0.55)	(2.47)	(1.35)	(9.71)	
Leaf roof	36.09	22.70	89.56	3.27	49.70	0.00
	(1.65)	(1.60)	(1.99)	(0.64)	(2.87)	
Metal roof	23.60	28.58	3.69	25.24	3.13	0.00
	(1.57)	(1.86)	(1.44)	(1.68)	(1.23)	
Asbestos roof	39.37	47.54	6.75	30.80	3.43	0.00
	(1.64)	(1.91)	(1.43)	(2.09)	(0.72)	
Tiles roof	0.58	0.73	0.00	20.14	0.00	0.00
	(0.13)	(0.16)	(0.00)	(1.38)	(0.00)	
Cement roof	0.08	0.11	0.00	20.04	0.00	0.09
	(0.05)	(0.06)	(0.00)	(1.37)	(0.00)	
Sand floor	9.06	7.08	17.00	18.28	37.56	0.00
	(1.05)	(1.08)	(2.94)	(1.38)	(5.83)	
Dung floor	24.83	13.07	71.77	7.52	57.88	0.00
	(1.50)	(1.31)	(3.33)	(0.99)	(3.46)	
Ceramic floor	1.88	2.25	0.41	20.32	4.36	0.00
	(0.39)	(0.48)	(0.41)	(1.39)	(4.27)	
Cement floor	63.70	76.94	10.82	49.20	3.40	0.00
	(1.67)	(1.64)	(1.97)	(2.90)	(0.63)	

Notes: All statistics in this table are percentages except for the last column. The numbers in parentheses are the standard errors for the estimation of the proportion/averages. The last column presents the p-value of the test for equality of poverty incidence for HHs with and without the characteristic in question.
Source: Authors' calculations.

With respect to livestock ownership, non-poor HHs are more likely to own cattle (at 60 percent relative to 33 percent for non-poor HHs) and goats (55 versus 48 percent). Sheep ownership is also different across poor and non-poor HHs, but only a few HHs own them (8 percent of non-poor versus

4 percent of poor).[5] The importance of livestock in rural livelihoods and food security lies in the provision of meat, milk, eggs, hides & skins, draught power, and manure. They also act as strategic household investment. Small ruminants (sheep and goats) and non-ruminants, particularly poultry, are an important safety net in the event of a drought as they are easily disposable for cash when need arises or during drought crises (FAO, 2019). While statistically significant differences are registered by type of animals, the different in ownership (irrespective of specia) is not statistically significant (82 percent of non-poor HHs own livestock compared to 78 percent of poor HHs).

Distribution of other characteristics associated with poverty

Table 3 presents the distribution of the HHH's characteristics across poor and non-poor HHs. Approximately half of all HHs are headed by women, regardless of poverty status. Poor and non-poor HHHs are similar in age (45 versus 47 years on average); however, they differ by education and marital status. Education provides a foundation for eradicating poverty and providing economic and social well-being. Poor HHs are more likely to have a head who has no schooling (22 versus 9 percent) or a head who has primary education (46 versus 32 percent). Grouping education into two main categories, i.e., primary or less and secondary or more, reveals that poor HHHs are unlikely to have post-secondary education, relative to non-poor HHHs (0.73 versus 12 percent). Furthermore, poor HHHs are more likely to be divorced (10 versus 6 percent). Poor and non-poor HHHs are comparable in terms of their likelihood of being married or widowed, and very few HHHs are single (regardless of poverty status).

Table 3. HHH characteristics, HH structure, and poverty in Masvingo

	Distribution among			Poverty incidence among		
	All	Non-poor	Poor	HH without	HH with	p
HHH is a woman	48.81	48.20	51.24	19.07	21.02	0.48
	(1.72)	(1.92)	(3.82)	(1.88)	(1.99)	
HHH age	46.22	46.55	44.93			0.28
	(0.60)	(0.66)	(1.35)			
HHH education: no schooling	11.20	8.61	21.54	17.69	38.51	0.00
	(1.13)	(1.11)	(3.34)	(1.36)	(5.31)	
HHH education: primary	35.11	32.35	46.11	16.63	26.30	0.00
	(1.63)	(1.79)	(3.80)	(1.60)	(2.51)	
HHH education: secondary	43.59	46.59	31.62	24.27	14.53	0.00
	(1.71)	(1.92)	(3.48)	(1.98)	(1.77)	
HHH education: higher	9.86	12.15	0.73	22.05	1.49	0.00
	(0.99)	(1.22)	(0.47)	(1.50)	(0.96)	
HHH is single	4.40	4.86	2.58	20.42	11.75	0.10
	(0.71)	(0.84)	(1.10)	(1.42)	(4.82)	
HHH is married	70.01	70.18	69.37	20.47	19.86	0.84
	(1.56)	(1.74)	(3.51)	(2.49)	(1.65)	
HHH is widowed	19.19	19.41	18.30	20.26	19.12	0.74
	(1.34)	(1.50)	(2.99)	(1.53)	(3.10)	
HHH is divorced	6.40	5.56	9.75	19.32	30.55	0.07

[5] These statistics are not displayed in Table 1, but they can be generated from ZDHS 2015, in particular using the statistical source files provided with the technical appendix/documentation (or available from the authors upon request).

	Distribution among			Poverty incidence among		
	All	Non-poor	Poor	HH without	HH with	p
	(0.81)	(0.84)	(2.19)	(1.41)	(5.99)	

Notes: All statistics in this table are percentages except for the last column and the HHH's age. The numbers in parentheses are the standard errors for the estimation of the proportion/averages. The last column presents the p-value of the test for equality of poverty incidence for HHs with and without the characteristic in question.
Source: Authors' calculations.

Poor and non-poor HHs have similar composition. Poor and non-poor HHs have just over four members. The dependency ratio is about the same, with 0.6 persons "below 15 or above 65 years of age" in poor HHs and 0.5 persons "below 15 or above 65 years of age" in non-poor HHs.

Safe drinking water and sanitation practices are important as they reduce morbidity from diseases like diarrhea, dysentery, cholera, and typhoid. Poor and non-poor HHs differ in terms of sanitation and hygiene. Poor HHs are less likely to have access to: 1) clean sources of drinking water, 2) a fixed place for washing their hands, and 3) toilet facilities. Typically, poor HHs access drinking water through tubes or boreholes and unprotected wells. On the other hand, non-poor HHs primarily access drinking through pipes into their dwelling and a tube or borehole. Most HHs do not have access to a place for washing their hands; however, the lack of access is greater for poor HHs (93 percent versus 76 percent). For non-poor HHs, 20 percent have a mobile place for washing their hands, compared to 5 percent of poor HHs. Eighty-five percent of poor HHs have no toilet facility, compared to 33 percent of non-poor HHs.

