Zimbabwe Vulnerability Assessment Committee (ZimVAC)

2023 RURAL LIVELIHOODS ASSESSMENT

TECHNICAL REPORT

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Foreword

The Zimbabwe Vulnerability Assessment Committee (ZimVAC) continues to undertake annual livelihoods assessments in fulfilment of Commitment 6 of the Food and Nutrition Security Policy. To date, ZimVAC has undertaken 10 Urban and 23 Rural Livelihoods Assessments. The assessment results have become an important tool for informing and guiding policies and programmes that respond to the prevailing food and nutrition security situation. The 2023 Rural Livelihoods Assessment was guided by the Government of Zimbabwe's unwavering commitment to ensuring a national integrated Food and Nutrition Security Information System that provides timely and reliable information on the food and nutrition security situation and the effectiveness of programmes and informs decision-making.

This report provides updates on pertinent rural households' livelihoods issues which include demographics, health, nutrition, WASH, social protection, food consumption patterns, income sources, income levels, expenditure patterns, coping strategies, shocks and food security. This Rural Livelihoods Assessment places households and their members at the centre of analysis and decision making, with the implication that household-centred analysis must play a role in developing an understanding of livelihood strategies, programmes, project planning and evaluation. The methodology used in this assessment is contextual and attempts to capture a social phenomenon within its social, economic and cultural context, whilst acknowledging the complex nature of rural livelihoods.

We continue to express our gratitude to ZimVAC stakeholders for undertaking the assessment, with tremendous support from the food and nutrition security structures at both provincial and district levels. The assessment received financial support and technical leadership from the Government of Zimbabwe and its Development Partners. Without this support, the 2023 Rural Livelihoods Assessment would not have been successful. We would like to appreciate the rural communities of Zimbabwe, the local authorities as well as Traditional Leaders for cooperating and supporting this assessment. We submit this report to you for your use and reference in your invaluable work towards addressing priority issues keeping many of our rural households vulnerable to food and nutrition insecurity.

George D. Kembo (Dr.)
FNC Director General / ZimVAC Chairperson

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Executive Summary

The Zimbabwe Vulnerability Assessment Committee (ZimVAC) successfully carried out the 23rd Rural Livelihoods Assessment (RLA) in May 2023 under the overall coordination of the Food and Nutrition Council (FNC). The ZimVAC is a Government led consortium of Ministries, United Nations (UN) agencies, Non-Governmental Organisations (NGOs), other international organisations and Academia established in 2002 as part of the Southern Africa Development Community (SADC)'s Vulnerability Assessment and Analysis (VAA) system. The ZimVAC regularly contributes towards updating Government and its Development Partners on the food and nutrition security situation through baselines, assessments and monitoring exercises, complementing other information sources such as the Ministry of Agriculture's Crop, Livestock and Fisheries Assessments, ZimSTAT's Zimbabwe Demographic and Health Survey (ZDHS), Poverty Income, Consumption and Expenditure Survey (PICES) and Multiple Indicator Cluster Survey (MICS).

This technical report provides updates on pertinent urban household livelihoods issues such as demographics, housing, education, health, nutrition, WASH, energy, social protection, food consumption patterns, food and income sources, income levels, expenditure patterns, debts, coping strategies, and food security.

The assessment results will be used to guide the following:
   i. Inform planning for targeted interventions to help the vulnerable people, given the prevailing situation in the country as well as their long-term vulnerability context.
   ii. Inform short-, medium- and long-term interventions that address immediate and long term needs as well as building resilient livelihoods.
   iii. Monitor and report towards commitments within the guiding frameworks of existing national food and nutrition policies and strategies, among them the National Development Strategy 1, the Food and Nutrition Security Policy and the Zero Hunger Strategy.
   iv. Monitor interventions to ensure adherence to the principles spelt out in regional and international frameworks which Zimbabwe has committed itself to, which include the Comprehensive African Agriculture Development Programme (CAADP) and the SDGs.
   v. Guide early warning for early action.

Objective of the 2023 Rural Livelihoods Assessment (RLA)

The overall purpose of the assessment was to provide an annual update on livelihoods in Zimbabwe's rural areas, for the purpose of informing policy formulation and programming appropriate interventions.

The specific objectives of the assessment were to:

i.   Estimate the population that is likely to be food insecure in the 2023/24 consumption year, their geographic distribution, and the severity of their food insecurity.
ii. Assess the nutritional status of children of 6 – 59 months.
iii. Describe the socio-economic profiles of rural households in terms of characteristics such as their demographics, access to basic services (education, health services and water and sanitation facilities), assets, income sources, incomes and expenditure patterns, food consumption patterns and consumption coping strategies.
iv. Determine the coverage of humanitarian and developmental interventions in the country.
v.   Determine the effects of shocks experienced by communities on food and nutrition security.
vi. Identify development priorities for communities.

Methodology

The 2023 ZimVAC rural livelihood assessment was informed by the multi-sectorial objectives generated by a multi-stakeholder consultation process. The assessments employed both a structured household questionnaire, community focus group discussion questionnaire and chiefs key informant questionnaire as the three primary data collection instruments. ZimVAC national supervisors and enumerators were recruited from Government Ministries/departments, United Nations and Non-Governmental Organizations and underwent a 2-day training in all aspects of the assessments organized virtually at district level. The Ministry of Local Government, through the Provincial Development Coordinators' offices coordinated the recruitment of district level enumerators and mobilisation of provincial and district enumeration vehicles. Four enumerators were selected from each district for data collection.

Sample size determination and description

Household food insecurity prevalence was used as the key indicator to determine the sample to ensure 95% confidence level of statistical representativeness at district, provincial and national level. The survey sampling followed two staged cluster sampling at each of the 60 rural district level. First, 25 EAs were randomly selected based on Probability Proportional to Size (PPS) methodology. At second level, 10 households were selected for interviews in each EA by using systematic random sampling from household lists available at the EA. At least 250 households were interviewed per district, bringing the total sampled households to 15, 009.

Data collection

The survey data was collected using androids and CSPro software and uploaded to the server to ensure timely availability of the data.

Data analysis

Data analysis and report writing were conducted from 22 May to 2 June 2023. Various secondary data sources and field observations were used to contextualise the analysis and reporting. Data analysis and report writing were based on thematic areas of interest to all stakeholders. The conceptual framework presented below, which is based on the Food and Nutrition Security Framework was used to structure the data analysis and report. The green arrows indicate some specific linkages, relationships analysed and presented in this report.
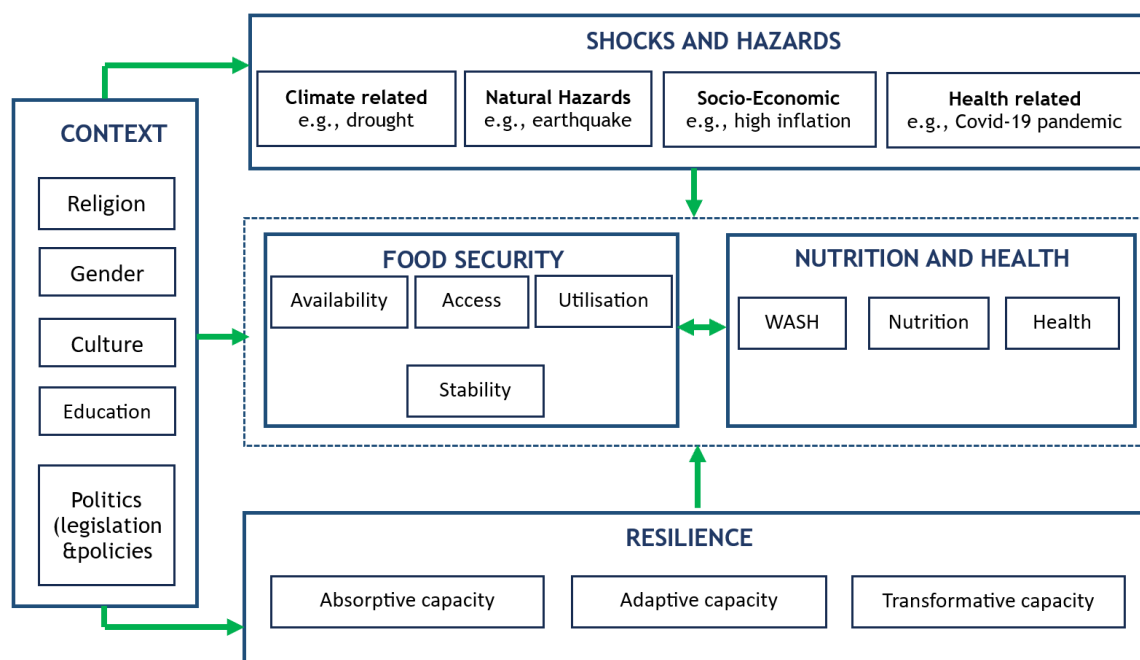
Data analysis framework (FNC, 2023)

Main findings

1. *Sample size and background characteristics*

- A total of 15,009 households were sampled and this was a slight increase from the 14 965 households sampled during the 2022 ZimVAC RLA. Mashonaland East Province (2 254) had the highest number of surveyed households and Masvingo Province (1 730) had the least.

