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Poverty and Malnutrition in Zimbabwe: Findings from Matabeleland North Province

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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 Matabeleland North 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 Matabeleland North, significant distinctions between poor and non poor households are seen through assets, house materials, and livestock. Poor and non-poor households (HHs) can mainly be distinguished by their ownership of mobile phones, solar panels, animal-drawn carts, plows, wardrobes, decoders, and beds. The share of poor HHs that own any given asset is lower than the share of non-poor HHs, except for two agricultural assets—land for agriculture and axes/hoes. Poor HHs are more likely to live in houses with mud walls, sand or dung floors, and leaf roofs. Poor and non-poor HHs also differ by their ownership of livestock—in particular, cattle, horses, goats, and sheep (in decreasing order of importance).

With respect to characteristics of the household heads (HHHs), poor and non-poor HHHs differ by their sex, education level, and marital status. Poor HHHs are less likely to be educated or married but more likely to be women or widowed. Education has a stronger association with poverty when the HHH is a woman. Similarly, being a widow has a stronger impact on poverty for female HHHs. On the other hand, house materials seem to be more predictive of poverty for male HHHs, particularly the type of material that the floor is made of.

Poor HHs are more likely to contain women than non-poor HHs. Non-poor individuals have a higher education level and are more likely to be employed in professional and paid agricultural jobs than poor individuals.

Access to water, sanitation and hygiene practices are crucial for improved health outcomes at the household levels. Households that have less accessibility to clean water are more likely to be poor and have children that are stunted. 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) a toilet facility. Poor HHs primarily access drinking water through unprotected wells.

When comparing rural and urban areas of Matabeleland North, agricultural assets help distinguish poor from non-poor HHs only in rural areas. Ownership of phones, watches, and solar panels makes a greater difference in poverty in rural areas, while ownership of decoders, chair/stools, and bed nets makes a greater difference in urban areas. House materials (i.e., walls, floors, and roofs) differentiate between poor and non-poor HHs only in rural areas. Livestock ownership is predictive of poverty incidence only in rural areas. Similarly, being a widow is associated with an increase in poverty, but only in rural areas. In response to

EWhen other factors are controlled for, the following remain statistically significantly associated with poverty: ownership of beds, mobile phones, plows, wardrobes, mattresses, and cattle, as well as the number of rooms, are all associated with a decrease in the likelihood of being poor. On the other hand, ownership of axes/hoes or living in a house with a leaf or asbestos roof is associated with an increase in poverty incidence. Finally, having access to drinking water through public tap, a tube or borehole, or a protected well is associated with a decrease in the likelihood of being poor.

Child malnutrition

In Matabeleland North, 24 percent of children under the age of five are stunted. The ZDHS sample size for these children is fairly small and limits its analysis. Therefore, the malnutrition analysis is not robust and as such, it is not advised to derive policy and/or targeting recommendations from this analysis.

Table of Contents

List of Tables

List of Figures

List of Acronyms

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

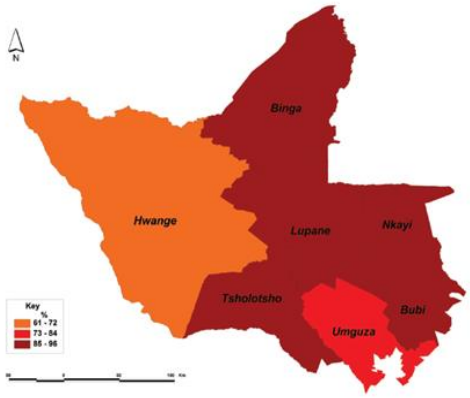
1. Background

Matabeleland North is a province located in western Zimbabwe. According to the 2012 Census, it was ranked eighth by its population size. It comprises seven districts (Binga, Bubi, Hwange, Lupane, Nkayi, Tsholotsho, and Umguza) and is also one of the poorest provinces in Zimbabwe. The prevalence of poverty in Matabeleland North seems to be linked to limited and irregular rainfall as well as decreased soil quality, which in turn impedes agricultural production.

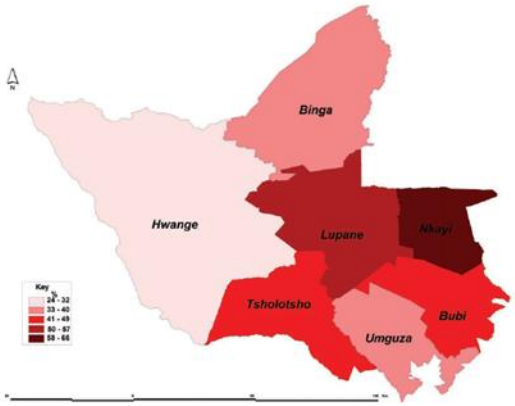
According to the 2015 Poverty Atlas (Figure 1) most districts in Matabeleland North have a poverty prevalence of more than 60 percent. Nkayi has the highest at 95.6 percent. In Binga, the high prevalence of poverty seems to be due to poor infrastructure, which fails to link other areas to the larger urban spaces. Similarly, in Bubi, wards that are farther away from Bulawayo (the nearest large city to the district) have an even higher incidence of poverty relative to wards that are closer to the city.