These statistics compare to 44 percent of HHs using an improved water source and a third of HHs using a non-shared improved sanitation facility in the Amalima and ENSURE programs (ICF International 2015, p. ix). According to Zimbabwe National Statistics Agency and ICF International (2016, p. 8–10), 67 percent of HHs in Masvingo have access to an improved water source and 23 percent of HHs in Zimbabwe do not have access to a toilet facility.

Analysis of poverty disaggregated by rural-urban and sex of the HHH

As previously mentioned, ZDHS 2015 does not allow for sub-province analysis. This section thus presents statistics disaggregated by rural versus urban areas. Disaggregation by rural versus urban areas illustrates that the associations between several characteristics and poverty highlighted thus far are different across rural and urban areas.

Assets. Having access to electricity has a bigger impact on poverty in urban areas, but 9 in 10 HHs in urban areas have electricity. On the other hand, ownership of solar panels makes a statistically significant difference in poverty only in rural areas. Beds and pushing trays make a bigger difference in poverty for rural HHs. Owning agricultural land or axes/hoes is synonymous with being poor in rural areas; whereas the opposite is true for urban HHs. Owning an animal-drawn cart is significantly associated with being non-poor, but only in rural areas.

Livestock. Ownership of horses and sheep only differentiates poor and non-poor HHs in rural areas; whereas ownership of chickens only differentiates poor and non-poor HHs in urban areas. Cattle and goats are significantly associated with poverty both in rural and urban areas, but the association is stronger in urban areas than in rural areas. HHs that own cattle or goats are less likely to be poor.

House materials. In rural areas, those living in houses with brick or mud walls are more likely to be poor; whereas those living in houses with cement walls are less likely to be poor. Moreover, asbestos and metal roofs are associated with lower prevalence of poverty, whereas leaf roofs are associated with higher prevalence of poverty. Dung and sand floors are associated with the highest prevalence of poverty in rural areas; whereas only 2 percent of rural HHs with cement floors are poor. In urban areas, only sand floors are significantly associated with higher incidence of poverty; however, less than 1 percent of houses in urban areas have such floors.

Characteristics of the HHH. More educated HHHs are less likely to be poor when the HHH is female. Meanwhile, widowed HHHs who are female are more likely to be poor; whereas widowed HHHs who are male are less likely to be poor.

Asset ownership and poverty by sex of the HHH. HHs with electricity are equally likely (3 percent) to be poor regardless of the HHH's sex. Otherwise, most assets make a greater difference in poverty for female HHHs than for HHs headed by men. For example, 21 percent of male-headed HHs without electricity are poor versus 27 percent for female-headed HHs without electricity. Moreover, mobile phones and solar panels present the greatest difference in poverty across female and male HHHs. One exception is watch ownership, which is statistically significantly associated with a decrease in poverty incidence, but only for male HHHs.

Characteristics of the individual. These results are based on men age 15–54 and women age 15–49 to whom additional questions were asked as part of ZDHS 2015. Poor HHs contain more women than non-poor HHs: 61 percent of members of poor HHs are women compared to 54 percent of members in non-poor HHs. This translates to a 4 percentage point/s (pp) increase in the likelihood of women being poor relative to men. Poor individuals are less educated. Overall, very few individuals have no schooling (less than 2 percent). Fifty percent of poor individuals have at most a primary level of education, compared to 21 percent of non-poor individuals. Less than 1 percent of poor individuals have post-secondary education compared to 10 percent of non-poor individuals. Lower education levels impact employment prospects: 57 percent of those experiencing poverty have no jobs compared to 46 percent of those classified as non-poor. Non-poor individuals are more likely to be engaged in professional occupations (10 versus 1 percent) and sales occupations (11 versus 7 percent). Poor individuals are more likely to be self-employed farmers.

Econometric analysis of HH poverty

This section presents findings from an econometric specification that essentially includes all potentially relevant covariates, i.e., the full set of variables that have been studied one by one thus far. An econometric approach is superior because it reduces concerns of omitted variable bias. Also, previous analyses already shed light on potential pairwise associations with poverty.

Specifically, Table 5 (refer to the Annex) presents estimates from an ordinary least squares (OLS) regression of a dummy for whether or not the HH is poor on an extensive list of variables, primarily informed by a review of the literature (see technical Annex for the full list of references that were consulted).

Assets. HHs who own a mobile phone, watch, solar panel, chair, mattress, or bed are less likely to be poor. Poverty decreases by 16 pp if the HH owns a bed, the largest increase for the ownership of any asset, followed by owning a mobile phone (15 pp less likely to be poor) and owning a chair/stool (13 pp less likely).

Livestock. Ownership of cattle or horses is associated with a decrease in the likelihood of being poor. HHs that own cattle are 5 pp less likely to be poor while HHs that own horses are 9 pp less likely. Meanwhile, HHs that own chickens are 5 pp more likely to be poor.

House materials. HHs living in dwellings with leaf roofs or dung floors are more likely to be poor. Meanwhile, those living in houses with brick walls are 12 pp less likely to be poor.

Water and sanitation. HHs that access drinking water through pipes into the dwelling, a tube or borehole, a protected well, or an unprotected well are less likely to be poor. Also, HHs that have access to a pit latrine with slab are 23 pp less likely to be poor relative to those who have no toilet.

Other characteristics. Sex and age of the HHH are not statistically associated with the likelihood of being poor. Education, on the other hand, is. HHs headed by individuals with a post-secondary education are 8 pp more likely to be poor compared to HHs headed by individuals with no schooling. This result is counterintuitive and thus should be taken with caution. The dependency ratio is also significantly associated with poverty. Further analysis (not shown in Table 5) suggests that the effect of the dependency ratio is driven by the number of children below age 5. Finally, divorced HHHs are significantly more likely to be poor compared to HHs headed by single individuals.

III. Child malnutrition in Manicaland

Analysis of malnutrition is challenging due to the relatively small sample size (N=614 children). The main outcome variables here are stunting and wasting. Stunting is prioritized as a measure of child malnutrition, especially in the pairwise analysis for the following reasons: first, stunting measures long-term malnutrition whereas wasting measures short-term malnutrition. Second, although wasting is easier to reverse, a proper targeting of stunting ensures that one reaches the chronically vulnerable.[6] Thus, stunting captures potentially more serious malnutrition issues. Finally, given the even smaller sample size of wasted children, pairwise analysis of wasting is more likely to lead to misleading results.