- Most of the sampled households were headed by males (67%) as compared to females (33%).

- The national average household size was 4.5 and at provincial level, the highest household size was recorded in Midlands Province (5) and the lowest (4.2) was recorded in Manicaland, Mashonaland Central and Mashonaland East provinces.

- At the national level, the average age of sampled household heads was 53.2years. The highest average age of household head was recorded in Matabeleland South province (57.9 years) and lowest in Mashonaland West Province (47.5 years).

- Most of the household heads attained primary education (35.8%) as their highest level of education, followed by those who attained O' Level (34%). In summary, the results show that 89% of the sampled household heads were literate (primary to graduate and postgraduate educational levels).

2. *Water, Hygiene and Sanitation (WASH)*

Water sources

- At least 78.4% of the sampled households had access to improved water sources. Matabeleland North had the highest access to improved water sources (87.2%) and Masvingot had the highest proportion of households with access to unimproved water sources (31.4%).

- Mashonaland East recorded the highest proportion of households with access to basic drinking water sources (71.3%) i.e., drinking water from an improved source, provided collection time is not more than 30 minutes for a roundtrip including queuing.

- Female headed households had a 2.04% increased likelihood to access improved water as compared to their male counterparts.

- Education was a positive determinant of access to basic water services. A household headed by a member with graduate level education was 14.5% more likely to have improved water access and 21.2% more likely to have basic drinking water.

- Household size was a negative determinant on both access to basic drinking water and improved water services at 1% significance level.

Sanitation

- The national average of households using improved sanitation facilities was 61.1 %, a decrease from 66% recorded in 2022. Mashonaland East had the highest proportion (74.8%) of households with improved sanitation facilities.
- Female headed households were 5.51% less likely to have improved sanitation facilities at the 1% level of significance, all things being constant.
- Household size was a negative determinant for both basic sanitation and improved sanitation.
- At 1% significance level, households in Matabeleland North province were 39.2% likely to have improved sanitation level compared to the reference province of Manicaland.

Open defecation

- There was a slight increase in open defecation from the national average of 27% recorded in 2022 to 28.6 % recorded in 2023. Matabeleland North had the highest proportion of households practicing open defecation (52.6%).

3. Food Safety

- Only 3.3 % of the households assessed purchased food which had expired or which was undergoing spoilage due to its reduced price.
- However, dissemination of information on food safety issues is still limited given that only 12.5 % of the households received information on food safety issues.

4. Biofortification

- Consumption of biofortified foods was still very low as at national level, only 5% of the sampled households indicated consumption of orange/vitamin A maize, only 7.4% were consuming NUA45 beans, and only 6% indicated consumption of orange fleshed sweet potato.
- A female headed household was 1.77% more likely to consume Orange Fleshed Sweet Potatoes (OFSP) at the 1% level of significance, all things being constant.

- Monthly income was a positive determinant in the consumption of both biofortified maize and OFSP as at 1% significance level, increasing monthly income by 1% increased the likelihood of consumption of biofortified beans and OFSP by 0.9% and 1%, respectively.

5. *Shocks*

- The most common shocks experienced by the sampled households included cash shortage (54.9%), drought/prolonged mid-season dry spell (45%), sharp cereal price increase (27.8%), crop pest (26.4%), high charges for mobile money or swipe (23.1%), livestock death (21.7%) and livestock diseases (20.9%).

- Except for the shock from high charges for mobile money or swipe, the highest proportion of households that experienced most of the shocks was in Masvingo province.

- Age, sex, marital status, religion and education level of household head, household size, monthly income, asset ownership, and household location were associated with the likelihood of the household experiencing shocks.

- At the 1% level of significance, elderly headed households were associated with increased vulnerability to crop pests (0.07%), prolonged mid-season dry spells (0.08%), livestock deaths (0.15%) and a 0.16% reduced vulnerability to cash shortage, *ceteris paribus*.

- All things being constant, female headed households were associated with a 5.35% reduced vulnerability to experience cash shortages at the 1% level of significance.

- Increasing income of household head by 1% at the 1% level of significance, reduced the likelihood of a household being vulnerable to cash shortages, crop pests, prolonged mid-season dry spells and waterlogging by 2.08%, 1.66%, 1.66% and 0.62% respectively, *ceteris paribus*.

- The results revealed that at the 1% level of significance, increasing asset index by one was associated with increased vulnerability to crop pest by 1.62%, drought by 0.63%, waterlogging by 0.64% and livestock death by 2.39%. We can however attribute this finding to the fact that in the surveyed households, assets are mainly owned by the elderly, who are already vulnerable to shocks.

6. *Asset Ownership*

- The most owned asset was a hoe (91%) and the least owned assets included threshers (0.1%), walking motorized tillers (0.2%), peanut butter producing machine (0.3%), shellers (0.4%) and welding machines (0.4%).

- Household assets used as mode of transport were found at relatively low proportions. Scotch carts, wheelbarrows, bicycles, vehicles, motorcycles and tractors had the following proportions respectively, 31.3%; 31.2%; 18.5%; 4.1%; 2.0% and 0.7%.
- Phone ownership was relatively high across all provinces with an average of 72.6%.
- Age, sex, education level, religion and marital status of household head, household size, location of household, presence of household member with disability or chronic condition were determinates of asset township.
- For example, at the 1% level of significance, increasing the age of household head by one year was associated with a 6.32% increase in the probability of the household owing assets, *ceteris paribus*.
- However, at the 1% level of significance, female headed households had a 25.3% reduced chance of owning assets as compared to their male counterparts, same as households headed by divorcees and widows, whose chance of owning assets was reduced by almost 100% for both instances at the 1% level of significance, *ceteris paribus*.

7. *Child nutrition status*

Prevalence of stunting, wasting, under weight

- The results revealed a high stunting prevalence of 26%. Prevalence of underweight and wasting was 8.5% and 4.1%, respectively.
- Stunting was higher in males (28%) than females (24.2%), however this difference was not statistically significant at 5% level of significance.
- Similarly, underweight and wasting were higher among males compared to females and the differences were not statistically significant, *p*=0.037 and *p*=0.226, respectively.

Stunting

Association between stunting and selected variables

- Stunting was significantly higher among children from Manicaland (33.6
- Although not statistically significant, the results showed higher stunting levels in female headed households, households practising traditional religion and those whose household head had a diploma/certificate after primary qualification.

Association between stunting, and selected diet quality, care practices variables

- Diet quality of children was generally poor, with only 4% receiving adequate age-appropriate diets.
- Stunting was statistically significantly higher among children who had not been "ever breastfed" (30.6%, *p*=0.048).
- Though not statistically significant, results also showed slightly higher prevalence of stunting from households with low HDDS, poor FCS and moderate and severe hunger.

Association between stunting, and selected WASH variables

- There was no statistically significant association between stunting and the majority of the WASH variables besides the type of main water source at 5% level of significance.
- Stunting prevalence was significantly higher among children from households using water "piped into neighbour" as their primary source (33.6%, p=0.017).

Association between stunting, and selected social protection variables

- Prevalence of stunting was higher among children who were receiving support from NGOs (28.8%, *p*=0.042) possibly due to targeting. This validates the selection criteria of most relief agencies.
- Receiving support from an NGO was a significant negative predictor of stunting at 5% level of significance as a child from a household that got support from an NGO was 0.58 times less likely to be stunted (OR= 0.57 95% CI 0.369-0.903).
- Stunting was also highest in children from households that were not receiving support from within the community (26.0% p=0.042).
- Regardless of lack of significance, stunting was higher among children who did not belong to a Care Group.

Association between stunting, and selected shocks

- Stunting was higher among children from households that had experienced divorce/separation (33.7% p=0.013)and cash shortage (26.8%, *p*=0.077),
- There was no statistical significance association between stunting prevalence and the rest of the shocks reported to have been experienced by households at the 5% or 10% level of significance.

Underweight

Association between underweight and selected diet quality, care practices variables

- Underweight prevalence was consistently higher in all children with poor diet quality indicators.
- There was a significant association between underweight and HDDS (p=0.042) and FCS (p=0.035).
- There was a higher proportion of underweight children with inadequate meal frequency, low household dietary diversity score, and poor food consumption score.

Association between underweight, and selected disease prevalence and access to health service indicators

- There was a significant association between underweight and cough incidence (p=0.007).
- Underweight prevalence was higher in children who had experienced a cough in the two weeks preceding the survey (significant).
- Underweight was also higher in children who had diarrhoea, fever, no access to nutrition and health information.

Association between underweight and selected social protection variables

- Though underweight was higher in households with support (Caregroup membership, NGOs and churches) probably through targeting and screening, this relationship was not statistically significant.
- There was no significant association between underweight and the rest of the social protection indicators with slightly higher prevalence of wasting in most households with no support from the community and relatives.

Association between underweight, and selected shocks

- There was an association between shocks experienced and underweight. Overall, households which experienced the following shocks had a higher proportion of underweight children; waterlogging, floods, hailstorm, livestock disease, livestock deaths, cash shortage, loss of employment, divorce/separation, gender-based violence, chronic illness.
- The odds of underweight were significantly increased if the child was in Mashonaland West and Matabeleland South.