Figure 1. Poverty and extreme poverty in Matabeleland North

Panel A: Poverty



Panel B: Extreme poverty

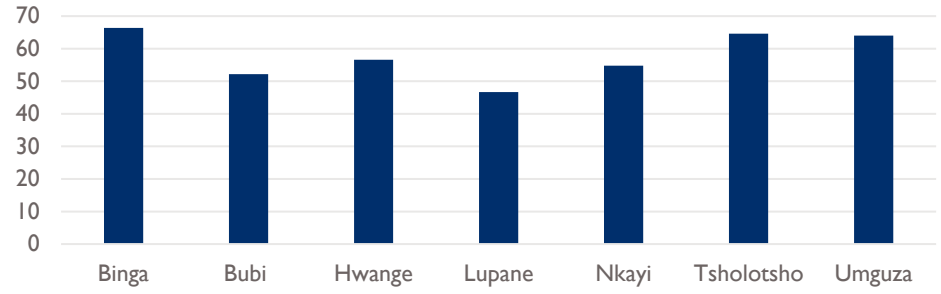


Source: Zimbabwe Poverty Atlas (ZIMSTAT et al, 2015).

The range of poverty rates suggested by Panel A of Figure 1 is consistent with the 68.5 percent sample average reported by ICF International (2015, p. ix). The purpose of that report was to assess the initial impact of certain USAID-funded food assistance programs in Zimbabwe—specifically, Amalima in Matabeleland North and South. As such, the above poverty rate may differ from the district-level ranges. Panel B of Figure 1illustrates that there is also significant food (i.e., extreme) poverty in Matabeleland North. As signaled previously, Nkayi has the highest extreme poverty rate in the province and the country at 66 percent. It is also the poorest district in all of Zimbabwe.

Additionally, during the 2019 lean season, Zimbabwe Vulnerability Assessment Committee (ZimVAC) found that 57.9 percent of the households in Matabeleland North were food insecure. Figure 2, shows the breakdown of food insecure households in each of seven the districts.

Figure 2. Food insecurity in Matabeleland North province's districts



Source: ZimVAC, 2019.

Indeed, although Zimbabwe's overall stunting rate was 27 percent in 2015, Matabeleland North reported a 24 percent stunted growth rate in children. 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.

This report will assess the prevalence and potential determinants of poverty and child malnutrition in the province of Matabeleland North 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 Matabeleland North

For the purpose of this analysis, "p*overty"* 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.[1] Due to

[1] For brevity, the full list of literature (and references) consulted has been omitted from this report and is part of a separate technical appendix.

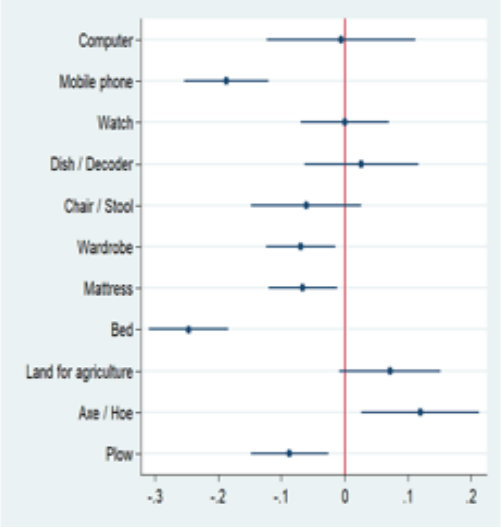
limitations of the ZDHS data, it was infeasible to include characteristics of the sub-province level[2]. Instead, the analysis will conclude with a brief disaggregation by rural versus urban areas.

The analysis of poverty in Matabeleland North is based on a sample of 933 households. For simplicity, this number is not included in the tables that follow. Moreover, only the main tables are presented in this document.[3]

Comparing poor and non-poor HHs

Distribution of assets and house materials

Figure 3. Asset Ownership



Source: Authors' calculations

Factors that are associated to household assets and characteristics play a significant role in determining HH 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.