In an effort to increase precision of the estimates due to lack of statistical power, Table 8 presents results from an econometric specification (see separate technical appendix for an estimating equation) that essentially includes all potentially relevant covariates. This analysis considers wasting alongside stunting in order to complement the insights obtained from the stunting analysis. The choice of explanatory variables underlying this specification is mainly informed by a review of the literature, particularly a meta-analysis by Charmarbagwala et al. (2004), which suggests three main characteristics: 1) those of the HH, including those of the HHH; 2) those of the parents of the child; and 3) those of the child.[7]

Given the concerns raised above, it is best to be cautious when deriving policy and targeting recommendations from this analysis. A key take-away should be that when associations are not statistically significant, this could be due to the sample size (i.e., lack of statistical power) and not because such characteristics are not relevant for stunting and/or wasting.

[6] Devereux (2006) discusses chronic and transitory food insecurity in emergency assessment.
[7] Characteristics of the place of residence are also used in the literature, but those are not included for reasons explained in the appendix.

Child stunting

HH-level characteristics

The incidence of stunting is higher at lower levell of education of the HHH. Stunted children tend to live in HHs where the head has no schooling, whereas non-stunted children tend to live in HHs where the head has a post-secondary education. Stunted children are more likely to live in HHs headed by women, but this difference is not statistically significant. There is no clear pattern between marital status of the HHH and stunting.

Stunted children are more likely to live in houses with brick or mud walls, whereas non-stunted children are more likely to live in houses with cement walls (table of results not in the report).[8] The type of wall seems to be, on its own, a distinctive (i.e. significant) feature of stunting. Stunted children are likely to live in houses with leaf roofs whereas non-stunted children are more likely to live in houses with asbestos roofs. Similarly, stunted children are more likely to live in houses with sand floors whereas non-stunted children are more likely to live in houses with cement floors.

Table 4. Characteristics of the HHH and child malnutrition in Masvingo

	Distribution among			Stunting prevalence among		
	All	Non-stunted	Stunted	Children without	Children with	p
HHH is a woman	46.30 (1.83)	44.00 (2.31)	49.60 (3.98)	23.58 (2.31)	27.87 (2.67)	0.22
HHH education: no schooling	8.72 (1.03)	7.54 (1.23)	13.79 (2.74)	24.22 (1.80)	38.52 (6.51)	0.02
HHH education: primary	34.53 (1.74)	32.90 (2.18)	31.43 (3.69)	25.94 (2.14)	24.68 (3.04)	0.73
HHH education: secondary	49.08 (1.83)	50.23 (2.32)	50.82 (3.98)	25.30 (2.48)	25.75 (2.47)	0.90
HHH education: higher	7.62 (0.97)	9.33 (1.35)	3.96 (1.55)	26.64 (1.85)	12.69 (4.78)	0.03
HHH is single	0.26 (0.18)	0.35 (0.28)	0.00 (0.00)	25.60 (1.75)	0.00 (0.00)	0.45
HHH is married	85.69 (1.28)	85.57 (1.63)	88.16 (2.57)	21.96 (4.50)	26.10 (1.90)	0.41
HHH is widowed	10.47 (1.12)	10.89 (1.45)	10.23 (2.41)	25.67 (1.85)	24.36 (5.29)	0.82
HHH is divorced	3.58 (0.68)	3.19 (0.82)	1.61 (1.00)	25.84 (1.78)	14.77 (8.77)	0.30

Notes: All statistics in this table are percentages, except for the last column. The numbers in parentheses are the standard errors for the estimation of the proportion/averages. The last column presents the p-value of the test for equality of stunting among children with and without the characteristic in question.
Source: Authors' calculations.

[8] Unless otherwise noted, all statements are in relative terms, comparing stunted and non-stunted children's characteristics. For example, more stunted children live in houses with brick or mud walls relative to non-stunted children. In absolute terms, there are actually more stunted children in brick houses, but that is due to the general structure of houses in the province.

Parent characteristics

In what follows (Table 6 refer to annex), "father" refers to the husband or partner of the child's mother. Most children live in HHs where the head is their father. Living in a HH where the mother is the head significantly increases the incidence of stunting.

Stunting is significantly more prevalent when the mother has little or no schooling. Having a head that has a secondary degree is significantly associated with a decrease of stunting. Overall, the mother's education is associated with better children's health and nutritional outcomes through improving the socioeconomic status of mothers.

There seems to be a difference in stunting with respect to the religion of the mother, as children of apostolic-sect mothers are more likely to be stunted. On the other hand, stunting is less prevalent when the mother is Roman Catholic or does not practice any religion.

The only case where the mother's occupation is significantly associated with stunting is when she is a self-employed farmer: children of women farmers are significantly more stunted than other children.

Children whose mothers experience emotional violence are more likely to be stunted. This is the only type of violence that was found to be significantly associated with stunting.

Stunted children's mothers are less likely to have taken iron tablets during pregnancy. There is no such difference with regard to taking deworming drugs during pregnancy.

Recalling the prior definition of "father," there is no significant association between stunting and the father's education. On the other hand, some types of occupations for the father make a significant difference in stunting prevalence. Fathers who are employed as professionals or in clerical occupations have children who are less likely to be stunted. Children of self-employed farmers, on the other hand, are more likely to be stunted.

Child characteristics

As noted earlier, 27 percent of all children under five are stunted in Masvingo province. Sixty-five percent of them are boys (Table 7 refer to annex). Stunted children have on average the same age as non-stunted children.

One of the most prominent risk factors for stunting is low birth weight. Children who are small at birth tend to be more likely to be stunted. Size at birth is significantly associated with stunting, with stunting decreasing with the child's size at birth. Stunted kids are significantly more likely to have been very small or smaller than average when they were born, whereas non-stunted kids are significantly more likely to have been larger than average when they were born. This points to a permanent component of stunting among children.

Breastfeeding is a protective factor against stunting, and the World Health Organization (WHO), recommends children to be exclusively breastfed during the first six months to promote optimal growth and development. The share of children that were never breastfed is the same among stunted and non-stunted children. Stunted children are less likely to still be breastfed, and conversely, non-stunted children are more likely to still be breastfed.

Stunting is associated with increased morbidity and mortality. Due to their weakened immune systems, stunted children are more susceptible to illness. However, the results indicate that there does not seem to be a link between stunting and the prevalence of anemia in Masvingo. While anemia rises with stunting, the prevalence of anemia is statistically similar for stunted and non-stunted children (no matter the degree of anemia). The share of stunted children suffering from severe anemia is slightly higher than the share among stunted children, but overall there are relatively few severely anemic children (less than 1 percent). Stunted children tend to experience significantly more coughs and shortness of breath.