Wasting

Association between wasting, and selected demographic variables

- There was a significant association between wasting and province of origin (p=0.000)

- There was no significant association between wasting and other demographic variables education status of head of household, marital status, religion, and employment.

Association between wasting, and selected diet quality, care practices variables
- There was significant association between wasting and women's minimum dietary diversity, food consumption score and household hunger score.
- A higher proportion of wasted children were found in households with a poor FCS and Severe Hunger (HHS).
- Conversely there was a higher proportion of wasted children in households with women above the cut-off for minimum dietary diversity. This could be due to poor intra-household food distribution.

Association between wasting and selected disease prevalence and access to health service indicators
- There was a significant association between wasting and diarrhoea incidence (p=0.043), cough prevalence (p=0.005), receiving the recommended vitamin A dose (p=0.001) and access to nutrition information (p=0.020).
- There was a higher proportion of children who were wasted and had experienced a cough, fever (not significant) and diarrhoea in the 2 weeks preceding the survey.
- Children whose households had no access to nutrition information (significant p=0.020) and health information (not significant) had a higher prevalence of wasting.
- There was also no association between wasting and the rest of the social protection indicators.

Association between wasting, and selected shocks
- Households experiencing the following shocks had a higher proportion of wasted children; chronic illness, other health condition, gender-based violence, death of main income earner, loss of employment of key household member, cash shortage, livestock disease, waterlogging, veld fires.
- The odds were higher if the child was from a household with no access to nutrition information.

8. *Food Security*
- The results revealed that 28% of the surveyed households were food insecure.

- Before controlling for confounding factors, food insecure households had the following characteristics: headed by lowly educated (none to primary level education) household heads, married and living together couples, members of the Apostolic Sect, and large household size.

- Regarding the correlates of background characteristics and food security outcomes, all things being constant, increasing the age of household head by one year at the 1% level of significance was associated with a positive household food security status.

- Increasing the education level of household head had a similar effect on all the food security indicators, that is, it was associated with a decrease in food insecurity.

- Similarly, at the 1% level of significance, increasing household income by 1% and household asset ownership increased the probability of the household being food secure by 1.23% and 1.46%, respectively.

- At the 5% level of significance, female headed households had a lower (0.06-points) coping behaviour and were marginally statistically associated with food insecurity as compared to their male counterparts, *ceteris paribus*.

- Increasing household size by one member and having a member with a disability increased the probability of the households being food insecure.

- All things being constant, households in Mashonaland Central, Mashonaland East, Mashonaland West, Matabeleland South, and Midlands provinces had a reduced likelihood of being food secure at the 1% level of significance as compared to the base Province of Manicaland.

- In summary, vulnerable households with high propensity to be vulnerable and might need food assistance and social protection services include those headed by females, live with a member who is chronically ill, have a member with disability, large size households and households that have no religion, are of the traditional religion and those of the Apostolic sect

9. **Social Protection**

Sources of social protection

- The results revealed that at least 73.5% of the surveyed households received support. The Government of Zimbabwe (65.4%), followed by UN/NGOs (11.8%) and relatives from outside the community (10%) were the main sources of social protection.

- Disaggregating the data by province, households in Midlands Province (73.1%) received the highest support from government and Matabeleland South Province received the least (54.3%).

- Support from UN/NGOS was mainly received by households in Matabeleland North (17%) and Masvingo provinces (16.6%).

Forms of social protection support from Government and UN/NGOs

- Social protection from Government was mainly in the form of crop inputs support (54.6%) and food assistance (29.2%). Matabeleland North (40.5%) and Midlands Province (39.9%) received the most food assistance from Government as compared to the other provinces. Regarding crop input support, the highest support was in Mashonaland Central Province (66.6%) followed by Midlands Province (62.4%).

- Social protection support from UN/NGOs was mainly in the form of food assistance (9%) followed by crop input support (1.6%). Similar to Government support, food assistance was mainly received in Matabeleland North (14.8%).

Target groups for Government social protection programmes

- Government social protection programmes were mainly targeting households (60%) and followed by the elderly (8.7%) in the community.

- On the other hand, UN/NGOs social protection programmes were mainly targeted at households (9.2%).

- However, the coverage of UN/NGOs social protection programmes was very low as compared to the 60% by government. This is expected as UN/NGOs only play a complementary role, as it is the primary responsibility of the Government to support its people.

Correlates of background characteristics and access to social support

- Elderly headed households, female headed households, large size households, households with a member with a chronic condition, households with high asset index, households with lowly educated heads (primary, ZJC and O' Level education), and households in Mashonaland Central, Mashonaland West and Midlands province had a high propensity to receive social protection support from Government.

- In particular, increasing the age of household head by one year was associated with a 0.52% probability of the household receiving social protection at the 1% level of significance, *ceteris paribus*. More so, all things being constant, female headed households had a 4.07%

chance of receiving social protection support from government as compared to their male counterparts at the 1% level of significance.

▪ Regarding correlates of background characteristics and access to support from the UN/NGOs, elderly headed households, large size households, households with high asset index, households with low income, and households in Masvingo and Matabeleland North provinces had a high propensity to receive social protection support from government.

▪ In particular, increasing the age of household head by one year was associated with a 0.52% probability of the household receiving social protection at the 1% level of significance, *ceteris paribus*. More so, all things being constant, female headed households had a 4.07% chance of receiving social protection support from Government as compared to their male counterparts at the 1% level of significance.

10. Adoption of Agricultural Technologies

▪ Use of quality certified seeds (47.3%), practicing Pfumvudza/Intwasa (47.1%) and crop rotation (31.8%) were the most adopted improved climate smart technologies by rural households in Zimbabwe.

▪ At provincial level, use of quality certified seeds was mostly adopted in Mashonaland East (64.3%), Masvingo (56.7%), and Midlands (51%) provinces.

▪ Pfumvudza/Intwasa was mainly practised in Mashonaland East (56.9%), Masvingo (56.4%), and Midlands (56%) provinces.

▪ Dipping (40.5%), deworming (20.9%) and use of improved animal shelter (20.7%) were the most adopted improved livestock practices. Disaggregating the data by province, dipping was most common in Midlands (51%) and was lowest in Mashonaland West province (29.3%). Adoption of deworming was highest in Midlands (28%) and lowest in Mashonaland West province (10.7%).

▪ The correlates of background characteristics and adoption of quality certified seeds, Pfumvudza/Intwasa, crop rotation, and growing of traditional grains revealed an association between age and education level of household head and adoption of cropping technologies.

▪ In particular, at the 1% level of significance, increasing the age of household head by one year increased the likelihood of the household adopting the use of quality certified seeds by 0.12%, practising Pfumvudza/Intwasa by 0.22% and use of crop rotation by 0.19%, all things being constant.

▪ However, all things being constant, increasing the age of household head by one-year reduced the probability of the household growing traditional grains.

- Increasing income of household head by 1% reduced the propensity of the household practising Pfumvudza/Intwasa and crop rotation by 0.5% and 1.64% respectively. Increasing income of household head by 1% reduced the probability of the household using quality certified seeds by 0.89% at the 1% level of significance.
- Large size households, households with high asset index, households located in Mashonaland East, Matabeleland North, Matabeleland South, and Masvingo provinces had an increased likelihood of growing traditional grains.

11. Treatment effects

Impact of Government support on food security

- The results showed that Government support was associated with improvement in household food security status. All things being equal, receiving support from the Government reduced the household hunger scale by 0.0414 points at the 10% level of significance.
- More so, receiving support from the Government was *ceteris paribus* associated with an improvement in the household dietary diversity score of 0.0899 at the 5% level of significance.
- In addition, holding all things constant, government support reduced the probability that the household is food insecure by 6.12% at the 1% level of significance.

Impact of selected shocks on food security

- *Cash shortages* - experiencing cash shortages had deleterious effects on household food security all things being held constant. Cash shortages had harmful effects to all the six indicators of food security considered, i.e., HHS, FCS, RCSI, LCSI, HDDS, and Food insecurity.
- *Crop pests* **-** experiencing crop pests, *ceteris paribus,* reduced the household propensity to be food secure all things being held constant. Experiencing crop pests was harmful to all the six indicators of food security considered. For example, experiencing crop pests increased the probability of the household being food insecure by 4.78% at the 1% level of significance, *ceteris paribus*.
- *Prolonged mid-season dry spells* – experiencing prolonged mid-season dry spells increased the probability that a household was food insecure all things being equal at the 1% level of significance. At the 1% level of significance, experiencing prolonged mid-season dry spells increased the household propensity to be food insecure by 6.55% all things being equal.

Impact of selected agricultural technologies and practices

- *Quality certified seeds -* adopting quality certified seeds, *ceteris paribus*, improved the household hunger scale food consumption score and the household dietary diversity score. Moreover, adoption of quality certified seeds reduced the household hunger scale by 0.0828 points, all things being equal.

- *Crop rotation - s*ave for the household hunger scale, the results showed that adopting crop rotation, *ceteris paribus* improved all indicators of food security.

- *Traditional grains -* all things being equal, adoption of traditional grains was associated with 0.107 points increase in the household hunger scale at the 5% level of significance. More so, at the 5% level of significance, adoption of small grains was associated with an increase in the probability (3.46%) that the household was food insecure, all things being held constant.

