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Poverty and Malnutrition in Zimbabwe: Findings from Manicaland 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 Manicaland 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 Manicaland province, significant distinctions between poor and non-poor households are seen through assets, house materials, and livestock. Poor and non-poor HHs primarily differ in terms of their ownership of beds, wardrobes, chairs/stools, solar panels, mattresses, plows, mobile phones, and pushing trays. Not owning a mobile phone, chair, or bed is associated with the highest poverty incidence. Poor HHs mostly live in houses with brick walls, leaf roofs, and sand floors; whereas non-poor HHs mainly live in houses with cement walls, asbestos roofs, and cement floors. In terms of livestock, the greatest difference across poor and non-poor HHs is in terms of their ownership of cattle, goats, and chickens. HHs who own horses or sheep are exclusively non-poor.

Poor and non-poor household heads (HHHs) are equally likely to be female, but poor HHHs are on average younger, more likely to have no schooling, and less likely to have post-secondary education. The negative link between education and poverty seems to be more pronounced for female HHHs. Having access to electricity makes a difference in poverty—but only among male HHHs. The difference in poverty associated with owning a mobile phone or chair/stool is greater in the case of HHs headed by men, whereas the difference associated with owning a watch or bed nets is higher for HHs headed by women. Ownership of agricultural assets (especially land and axes) makes a greater difference in poverty for female HHHs.

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. Both poor and non-poor HHs primarily use protected wells as their main source of drinking water. The only difference is the availability of drinking water that is piped into the dwelling, which is more prevalent among non-poor HHs. Poor HHs usually do not have any toilet facilities; whereas non-poor HHs usually have access to pit latrines with slabs or ventilated improved pit latrines. Consequently, not having access to a toilet facility is associated with the highest incidence of poverty.

When comparing rural and urban areas of Manicaland, ownership of agricultural assets (such as land and hoes) is a sign of poverty; whereas the contrary is true in urban areas. Urban areas typically have less land available, therefore not owning agriculture assets is not a sign of poverty. For most assets, ownership more clearly distinguishes the poor from the non-poor in urban areas. Exceptions are solar panels and pushing trays which these make a greater difference in rural areas. House materials are most predictive of (non)poverty in rural areas, while ownership of livestock (in particular, cattle, goats, or chickens) is most predictive of (non)poverty in urban areas. In urban areas, HHHs who have post-secondary education are less likely to be poor.

When other factors are controlled for, the following remains statistically significantly associated with poverty. First, HHs who own computers, mobile phones, chairs/stools, beds, solar panels, pushing trays, hoes, decoders, or mattresses are less likely to be poor. Second, HHs living in dwellings with dung or sand floors are more likely to be poor. Third, HHs who mainly access drinking water from an unprotected well are more likely to be poor.

Child malnutrition

In Manicaland Province, 30 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 in HHs headed by women and less likely to be in HHs where the head has post-secondary education. They are more likely to live in houses with brick or mud walls, leaf roofs, or sand floors. Meanwhile, non-stunted children are more likely to live in houses with cement walls, asbestos roofs, or cement floors. Mothers of stunted children are less likely to have post-secondary education and more likely to: 1) be a self-employed farmer, 2) be separated from a partner, or 3) have experienced sexual violence. Non-stunted children tend to have a mother who has a professional or clerical occupation. Fathers of stunted children are more likely to hold an occupation in the sales sector. Stunted children are more likely to have grains, animal organs, and fruits in their diets,

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

while non-stunted children are more likely to consume squash and insects. Overall, stunting decreases with the child's size at birth and increases with the prevalence of anemia.

In addition, when controlling for additional factors it was found that stunting is significantly associated with gender, age, health, parent characteristics, the HH compositions, and HH decision making.

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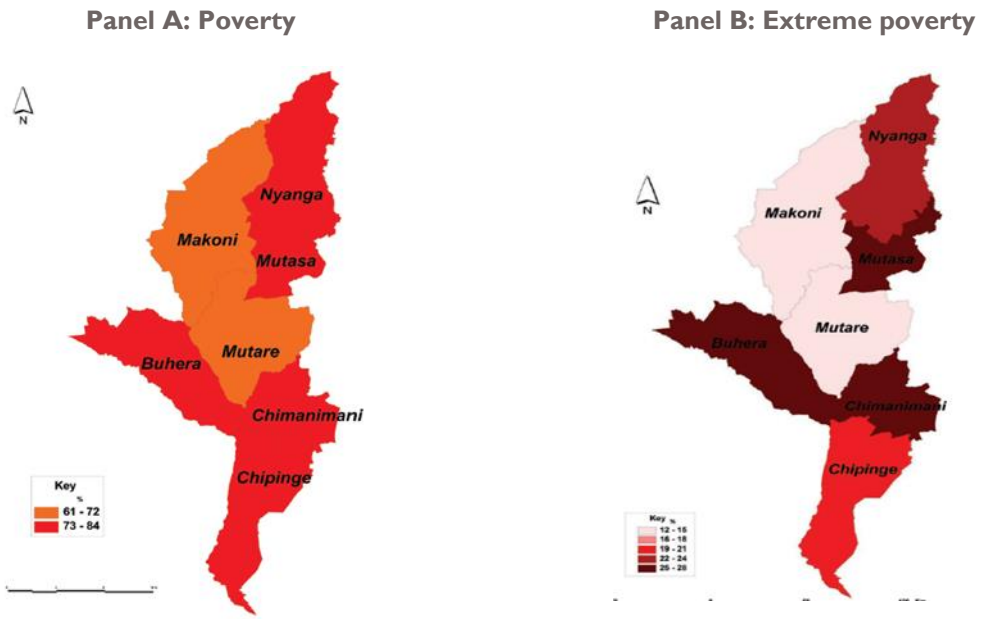
ha	hectare
HH	household
HHH	head of household
OLS	Ordinary Least Squares
pp	percentage point(s)
RQ	research question
SD	standard deviation
ZDHS	Demographic and Health Survey for Zimbabwe
ZimVAC	Zimbabwe Vulnerability Assessment Committee

1. Background

Manicaland is a province that covers the eastern highlands and southeastern plateau of Zimbabwe. According to the 2012 Census, it was ranked second by its population size. Manicaland is composed of seven districts: Buhera, Chimanimani, Chipinge, Makoni, Mutare, Mutasa, and Nyanga. Despite Mutare being the province's capital, its rural parts have the highest prevalence of poverty across the district.

According to the 2015 Poverty Atlas (Figure 1), five of the districts in Manicaland have poverty rates of more than 70 percent. Livelihoods are characterized by cereal agriculture, animal husbandry, and remittances from migratory labor. Over the past decade, rainfall has steadily decreased in the northeastern zone of Manicaland, further exacerbating issues of food insecurity.