Children that are less likely to sleep in bed nets are more susceptible to vector borne diseases which can lead to an array of symptoms. Stunted children are more likely to live in HHs with no nets, and when they do have them, they are significantly more likely to be in HHs where no kids sleep under nets.

Vaccinated children seem to be less likely to be stunted than non-vaccinated children, however the difference in coverage is not statistically significant across stunted and non-stunted children. In terms of their diets, stunted children are more likely to eat grains, green vegetables, and legumes. This result is counterintuitive and warrants further investigation.

Econometric analysis of child malnutrition

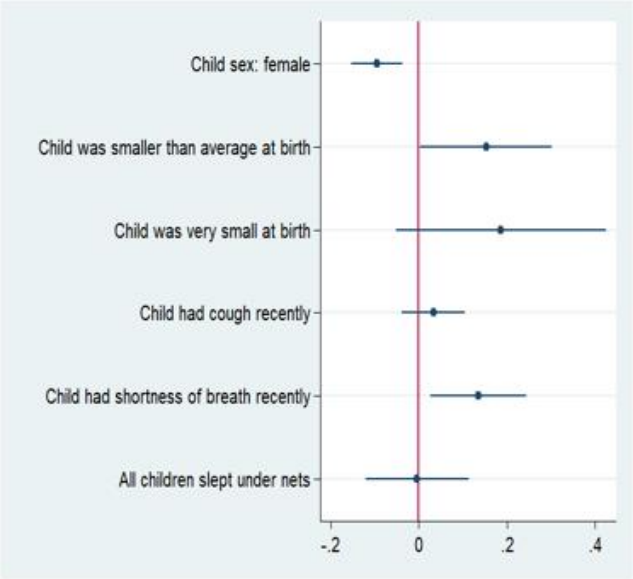
The econometric analysis (Table 8 in the Annex) has been conducted separately for all children as well as for children living with both parents in order to include father characteristics. Since vaccination and dietary questions were only asked for a subset of children, these variables are not included in the analysis.

Once several other factors are accounted for, girls are significantly less likely to be stunted (Table8, Figure 4). Stunting prevalence is 10 percentage points (pp) lower among girls. Although the data suggest a pattern, stunting does not change with age of the children. In Figure 4, stunted children are more likely to be small at birth. Size at birth is a significant predictor of stunting, even when all other factors are controlled for.

Recent morbidity is also significantly associated with the incidence of stunting. As observed in the pairwise analysis, children who have shortness of breath are significantly more likely to be stunted (Figure 4). There seems to be a statistical association with the incidence of diarrhea as well but only for children who live with both parents.

There is no statistical association between stunting and the child sleeping under a net, once other factors are controlled for. This association does hold for wasting, suggesting a similar relationship to what was observed when exploring the pairwise link between stunting and sleeping under net. Children in HHs with nets who do not sleep under such nets are

Figure 4. Child's key predictors of stunting in Masvingo



Source: Authors' calculations

significantly more likely to be wasted. The timing of this association is a bit unclear; however, part of this probably has to do joint occurrence of wasting and not sleeping under a net (i.e., the relationship is unlikely to be causal).

Age of the mother is weakly associated with stunting, suggesting a moderate increase in stunting as the child is born later in the mother's life. There is some significant association between religious practices of the mother and stunting among children. Compared to mothers who do no practice any religion, children whose mothers are Protestant, Pentecostal or in an apostolic sect are significantly more likely to be stunted. For mothers who are in apostolic sect, there is also a weakly, but significantly, higher incidence of wasting.

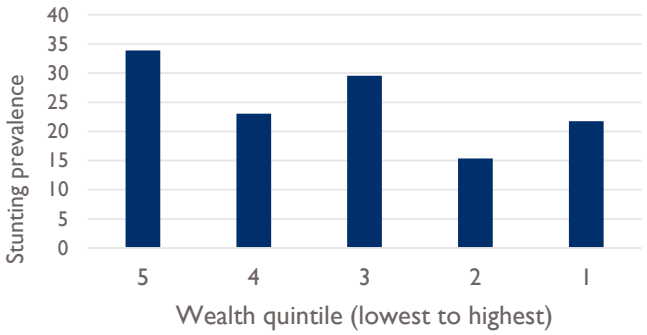
The relationship of the mother with the HHH does not have any impact on the incidence of child malnutrition. The same is true for marital status and education. Children whose mothers are self-employed farmers are more likely to be stunted.

When considering women who are in a relationship (i.e., married or living with a partner), the father's occupation does not seem to be associated with stunting, but some patterns emerge when looking at wasting. Children whose father works in sales or agriculture (as self-employed or employee farmers) are most likely to be stunted. The father's education has no impact on child malnutrition. Finally, children whose mothers can make sole decisions with regard to earnings are more likely to be stunted.

Child malnutrition and HH poverty

The link between poverty and child malnutrition is assessed by looking at the prevalence of stunting by quintile of the asset index distribution (Figure 5). Stunted children are over-represented in the bottom quintile. More than a third of stunted children live in HHs that are poor by the definition maintained in this report. While stunting does not have a clear relationship with the wealth index, it is safe to say that stunting is lowest in the top two quintiles (i.e. the wealthier households).

Figure 5. Stunting prevalence by wealth quintile in Masvingo



Source: Authors' calculations.

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Annexes

Annex 1. Methodology

Research questions

- **RQ1:** What are the characteristics of HHs and individuals with high levels of poverty, low levels of access to food, and high levels of acute and chronic malnutrition for each of the targeted provinces?
- **RQ2:** How do the characteristics of HHs and individuals with high levels of poverty and high levels of acute and chronic malnutrition vary geographically across each of the targeted provinces?
- **RQ3:** How do the characteristics of HHs and individuals (as described in RQ 1) with high levels of poverty and high levels of acute and chronic malnutrition for each of the targeted provinces compare to HHs and individuals for those indicators that are not target populations (by quintile or that are above -2 z-score for nutrition)?
- **RQ4:** What predictors are highly associated with high levels of poverty and high levels of acute and chronic malnutrition in each of the targeted provinces?