- *Pfumvudza/Intwasa -* implementation of *Pfumvudza/Intwasa* was associated with improvements in all food security indicators save for food insecurity at the 1% level of significance all things being equal. *Ceteris paribus,* adopting *Pfumvudza/Intwasa* reduced the household hunger scale by 0.0889 points at the 1% level of significance. More so, *Pfumvudza/Intwasa* improved food consumption score and the household dietary diversity score and it also reduced negative consumption and livelihoods coping.

Recommendations

Based on the main findings highlighted above, the following recommendations are put forward:

Mitigating against household vulnerability to economic and climate related shocks

The impact of economic shocks (54.9% of the sampled households experienced cash shortage, 27.8% experienced sharp cereal price increase, and 23.1% experienced high charges for mobile money or swipe) and climate related shocks (45% experienced drought/prolonged mid-season dry spell) is contributing negatively on the food and nutrition security status of rural households.

i. There is need for the Government to continue on the current path of putting in place economic measures that reduce the cost of transactions and the need to use hard cash. The results presented in this report revealed that 54.9% of the sampled rural households experienced cash shortages, meaning that the bulk of transactions in rural areas require hard cash (cash economy). Moreover, the high charges for mobile money or swipe transfers (23.1%) are also a cause for concern. Therefore, there is a need for a holistic approach towards solving these economic challenges.

ii. Most rural households depend on rain-fed agriculture and with the worsening impact of climate change, e.g., increased frequency and incidence of prolonged mid season dry spells, most rural households, especially those in dry regions, are increasingly becoming vulnerable to food insecurity due to climate change. The Government is commended for the Accelerated Irrigation Rehabilitation and Development programme, through which the Government has started resuscitating communal irrigation schemes nationwide. These irrigation schemes will not only boost agricultural production, but also livestock production. The government is urged to prioritise the dry regions to mitigating the effect of prolonged mid-season dry spells on both crops and livestock production.

Improving Access to Post-Secondary Education

Educational status is recognised to be associated with household food insecurity and is an essential determinant of food production, access and utilisation. According to Mutisya et al. (2016) and Mortazavi et al. (2021), in the rural context, education influences food and nutrition security through access to information on best agricultural production, nutrition and sanitation; increased efficiency, hence increased production and better decision making. However, the findings presented in this report show that although the literacy rate is good, 89%, only 2.2% of the sampled household heads had attained tertiary level education. More so, the result revealed low education of household head as a determinant of most negative food and nutrition security outcomes.

i. Whilst the Government is commended for its current efforts in setting up Vocational Training Centres (VTCs) and technical colleges in rural areas, there is need to increase access to such technical and vocational colleges in all corners of the country. These technical and vocational colleges will help empower both the youths and elderly with knowledge and skills they can use to improve agricultural productivity and also their livelihoods.

ii. The setting up on vocational and technical colleges in rural areas can also help mitigate against the challenges of drug abuse by the youth, curb rural urban migration and also help modernise and industrialise rural areas through setting up of home-based industries by the trained and skilled youths.

Improving child nutrition status

Stunting continues to be a challenge. The results revealed that the stunting rate is at 26.1% against the NDS1 set target of 19% for 2023. The results show that the stunting rate is drifting in the negative direction from the set target. The challenge is mainly in Manicaland (33.6%) and Matabeleland North provinces (31.3%). In Manicaland the situation is dire as the rate is increasing, in 2022 it was 32.2%. Although not statistically significant, the results showed higher stunting levels in female headed households, households practising traditional religion and those whose household head had a Diploma after primary qualification.

i. There is need for an aggressive drive on nutrition education targeting single headed households, lowly educated household heads and female headed households. The findings also revealed that stunting was higher among children from households that had experienced divorce/separation and this is a cause for concern, vis-à-vis the high number of divorce rates in the country. Nutrition education therefore becomes a key determinant of child nutrition status. Government is encouraged to increase support towards Village Health Workers, who have a broad range of roles and responsibilities from prevention and health promotion to treating common conditions.

ii. The Government is also encouraged to target children and improve the nutrition sensitivity of its social protection programmes. For example, this can be done through ensuring that all feeding programme follow the 4-star diet requirements.

iii. There is need to support and scale-up the care-group model as the results presented in this report revealed that regardless of lack of significance, stunting was low among households which belonged to a care group. More so, evidence from the Livelihoods and Food Security programme (LFSP) piloted in 9 rural districts in Zimbabwe showed positive associations between participation in care groups and nutrition knowledge, nutrition behavior, nutrition practices and dietary diversity.

Chapter 1   Background and Context of the Assessment

The ZimVAC livelihoods assessments' results continue to be an important tool for informing and guiding policies and programmes that respond to the prevailing food and nutrition security situation. ZimVAC plays a significant role in fulfilling Commitment Six of the Food and Nutrition Security Policy (GoZ, 2012), in which the "Government of Zimbabwe is committed to ensuring a national integrated Food and Nutrition Security Information System that provides timely and reliable information on the food and nutrition security situation and the effectiveness of programmes and informs decision-making". It has become mandatory for FNC to coordinate annual livelihoods updates with the technical support of ZimVAC.

The 2023 RLA was conducted within the following context.

- Rural communities continue to be exposed to both systemic and idiosyncratic shocks. This calls for ongoing monitoring of the food and nutrition situation as it evolves.
- The 2022/2023 season was characterised by an early onset of rains in most parts of the country. However, the Mashonaland provinces experienced a rather late onset of the season.
- The earliest effective rains were received towards the end of November 2022 in the central and northern parts of the country. Most southern parts of the country experienced their onset from the third dekad of December 2022. The bulk of the cereal crops were planted in November and December 2022.
- Cyclone Freddy, which formed in the Indian Ocean in late January 2023, brought heavy rains and strong winds to parts of eastern Zimbabwe, causing damage to crops and infrastructure. The cyclone also triggered landslides and mudslides in some areas, displacing people.
- According to the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development's 2023 2nd Round Crop, Livestock and Fisheries Assessment Report, there was a 59% increase in food crops production compared to last season. The total cereal production was 2 579 247 MT against a national cereal requirement of 1 837 742 MT for human consumption and 450 000 MT for livestock.
- Between April and May 2023, food prices generally increased across the country, mainly in ZWL.
- The increasing food prices continue to limit household purchasing power, particularly households that are dependent on market purchases for food.

Economic Stabilisation Measures

Government, through the Ministry responsible for Finance has also put in place a number of measures which resulted in the following :

I.   Total foreign currency receipts for the period January to 31 December 2022 amounted to US$11.6 billion compared to US$9.9 billion received during the same period in 2021, representing a 17.3% increase.

II. Month-on-month inflation declined from 0.7% in January 2023 to -1.6% in February 2023 and 0.1% in March 2023. The month-on-month inflation rate in April 2023 was 2.4 percent gaining 2.3 percentage points on the March 2023 rate of 0.1 percent. Annual inflation also declined from 101.5% in January 2023 to 92.3% in February 2023 and further down to 87.6% in March 2023.

III. Economic growth is forecast at 3.8% in 2023, largely premised on the anticipated increase in mining output supported by the favourable international commodity prices. The recovery of the agriculture sector, following the drought-induced fall in outturn thus far, is also expected to contribute significantly to growth in 2023 (RBZ, 2023).

IV. Government increased access to foreign currency to the formal banking system through the willing-buyer willing-seller policy as well as the Dutch Auction System.

Government Mitigatory Measures

Government remained committed to ensuring that every Zimbabwean is free from hunger and all forms of malnutrition and led the implementation of the following measures to ensure food security for all people:

i.   Supporting the vulnerable groups through the Sustainable Livelihoods Programme, distribution of food aid (in-kind) and cash transfers; cash transfer for cereals, harmonised social cash transfers.

ii. Removing restrictions on food importation (Statutory Instrument 80 of 2023): Removal of import duty on cooking oil, maize meal, milk, sugar and rice, among other basic commodities to ensure affordability of essential foodstuffs.

iii. Easing of restrictions on maize grain trade (Statutory Instrument 56 of 2023) thus increasing maize grain flows and improving availability.

iv. Acceleration of rural industrialisation and rural development: Eight Presidential Programmes are being implemented to accelerate rural industrialisation and rural development - Presidential Climate-Proofed Inputs Scheme, Presidential Climate-Proofed

Cotton Scheme, Presidential Rural Development Programme, Presidential Blitz Tick Grease Scheme, Presidential Community Fisheries Scheme, Presidential Poultry Scheme, Presidential Goat Scheme and Vision 2030 Accelerator Model (V30 Accelerator).

v. Enabling environment- Government also opened up space for development partners to contribute and assist.

vi. National Public Infrastructure Investment Programme prioritises and embraces projects identified by communities. Major trunk roads are now being upgraded, new infrastructure being constructed, and additional raw water sources are being delivered to mitigate the impact of climate change.

vii. Access to consumptive water through availing resources towards borehole drilling, rehabilitation and construction of Headworks for livestock water troughs.