Figure 1. Poverty and extreme poverty in Manicaland Province

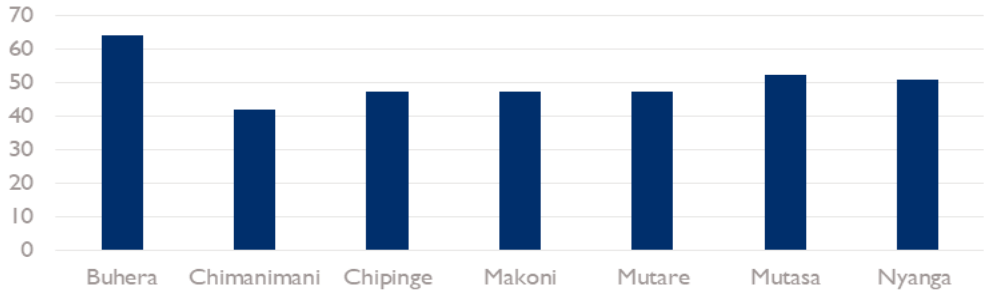


Source: Zimbabwe Poverty Atlas (ZIMSTAT et al, 2015).

The range of poverty rates suggested by Panel A in Figure 1 is consistent with the 63.2 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, ENSURE in parts of Manicaland and Masvingo. As such, the above poverty rate may differ from the district-level ranges. Panel B of Figure 1 illustrates that Mutasa, Buhera, and Chimanimani have the highest prevalence of food (i.e., extreme) poverty.

Additionally, during the 2019 lean season, Zimbabwe Vulnerability Assessment Committee (ZimVAC) found that 50.9 percent of the households in Manicaland were food insecure. Figure 2, shows the breakdown of food insecure households in each of seven the districts.

Figure 2. Food insecurity in Manicaland province's districts



Source: ZimVAC, 2019.

Indeed, although Zimbabwe's overall stunting rate was 27 percent in 2015, Manicaland reported a 30 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 Manicaland 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 Manicaland Province

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

[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.

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 Manicaland is based on a sample of 1,154 households. For simplicity, this number is not included in the tables that follow. Moreover, only the main tables are presented in this document.[4]

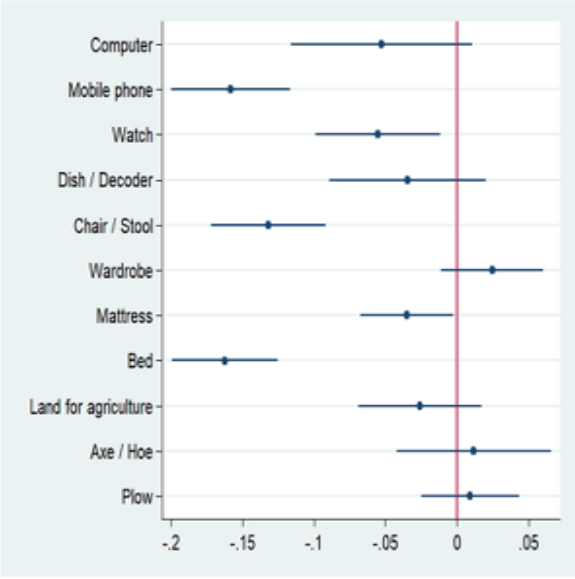
Comparing poor and non-poor HHs

Distribution of assets and house materials

Factors that are associated to household assets and characteristics play a significant role in determine 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) pushing trays, (3) chairs, (4) wardrobes, (5) mattresses, and (6) beds. For example, 88 percent of non-poor HHs have a mobile phone, while 62 percent of poor HHs have one. Moreover, only 41 percent of poor HHs have a bed compared to 82 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.

Figure 3. Asset ownership



Source: Authors' calculations

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 32 percent of men and 22 percent of women are employed in the agricultural sector. Although, it has been found that there is a larger proportion of both men and women working in

[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.

sales and services, these occupations still relate to the agriculture sector as sales may include selling agriculture outputs or livestock at markets.

Table 1. Household assets and poverty in Manicaland Province

HH has …	Distribution among			Poverty incidence among		p
	All	Non-poor	Poor	HH without	HH with	
Bank account	15.15 (1.08)	17.94 (1.30)	4.06 (1.06)	22.69 (1.47)	5.38 (1.39)	0.00
Car / truck	6.21 (0.70)	7.42 (0.85)	1.43 (0.72)	21.09 (1.35)	4.61 (2.27)	0.00
Computer	5.03 (0.63)	6.23 (0.78)	0.23 (0.17)	21.08 (1.34)	0.94 (0.67)	0.00
Electricity	18.53 (1.09)	19.99 (1.29)	12.71 (1.74)	21.50 (1.51)	13.76 (1.80)	0.00
Mobile phone	83.07 (1.25)	88.24 (1.20)	62.45 (3.52)	44.51 (4.05)	15.09 (1.22)	0.00
Watch	10.99 (0.96)	13.16 (1.17)	2.32 (0.87)	22.02 (1.41)	4.24 (1.58)	0.00
Solar panel	45.63 (1.61)	51.61 (1.80)	21.82 (2.93)	28.86 (1.96)	9.60 (1.39)	0.00
Dish / Decoder	12.24 (0.91)	14.72 (1.11)	2.40 (0.71)	22.32 (1.44)	3.94 (1.15)	0.00
Washing machine	1.19 (0.34)	1.36 (0.41)	0.49 (0.49)	20.21 (1.29)	8.33 (7.98)	0.17
Borehole	5.19 (0.71)	6.37 (0.87)	0.49 (0.49)	21.06 (1.34)	1.91 (1.89)	0.00
Chair / Stool	78.39 (1.36)	84.68 (1.34)	53.30 (3.57)	43.36 (3.53)	13.65 (1.21)	0.00
Wardrobe	45.19 (1.59)	53.47 (1.81)	12.21 (1.81)	32.15 (2.09)	5.42 (0.81)	0.00
Mattress	39.97 (1.57)	45.71 (1.80)	17.11 (2.38)	27.71 (1.88)	8.59 (1.23)	0.00
Bed	73.64 (1.46)	81.96 (1.43)	40.53 (3.40)	45.28 (3.26)	11.05 (1.07)	0.00
Bed nets for sleeping	66.86 (1.50)	70.57 (1.62)	52.05 (3.56)	29.04 (2.51)	15.62 (1.42)	0.00
Pushing tray	46.69 (1.60)	51.54 (1.81)	27.40 (2.88)	27.33 (2.04)	11.78 (1.30)	0.00
Land for agriculture	74.21 (1.34)	75.32 (1.50)	69.81 (2.96)	23.50 (2.29)	18.88 (1.54)	0.10
Land size (ha)	2.27 (0.17)	2.55 (0.21)	1.06 (0.09)	—	—.	0.00
Animal-drawn cart	15.24 (1.18)	18.50 (1.43)	2.28 (1.03)	23.14 (1.46)	3.01 (1.35)	0.00
Axe / Hoe	91.99 (0.79)	93.31 (0.85)	86.74 (2.00)	33.23 (4.50)	18.92 (1.34)	0.00
Plow	36.55 (1.57)	41.80 (1.80)	15.63 (2.71)	26.69 (1.75)	8.58 (1.56)	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.