Theoretical framework and prior literature

The theoretical framework for this study, particularly as it pertains to nutrition, dates back to the theory of human capital by Becker (1981), which has since been adapted by Currie (2000). The framework assumes that HHs maximize utility, which can be a function of nutrition and consumption, and relates nutrition to HH characteristics. The same framework can be used to study poverty, as poverty status is usually defined by a variable that captures consumption, e.g., food consumption, by a HH. Food consumption, and thus poverty in this context will be a function of characteristics that explain how much labor the HH supplies and how much it can earn from this labor given the conditions in which such decisions are made.

Prior literature suggests potential determinants (i.e., variables to be included in the analysis) of poverty and child malnutrition at three different levels:

- the community (e.g., unemployment rate, rural/urban status, access to sanitation)
- the HH, including:
    - Characteristics of the HHH (e.g., age, sex, education, employment status)
    - Other characteristics of the HH (e.g., poverty status, assets)
- the individual, including:
    - Characteristics of HH members (e.g., size, dependency ratio, average level of education)
    - Characteristics of parents (e.g., alive, age, ethnicity, education, employment status)
    - Characteristics of the child (e.g., sex, age, birth order, number of younger siblings, immunization, previous/recent illnesses)

Data and methodology

The data for the study come from the 2015 ZDHS. The data are representative at the province level and, within province, at the rural/urban level.[9] This implies that the province is the equivalent of the community. However, in general, a province is larger than a community. Since the analysis is done within the three provinces of interest, community-level variables cannot be included. Instead, disaggregated analyses are conducted by rural versus urban.

The main indicators used are poverty, stunting, and wasting. A HH is poor if it falls, within its province, in the bottom quintile of the distribution of the asset index computed in the 2015 ZDHS. A child is stunted if his/her z-score of height-for-age is below -2 SD. A child is wasted if his/her z-score of weight-for-height is below -2 SD. The z-scores have been computed in terms of SD from the median of the World Health Organization reference population (see the 2015 ZDHS documentation for additional detail).

The research approach consists of two parts:

1. Documentation and description of the dimensions of vulnerability (i.e., poverty, wasting and stunting) by highlighting associations with other characteristics that will eventually help identify HHs that are at high risk of vulnerability. This is achieved by presenting descriptive tables, figures, and/or graphs associating HH and child characteristics to HH poverty and child malnutrition.
2. An econometric analysis of the association between characteristics and the vulnerability dimension.

Moreover, the analysis includes some disaggregation: for example, by sex of the HHH and by urban versus rural of the area.

Limitations

It is important to note some limitations. First, in conducting the poverty analysis, there is no consumption or revenue data. As such, the study relies on "asset index wealth" as the proxy for poverty. Although poverty is a multidimensional concept, consumption or revenue data (i.e., to assert what HHs consume) remain the main measure of HH welfare. This, in turn, is usually augmented along other dimensions such as educational attainment in order to account for the "capabilities aspect" of poverty. So, this analysis primarily captures a more permanent/long-term dimension of poverty/welfare.

Second, due to the lack of experimental data (e.g., from a randomized controlled trial) or a clear instrumental variable, the analysis is primarily descriptive and/or correlative, as opposed to causal. It is therefore important to interpret the findings, particularly for RQ4, as associative rather than causal.

Third, there are additional variables (such as behavioral characteristics that capture risk and time preferences) that would have been interesting to exploit. However, these are not present in the DHS.

Finally, since the child malnutrition data are available for a relatively small sample, only select covariates can be included and any related findings should be interpreted with particular caution.

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[9]See Sections 1.2, 1.3, 1.7, and 1.8 of the 2015 ZDHS report for more details on the data: https://dhsprogram.com/pubs/pdf/FR322/FR322.pdf.

Annex 2. Tables

Table 5. Regression analysis (Ordinary Least Squares) of poverty in Masvingo

Characteristic	OLS estimate
Assets	
Bank account	0.003 (0.028)
Computer	-0.054 (0.038)
Electricity	-0.027 (0.043)
Mobile phone	-0.152 (0.025)***
Watch	-0.052 (0.027)**
Solar panel	-0.039 (0.018)**
Dish / Decoder	-0.037 (0.033)
Washing machine	-0.063 (0.071)
Borehole	0.010 (0.047)
Chair / Stool	-0.128 (0.024)***
Wardrobe	0.025 (0.022)
Mattress	-0.034 (0.020)*
Bed	-0.163 (0.022)***
Bed nets for sleeping	-0.008 (0.017)
Pushing tray	-0.028 (0.018)
Land for agriculture	-0.027 (0.026)
Animal-drawn cart	0.012 (0.023)
Axe / Hoe	0.012 (0.033)
Plow	0.011 (0.021)
# of rooms for sleeping	0.005 (0.009)
House materials	
Brick walls (base = other materials)	-0.117 (0.045)***
Mud walls	0.006 (0.046)
Cement walls	-0.077 (0.048)

Characteristic	OLS estimate
Leaf roof (base = other materials)	0.277 (0.091)***
Metal roof	0.043 (0.089)
Asbestos roof	0.110 (0.089)
Cement roof	-0.019 (0.275)
Sand floor (base = other materials)	0.044 (0.116)
Dung floor	0.244 (0.114)**
Ceramic floor	-0.011 (0.122)
Cement floor	-0.014 (0.111)
Animals	
Cattle	-0.051 (0.020)**
Sheep	0.011 (0.032)
Goats	-0.016 (0.019)
Horses	-0.086 (0.028)***
Chickens	0.050 (0.020)**
Rabbits	0.026 (0.044)
HHH characteristics and HH structure	
HHH is a woman	-0.016 (0.019)
HHH age	-0.001 (0.001)
HHH education: primary (base = no schooling)	0.040 (0.029)
HHH education: secondary	0.013 (0.033)
HHH education: higher	0.079 (0.046)*
HHH is married	0.008 (0.042)
HHH is widowed	-0.027 (0.049)
HHH is divorced	0.087 (0.051)*
HH size	-0.001 (0.004)
Dependency ratio of the HH	0.085 (0.035)**
Water access, hygiene and sanitation	
Drinking water: piped into dwelling (base = other	-0.170

Characteristic	OLS estimate
sources)	(0.083)**
Drinking water: piped to yard	-0.126 (0.088)
Drinking water: piped to neighbor	0.139 (0.105)
Drinking water: public tap	-0.029 (0.067)
Drinking water: tube or borehole	-0.060 (0.025)**
Drinking water: protected well	-0.104 (0.033)***
Drinking water: unprotected well	-0.027 (0.029)
Drinking water: protected spring	-0.071 (0.156)
Drinking water: unprotected spring	-0.204 (0.051)***
Mobile place for hand washing (base = fixed place)	0.001 (0.027)
No place for hand washing	-0.099 (0.051)*
Toilet: flushed to sewer (base = no toilet)	0.081 (0.070)
Toilet: ventilated improved pit latrine	-0.174 (0.096)*
Toilet: pit latrine with slab	-0.231 (0.098)**
Toilet: pit latrine without slab/open pit	-0.196 (0.103)*
Toilet: no facility/ bush/ field	-0.168 (0.097)*
Toilet: other	0.154 (0.211)
R^2	0.58
Adjusted R^2	0.56
F-stat	25.41
P-value for joint significance	0.00
N	1066