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) solar panels, (3) animal-drawn carts, (4) plows, (5) wardrobes, and (6) beds. For example, 90 percent of non-poor HHs have a mobile phone whereas less than 50 percent of poor HHs have one. Moreover, only 38 percent of poor HHs have a bed, compared to 87 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. Poor HHs are more likely than non-poor HHs, however, to own agricultural assets. For instance, 91 percent of poor HHs have access to land for agriculture, compared to 77 percent of the non-poor; and 95 percent of poor HHs own axes or hoes, compared to 90 percent of non-poor HHs.

[2] See annex for more details.

[3] Other tables can be generated based on the source statistical code (i.e., Stata .do files) available with this documentation (or from the authors upon request).

Table 1. Household assets and poverty in Matabeleland North Province

HH has …	Distribution among			Poverty incidence among		
	All	Non-poor	Poor	HH without	HH with	p
Bank account	16.08 (1.25)	20.03 (1.53)	0.31 (0.24)	23.81 (1.76)	0.39 (0.30)	0.00
Car / truck	5.63 (0.78)	7.04 (0.97)	0.00 (0.00)	21.24 (1.59)	0.00 (0.00)	0.00
Computer	5.61 (0.78)	7.01 (0.97)	0.00 (0.00)	21.24 (1.59)	0.00 (0.00)	0.00
Electricity	17.24 (1.22)	20.91 (1.48)	2.57 (0.76)	23.60 (1.78)	2.99 (0.87)	0.00
Mobile phone	81.53 (1.45)	90.12 (1.21)	47.28 (4.25)	57.24 (4.31)	11.63 (1.32)	0.00
Watch	11.67 (1.14)	13.24 (1.33)	5.44 (2.02)	21.46 (1.64)	9.34 (3.37)	0.00
Solar panel	47.94 (1.81)	54.17 (1.98)	23.10 (3.80)	29.62 (2.32)	9.66 (1.74)	0.00
Dish / Decoder	13.49 (1.09)	16.82 (1.34)	0.21 (0.21)	23.13 (1.72)	0.31 (0.31)	0.00
Washing machine	0.54 (0.25)	0.68 (0.31)	0.00 (0.00)	20.16 (1.52)	0.00 (0.00)	0.03
Borehole	0.93 (0.35)	1.17 (0.44)	0.00 (0.00)	20.24 (1.52)	0.00 (0.00)	0.01
Chair / Stool	91.65 (1.00)	92.96 (1.03)	86.43 (2.85)	32.59 (5.95)	18.91 (1.55)	0.03
Wardrobe	49.57 (1.81)	60.38 (1.98)	6.47 (1.78)	37.19 (2.59)	2.62 (0.73)	0.00
Mattress	22.70 (1.48)	25.39 (1.71)	11.97 (2.62)	22.83 (1.81)	10.57 (2.31)	0.00
Bed	77.54 (1.61)	87.48 (1.41)	37.89 (3.98)	55.44 (4.12)	9.80 (1.16)	0.00
Bed nets for sleeping	79.43 (1.46)	80.40 (1.61)	75.60 (3.47)	23.79 (3.33)	19.08 (1.70)	0.21
Pushing tray	12.92 (1.10)	15.09 (1.32)	4.27 (1.26)	22.04 (1.69)	6.63 (1.92)	0.00
Land for agriculture	79.65 (1.39)	76.75 (1.64)	91.24 (1.91)	8.63 (1.85)	22.97 (1.81)	0.00
Land size	1.56 (0.12)	1.74 (0.15)	0.95 (0.09)	- -	- -	0.00
Animal-drawn cart	27.84 (1.61)	34.09 (1.89)	2.93 (1.31)	26.97 (1.97)	2.11 (0.94)	0.00
Axe / Hoe	90.53 (0.93)	89.45 (1.10)	94.83 (1.42)	10.95 (2.89)	21.00 (1.63)	0.00
Plow	49.42 (1.81)	55.55 (1.98)	24.97 (3.75)	29.74 (2.39)	10.13 (1.67)	0.00

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.

The ownership of agricultural related assets by poorer households 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).

In addition to some of the characteristics in Table 1, poor and non-poor HHs differ by their ownership of livestock. 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). Poor HHs are always less likely to own a given animal relative to non-poor HHs. More than 50 percent of non-poor HHs own cattle, but only 19 percent of poor HHs do. Fifty-eight percent of non-poor HHs own goats, compared to 43 percent of poor HHs. The shares are 22 and 5 percent, respectively, for horse ownership.

Table 2 presents the distribution of housing materials. Poor and non-poor HH differ in the type of materials that their houses are built from. Poor HHs are more likely to live in houses with mud walls (90 percent), leaf roofs (95 percent), and sand or dung floors (53 or 42 percent). Non-poor HHs are more likely to live in houses with cement or brick walls (35 or 15 percent), asbestos or metal roofs (28 or 15 percent), and cement floors (47 percent).