Poor HHs are also less likely than non-poor HHs to own agricultural assets. For example, 70 percent of poor HHs have access to land for agriculture, while 75 percent of non-poor HHs do. Non-poor HH have larger land holdings than poor HH (2.55 hectares vs 1.06 hectares). Moreover, 93 percent of non-poor HHs own axes or hoes compared to 87 percent of poor HHs.

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 brick walls (57 percent), leaf roofs (57 percent), and sand or dung floors (38 or 30 percent). Non-poor HHs are more likely to live in houses with cement walls (55 percent), asbestos roofs (65 percent), and cement floors (82 percent).

Table 2. House materials and poverty in Manicaland

House material	Distribution among			Poverty incidence among		p
	All	Non-poor	Poor	HH without	HH with	
Brick walls	40.38 (1.60)	36.20 (1.76)	57.05 (3.45)	14.46 (1.34)	28.35 (2.39)	0.00
Mud walls	10.53 (0.99)	7.50 (0.93)	22.59 (3.06)	17.36 (1.27)	43.07 (4.95)	0.00
Cement walls	47.47 (1.60)	55.47 (1.80)	15.61 (2.02)	32.24 (2.14)	6.60 (0.86)	0.00
Other types of walls	1.62 (0.35)	0.84 (0.31)	4.76 (1.19)	19.43 (1.29)	58.85 (10.94)	0.00
Leaf roof	22.24 (1.38)	13.59 (1.26)	56.66 (3.45)	11.18 (1.04)	51.14 (3.56)	0.00
Metal roof	18.46 (1.30)	18.92 (1.46)	16.63 (2.81)	20.52 (1.41)	18.07 (3.06)	0.47
Asbestos roof	56.81 (1.61)	64.98 (1.74)	24.26 (2.60)	35.20 (2.44)	8.57 (0.94)	0.00
Tiles roof	0.87 (0.19)	1.00 (0.23)	0.33 (0.24)	20.18 (1.29)	7.73 (5.37)	0.04
Cement roof	1.40 (0.32)	1.40 (0.39)	1.38 (0.47)	20.07 (1.30)	19.79 (6.95)	0.97
Sand floor	14.78 (1.20)	8.91 (1.06)	38.16 (3.57)	14.56 (1.17)	51.83 (4.42)	0.00
Dung floor	10.68 (1.03)	5.71 (0.84)	30.44 (3.41)	15.63 (1.19)	57.23 (5.04)	0.00
Ceramic floor	2.27 (0.41)	2.73 (0.51)	0.41 (0.30)	20.45 (1.31)	3.61 (2.66)	0.00
Cement floor	71.31 (1.48)	81.58 (1.40)	30.39 (2.94)	48.69 (3.10)	8.55 (0.88)	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.

With respect to livestock ownership, poor and non-poor HHs also present clear differences. 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). Seventy-eight percent of non-poor HHs own livestock compared to 55 percent of poor HHs. The greatest differences are in terms of cattle, goats, and chickens. Close to 50 percent of poor HHs owns cattle, while 69 percent of non-poor HHs do. Twenty-one percent of poor HHs own goats while close to 50 percent of non-poor HHs do. Poor and non-poor HHs also differ in their ownership of horses and sheep, although overall, few HHs own either of these two animals (i.e., less than 3 percent).

Distribution of other characteristics associated with poverty

Table 3 presents the distribution of the household head's (HHH) 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 terms of marital status (e.g., 67 percent are married and 20 percent are widowed regardless of poverty status); however, poor HHHs are younger (43 versus 46 years on average) and less educated. Poor HHH tend to have a lower educational achievement than non-poor HHHs. 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 (1.47 versus 8 percent). Education provides a foundation for eradicating poverty and providing economic and social well-being.

With respect to HH composition, poor and non-poor HHs have similar sizes. Poor and non-poor HHs have about four members. The dependency ratio does differ across poor and non-poor; however, the difference is quite small.[5]

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 are similar in terms of how they access water; however, they differ with regard to the types of toilets they have access to. Both poor and non-poor HHs primarily use protected wells as their main source of drinking water (20 percent of poor HHs versus 22 percent of non-poor HHs). The second most used source for water is tubes or boreholes (17 percent of poor HHs versus 18 percent of non-poor HHs). The only significant difference with regard to access to drinking water is the availability of pipes into the dwelling. Only 6 percent of poor HHs have this as their main source of drinking water compared to about 10 percent of non-poor HHs. Forty-two percent of poor HHs have no toilet facility compared to 12 percent of non-poor HHs. The importance of having a toilet facility or pit latrine, is to help eliminate open defecation from the environment.

These statistics compare to 44 percent of all 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), 75 percent of HHs in Manicaland have access to an improved water source and 23 percent of HHs in Zimbabwe do not have access to a toilet facility.

[5] These statistics are not reported in Table 3, 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).

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

Characteristic of household head	Distribution among			Poverty incidence among		p
	All	Non-poor	Poor	HH without	HH with	
HHH is a woman	48.08 (1.61)	47.71 (1.81)	49.56 (3.56)	19.50 (1.76)	20.69 (1.87)	0.64
HHH age	45.16 (0.56)	45.72 (0.62)	42.92 (1.32)	—	—	0.06
HHH education: no schooling	10.63 (1.04)	9.63 (1.11)	14.60 (2.70)	19.18 (1.31)	27.58 (4.73)	0.09
HHH education: primary	38.34 (1.59)	37.52 (1.77)	41.61 (3.57)	19.01 (1.54)	21.78 (2.24)	0.30
HHH education: secondary	43.22 (1.58)	43.45 (1.78)	42.31 (3.44)	20.39 (1.79)	19.65 (1.80)	0.77
HHH education: higher	6.60 (0.74)	7.89 (0.91)	1.47 (0.55)	21.17 (1.36)	4.48 (1.67)	0.00
HHH is single	5.54 (0.69)	5.97 (0.82)	3.85 (1.06)	20.45 (1.34)	13.95 (3.74)	0.11
HHH is married	67.46 (1.52)	67.50 (1.70)	67.30 (3.38)	20.19 (2.29)	20.04 (1.55)	0.96
HHH is widowed	20.02 (1.32)	20.11 (1.48)	19.69 (2.99)	20.17 (1.41)	19.75 (3.03)	0.90
HHH is divorced	6.98 (0.81)	6.42 (0.88)	9.17 (2.05)	19.61 (1.32)	26.41 (5.31)	0.22
HH size	4.34	4.39	4.13	-	-	0.13
# of HH members below 15	2.01	1.97	2.16	-	-	0.14
# of HH members above 65	0.23	0.23	0.21	-	-	0.58
Dependency ratio of the HH	0.47	0.45	0.54	-	-	0.00

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

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. Possession of agricultural assets (land and hoes/axes) in rural areas is a sign of poverty, whereas the opposite is true in urban areas. However, having an animal-drawn cart is associated with the HH being less likely to be poor in rural areas. Ownership of most devices (computers, mobile phones, watches, decoders) and furniture (chair/stool and wardrobe) makes a greater difference in poverty prevalence for urban HHs, whereas solar panels make a greater difference for rural HHs. Finally, pushing trays are significantly associated with poverty only in rural areas.