*** p<0.1; ** p<0.05; *** p<0.01**

Table 6. Characteristics of the mother and child malnutrition in Masvingo

Mothers' characteristics	Distribution among			Stunting prevalence among		
	All	Non-stunted	Stunted	Children without	Children with	p
Mother is HHH	32.69 (1.72)	30.22 (2.13)	37.98 (3.86)	23.35 (2.06)	30.11 (3.25)	0.07
Mother is HHH's wife	42.62 (1.81)	44.96 (2.31)	39.42 (3.89)	27.39 (2.38)	23.11 (2.56)	0.23
Mother is HHH's daughter	7.49 (0.96)	8.15 (1.27)	6.29 (1.93)	25.91 (1.83)	20.91 (5.95)	0.45
Mother is HHH's daughter-in-law	10.06 (1.10)	10.50 (1.42)	11.35 (2.52)	25.35 (1.85)	27.04 (5.48)	0.77
Mother's education: no schooling	1.78 (0.48)	1.02 (0.47)	4.61 (1.67)	24.83 (1.75)	60.83 (14.69)	0.00
Mother's education: primary education	32.27 (1.71)	30.71 (2.14)	37.81 (3.86)	23.53 (2.07)	29.68 (3.22)	0.10
Mother's education: secondary education	60.57 (1.79)	62.11 (2.25)	53.92 (3.97)	29.42 (2.89)	22.94 (2.18)	0.07
Mother's education: higher education	5.38 (0.83)	6.16 (1.12)	3.66 (1.49)	26.03 (1.81)	16.93 (6.49)	0.23
Mother's religion: Roman Catholic	6.10 (0.88)	6.94 (1.18)	2.59 (1.26)	26.41 (1.82)	11.36 (5.34)	0.04
Mother's religion: Protestant	14.45 (1.29)	15.72 (1.69)	12.89 (2.67)	26.16 (1.91)	21.94 (4.30)	0.39
Mother's religion: Pentecostal	17.28 (1.38)	16.85 (1.74)	17.50 (3.02)	25.38 (1.92)	26.25 (4.29)	0.85
Mother's religion: Apostolic Sect	53.07 (1.83)	50.23 (2.32)	60.70 (3.89)	21.30 (2.39)	29.29 (2.51)	0.02
Mother's religion: None	4.45 (0.75)	5.17 (1.03)	1.83 (1.07)	26.19 (1.80)	10.84 (6.11)	0.07
Mother was never in a union	1.85 (0.49)	1.77 (0.61)	2.49 (1.24)	25.39 (1.76)	32.56 (14.03)	0.57
Mother is married	87.73 (1.20)	89.31 (1.44)	89.81 (2.41)	24.63 (5.35)	25.64 (1.85)	0.86
Mother lives with partner	1.20 (0.40)	1.20 (0.51)	1.11 (0.83)	25.55 (1.76)	24.08 (16.97)	0.93
Mother is a widow	2.93 (0.62)	2.38 (0.71)	2.10 (1.14)	25.58 (1.77)	23.27 (11.56)	0.84
Mother is divorced	2.24 (0.54)	1.92 (0.64)	0.79 (0.70)	25.75 (1.77)	12.35 (10.87)	0.33
Mother is separated from partner	4.04 (0.72)	3.42 (0.84)	3.69 (1.50)	25.48 (1.78)	27.02 (9.75)	0.87
Mother occupation: professional or clerical	5.20	6.18	3.69	26.09	17.06	0.24

Mothers' characteristics	Distribution among			Stunting prevalence among		
	All	Non-stunted	Stunted	Children without	Children with	p
	(0.82)	(1.13)	(1.51)	(1.82)	(6.53)	
Mother occupation: sales	16.48	16.72	18.53	25.17	27.60	0.60
	(1.37)	(1.74)	(3.10)	(1.92)	(4.36)	
Mother occupation: agricultural, self-employed	6.67	4.50	15.32	23.37	53.92	0.00
	(0.92)	(0.97)	(2.88)	(1.77)	(7.53)	
Mother occupation: agricultural, employed	0.41	0.66	0.00	25.71	0.00	0.31
	(0.23)	(0.38)	(0.00)	(1.77)	(0.00)	
Mother occupation: HH and domestic	2.26	2.12	0.66	25.87	9.72	0.23
	(0.55)	(0.67)	(0.65)	(1.78)	(9.48)	
Mother occupation: services	4.91	3.72	4.49	25.44	29.33	0.67
	(0.80)	(0.88)	(1.65)	(1.79)	(9.47)	
Mother occupation: skilled manual	2.15	1.55	3.30	25.25	42.30	0.18
	(0.53)	(0.58)	(1.43)	(1.77)	(14.70)	

Notes: All statistics in this table are percentages, except for the last column. The numbers in parentheses are the standard errors for the estimation of the proportion/averages. The last column presents the p-value of the test for equality of stunting among children with and without the characteristic in question.