Table 2. House materials and poverty in Matabeleland North

	Distribution among			Poverty incidence among		
	All	Non-poor	Poor	HH without	HH with	p
Brick walls	12.95	15.08	4.46	22.00	6.91	0.00
	(1.18)	(1.41)	(1.49)	(1.68)	(2.27)	
Mud walls	56.54	48.22	89.71	4.75	31.81	0.00
	(1.78)	(2.00)	(2.02)	(0.93)	(2.38)	
Cement walls	28.78	34.85	4.59	26.86	3.20	0.00
	(1.58)	(1.87)	(1.07)	(2.00)	(0.74)	
Other types of walls	1.73	1.85	1.25	20.15	14.44	0.57
	(0.51)	(0.60)	(0.88)	(1.53)	(9.67)	
Leaf roof	63.40	55.46	95.05	2.71	30.06	0.00
	(1.71)	(1.98)	(1.01)	(0.54)	(2.20)	
Metal roof	12.03	15.00	0.20	22.75	0.33	0.00
	(1.23)	(1.50)	(0.14)	(1.68)	(0.23)	
Asbestos roof	23.32	28.06	4.42	24.99	3.80	0.00
	(1.43)	(1.71)	(0.96)	(1.89)	(0.81)	
Cement roof	0.41	0.51	0.00	20.13	0.00	0.06
	(0.21)	(0.27)	(0.00)	(1.51)	(0.00)	
Sand floor	33.84	28.99	53.20	14.18	31.52	0.00
	(1.73)	(1.83)	(4.26)	(1.64)	(2.98)	
Dung floor	25.81	21.79	41.85	15.71	32.50	0.00
	(1.62)	(1.66)	(4.27)	(1.54)	(3.60)	
Ceramic floor	0.71	0.89	0.00	20.19	0.00	0.00
	(0.23)	(0.29)	(0.00)	(1.52)	(0.00)	
Cement floor	38.78	47.27	4.95	31.13	2.56	0.00
	(1.74)	(1.99)	(1.01)	(2.25)	(0.51)	

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. Authors' calculations.

Distribution of other characteristics associated with poverty

Table 3 presents the distribution of the HHH's characteristics across poor and non-poor HHs. Almost half of poor HHs are headed by women, relative to 40 percent of non-poor HHs. This difference is statistically significant.

Poor and non-poor HHHs are about the same age (48 years on average); however, they differ by education and marital status. Poor HHs are more likely to have a head who has no schooling (20 versus 7 percent) or a head who only has primary education (65 versus 53 percent). This is reversed for higher levels of education, with 15 percent of poor HHs having a head with secondary education relative to 33 percent of non-poor HHs. 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 (0.1 versus 8 percent). Education provides a foundation for eradicating poverty and providing economic and social well-being. Poor HHHs are also less likely to be married (63 versus 71 percent) and more likely to be widowed (24 versus 16 percent). Poor and non-poor HHHs are comparable in terms of their likelihood of being divorced or single.

With respect to HH composition, poor and non-poor HHs have similar structures. Poor HHs tend to be smaller, but the difference is relatively small (4.1 versus 4.5 members). The dependency ratio is about the same, with 0.5 persons "below 15 or above 65" in poor HHs and 0.4 persons "below 15 or above 65" in non-poor HHs.

Table 3. HHH characteristics and poverty in Matabeleland North

Characteristic of the household head	Distribution among		Poverty incidence among			
	All	Non-poor	Poor	HH without	HH with	p
HHH is a woman	41.83 (1.79)	40.12 (1.96)	48.65 (4.26)	17.70 (1.89)	23.32 (2.46)	0.07
HHH age	47.66 (0.61)	47.67 (0.67)	47.61 (1.44)	- -	- -	0.97
HHH education: no schooling	9.58 (1.11)	6.93 (1.04)	20.14 (3.51)	17.71 (1.50)	42.16 (6.12)	0.00
HHH education: primary	55.23 (1.79)	52.87 (1.99)	64.63 (4.01)	15.84 (1.99)	23.46 (2.19)	0.01
HHH education: secondary	29.06 (1.59)	32.55 (1.84)	15.13 (2.72)	23.99 (1.95)	10.44 (1.88)	0.00
HHH education: higher	6.03 (0.86)	7.52 (1.07)	0.10 (0.10)	21.31 (1.59)	0.33 (0.33)	0.00
HHH is single	5.24 (0.79)	5.47 (0.92)	4.33 (1.47)	20.28 (1.57)	16.61 (5.34)	0.51
HHH is married	69.28 (1.67)	70.78 (1.83)	63.32 (4.02)	23.99 (2.78)	18.36 (1.80)	0.09
HHH is widowed	17.21 (1.34)	15.58 (1.43)	23.69 (3.51)	18.52 (1.63)	27.65 (3.89)	0.03
HHH is divorced	8.27 (1.03)	8.17 (1.15)	8.66 (2.34)	20.01 (1.58)	21.04 (5.28)	0.85

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.