Livestock. While livestock possession is more prevalent in rural areas, it makes a greater difference in poverty incidence in urban areas. Owning any type of animal is statistically significantly associated with the HH being non-poor, both in urban and rural areas. However, in urban areas, the possession of cattle, goats, or chickens matters more strongly for poverty incidence.

Characteristics of the HHH. Both in rural and urban areas, poverty decreases as HHH's education increases. This link seems to be more pronounced for female HHHs. HHs with a head that has no education are more likely to be poor when the head is female (29 percent versus 22 percent for HHs headed by men with no schooling). Similarly, HHs headed by women with a higher education are less likely to be poor than when they are headed by men with a similar level of education (2 versus 6 percent).

Asset ownership and poverty by sex of the HHH. The link between assets and poverty seems similar regardless of the HHH's sex, with some exceptions. Access to electricity is significantly associated with a lower incidence of poverty but only for male HHHs. Moreover, ownership of mobile phones or chairs/stools has a stronger association with poverty in the case of male HHHs. Finally, ownership of agricultural assets (especially land and axes) makes a greater difference in poverty for female 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 members of poor HHs are women, compared to 50 percent of members in non-poor HHs. This translates to a 5 percentage point/s (pp) increase in the likelihood of women being poor relative to men. Poor individuals are less educated. As observed with HHHs, poor individuals are more likely than non-poor individuals to have no schooling or primary education, whereas non-poor individuals are more likely to have secondary or post-secondary education. With less education, poor individuals are less likely to be employed; although the difference between 43 and 39 percent is not statistically significant. Poor individuals are less likely to be employed in all types of occupations with one exception—skilled manual labor and services. The difference between poor and non-poor individuals is significant only for professional occupations and agricultural work (both as self-employed farmers and as employees). Non-poor individuals are significantly more likely to be employed in one of these occupation groups.

Econometric analysis of HH poverty

This section presents findings from an econometric specification that 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 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 computers, mobile phones, solar panels, pushing trays, hoes, chairs, decoders, beds, or mattresses are less likely to be poor. Owning a computer has the highest association with poverty, as such HHs are 15 percentage points (pp) less likely to be poor. Owning a chair or bed is associated with a 10 pp decrease in the likelihood of being poor, whereas owning a mobile phone, solar

panel, or decoder is associated with a 9 pp decrease. The number of bed nets is also significantly associated with the HH being non-poor.

Livestock. Ownership of horses is the only form of livestock that is significantly associated with poverty. HHs that own horses are 11 pp less likely to be poor.

House materials. HHs with mud walls are least likely to be poor, followed by HHs with brick and then cement walls. This result contradicts the pairwise as well as the rural versus urban results found previously. Further exploration has not shed light on why this finding may be reversed, and given it is counterintuitive, it should be interpreted with caution. While the type of roof material does not seem to be associated with poverty, HHs with dung or sand floors are more likely to be poor relative to those with other types of floors.

Water and sanitation. Most of associations between poverty and water access, sanitation, or hygiene practices become insignificant. One exception is HHs that access drinking water from an unprotected well are significantly more likely to be poor.

Other characteristics. Two characteristics seem to matter. HHHs with secondary education (relative to no schooling) are more likely to be poor. This result is counterintuitive and should be taken with caution. Moreover, larger HHs are more likely to be poor. In particular, each additional HH member is associated with a 0.9 pp increase in the incidence of poverty.

III. Child Malnutrition in Manicaland

Analysis of malnutrition is challenging due to the relatively small sample size (N=609 children). The main outcome variables 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 (see Annex) presents results from an econometric specification 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]

[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.

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); it need not mean that such characteristics do not matter for stunting and/or wasting.

Child stunting

HH-level characteristics

Stunted children are mostly in HHs headed by women. Stunted children are less likely to live in HHs where the head has post-secondary education. Stunted children do not differ from non-stunted children in terms of the marital status of HHH with whom they live.

Stunted children live mostly in houses with brick and mud walls. The share of stunted children who live in houses with cement walls is large, but significantly less than the share of non-stunted children living in such houses. Thus, brick or mud walls are associated with stunted children, whereas cement walls are associated with non-stunted children.

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

	Distribution among			Stunting prevalence among		
	All	Non-stunted	Stunted	Children without	Children with	p
HHH is a woman	44.90	41.47	47.95	27.30	32.81	0.09
	(1.61)	(2.07)	(3.23)	(2.09)	(2.51)	
HHH education: no schooling	5.55	5.32	7.99	29.10	38.79	0.15
	(0.74)	(0.94)	(1.75)	(1.65)	(7.00)	
HHH education: primary	38.69	36.49	37.38	29.40	30.19	0.81
	(1.58)	(2.02)	(3.13)	(2.02)	(2.67)	
HHH education: secondary	51.77	53.12	53.54	29.50	29.86	0.91
	(1.62)	(2.10)	(3.23)	(2.35)	(2.21)	
HHH education: higher	2.77	3.38	1.09	30.18	12.02	0.07
	(0.53)	(0.76)	(0.67)	(1.64)	(7.13)	
HHH is single	0.99	0.47	1.44	29.49	56.26	0.15
	(0.32)	(0.29)	(0.77)	(1.61)	(21.89)	
HHH is married	83.82	82.36	85.88	25.26	30.57	0.22
	(1.19)	(1.60)	(2.25)	(3.77)	(1.78)	
HHH is widowed	9.98	11.01	7.99	30.39	23.45	0.19
	(0.97)	(1.31)	(1.75)	(1.71)	(4.72)	
HHH is divorced	5.22	6.16	4.70	30.01	24.36	0.41
	(0.72)	(1.01)	(1.37)	(1.66)	(6.38)	

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.

Stunted children tend to live in houses with leaf roofs, whereas non-stunted children tend to live in houses with asbestos roofs. Although most houses have asbestos roofs in general, the share of non-stunted children living in houses with asbestos roofs is significantly larger than the share of stunted children living in such houses. While cement floors are more common overall, such floors are mostly

associated with non-stunted children. In other words, cement floors are associated with a decrease in the incidence of stunting. On the other hand, sand floors are associated with an increase in the incidence of stunting.

This distinction in house materials across stunted and non-stunted children, together with the discussion on poverty, implies that there is a higher prevalence of stunting in rural versus urban areas (31 versus 18 percent). Also, given that house materials are associated with poverty in rural areas, it is also likely that such materials would help identify vulnerable children primarily in rural areas.

Parents' characteristics

Mothers of stunted children do not differ from mothers of non-stunted children in terms of their relationship with the HHH. Typically, they are the HHH's wife. Moreover, a sizeable share of mothers is actually the HHH. Mother's education is associated with better children's health and nutritional outcomes through improving the socioeconomic status of mothers. While overall, mother's education is similar across stunted and non-stunted children, there is a slight difference for post-secondary education: mothers of stunted children are less likely to have post-secondary education.

The marital status of the mother is also similar across stunted and non-stunted children. Typically, mothers are married. The only significant difference is that stunted children tend to live more with mothers who are separated from a partner with whom they were not previously married.