Table 7. Characteristics of the child and child malnutrition in Masvingo

Child characteristics	Distribution among			Stunting prevalence among		
	All	Non-stunted	Stunted	Children without	Children with	p
Child gender: female	48.65 (1.83)	49.84 (2.32)	35.50 (3.81)	30.60 (2.52)	19.63 (2.35)	0.00
Pregnancy wanted then	66.42 (1.73)	66.85 (2.19)	63.20 (3.84)	27.57 (3.07)	24.48 (2.12)	0.40
Pregnancy wanted later	26.13 (1.61)	26.71 (2.06)	23.88 (3.39)	26.26 (2.05)	23.46 (3.34)	0.48
Pregnancy not wanted	7.45 (0.96)	6.44 (1.14)	12.93 (2.67)	24.19 (1.79)	40.75 (6.99)	0.01
Child at birth was very large	4.74 (0.78)	5.76 (1.08)	3.32 (1.43)	26.02 (1.81)	16.50 (6.67)	0.23
Child at birth was larger than average	32.12 (1.71)	35.61 (2.23)	20.40 (3.21)	29.76 (2.22)	16.42 (2.64)	0.00
Child at birth had average size	47.62 (1.83)	47.89 (2.32)	54.01 (3.96)	23.23 (2.38)	27.89 (2.56)	0.18
Child at birth was smaller than average	11.26 (1.16)	8.48 (1.29)	16.63 (2.96)	23.80 (1.81)	40.21 (6.09)	0.00
Child at birth was very small	2.41 (0.56)	1.30 (0.53)	4.11 (1.58)	24.98 (1.75)	52.03 (14.69)	0.03
Child was breastfed, not anymore	67.49 (1.71)	62.42 (2.25)	75.17 (3.44)	18.47 (2.66)	29.22 (2.25)	0.00
Child has never been breastfed	2.36 (0.56)	0.67 (0.38)	0.93 (0.76)	25.48 (1.75)	32.42 (24.76)	0.73
Child still breastfed	30.14 (1.68)	36.91 (2.24)	23.89 (3.39)	29.26 (2.24)	18.16 (2.67)	0.00
Anemia level: severe	0.74 (0.37)	0.32 (0.29)	1.86 (1.11)	27.48 (1.93)	68.90 (26.57)	0.06
Anemia level: moderate	11.45 (1.37)	10.66 (1.57)	13.14 (2.77)	27.23 (2.04)	32.16 (6.03)	0.42
Anemia level: mild	18.58 (1.67)	18.51 (1.97)	19.39 (3.24)	27.57 (2.14)	28.73 (4.53)	0.82
Anemia level: not anemic	69.23 (1.98)	70.50 (2.32)	65.62 (3.90)	30.97 (3.60)	26.37 (2.29)	0.27
Child had diarrhea recently	16.75 (1.40)	16.02 (1.70)	21.62 (3.27)	24.24 (1.89)	31.63 (4.48)	0.11
Child had fever recently	12.21 (1.23)	12.15 (1.52)	16.37 (2.94)	24.61 (1.85)	31.58 (5.15)	0.18
Child had cough recently	36.12 (1.80)	33.33 (2.19)	45.99 (3.96)	21.73 (2.08)	32.12 (3.10)	0.00
Child had shortness of breath recently	10.20	8.28	18.73	23.30	43.68	0.00

Child characteristics	Distribution among			Stunting prevalence among		p
	All	Non-stunted	Stunted	Children without	Children with	
	(1.13)	(1.28)	(3.10)	(1.80)	(6.05)	
No child slept under nets	47.25	49.78	41.65	28.55	22.35	0.08
	(1.88)	(2.33)	(3.92)	(2.51)	(2.42)	
All children slept under nets	8.65	8.43	9.04	25.46	26.96	0.81
	(1.06)	(1.29)	(2.28)	(1.83)	(6.13)	
Some children slept under nets	3.87	3.92	4.31	25.51	27.45	0.83
	(0.72)	(0.90)	(1.62)	(1.79)	(9.11)	
No nets in the HH	40.23	37.87	44.99	23.34	29.01	0.11
	(1.84)	(2.26)	(3.96)	(2.19)	(2.90)	

Notes: All statistics in this table are percentages, except for the last column. The numbers in parentheses are the standard errors for the estimation of the proportion/averages. The last column presents the p-value of the test for equality of stunting among children with and without the characteristic in question.

Table 8. Regression analysis of child malnutrition associations in Masvingo

Dependent variable	(1) Stunting	(2) Stunting	(3) Wasting	(4) Wasting
Sample of children	All children	Living with two parents	All children	Living with two parents
Child gender: female	-0.095	-0.058	0.031	0.024
	(0.035)***	(0.038)	(0.015)**	(0.017)
Child's age in months	-0.002	-0.001	0.001	0.001
	(0.002)	(0.002)	(0.001)	(0.001)
Pregnancy wanted later	0.023	0.038	-0.028	-0.015
	(0.043)	(0.045)	(0.019)	(0.021)
Pregnancy not wanted	0.046	0.068	-0.030	-0.033
	(0.073)	(0.082)	(0.032)	(0.038)
Child at birth was larger than average	-0.041	-0.014	0.011	0.011
	(0.079)	(0.085)	(0.035)	(0.038)
Child at birth had average size	0.027	0.080	0.061	0.072
	(0.076)	(0.082)	(0.033)*	(0.037)*
Child at birth was smaller than average	0.153	0.138	0.027	0.036
	(0.091)*	(0.097)	(0.040)	(0.044)
Child at birth was very small	0.187	0.145	0.017	-0.016
	(0.145)	(0.152)	(0.063)	(0.069)
Child was breastfed, not anymore	-0.140	-0.103	0.073	0.068
	(0.202)	(0.203)	(0.088)	(0.092)
Child still breastfed	-0.304	-0.267	0.148	0.146
	(0.210)	(0.212)	(0.092)	(0.096)
Child had vitamin A last 6 months	-0.029	-0.021	0.002	-0.001
	(0.038)	(0.041)	(0.017)	(0.019)
Child had diarrhea recently	0.051	0.115	0.069	0.088
	(0.049)	(0.055)**	(0.022)***	(0.025)***
Child had fever recently	0.016	0.042	-0.044	-0.043
	(0.056)	(0.061)	(0.024)*	(0.028)
Child had cough recently	0.033	0.024	0.024	0.028
	(0.043)	(0.048)	(0.019)	(0.022)
Child had shortness of breath recently	0.135	0.149	0.004	-0.022
	(0.066)**	(0.072)**	(0.029)	(0.033)
No child slept under nets	-0.054	-0.071	0.037	0.046
	(0.040)	(0.044)	(0.018)**	(0.020)**
All children slept under nets	-0.003	-0.045	-0.001	0.006
	(0.071)	(0.077)	(0.031)	(0.035)
Some children slept under nets	-0.011	-0.006	0.022	0.028
	(0.095)	(0.100)	(0.042)	(0.045)
Mother is HHH	0.120	0.195	0.003	0.017
	(0.101)	(0.126)	(0.044)	(0.057)
Mother's age at child's birth	0.006	0.008	-0.000	-0.001
	(0.004)*	(0.004)*	(0.002)	(0.002)
Mother's education: primary education	-0.125	-0.135	0.089	0.116
	(0.152)	(0.165)	(0.075)	(0.086)
Mother's education: secondary education	-0.179	-0.204	0.102	0.138
	(0.160)	(0.175)	(0.079)	(0.091)
Mother's education: higher education	-0.125	-0.057	0.155	0.109
	(0.209)	(0.231)	(0.098)	(0.114)