Strengthening of Multi-Sectoral Structures in order to operationalise a cohesive response to the food and nutrition challenges. The structures include the following: Inter-Ministerial Cabinet Committee for Food and Nutrition Security, Inter-Ministerial Grain Importation Committee, Internal Logistics and Distribution of Grain Committee, Working Party of Permanent Secretaries, Food Aid Working Group, National Food and Nutrition Security Committee, District Food and Nutrition Security Committees, District Drought Relief Committees and Ward Food and Nutrition Security Committees (inclusive of local leadership including local Councilors and Chiefs).

Chapter 2   Literature Review

In this chapter, a literature review is presented to help readers understand food and nutrition security and the different factors that influence food and nutrition security at household, community and national level. In addition, the Food and Nutrition Security Conceptual Framework, which was used to guide and inform the study design of the assessment, is presented and unraveled for better understanding of the findings presented in later chapters of this report.

2.1 Unravelling the Food and Nutrition Security Conceptual Framework

In developing its Food and Nutrition Security Policy, Zimbabwe adopted the Food and Nutrition Security Conceptual Framework (**Figure 1**), which is used to guide and inform the Rural and Urban Livelihoods Assessments coordinated by the Food and Nutrition Council of Zimbabwe. The framework is anchored on the four pillars or domains of food security as propounded by Jones et al. (2013).
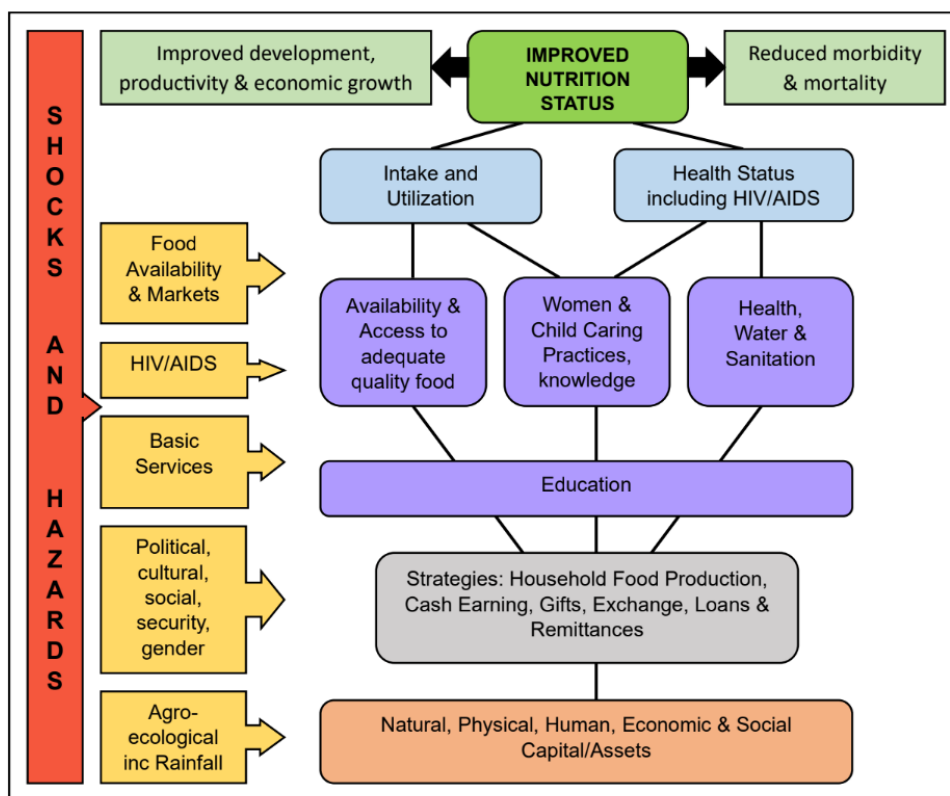
Figure 1. The Food and Nutrition Security Conceptual Framework (FNC, 2023)

The Food and Nutrition Security Conceptual Framework presented in **Figure 1.** is explained in this section to help the reader understand and comprehend how factors that influence the food and nutrition security are interlinked.

2.1.1 Food and Nutrition Security Pillars

Food and nutrition security can be defined as the situation 'when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life' (FAO, 2005; Simelane & Worth, 2020). This definition of food and nutrition security reflects two key dimensions (Pieters et al., 2013): (i) the food and nutrition status and (ii) the stability of this food and nutrition status. Food availability, food access and food utilization determine the state of affairs, referred to as the food and nutrition status of an individual or a household. Stability refers to two additional important dimensions, notably vulnerability and resilience towards the state of affairs (**Figure 2**).

The three major dimensions of the food and nutrition status, i.e., food availability, food access, and food utilization, are strongly interlinked (Jones et al., 2013). The realisation of food availability is a necessary but not a sufficient condition for the realisation of food access. In turn, the realisation of food access is a necessary but not sufficient condition for the realisation of food utilization. Therefore, the relation between food and nutrition status and the stability of the food and nutrition status is non-linear and both categories and their dimensions are highly interlinked.
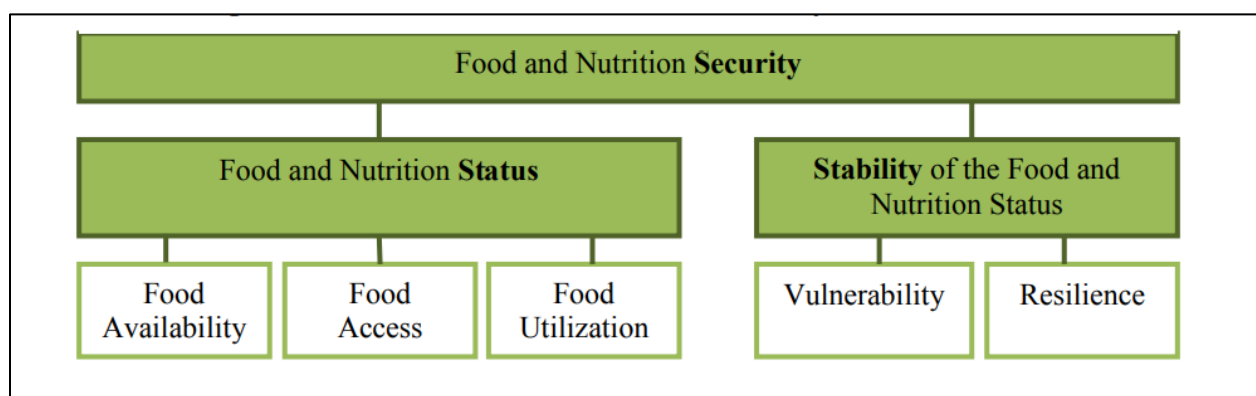
Figure 2. Dimensions of Food and Nutrition Security at the Micro-Level (Adapted from Jones et al., 2013)

i. Food Availability

Food availability can be described as the extent to which food is within reach of households (for example in local shops and markets), both in terms of sufficient quantity and quality (Gibson, 2012; Simelane & Worth, 2020). Food availability at the micro-level is strongly related to the overall availability of food, which is determined by domestic food production, commercial food imports and food aid (FAO, 2005). These are in turn influenced by domestic policies regarding food production, such as policymakers' focus on food self-sufficiency or food self-reliance. Other policies directly affecting food availability are agricultural subsidy programmes, exchange rate policies affecting international trade opportunities and policies creating stable and attractive conditions for agricultural investments. In general, the food availability dimension reflects the supply side and will therefore be affected by all the drivers and determinants that have an impact on the domestic supply of food and the ability to finance food imports (Jones et al., 2013). At a more local level, food availability is strongly contingent on road and market infrastructure, the degree of market integration, and local market institutions (Pieters et al., 2013).

ii. Food Access

Household-level food access is considered to be achieved when a household has the opportunity to obtain food of sufficient quantity and quality to ensure a safe and nutritious diet (FAO, 2005; Pieters et al., 2013). To realise this, not only domestic and local food availability must be realised; households must also have access to the necessary resources to acquire food. Important drivers of food access are household resources, food prices, food preferences and socio-political factors such as discrimination and gender inequality (Jones et al., 2013; Pieters et al., 2013). Food access is to a large extent determined by food prices and household resources. Every household has a limited amount of resources at its disposal, including assets, labour, human capital, and natural resources. These resources are allocated across different income and non-income generating activities (Hoddinott, 2012). Access to natural resources such as fields, forests, grasslands and water resources is a major determinant of the productive capacity of the food producing household and therefore of household food supply decisions (Hoddinott, 2012).

Access to income-generating activities is a major determinant of the ability of households to purchase food. The allocation of household resources to food production, wage labour or other

business activities allows the household to access food, either directly through food production or indirectly through income generation (Hoddinott, 2012).

On the other hand, income generation and food production possibilities of the household are directly affected by individual characteristics such as the education level and health status. Education is linked to the development of cognitive skills that are likely to support income generation and food production. More so, the health status of an individual directly affects his/her ability to learn and to work. An improvement of the health status can give rise to a virtuous cycle while the opposite is true as well, worsening of the health status can result in a vicious cycle. A better nutritional and health status enhances the returns to education and increases an individual's labour time and labour productivity (Bobonis et al., 2006).

iii. *Food Utilisation*

Food utilisation refers to an individual's dietary intake and his/her ability to absorb nutrients contained in the food that is eaten (Pieters et al., 2013). Hence, food utilisation relates not only to the quantity of food that is eaten, but also to the quality of the diet (Jones et al., 2013). In particular, the food consumed by an individual must be of sufficient quantity and quality to satisfy not merely subsistence needs, but also energy needs for daily activities, notably income generation (Galhena et al., 2013). However, food access is a necessary but not a sufficient condition to ensure an adequate food and nutrition status (Barrett et al., 2009). For example, an increase in household income does not necessarily lead to an increase in the quantity or quality of food consumed but can be spent on items such as alcohol or fast-food. Alternatively, an unequal distribution of food within the household might cause some members to eat more and others less than required. In both cases, at least some household members will not absorb the required amount of micronutrients, resulting in a poor food and nutrition status.