Stunted children are more likely to have a mother who is self-employed as a farmer whereas non-stunted children are more likely to have more a mother who has a clerical profession. The share of mothers engaged with clerical professions is relatively low at 2 percent.

Overall, mothers of stunted children are more likely to experience domestic violence. The difference in stunting is significant only for exposure to sexual violence: Mothers of stunted children are more likely to experience sexual violence than those of non-stunted children (26 versus 14 percent).

Mothers of stunted children are more likely to have taken iron tablets while pregnant. They are also more likely to have taken deworming drugs, but the difference is not significant. While the data does not allow to assess whether these women benefitted from any assistance program during their pregnancy, it might be possible that this was the case.

In what follows (Table 6 see Annex) "father" refers to the husband or partner of the child's mother. Fathers of stunted versus non-stunted children do not differ in terms of their education level. Although fathers of stunted children are relatively less educated (more of these fathers have just a primary education and less have secondary or post-secondary education), this difference is not significant. Fathers of stunted and non-stunted children *do* differ in terms of their occupation. Fathers of stunted children are more likely to be employed in sales.

Finally, with respect to decision making in the household, stunted children are more likely to live in HHs where the father is the sole decision-maker. This difference is statistically significant for decisions on: 1) how to spend the mother's earnings, 2) how to spend the father's earnings, and 3) family visits the mother is allowed to make. On the other hand, non-stunted children are more likely to live in HHs where decisions are made jointly, especially for decisions related to the father's earnings and family visits by the mother.

Child's characteristics

The child's sex is not significantly associated with stunting, but stunted children are more likely to be girls. Stunted and non-stunted children are also about the same age.

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. However, there are few cases in which the mother declares the child to be very small at birth. Overall, the risk of being stunted decreases with size at birth, but only being "very small" at birth is significantly associated with stunting. 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. Breastfeeding is more prevalent among non-stunted children, but the difference is not statistically significant. On the contrary, children who are no longer breastfed are significantly more stunted.

Stunting is associated with increased morbidity and mortality. Due to their weakened immune systems, stunted children are more susceptible to illness. Stunting and anemia tend to co-exist in children, as the stunting prevalence increases with anemia. Non-stunted children are significantly more likely to be non-anemic or mildly anemic. They are less likely to have recently had a cough.

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 also less likely to have spent the night under a net and more likely to be in HHs where there is no net at all.

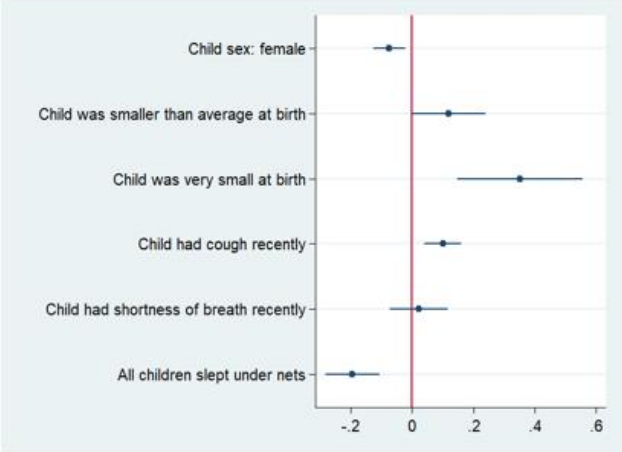
Vaccinated children are less likely to be stunted than non-vaccinated children, but the difference is not statistically significant. These data are only available for children younger than 3 years old. Stunted and non-stunted children differ in terms of their diets. For example, stunted children are more likely to have grains, animal organs, and fruits in their diets, while non-stunted children are more likely to have squash and insects in their diets (the prevalence of the latter is relatively low). 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 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 (Table 8, Figure 4). Stunting decreases with age, but at a rather small pace. In spite of this, there seems to be a persistent component of stunting, as noted above, since children who were very small compared to the average child

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



Source: Authors' calculations

at birth are significantly more likely to be stunted. So, size at birth is a significant predictor of stunting, even when all other factors are controlled for. In Figure 4, non-stunted children are more likely to be girls and sleep under mosquito nets (left side of the vertical line). Stunted children are more likely to be small at birth and to have been sick recently.

Recent morbidity remains a statistically significant predictor of stunting, as children who recently had a cough are more stunted than those who did not. Given the chronic dimension of stunting, the causation is likely to go from stunting to the incidence of illnesses. The same goes for whether the child slept under a net. Relative to when there is no net, children in HHs where all of them sleep under a net are less likely to be stunted. The timing of this association is a bit unclear; however, part of this probably has to do with HH resources (HHs in which all children sleep under a net are probably wealthier).

When child characteristics are associated with wasting, they are is usually in the same direction as stunting. Children who are smaller than average and those who are very small are most likely to be wasted. A child who has recently received vitamin A is also more likely to be wasted. This is likely because of the mother's action to improve the child's health.

Stunting decreases with: 1) the mother being the HHH and 2) the mother's education (although these results lack statistical power). The child is also less likely to be stunted if the mother is married or living with a partner, compared to when the mother is single. A child living with a grandparent who is the HHH is less likely to be stunted, but when the HHH is a woman, the child is more likely to be stunted. Children of mothers who live with a partner are also less likely to be wasted and so are those whose mother is divorced.

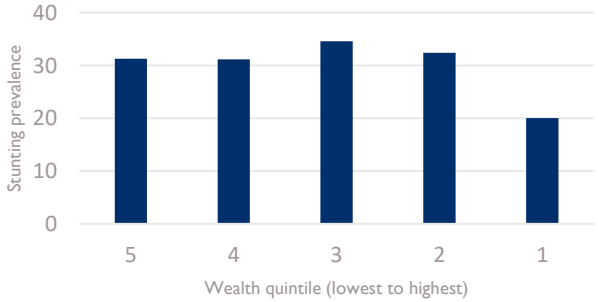
There seems to be a difference in stunting with respect to the religion of the mother, as children of apostolic-sect mothers are more likely to be stunted. Children whose mothers are self-employed farmers are most likely to be stunted, followed by those whose mothers work in sales. Children whose mothers are domestic workers are most likely to be wasted.

When considering women who are in a relationship (i.e., married or living with a partner), the father's occupation also plays a role in child stunting. Children whose father is in sales are the most likely to be stunted. It is possible that these results are driven by the resources that the mother has access to via the HH. The child is also more likely to be stunted when the husband decides alone how to spend his earnings compared to when he decides jointly with the woman. There is a similar result for the mother's earnings: children whose mothers do not have a say over earnings are more likely to be stunted. Those children are also most likely to be wasted.

Child malnutrition and 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 overrepresented in the bottom quintile. A little over a quarter of stunted children live in HHs that are poor, whereas only 14 percent of stunted children live in better off HHs. It is only in the top quintile that children are significantly less stunted.

Figure 5. Prevalence of stunting by wealth quintile in Manicaland



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.[8] 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 gender 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.