Dependent variable	(1) Stunting	(2) Stunting	(3) Wasting	(4) Wasting
Sample of children	**All children**	**Living with two parents**	**All children**	**Living with two parents**
Mother is married	-0.105	-0.136	-0.026	-0.152
	(0.162)	(0.172)	(0.071)	(0.078)*
Mother lives with partner	-0.030		0.128	
	(0.228)		(0.099)	
Mother is a widow	-0.143		-0.003	
	(0.198)		(0.086)	
Mother is divorced	-0.165		-0.009	
	(0.197)		(0.086)	
Mother is separated from partner	-0.011		-0.052	
	(0.169)		(0.073)	
Mother's religion: Roman Catholic	0.027	0.073	0.003	0.040
	(0.100)	(0.110)	(0.044)	(0.050)
Mother's religion: Protestant	0.151	0.158	0.041	0.044
	(0.077)*	(0.085)*	(0.034)	(0.039)
Mother's religion: Pentecostal	0.161	0.143	0.042	0.066
	(0.079)**	(0.087)	(0.034)	(0.040)*
Mother's religion: Apostolic Sect	0.133	0.115	0.055	0.090
	(0.066)**	(0.074)	(0.029)*	(0.034)***
Mother's occupation: professional or clerical	-0.020	-0.016	-0.048	-0.014
	(0.098)	(0.101)	(0.043)	(0.046)
Mother's occupation: sales	0.044	-0.060	-0.033	-0.053
	(0.052)	(0.062)	(0.023)	(0.028)*
Mother's occupation: agricultural, self-employed	0.260	0.174	-0.016	-0.040
	(0.070)***	(0.080)**	(0.031)	(0.036)
Mother's occupation: agricultural, employed	-0.319	-0.442	0.343	0.691
	(0.262)	(0.371)	(0.114)***	(0.168)***
Mother's occupation: HH and domestic	-0.038	-0.283	-0.040	-0.009
	(0.135)	(0.191)	(0.059)	(0.087)
Mother's occupation: services	0.094	0.095	-0.077	-0.067
	(0.098)	(0.108)	(0.043)*	(0.049)
Mother's occupation: skilled manual	0.124	-0.044	-0.049	-0.062
	(0.129)	(0.145)	(0.056)	(0.066)
Mother can read parts of a sentence	0.099	0.062	-0.089	-0.117
	(0.109)	(0.118)	(0.051)*	(0.058)**
Mother can read whole sentence	-0.019	-0.072	-0.052	-0.104
	(0.099)	(0.108)	(0.045)	(0.051)**
Mother is HHH's wife	0.003	0.062	0.013	0.032
	(0.101)	(0.114)	(0.044)	(0.052)
Mother is HHH's daughter	-0.010	0.118	-0.028	-0.065
	(0.119)	(0.156)	(0.052)	(0.071)
Mother is HHH's daughter-in-law	0.024	0.131	0.050	0.007
	(0.115)	(0.134)	(0.050)	(0.061)
Mother is HIV positive	-0.079	-0.008	-0.009	-0.008
	(0.053)	(0.059)	(0.023)	(0.027)
HHH is a woman	-0.013	-0.058	0.056	0.061

Dependent variable	(1) Stunting	(2) Stunting	(3) Wasting	(4) Wasting
Sample of children	All children	Living with two parents	All children	Living with two parents
	(0.099)	(0.117)	(0.043)	(0.053)
HHH age	0.003	0.004	0.000	0.001
	(0.002)	(0.003)	(0.001)	(0.001)
HHH education: primary	-0.059	0.045	-0.012	-0.011
	(0.072)	(0.096)	(0.032)	(0.044)
HHH education: secondary	-0.050	0.011	-0.005	0.001
	(0.082)	(0.112)	(0.036)	(0.051)
HHH education: higher	-0.123	-0.052	-0.053	-0.031
	(0.132)	(0.162)	(0.058)	(0.074)
HHH is married	-0.046	-0.192	-0.094	-0.196
	(0.358)	(0.368)	(0.156)	(0.166)
HHH is widowed	-0.047	-0.218	-0.134	-0.217
	(0.383)	(0.398)	(0.167)	(0.180)
HHH is divorced	-0.231	-0.197	-0.107	-0.146
	(0.380)	(0.506)	(0.166)	(0.229)
Mother usually decides how her earnings are spent		0.283		-0.021
		(0.073)***		(0.033)
Father usually decides how mother's earnings are spent		-0.188		-0.045
		(0.137)		(0.062)
Wife usually decides how father's earnings are spent		0.048		0.054
		(0.080)		(0.037)
Father usually decides how his earnings are spent		0.037		0.019
		(0.071)		(0.032)
Family visits decisions: herself		-0.021		0.012
		(0.052)		(0.024)
Family visits decisions: Father		-0.001		0.042
		(0.072)		(0.033)
Father's education: primary		-0.015		-0.005
		(0.131)		(0.059)
Father's education: secondary		0.067		0.015
		(0.135)		(0.061)
Father's education: higher		0.022		0.076
		(0.175)		(0.079)
Father's occupation: professional or clerical		-0.125		-0.004
		(0.083)		(0.038)
Father's occupation: sales		0.078		0.189
		(0.103)		(0.047)***
Father's occupation: agricultural, self-employed		0.174		0.101
		(0.112)		(0.051)**
Father's occupation: agricultural, employed		-0.125		0.131
		(0.114)		(0.053)**
Father's occupation: HH and domestic		-0.009		-0.059

Dependent variable	(1) Stunting	(2) Stunting	(3) Wasting	(4) Wasting
Sample of children	**All children**	**Living with two parents**	**All children**	**Living with two parents**
		(0.133)		(0.060)
Father's occupation: services		-0.101		0.003
		(0.065)		(0.030)
Father's occupation: skilled manual		-0.006		-0.023
		(0.053)		(0.024)
Constant	0.410	0.337	-0.143	0.011
	(0.445)	(0.468)	(0.195)	(0.214)
R^2	0.18	0.24	0.15	0.25
Adjusted R^2	0.11	0.14	0.07	0.14
F-stat	2.37	2.35	1.91	2.37
P-value joint significance	0.00	0.00	0.00	0.00
N	503	441	500	438

*** p<0.1; ** p<0.05; *** p<0.01.**

Other types of robustness checks—e.g., quantile regressions and/or specifications that proceed through progressive selection/removal of covariates—are not included in this report. However, most of these checks are included in the source statistical files provided with the technical appendix/documentation (or available from the authors upon request). To the extent that they are not, these checks can be performed by working from the existing code and utilizing the 2015 ZDHS.