In summary, availability is achieved if adequate food is readily available and is at people's disposal. Access is ensured when all households and all individuals within those households have sufficient resources to obtain appropriate foods (through production, purchase or donation) for a nutritious diet. Adequate utilization is the ability of the human body to ingest and metabolize food.

iv. Stability

Stability refers to the time frame over which food and nutrition security is being considered (Simelane & Worth, 2020). There is always a prevailing possibility, that at any time, food security could be lost or gained. This suggests that, even if one's food consumption is optimum today, one may still be food and/or nutrition insecure if access to the correct food cannot be sustained as long as it is needed. Specifically, intermittent access to food is associated with compromised nutritional status. Therefore, to sustain food and nutrition security, stresses and shocks such as climatic conditions, conflicts borne of unstable political environment, and economic attributes (eg, unemployment, rising food prices) need to be managed as they may have an impact (directly or indirectly) on food and nutrition security status. Hence, the need to put in place means to stabilize all the factors that impact on ensuring the stability of food and nutrition security (Simelane & Worth, 2020).

The stability of access implies that the physical and monetary means to access food is stable. The stability of utilization suggests, at the very least, stability of the health of the body to assimilate the required nutrition and the consistency of preparation of food to ensure it consistently delivers the required nutrition. Further, the complex nature of stability of each of the 3 pillars and the dynamic relationship among the 4 pillars suggests that food and nutrition security is not the responsibility of just one entity or agency but requires coordination and collaborative efforts from various stakeholders and players in the whole food system to ensure food and nutrition security at all levels (Simelane & Worth, 2020).

2.1.2 Linkages of Food and Nutrition Security Pillars

To achieve food and nutrition security, each of these 4 pillars must be satisfied at all times without neglecting one in favor of the others (Simelane & Worth, 2020). Thus, it is essential to explore each pillar. Each pillar can and should be viewed from at least 3 perspectives: individual, household, and national food and nutrition security. These are vital distinctions because it is entirely possible for a nation to be considered "food secure" while simultaneously households and individuals within that nation experience food insecurity. Conversely, it is also possible for individuals and households to be food secure when a nation is not, as is often the case with highly inequitable economies.

Each of these pillars are functions of the physical environment, social environment, and policy environment. They directly influence food and nutrition security, particularly at the household

level. Factors such as extreme weather (e.g., floods and droughts), inadequate roads and transport, social conflict, and ineffectual government policy may limit the ability to produce, distribute, and/or access food and the stability thereof. Such vagaries affect not only current production and availability but often lead to the loss of productive assets such as land, livestock, equipment, and infrastructure, affecting individual households, regions, and even whole nations. This loss of productive capacity is not always easily regained and usually requires a considerable amount of time to recover, potentially creating long-term challenges to achieving food and nutrition security.

2.2 Importance of Policies to Promote Food and Nutrition Security

Several micro-level policies can influence the drivers of food and nutrition security at the individual and household level. In the short term, aid and social protection policies can mitigate the effects of temporary income shocks resulting from economic crisis, natural disasters, etc. In the long term, public services, growth policies, social policies and natural resource policies are likely to affect the individual and household food and nutrition status.

Availability, accessibility, use and utilization of food and the stability of these three elements differ in their nature, causes and effects at the Macro-, Meso- and Micro-level respectively. For example, food may be available in a country but not in certain disadvantaged districts or among discriminated population groups. The seasonality of food availability and utilization, for example, due to cyclic appearance of diseases, may be a rural but not an urban phenomenon. It is therefore important to promote appropriate policies at the appropriate level to promote food and nutrition security.

2.3 Impact of WASH on Nutrition Outcomes

The three main underlying causes of undernutrition are unsuitable or insufficient food intake, poor care practices and disease. These are directly or indirectly related to inadequate access to Water, Sanitation and Hygiene (WASH). Fortunately, there is a growing base of evidence that indicates that the WASH environment can be critical in shaping children's nutritional outcomes and complementary resources which provide guidance on how this integration can happen, practically (Anyanwu et al., 2022). The Sustainable Development Goals (SDGs) announced by the UN in 2015 stress the availability of clean water and proper sanitation as critical elements for achieving SDG 6 – global health.

In Low- and Middle-Income Countries (LMICs), access to WASH is associated with nutritional status including stunting, which affects 144 million children under 5 years globally. Despite the consistent epidemiological association between WASH indicators and nutritional status, the provision of WASH interventions alone has not been found to improve child growth in recent randomized control trials (Zavala et al., 2021). The association of poor nutritional status with diverse and interconnected determinants has led to a global call for multisectoral approaches to combat nutritional issues (Shrestha et al., 2020). For decades, epidemiologic studies have revealed how household level access to and quality of WASH facilities are associated with child stunting, wasting and maternal and child micronutrient deficiencies (Danaei et al., 2016).

WASH interventions are theorised to improve nutritional status by breaking the transmission of pathogens from the environment to the individual, thus reducing the nutrient needs required to combat infections and increasing their availability for growth and development (Mbuya & Humphrey, 2016). Strategies to achieve this have included the development of intervention packages with technological inputs and behaviour change communication delivered at the household or community level to reduce exposure to pathogens (Prendergast & Kelly, 2016). The justification for improving WASH for nutrition is based on the theory that WASH improves nutritional status through the direct prevention of infection and disease (Shrestha et al., 2020). WASH is thought to influence nutritional status via three main disease pathways (Zavala et al., 2021): bacterial, viral and protozoal infections, microbiome dysbiosis, and helminth infections (**Figure 3**).
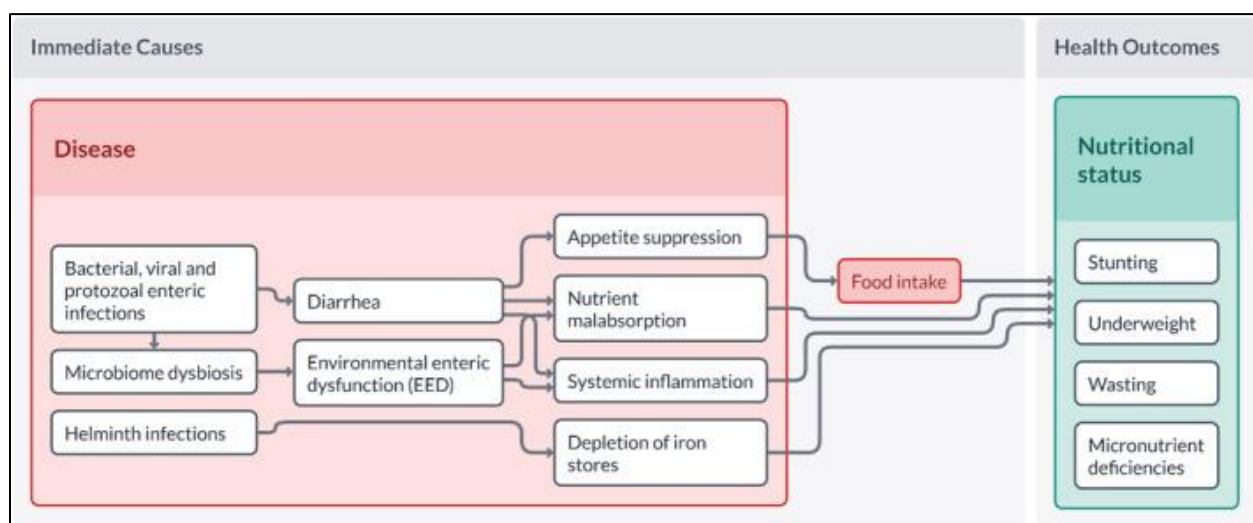
Figure 3. *Water, sanitation and hygiene (WASH)-related disease and nutritional status (Zavala et al., 2021)*