[8]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 Manicaland

Characteristic	OLS estimate
Assets	
Bank account	-0.006 (0.027)
Computer	-0.161 (0.041)***
Electricity	-0.004 (0.034)
Mobile phone	-0.081 (0.023)***
Watch	-0.026 (0.026)
Solar panel	-0.087 (0.018)***
Dish / Decoder	-0.088 (0.031)***
Washing machine	-0.079 (0.071)
Borehole	-0.013 (0.036)
Chair / Stool	-0.101 (0.021)***
Wardrobe	0.011 (0.020)
Mattress	-0.049 (0.018)***
Bed	-0.106 (0.021)***
Bed nets for sleeping	-0.031 (0.017)*
Pushing tray (i.e. serving cart)	-0.034 (0.017)**
Land for agriculture	-0.046 (0.022)**
Animal-drawn cart	0.001 (0.025)
Axe / Hoe	-0.075 (0.032)**
Plow	0.006 (0.022)
# of rooms for sleeping	-0.005 (0.008)
House materials	
Brick walls (base = other materials)	-0.287 (0.062)***
Mud walls	-0.345 (0.067)***
Cement walls	-0.276 (0.063)***
Leaf roof (base = other materials)	0.102

Characteristic	OLS estimate
	(0.080)
Metal roof	-0.093
	(0.080)
Asbestos roof	-0.064
	(0.077)
Cement roof	0.023
	(0.100)
Sand floor (base = other materials)	0.338
	(0.083)***
Dung floor	0.388
	(0.084)***
Ceramic floor	0.023
	(0.095)
Cement floor	0.025
	(0.081)
Animals	
Cattle	-0.029
	(0.022)
Sheep	-0.027
	(0.055)
Goats	-0.026
	(0.019)
Horses	-0.110
	(0.047)**
Chickens	-0.021
	(0.020)
Rabbits	-0.034
	(0.043)
HHH characteristics and HH structure	
HHH is a woman	0.001
	(0.019)
HHH age	-0.000
	(0.001)
HHH education: primary	0.047
	(0.027)*
HHH education: secondary	0.088
	(0.031)***
HHH education: higher	0.085
	(0.047)*
HHH is married	0.035
	(0.038)
HHH is widowed	0.039
	(0.044)
HHH is divorced	0.074
	(0.047)
HH size	0.009
	(0.004)**
Dependency ratio of the HH	0.037
	(0.035)
Water access, sanitation and hygiene	
Drinking water: piped into dwelling (base = other sources)	-0.029

Characteristic	OLS estimate
	(0.051)
Drinking water: piped to yard	0.050
	(0.038)
Drinking water: piped to neighbor	0.062
	(0.052)
Drinking water: public tap	-0.001
	(0.045)
Drinking water: tube or borehole	0.003
	(0.033)
Drinking water: protected well	0.022
	(0.032)
Drinking water: unprotected well	0.063
	(0.036)*
Drinking water: protected spring	0.069
	(0.050)
Drinking water: unprotected spring	0.034
	(0.042)
Mobile place for hand washing (base = fixed place)	0.024
	(0.026)
No place for hand washing	-0.118
	(0.115)
Toilet: flushed to sewer (base = no toilet)	0.069
	(0.186)
Toilet: flushed to septic tank	0.032
	(0.195)
Toilet: ventilated improved pit latrine	-0.175
	(0.186)
Toilet: pit latrine with slab	-0.171
	(0.186)
Toilet: pit latrine without slab/open pit	-0.147
	(0.187)
Toilet: no facility/bush/field	-0.037
	(0.187)
Toilet: other	0.197
	(0.200)
R^2	0.51
Adjusted R^2	0.49
F-stat	22.63
P-value for joint significance	0.00
N	1153

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

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

Mothers' characteristics	Distribution among			Stunting prevalence among		p
	All	Non-stunted	Stunted	Children without	Children with	
Mother is HHH	30.56 (1.49)	28.87 (1.90)	31.85 (3.01)	28.81 (1.90)	31.78 (3.01)	0.40
Mother is HHH's wife	47.92 (1.62)	50.24 (2.10)	45.54 (3.22)	31.61 (2.29)	27.69 (2.26)	0.22
Mother is HHH's daughter	9.91 (0.97)	11.48 (1.34)	9.06 (1.86)	30.26 (1.71)	24.98 (4.67)	0.31
Mother is HHH's daughter-in-law	6.68 (0.81)	6.70 (1.05)	7.25 (1.68)	29.57 (1.66)	31.38 (6.29)	0.78
Mother's education: no schooling	2.19 (0.47)	1.51 (0.51)	3.26 (1.15)	29.32 (1.62)	47.72 (12.72)	0.11
Mother's education: primary education	39.01 (1.58)	37.10 (2.03)	43.27 (3.21)	27.58 (2.01)	33.00 (2.66)	0.10
Mother's education: secondary education	56.65 (1.61)	58.90 (2.07)	53.17 (3.23)	32.48 (2.52)	27.60 (2.08)	0.13
Mother's education: higher education	2.15 (0.47)	2.49 (0.65)	0.29 (0.35)	30.16 (1.63)	4.73 (5.70)	0.03
Mother's religion: Roman Catholic	2.89 (0.54)	3.61 (0.78)	1.82 (0.87)	30.08 (1.64)	17.56 (7.78)	0.18
Mother's religion: Protestant	9.33 (0.94)	11.14 (1.32)	6.77 (1.62)	30.70 (1.71)	20.41 (4.55)	0.06
Mother's religion: Pentecostal	17.09 (1.22)	18.24 (1.62)	14.95 (2.31)	30.52 (1.78)	25.71 (3.71)	0.26
Mother's religion: Apostolic sect	65.08 (1.54)	60.81 (2.05)	70.86 (2.94)	23.89 (2.50)	32.98 (2.07)	0.01
Mother's religion: None	3.26 (0.57)	3.07 (0.72)	3.93 (1.26)	29.50 (1.63)	35.12 (9.39)	0.53
Mother was never in a union	2.00 (0.49)	2.00 (0.59)	2.01 (0.91)	29.69 (1.62)	29.80 (11.75)	0.99
Mother is married	85.81 (1.13)	85.52 (1.48)	84.49 (2.34)	31.14 (4.25)	29.44 (1.74)	0.71
Mother lives with partner	2.26 (0.48)	2.44 (0.65)	1.82 (0.86)	29.82 (1.63)	23.89 (10.27)	0.58
Mother is a widow	2.77 (0.53)	2.28 (0.63)	3.45 (1.18)	29.44 (1.63)	39.02 (10.85)	0.34
Mother is divorced	4.52 (0.67)	5.42 (0.95)	3.20 (1.14)	30.18 (1.66)	19.97 (6.53)	0.18
Mother is separated from partner	2.91 (0.54)	2.35 (0.64)	5.04 (1.41)	29.11 (1.62)	47.55 (10.11)	0.05
Mother occupation:	2.37	2.90	0.86	30.13	11.18	0.08