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. In fact, less than 1 percent of poor HHs have drinking water piped into their dwelling. On the other hand, non-poor HHs primarily access drinking through public taps, pipes into their dwelling or yard, and protected or unprotected wells. Most HHs have a mobile place in their dwelling to wash hands; however, the prevalence is greater among poor HHs (97 percent versus 88 percent). Ninety-one percent of poor HHs have no toilet facility, compared to 46 percent of non-poor HHs. HHs with toilets mostly have access to improved pit latrines (27 percent of non-poor HHs versus 4 percent of 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), 80 percent of HHs in Matabeleland North 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. This analysis illustrates that the associations between several characteristics and poverty highlighted thus far are different across rural and urban areas.

Assets. Phones, watches, solar panels, and agricultural assets only distinguish poor from non-poor HHs in rural areas. Consistent with prior findings, in rural areas, certain agricultural assets (e.g., land for agriculture or axes/hoes) are associated with the HH being poor while others (e.g., animal-drawn carts or plows) are not. Moreover, ownership of wardrobes and mattresses is more strongly associated with being non-poor in rural areas. On the other hand, ownership of decoders, chairs/stools, or bed nets is more strongly associated with being non-poor in urban areas.

Livestock. Ownership of livestock is only associated with being non-poor in rural areas. Cattle are the type of animals that matter most. Nine percent of HHs that own cattle are poor, compared to 33 percent of HHs that do not. Ownership of horses, sheep, and goats is also associated with being non-poor in rural areas (in that order of importance).

House materials. The materials that houses are made of are only associated with poverty in rural areas. Those living in houses with mud walls have the highest incidence of poverty, whereas those living in houses with cement walls have the lowest one. Seventy percent of rural HHs live in houses with leaf roofs, and 30 percent of them are poor—the highest incidence across all types of roof. No poor HH lives in a house with a cement or an asbestos roof. Rural HHs that live in houses with sand or dung floors are 32 percent likely to be poor.

Characteristics of the HHH. There are more female HHHs in rural areas (43 percent) than in urban areas (30 percent). However, sex of the HHH is not statistically significantly associated with poverty status in either rural or urban areas. The education level of rural HHHs is statistically significantly associated with poverty, but this is not the case in urban areas. Finally, rural HHHs who are widowed

are more likely to be poor. Twenty-nine percent of HHs with a widowed head are poor, compared to 20 percent of other HHs.

Asset ownership and poverty by sex of the HHH. Ownership of most assets makes a significant difference in poverty incidence for both HHs headed by men and HHs headed by women. There are two exceptions. Owning a watch is associated with being non-poor, but this is statistically significant only for male HHHs. Meanwhile, owning axes or hoes is associated with being poor, but only for female HHHs. For all other assets, the difference in poverty related to ownership is bigger for HHs that are headed by women than by 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: 60 percent of poor individuals are women, compared to only 51 percent of non-poor. This translates to a 5 percentage points (pp) increase in the likelihood of women being poor relative to men. Poor individuals are less educated, and therefore, education decreases the likelihood that an individual is poor. There are almost no poor individuals among those who have post-secondary education; although the latter only makes up 4 percent of the population. On the other hand, 28 percent of individuals with no schooling are poor. With less education, poor individuals are significantly less likely to be employed (62 versus 47 percent of members of non-poor HHs). The distribution of occupations is similar across poor and non-poor individuals, except for professional or paid agricultural jobs. Non-poor individuals are more likely to be engaged in professional occupations (7 versus 1 percent) or paid agricultural jobs (5 versus 1 percent). Poor and non-poor individuals are equally likely to be engaged with other occupations.

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 since it reduces concerns of omitted variable bias. Also, previous analyses already shed light on potential pairwise associations with poverty.

Specifically, Table 4 (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 separate technical appendix for the full list of references that were consulted).

Assets. The following assets remain statistically significantly associated with being (non) poor. Having a bed is most strongly associated with poverty, as HHs that have a bed are 25 pp less likely to be poor relative to those who do not have a bed. A similar directional effect is observed for the following assets: mobile phones (HHs are 19 pp less likely to be poor), solar panels (13 pp less likely), plows (9 pp less likely), wardrobes or mattresses (7 pp less likely), and the number of bedrooms in the house (each additional room is associated with a 5 pp decrease in the likelihood of being poor). On the other hand, HHs that own a hoe or axe are 12 pp more likely to be poor.