Exposure to pathogens is impacted by the availability of WASH infrastructure and service levels to health behaviours (Zavala et al., 2021). **Figure 4** shows the linkages between WASH infrastructure and service levels to health behaviours and exposure to pathogens.
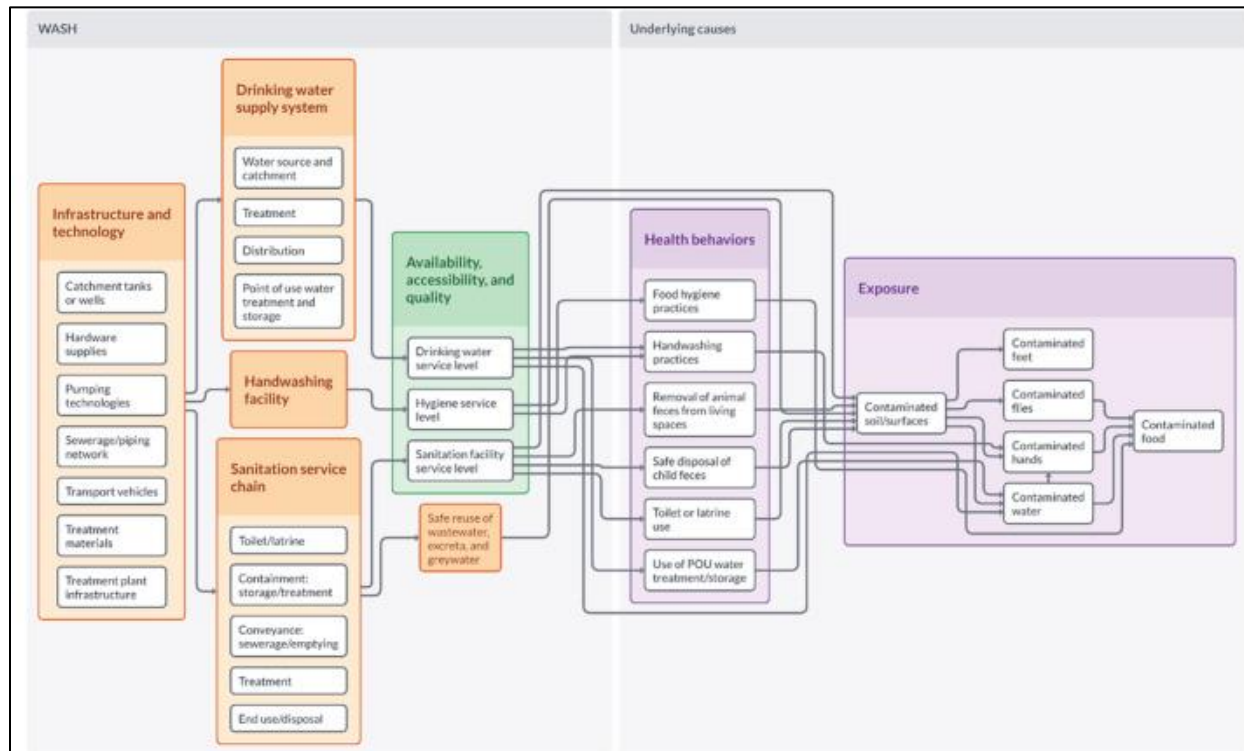
Figure 4. *Linkages between WASH infrastructure and service levels to health behaviours and exposure to pathogens (Zavala et al., 2021).*

In addition, contextual factors such as sociocultural norms, economic conditions, national level policies and politics, the role of the private sector, climate conditions and conflict impact WASH resources at various levels (see Figure 5). For example, climate change is causing stress on the natural resources for drinking water, which directly impacts supply and may fuel conflict, further exacerbating water scarcity and the public health consequences (DeNicola et al., 2015). Separately, understanding sociocultural norms and incorporating them into Behavior Change and Communication (BCC) interventions has been found to be integral to their success, as different cultural drivers may more readily influence behaviour uptake (De Buck et al., 2017). However, more research on the effects of contextual factors on WASH implementation, coverage and effectiveness is warranted.
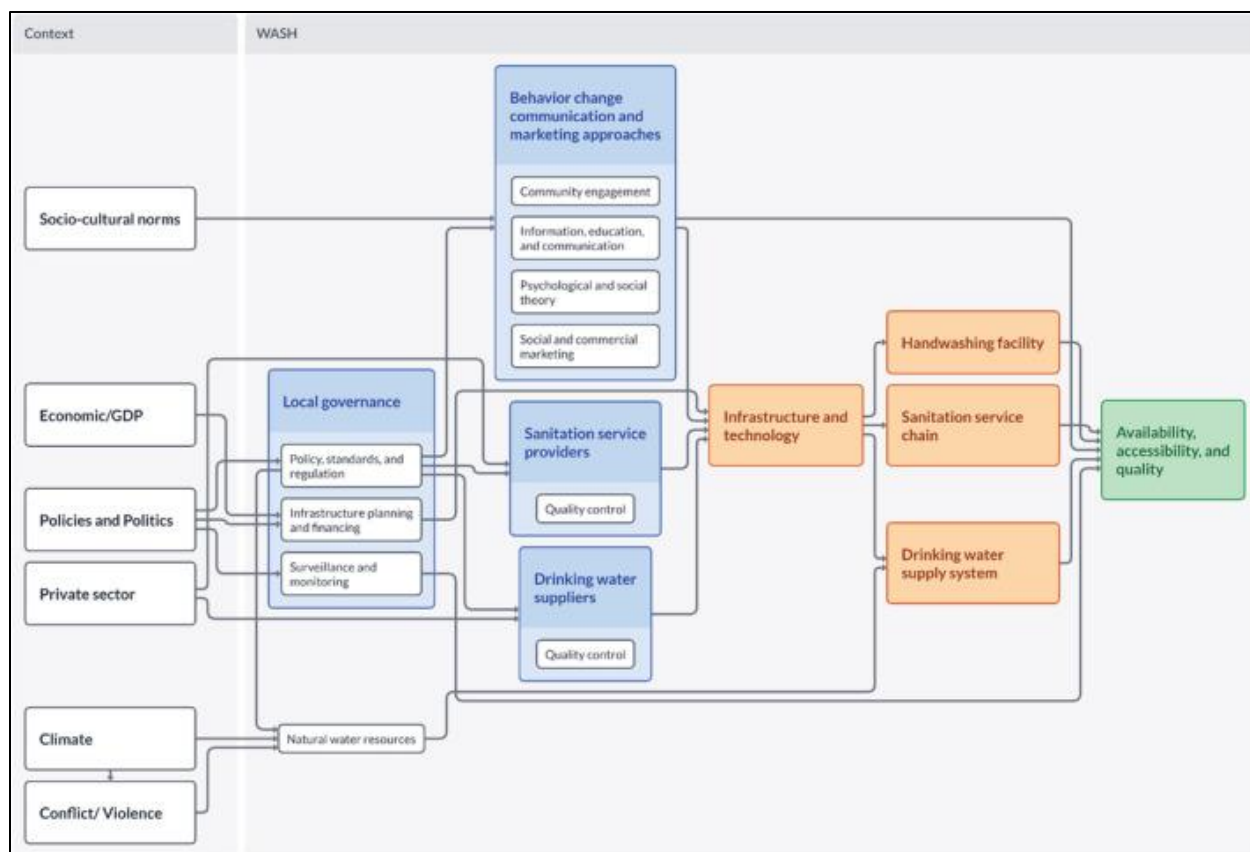
Figure 5. *Influence of context and role of capacity and human resources in water, sanitation and hygiene (WASH) systems (Zavala et al., 2021).*

2.4 Effect of child Caring Practices on Child Nutrition Status

Malnutrition has long been associated with poor diet and inadequate access to health and sanitation services (Caulfield et al., 2006). Malnutrition remains a major public health problem particularly in the developing countries where it accounts for more than 90% of all nutritional related conditions with two thirds of all cases originating from Sub Saharan Africa (Akombi et al., 2017). Despite several investments in the welfare of children and women, morbidity and mortality due to malnutrition is still high among children under 5 years of age (Bain et al., 2013). Further, only one-quarter of countries are on track to meet the targets on stunting, wasting, and overweight (WHO et al., 2021). Childcare practices have long been seen to be a vital cog in the growth and development of a child with policy attention first directed at them at the International Conference of Nutrition 1992, Rome, Italy (International Conference on Nutrition (1992: Rome et al., 1992). These childcare practices have been recognised to affect child dietary intake and also incidence of disease (which are the immediate causes of child malnutrition according to the UNICEF conceptual framework). Thus, ultimately impacting

heavily on child survival. Childcare practices can be grouped into three, that is feeding practices of infants and young children, psycho-social care, and health and hygiene practices (IFPRI, 1997). A fourth-dimension - maternal care and social support systems - is recognised to also influence child nutritional outcomes.

2.4.1 Feeding Practices

UNICEF has recently published the updated 17 indicators that assess Appropriate Infant and Young Child Feeding (IYCF) (WHO & UNICEF, 2021). Appropriate IYCF practices include breastfeeding up to 24 months and beyond and introducing solid and semi-solid foods at the age of 6 months. It also involves gradually increasing the amount of food given as well as frequency of feeding as the child gets older. It is also important to change the consistency of foods as the child grows older. Food diversity, hygiene and practice of active response feeding are important factors to be considered in infant and young child feeding.

A healthy breastfed child should receive solid complementary foods 2-3 times per day at age 6-8 months, and 3-4 times per day at age 9-23 months. Additional snacks should also be given to the child 1-2 times per day. The frequencies for feeding infants and young children in developing countries are based on the energy requirements of children and increase as the child grows. Mothers should not stop breastfeeding upon introduction of complementary foods. At six months, breastmilk contributes to half of the total energy intake of the infant. Infants with low breast milk intake require more frequent feeding than those with high breast milk intake. Feeding frequencies should not exceed recommended input from complementary foods. However, excessive complementary feeding can result in displacement of breast milk as infants might refuse to breastfeed. (PAHO/WHO, 2003).