Mothers' characteristics	Distribution among			Stunting prevalence among		
	All	Non-stunted	Stunted	Children without	Children with	p
professional or clerical	(0.49)	(0.70)	(0.60)	(1.63)	(7.52)	
Mother occupation: sales	19.68	17.96	22.33	28.56	34.43	0.15
	(1.29)	(1.61)	(2.69)	(1.77)	(3.82)	
Mother occupation: agricultural, self-employed	10.93	8.07	14.39	28.23	42.96	0.01
	(1.01)	(1.14)	(2.27)	(1.67)	(5.56)	
Mother occupation: agricultural, employed	1.83	2.50	1.36	29.94	18.61	0.31
	(0.43)	(0.66)	(0.75)	(1.63)	(9.58)	
Mother occupation: HH and domestic	1.30	1.61	0.82	29.86	17.65	0.38
	(0.37)	(0.53)	(0.58)	(1.62)	(11.99)	
Mother occupation: services	9.71	9.46	11.12	29.31	33.18	0.47
	(0.96)	(1.23)	(2.03)	(1.69)	(5.28)	
Mother occupation: skilled manual	1.17	1.20	0.81	29.77	22.15	0.62
	(0.35)	(0.46)	(0.58)	(1.62)	(14.91)	

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 malnutrition in Manicaland

Child characteristics	Distribution among			Stunting prevalence among		p
	All	Non-stunted	Stunted	Children without	Children with	
Child gender: female	51.38 (1.62)	54.56 (2.09)	48.16 (3.23)	32.51 (2.40)	27.15 (2.16)	0.10
Pregnancy wanted then	73.59 (1.43)	76.52 (1.78)	64.30 (3.10)	39.10 (3.30)	26.19 (1.81)	0.00
Pregnancy wanted later	20.26 (1.30)	17.36 (1.59)	28.97 (2.93)	26.63 (1.75)	41.34 (3.81)	0.00
Pregnancy not wanted	6.15 (0.78)	6.12 (1.01)	6.73 (1.62)	29.56 (1.66)	31.70 (6.59)	0.75
Child at birth was very large	7.74 (0.87)	8.41 (1.17)	5.86 (1.52)	30.27 (1.68)	22.74 (5.37)	0.21
Child at birth was larger than average	27.37 (1.44)	27.57 (1.88)	25.87 (2.83)	30.18 (1.89)	28.37 (3.06)	0.62
Child at birth had average size	48.87 (1.62)	49.74 (2.10)	47.02 (3.23)	30.80 (2.28)	28.53 (2.27)	0.48
Child at birth was smaller than average	12.94 (1.09)	12.90 (1.41)	16.29 (2.39)	28.87 (1.72)	34.79 (4.51)	0.20
Child at birth was very small	2.76 (0.53)	1.23 (0.46)	4.34 (1.32)	29.03 (1.62)	59.76 (12.10)	0.01
Child was breastfed, not anymore	66.88 (1.52)	61.12 (2.05)	72.01 (2.90)	23.32 (2.50)	33.22 (2.07)	0.00
Child has never been breastfed	2.76 (0.53)	0.67 (0.34)	0.00 (0.00)	29.83 (1.61)	0.00 (0.00)	0.20
Child still breastfed	30.36 (1.49)	38.21 (2.04)	27.99 (2.90)	32.98 (2.06)	23.63 (2.52)	0.01
Anemia level: Severe	0.62 (0.32)	0.43 (0.31)	1.13 (0.83)	27.21 (1.82)	49.88 (30.07)	0.33
Anemia level: Moderate	14.23 (1.41)	14.19 (1.67)	13.31 (2.65)	27.56 (1.96)	26.09 (4.81)	0.78
Anemia level: Mild	26.25 (1.78)	22.77 (2.00)	36.49 (3.75)	23.64 (2.02)	37.63 (3.84)	0.00
Anemia level: Not anemic	58.91 (1.99)	62.61 (2.31)	49.07 (3.90)	33.90 (3.01)	22.79 (2.23)	0.00
Child had diarrhea recently	16.78 (1.26)	17.30 (1.59)	19.30 (2.55)	29.18 (1.77)	32.03 (3.89)	0.50
Child had fever recently	11.24 (1.06)	12.68 (1.40)	10.43 (1.98)	30.22 (1.72)	25.79 (4.46)	0.37
Child had cough recently	42.56 (1.67)	40.87 (2.06)	51.57 (3.23)	25.70 (2.06)	34.76 (2.53)	0.01
Child had shortness of breath recently	10.38	11.28	11.23	29.70	29.60	0.98

Child characteristics	Distribution among			Stunting prevalence among		p
	All	Non-stunted	Stunted	Children without	Children with	
	(1.03)	(1.33)	(2.04)	(1.71)	(4.81)	
No child slept under nets	45.78	47.28	46.33	29.99	29.19	0.80
	(1.65)	(2.10)	(3.24)	(2.23)	(2.35)	
All children slept under nets	13.60	15.30	7.27	31.54	16.65	0.00
	(1.14)	(1.52)	(1.69)	(1.76)	(3.68)	
Some children slept under nets	5.10	5.69	3.66	30.06	21.31	0.23
	(0.73)	(0.98)	(1.22)	(1.66)	(6.49)	
No nets in the HH	35.52	31.73	42.75	26.08	36.18	0.00
	(1.59)	(1.96)	(3.22)	(1.93)	(2.87)	

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 in Manicaland

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 sex: female	-0.075	-0.083	-0.009	-0.003
	(0.032)**	(0.034)**	(0.012)	(0.011)
Child's age in months	-0.003	-0.004	-0.000	-0.000
	(0.002)*	(0.002)***	(0.001)	(0.001)
Pregnancy wanted later	0.102	0.065	-0.018	-0.012
	(0.041)**	(0.045)	(0.015)	(0.015)
Pregnancy not wanted	0.062	-0.009	0.013	0.032
	(0.071)	(0.081)	(0.026)	(0.027)
Child at birth was larger than average	0.013	0.007	0.022	0.007
	(0.065)	(0.069)	(0.024)	(0.023)
Child at birth had average size	0.028	0.019	0.028	0.021
	(0.063)	(0.067)	(0.023)	(0.022)
Child at birth was smaller than average	0.119	0.150	0.054	0.039
	(0.072)*	(0.078)*	(0.026)**	(0.026)
Child at birth was very small	0.352	0.395	0.061	-0.018
	(0.124)***	(0.139)***	(0.045)	(0.046)
Child was breastfed, not anymore	0.333	0.430	-0.045	-0.035
	(0.240)	(0.244)*	(0.086)	(0.081)
Child still breastfed	0.142	0.189	-0.006	-0.019
	(0.246)	(0.250)	(0.088)	(0.083)
Child had vitamin A last 6 months	-0.033	0.023	0.025	0.026
	(0.034)	(0.039)	(0.012)**	(0.013)**
Child had diarrhea recently	0.038	-0.024	-0.010	-0.016
	(0.043)	(0.047)	(0.016)	(0.016)
Child had fever recently	-0.074	-0.056	0.011	0.020
	(0.053)	(0.057)	(0.019)	(0.019)
Child had cough recently	0.101	0.089	-0.006	0.004
	(0.036)***	(0.039)**	(0.013)	(0.013)
Child had shortness of breath recently	0.021	0.060	-0.003	-0.020
	(0.058)	(0.062)	(0.021)	(0.021)
No child slept under nets	-0.041	0.002	-0.019	-0.001
	(0.037)	(0.041)	(0.013)	(0.014)
All children slept under nets	-0.194	-0.188	-0.012	-0.006
	(0.054)***	(0.060)***	(0.019)	(0.020)
Some children slept under nets	-0.076	-0.182	-0.025	-0.019
	(0.078)	(0.089)**	(0.028)	(0.029)
Mother is HHH	-0.339	-0.302	0.003	-0.000
	(0.114)***	(0.132)**	(0.041)	(0.044)
Mother's age at the birth of the child (years)	0.002	0.003	-0.001	0.001
	(0.004)	(0.004)	(0.001)	(0.001)
Mother's education: primary education (base = no schooling)	-0.159	-0.150	0.038	0.038
	(0.142)	(0.159)	(0.051)	(0.053)
Mother's education: secondary	-0.175	-0.152	-0.014	-0.015