Livestock. The following remains statistically significantly associated with being (non) poor. HHs that do not own cattle are 8 pp more likely to be poor. Ownership of other types of livestock does not seem to be significantly associated with being (non)poor. Moreover, while not reported in Table 4, the number

of animals is significantly associated with poverty only when the dummy variable for ownership of such livestock is included. Since the latter is less likely to be noisy, it is included in lieu of the count.

House materials. The only house materials that seem to matter are asbestos roofs (HHs are 35 pp more likely to be poor) and leaf roofs (30 pp more likely to be poor), relative to other types of roofs. The materials for walls or floors do not seem to make a difference for poverty incidence.

Water and sanitation. HHs that access drinking water through a public tap, tube, borehole, or protected well are significantly less likely to be poor.

Other characteristics. Once a range of factors are controlled for, no other characteristics are significantly associated with poverty. For example, no HHH characteristics (e.g., sex or education) or HH characteristics (e.g., size or dependency ratio) are significantly associated with poverty. In particular, unlike the pairwise analysis presented previously, education and marital status are no longer significantly associated with poverty.

III. Child malnutrition in Matabeleland North

In Matabeleland North, about 24 percent of children under the age of five have stunted growth, however, wasting, at 5.2 percent, is higher than the national average of 3 percent. The relatively low incidence of stunting and a small sample of children (N=432) for this province renders the analysis of child malnutrition as not very informative. Most pairwise comparisons of characteristics for the stunted and/or wasted versus non-stunted or wasted children are statistically insignificant, suggesting spurious results (results included in the statistical files available or available from the authors upon request).

In an effort to increase precision of the estimates, Table 5 (refer to the Annex) presents results from an econometric specification that essentially includes all potentially relevant covariates. The main independent variables are stunting and wasting. The choice of explanatory variables 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.[4]

As Table 5 (refer to annex) illustrates, the variables are unable to collectively explain child malnutrition, be it stunting or wasting. This is supported by the negative adjusted R-squared (shown in the table) and a formal test of global significance of the estimated model (not shown in the table but included in the source statistical files). Given these concerns, it is best not to try to derive policy recommendations based on this analysis. In other words, there is little to inform targeting given the low robustness of the analysis and the small sample size. Accordingly, this section does not include an analysis of joint determination of poverty and malnutrition.

[4] Characteristics of the place of residence are also used in the literature, but those are not included for reasons explained in the Annex.

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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.[5] 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 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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[5]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 4. Regression analysis (Ordinary Least Squares) of poverty in Matabeleland North

Characteristic	OLS estimate
Assets	
Bank account	-0.030 (0.047)
Computer	-0.006 (0.072)
Electricity	-0.063 (0.067)
Mobile phone	-0.186 (0.041)***
Watch	0.001 (0.043)
Solar panel	-0.128 (0.033)***
Dish / Decoder	0.028 (0.055)
Washing machine	-0.096 (0.186)
Borehole	-0.152 (0.140)
Chair / Stool	-0.062 (0.053)
Wardrobe	-0.069 (0.033)**
Mattress	-0.066 (0.033)**
Bed	-0.249 (0.038)***
Bed nets for sleeping	-0.005 (0.035)
Pushing tray	-0.015 (0.043)
Land for agriculture	0.071 (0.049)
Animal-drawn cart	-0.040 (0.039)
Axe / Hoe	0.120 (0.057)**
Plow	-0.087 (0.037)**
# of rooms for sleeping	-0.043 (0.017)**
House materials	
Brick walls (base = other materials)	-0.045 (0.123)
Mud walls	0.012 (0.119)
Cement walls	-0.026 (0.122)
Leaf roof (base = other materials)	0.300

Characteristic	OLS estimate
	(0.159)*
Metal roof	0.224
	(0.165)
Asbestos roof	0.354
	(0.169)**
Cement roof (base = other materials)	0.422
	(0.286)
Sand floor	0.197
	(0.173)
Dung floor	0.171
	(0.174)
Ceramic floor	0.178
	(0.245)
Cement floor	0.178
	(0.176)
Animals	
Cattle	-0.079
	(0.035)**
Sheep	0.031
	(0.075)
Goats	0.014
	(0.034)
Horses	0.024
	(0.041)
Chickens	0.016
	(0.039)
Rabbits	-0.070
	(0.145)
HHH characteristics and HH structure	
HHH is a woman	0.016
	(0.033)
HHH age	-0.000
	(0.001)
HHH education: primary (base = no schooling)	-0.029
	(0.050)
HHH education: secondary	-0.062
	(0.059)
HHH education: higher	0.004
	(0.090)
HHH is married	0.051
	(0.065)
HHH is widowed	0.054
	(0.079)
HHH is divorced	-0.033
	(0.080)
HH size	0.007
	(0.007)
Dependency ratio of the HH	0.021
	(0.061)
Water access, hygiene and sanitation	
Drinking water: piped into dwelling (base = other sources)	-0.173

Characteristic	OLS estimate
	(0.126)
Drinking water: piped to yard	-0.097 (0.097)
Drinking water: piped to neighbor	-0.065 (0.216)
Drinking water: public tap	-0.240 (0.081)***
Drinking water: tube or borehole	-0.111 (0.060)*
Drinking water: protected well	-0.141 (0.074)*
Drinking water: unprotected well	0.049 (0.069)
Drinking water: protected spring	-0.056 (0.142)
Drinking water: unprotected spring	0.116 (0.122)
Mobile place for hand washing (base = fixed place)	0.021 (0.053)
No place for hand washing	-0.010 (0.203)
Toilet: flushed to sewer (base = no toilet)	0.103 (0.436)
Toilet: flushed to septic tank	0.166 (0.439)
Toilet: ventilated improved pit latrine	-0.019 (0.435)
Toilet: pit latrine with slab	0.014 (0.437)
Toilet: pit latrine without slab/open pit	-0.067 (0.441)
Toilet: no facility/ bush/ field	0.067 (0.435)
Toilet: other	0.043 (0.464)
R^2	0.53
Adjusted R^2	0.46
F-stat	7.90
P-value for joint significance	0.00
N	931

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

Table 5. Regression analysis of child malnutrition in Matabeleland North

Dependent variable	Stunting	Stunting	Wasting	Wasting
Sample of children	All children	Living with two parents	All children	Living with two parents
Child sex: female	-0.074	-0.078	-0.013	-0.030
	(0.059)	(0.066)	(0.032)	(0.037)
Child's age in months	-0.004	-0.005	0.000	0.001
	(0.003)	(0.003)	(0.002)	(0.002)
Pregnancy wanted later	0.069	0.050	-0.085	-0.082
	(0.070)	(0.079)	(0.038)**	(0.044)*
Pregnancy not wanted	0.083	0.176	0.001	-0.018
	(0.118)	(0.129)	(0.064)	(0.071)
Child at birth was larger than average	0.085	0.069	-0.040	-0.008
	(0.131)	(0.150)	(0.072)	(0.084)
Child at birth had average size	0.062	0.056	0.027	0.047
	(0.125)	(0.142)	(0.069)	(0.080)
Child at birth was smaller than average	0.240	0.176	0.064	0.112
	(0.153)	(0.172)	(0.084)	(0.098)
Child at birth was very small	0.213	0.254	-0.027	0.022
	(0.175)	(0.198)	(0.096)	(0.112)
Child was breastfed, not anymore	0.114	0.220	-0.068	-0.047
	(0.275)	(0.301)	(0.149)	(0.167)
Child still breastfed	-0.173	-0.082	-0.031	0.010
	(0.291)	(0.314)	(0.158)	(0.174)
Child had vitamin A last 6 months	0.115	0.071	0.053	0.057
	(0.063)*	(0.072)	(0.034)	(0.040)
Child had diarrhea recently	-0.020	-0.098	0.060	0.055
	(0.094)	(0.105)	(0.051)	(0.059)
Child had fever recently	-0.009	-0.063	0.005	-0.003
	(0.087)	(0.101)	(0.048)	(0.056)
Child had cough recently	0.020	0.014	0.026	0.028
	(0.073)	(0.080)	(0.040)	(0.045)
Child had shortness of breath recently	0.109	0.211	-0.013	-0.052
	(0.149)	(0.173)	(0.081)	(0.096)
No child slept under nets	-0.009	-0.042	-0.026	0.015
	(0.076)	(0.086)	(0.041)	(0.047)
All children slept under nets	-0.083	-0.111	-0.016	-0.010
	(0.099)	(0.106)	(0.053)	(0.059)
Some children slept under nets	0.188	0.308	0.023	0.004
	(0.188)	(0.216)	(0.102)	(0.120)
Mother is HHH	-0.319	-0.497	0.018	-0.053
	(0.202)	(0.315)	(0.111)	(0.180)
Mother's age at child's birth	-0.004	-0.009	-0.002	-0.002
	(0.006)	(0.007)	(0.003)	(0.004)
Mother's education: secondary education	-0.001	0.063	-0.052	-0.044
	(0.069)	(0.077)	(0.038)	(0.043)
Mother's education: higher education	0.054	0.096	0.066	0.109
	(0.316)	(0.335)	(0.171)	(0.186)
Mother is married	0.046	-0.277	-0.029	-0.009
	(0.154)	(0.203)	(0.084)	(0.115)
Mother lives with partner	0.317		-0.039	
	(0.224)		(0.125)	