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
education				
	(0.147)	(0.165)	(0.053)	(0.055)
Mother's education: higher education	-0.300	-0.345	0.023	0.054
	(0.211)	(0.230)	(0.076)	(0.076)
Mother is married (base = mother is single)	-0.319	0.105	-0.043	0.017
	(0.150)**	(0.124)	(0.054)	(0.043)
Mother lives with partner	-0.386		-0.113	
	(0.176)**		(0.065)*	
Mother is a widow	-0.085		-0.025	
	(0.174)		(0.062)	
Mother is divorced	-0.212		-0.103	
	(0.156)		(0.056)*	
Mother is separated from partner	0.026		-0.014	
	(0.158)		(0.057)	
Mother's religion: Roman Catholic (base = no religion)	0.057	0.059	-0.026	0.052
	(0.119)	(0.130)	(0.043)	(0.043)
Mother's religion: Protestant	0.065	0.026	0.018	0.053
	(0.086)	(0.090)	(0.031)	(0.030)*
Mother's religion: Pentecostal	0.089	0.062	0.010	0.023
	(0.078)	(0.083)	(0.028)	(0.028)
Mother's religion: Apostolic Sect	0.135	0.075	0.016	0.023
	(0.071)*	(0.073)	(0.025)	(0.024)
Mother's occupation: professional or clerical (base= unemployed)_	-0.030	0.018	-0.004	-0.060
	(0.121)	(0.131)	(0.043)	(0.043)
Mother's occupation: sales	0.098	0.019	-0.002	-0.011
	(0.043)**	(0.056)	(0.016)	(0.019)
Mother's occupation: agricultural, self-employed	0.181	0.106	0.003	-0.028
	(0.055)***	(0.067)	(0.020)	(0.022)
Mother's occupation: agricultural, employed	-0.101	0.136	-0.033	-0.018
	(0.119)	(0.156)	(0.043)	(0.052)
Mother's occupation: HH and domestic	-0.171	0.083	0.337	0.032
	(0.149)	(0.317)	(0.054)***	(0.106)
Mother's occupation: services	0.037	0.027	-0.020	-0.013
	(0.058)	(0.069)	(0.021)	(0.023)
Mother's occupation: skilled manual	-0.153	-0.370	0.012	-0.040
	(0.157)	(0.184)**	(0.056)	(0.061)
Mother can read parts of a sentence (base = cannot read)	0.047	0.029	0.010	0.046
	(0.096)	(0.107)	(0.034)	(0.036)
Mother can read whole sentence	-0.080	-0.063	-0.007	0.011
	(0.082)	(0.093)	(0.029)	(0.031)
Mother is HHH's wife (base = no	-0.121	-0.044	-0.066	-0.049

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
relationship)				
	(0.138)	(0.159)	(0.050)	(0.053)
Mother is HHH's daughter	-0.279	-0.162	-0.067	-0.018
	(0.119)**	(0.150)	(0.043)	(0.051)
Mother is HHH's daughter-in-law	-0.018	0.037	-0.099	0.016
	(0.124)	(0.142)	(0.045)**	(0.047)
Mother has no relationship with HHH	-0.423	-0.315	-0.064	0.013
	(0.344)	(0.352)	(0.124)	(0.117)
Mother is HIV positive	0.071	0.098	0.014	0.006
	(0.055)	(0.064)	(0.020)	(0.022)
HHH is a woman	0.248	0.295	-0.060	-0.056
	(0.100)**	(0.117)**	(0.036)*	(0.039)
HHH age (in years)	-0.002	-0.001	0.002	-0.000
	(0.003)	(0.003)	(0.001)**	(0.001)
HHH education: primary	0.079	0.003	0.030	-0.013
	(0.081)	(0.102)	(0.029)	(0.034)
HHH education: secondary	0.104	0.059	0.056	0.020
	(0.087)	(0.106)	(0.031)*	(0.035)
HHH education: higher	0.130	0.125	0.051	0.083
	(0.147)	(0.194)	(0.053)	(0.065)
HHH is married	-0.003	-0.112	0.038	0.044
	(0.213)	(0.233)	(0.076)	(0.077)
HHH is widowed	-0.202	-0.302	0.042	0.041
	(0.223)	(0.241)	(0.080)	(0.080)
HHH is divorced	-0.164	-0.398	0.048	0.073
	(0.227)	(0.254)	(0.082)	(0.084)
Mother usually decides how her earnings are spent (base = joint decision)		0.031		-0.013
		(0.059)		(0.020)
Father usually decides how mother's earnings are spent		0.129		0.171
		(0.123)		(0.041)***
Wife usually decides how father's earnings are spent (base = jointly)		0.027		0.026
		(0.057)		(0.019)
Father usually decides how his earnings are spent		0.179		0.014
		(0.053)***		(0.018)
Family visits decisions: herself (base = jointly)		-0.073		-0.005
		(0.051)		(0.017)
Family visits decisions: father		0.010		-0.013
		(0.057)		(0.019)
Father's education: primary (base = no schooling)		0.104		0.002
		(0.117)		(0.039)
Father's education: secondary		0.046		0.006

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
		(0.114)		(0.038)
Father's education: higher		0.063		-0.098
		(0.178)		(0.062)
Father's occupation: professional or clerical (base = unemployed)		-0.037		0.057
		(0.085)		(0.028)**
Father's occupation: sales		0.187		0.085
		(0.074)**		(0.025)***
Father's occupation: agricultural, self-employed		0.063		-0.004
		(0.067)		(0.022)
Father's occupation: agricultural, employed		-0.019		0.009
		(0.115)		(0.038)
Father's occupation: HH and domestic		0.135		-0.005
		(0.152)		(0.050)
Father's occupation: services		0.018		0.020
		(0.057)		(0.019)
Father's occupation: skilled manual		0.057		0.012
		(0.052)		(0.017)
Constant	0.515	-0.051	-0.001	-0.048
	(0.377)	(0.396)	(0.135)	(0.132)
R^2	0.16	0.21	0.17	0.13
Adjusted-R^2	0.10	0.13	0.11	0.03
F-stat	2.62	2.50	2.82	1.36
P-value joint significance	0.00	0.00	0.00	0.04
N	605	525	602	523

*** *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.