Dependent variable	Stunting	Stunting	Wasting	Wasting
Sample of children	All children	Living with two parents	All children	Living with two parents
Mother is a widow	-0.029		-0.117	
	(0.386)		(0.209)	
Mother is divorced	0.022		0.058	
	(0.256)		(0.139)	
Mother is separated from partner	-0.168		-0.104	
	(0.185)		(0.101)	
Mother's religion: Roman Catholic	-0.195	-0.267	0.074	0.076
	(0.141)	(0.148)*	(0.077)	(0.082)
Mother's religion: Protestant	-0.225	-0.245	-0.047	-0.005
	(0.117)*	(0.134)*	(0.064)	(0.075)
Mother's religion: Pentecostal	-0.088	-0.192	-0.002	-0.006
	(0.090)	(0.099)*	(0.049)	(0.055)
Mother's religion: Apostolic Sect	-0.037	-0.058	-0.035	-0.032
	(0.075)	(0.084)	(0.041)	(0.047)
Mother occupation: professional or clerical	-0.153	-0.077	0.030	0.050
	(0.235)	(0.261)	(0.127)	(0.145)
Mother occupation: sales	0.105	0.096	-0.055	-0.017
	(0.096)	(0.120)	(0.052)	(0.067)
Mother occupation: agricultural, self-employed	0.215	0.260	-0.063	-0.121
	(0.272)	(0.276)	(0.147)	(0.153)
Mother occupation: HH and domestic	0.011	-0.264	-0.062	-0.150
	(0.176)	(0.262)	(0.095)	(0.145)
Mother occupation: services	-0.030	-0.116	0.053	0.190
	(0.141)	(0.198)	(0.078)	(0.111)*
Mother occupation: skilled manual	-0.265	-0.328	0.338	0.396
	(0.322)	(0.337)	(0.175)*	(0.187)**
Mother can read parts of a sentence	0.035	0.046	0.057	0.026
	(0.146)	(0.170)	(0.079)	(0.094)
Mother can read whole sentence	0.044	0.052	-0.004	0.009
	(0.116)	(0.142)	(0.063)	(0.078)
Mother is HHH's wife	-0.138	-0.095	-0.006	0.007
	(0.174)	(0.224)	(0.095)	(0.126)
Mother is HHH's daughter	-0.034	-0.186	0.018	0.112
	(0.136)	(0.295)	(0.074)	(0.163)
Mother is HHH's daughter-in-law	-0.081	-0.194	-0.029	0.002
	(0.171)	(0.217)	(0.093)	(0.120)
Mother has no relationship with HHH	-0.334	-0.245	-0.055	-0.039
	(0.323)	(0.580)	(0.176)	(0.323)
HHH is a woman	-0.025	0.208	0.041	0.148
	(0.142)	(0.247)	(0.077)	(0.145)
HHH age	-0.002	-0.001	-0.001	-0.001
	(0.003)	(0.004)	(0.002)	(0.003)
HHH education: primary	-0.037	0.093	-0.038	-0.050
	(0.152)	(0.190)	(0.083)	(0.105)
HHH education: secondary	-0.027	0.055	-0.029	-0.058
	(0.168)	(0.203)	(0.091)	(0.113)
HHH education: higher	-0.032	0.028	-0.024	-0.074
	(0.250)	(0.290)	(0.136)	(0.161)
HHH is married	-0.110	0.273	0.110	0.172

Dependent variable	Stunting	Stunting	Wasting	Wasting
Sample of children	All children	Living with two parents	All children	Living with two parents
	(0.273)	(0.376)	(0.148)	(0.209)
HHH is widowed	-0.020	0.361	0.039	-0.010
	(0.304)	(0.436)	(0.165)	(0.242)
HHH is divorced	-0.097	0.402	0.283	0.182
	(0.327)	(0.529)	(0.181)	(0.341)
Mother usually decides how her earnings are spent		0.164		-0.099
		(0.160)		(0.090)
Husband usually decides how mother's earnings are spent		-0.137		0.005
		(0.963)		(0.533)
Wife usually decides how father's earnings are spent		0.093		0.078
		(0.098)		(0.055)
Father usually decides how his earnings are spent		0.194		0.084
		(0.100)*		(0.056)
Family visits decisions: herself		-0.038		-0.056
		(0.081)		(0.046)
Family visits decisions: husband		-0.067		-0.004
		(0.099)		(0.056)
Constant	0.632	0.500	0.168	-0.018
	(0.514)	(0.653)	(0.280)	(0.362)
R^2	0.19	0.27	0.17	0.22
Adjust R-squared	-0.03	-0.00	-0.06	-0.08
N	240	195	238	193

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