IYCF recommendations on child feeding dictate the following; concerning diet quality, children should be fed a variety of foods to make sure that nutrient requirements are met. Plant-based complementary foods by themselves cannot meet the nutrient requirements of some children (WHO/UNICEF, 1998). Children or infants should be given meat, poultry, fish, or eggs daily as often as possible. Supplements or fortified foods should be provided to children with vegetarian diets to improve their diets (WHO,2005). It is recommended that vitamin A-rich fruits and vegetables be consumed daily. Fat is also important in the diets of infants and young children because it provides essential fatty acids, facilitates absorption of fat-soluble vitamins (such as vitamin A), and enhances dietary energy density and palatability. Tea and coffee are not

recommended for children because they contain compounds that inhibit iron absorption. Sugary drinks such as sodas, and excessive juice consumption and consumption of biscuits and corn chips should be avoided because other than the energy they have, they contribute little to the child's diet and decrease the child's appetite for more nutritious foods (PAHO/WHO, 2003). These factors and their effects on child nutrition status have been published before in various studies (English et al., 2019; WHO, n.d.). It is now well known for example that responsive feeding in children below 3 years is associated with normal weight gain or weight status and in overall a positive relationship exists between maternal feeding practice and child weight gain (Spill et al., 2019).

2.4.2 Psychosocial Care

Children do not exist in a vacuum. The majority of the caring is therefore occurring in and around interpersonal interactions and spaces. Psychosocial factors can therefore influence the quality of physical care such as in the timeliness of feeding, health seeking behaviour, support when ill and sensitivity to a child's needs in general. Adequate child psychosocial care is in turn affected by various factors such as caregiver knowledge, education and beleifs, income level, caregiver health and nutrition status, efficacy, autonomy and control of resources, workload and time constraints and social support from family and community (Engle & Ricciuti, 1995). For example, concerning workload and education level, children from mothers engaged in agriculture and manual work have been seen to have higher odds of stunting than children from mothers in professional work (Nankinga et al., 2019). The effect of psychosocial care on child nutrition has been reviewed extensively in the past and it has been seen that good psychosocial care is positively related to good growth, behavoural and nutritional outcomes in children (Richter et al., 2019).

2.4.3 Health and Hygiene Practices

Health and hygiene practices are predictors of disease incidence and prevalence. Diarrhoea is one of the most common childhood infections, especially in poor sanitation settings. The effects of diarrhoeal infections may be short-lived as catch-up growth may occur between the episodes. Acute infections may cause wasting however, repeated diarrhoeal episodes to the growing child may lead to stunting through various pathways (A. Prendergast & Kelly, 2012). In an analysis of data from nine community-based studies with daily diarrhoea data and longitudinal anthropometric measurements, the odds of stunting by 24 months of age increased

multiplicatively with each episode of diarrhoea. Overall, 25% of stunting was attributed to five or more episodes of diarrhoea (A. J. Prendergast & Humphrey, 2014).

Although the benefits of interventions like provision of improved water, sanitation, and hygiene (WASH) have since been evaluated primarily in terms of reduced diarrhoea and soil-borne helminth infections, the potential impact of WASH on stunting has been underestimated. It has been argued that observational studies also support an association between these WASH conditions and height in children, including a recent meta-analysis of five cluster-randomized controlled trials evaluating water disinfection, soap provision, or improved water quality (Piper et al., 2017). It has also been argued that WASH has the potential to improve early child development through effects on inflammation, anaemia, and stunting (A. J. Prendergast & Humphrey, 2014). The Lancet series on effective interventions to address child malnutrition report that programmes with multiple components, including health, nutrition, and psychosocial stimulation, might be the most successful in promoting children's early development (Keats et al., 2021).

2.5 Impact of Shocks and Hazards and Strategies Influencing Food and Nutrition Security

2.5.1 Relationship of total income and poverty level to food security

De Marco and Thorburn (2009) perceive poverty as the chief culprit that hinders access to adequate food among households in developing countries as households are unable to acquire adequate resources to be food secure.   This is highly pronounced in Sub-Saharan Africa (SSA) where a substantial proportion of the population cannot bolster resources to acquire food, adequate housing, quality health care or quality education for their families (Abo and Kuma, 2015; Babatunde, Omotesho and Sholotan, 2007; Babatunde, Qaim, 2010; Bain, Awah, Geraldine, 2013; Bashir and Schilizzi, 2013 Foeken and Owuor, 2008; Owusu, Abdulai, Abdul-Rahman, 2010). Compared to high income households, overall expenditures on protein-rich foods is low for low income households consequently correlating food insecurity with malnutrition (Ali, Jalil and Muda, 2014; Daneshi-Maskooni and Dorosty-Motlagh, 2013; Ihab, Rohana, Manan, Suriati, Zalilah, Rusli, 2015; Mas-Harithulfadhli-Agus, Hamid & Rohana.2018).

2.5.2 Relationship of household human capital to food security
Household Size

Intra-household food sharing poses a challenge for large food insecure households in SSA (Deressa, Hassan, Ringler, Alemu and Yesuf, 2009) as large household size puts an extra burden on consumption in contrast to small household size (see e.g., Oluwatayo, 2009). Closely, related to the household size, the structure of the household vis a vis the gender composition and the ages of the household members shape food intake, allocation and nutritional needs of the household (Abo and Kuma, 2015; Ihab, Rohana and Manan, 2015). The adverse impact of household size on food security is however off set if the majority of household members contribute to total household income (Oluwatayo, 2009).

Age of the head of the household

Recent literature has postulated statistically significant associations between the age of the household head and household food production capabilities (e.g., Ejaz, Azid & Usama, 2012). One strand of literature associates increases in the age of the household head with a decline in the food production capacities of the household before controlling for confounding variables (Ejaz, Azid & Usama, 2012; Arene, Anyaeji, 2010; Owusu, Abdulai & Abdul-Rahman S., 2011; Titus & Adetokunbo, 2007). The rationale of these studies is that elderly household heads ceteris paribus lack the (normally unobserved in observational studies) mental and physical attributes to engage in on-farm and off-farm production. The second strand of literature which focuses on the un-observed bonding social capital ceteris paribus postulates positive association of age of household head with household food security as elderly headed households are inter alia likely to receive remittances (e.g., Campos,e Ferreira & Vargas, 2015; Naah,Njong & Kimengsi, 2020; Quashie, 2019; United Nations, 2016).

Female-Headed Household

Gender has been recognised as a significant factor in food security (Horrell & Krishnan 2007; King-Dejardin & Owens, 2009; Klasen et al. 2015; Peterman et al. 2010; Quisumbing 1996; Quisumbing & McClafferty 2006; Quisumbing & Pandolfelli 2009). Whilst women contribute towards the achievement of food availability, accessibility and utilisation (Amugsi, Lartey, Kimani & Mberu, 2016) as they comparatively produce a large number of cultivated foods in SSA (Bashir & Schilizzi, 2013), ceteris paribus they tend to be more vulnerable to food insecurity (Babatunde & Qaim M, 2010; Belachew et al., 2011; Schatz, Madhavan, & Williams, 2011).

Educational Status

Educational status is recognised to be associated with household food insecurity. It is an essential determinant of food production, access and utilisation (Titus & Adetokunbo G,2007).[42] The mechanisms through which education influences food security differ, depending on the context, including urban versus rural. In the rural context, education influences food security through access to information on best agricultural production, nutrition and sanitation; increased efficiency, hence increased production and better decision making as well as the pride that comes with education (De Muro and Burchi 2007; Bashir and Schilizzi 2013). While these mechanisms may also apply among urban households, the pathways differ. In the urban context, the effect of education is through proxies such as employment, household income and decision making. These proxies have effects on the access, utilization and availability dimensions of food security. Increased years of schooling are associated with better employment opportunities, working efficiency, better decision making and increased disposable income (Bashir and Schilizzi 2013; Gebre 2012).

2.5.3 Strategies to bolster food security

i. **Technological**

Storage

Addressing post-harvest losses is key to unlocking the tremendous promise for enhancing inclusive economic growth, food security, and nutrition. In order to reduce or eliminate food insecurity, postharvest approach in reducing loss of produce is a vital strategy to supplement increasing food productivity. Hence, the environmental issues in supplying safe and nutritious foods in a sustainable manner should be considered. Improvements in postharvest technologies such as good harvesting practices and packaging systems are vital to minimize postharvest losses and to improve quality characteristics of fresh produce so that more fresh produce is actually consumed (Elik et al., 2019).

Technology

Science, technology, and innovation can play a critical role in producing more food by creating plant varieties with improved traits, as well as optimizing the inputs needed to make agriculture more productive (UNCTAD, 2017). Mechanization is a multi-dimensional concept and widely used in agriculture. Increasing food production requires resource-friendly methods, and this will require the development of new mechanization technology (Emami et al., 2018). New and existing technologies to combat biotic and abiotic stresses, raise crop and livestock

productivity, improve soil fertility and make water available can potentially increase the amount of food produced. Agricultural technologies include tissue culture and micropropagation, marker-assisted breeding and advanced genetic engineering. Storage, refrigeration, transport and agro-processing innovations can address the dimension of food accessibility. Science to produce high-nutrient staple crops can combat malnutrition, improving food utilization and use. Finally, innovations for change mitigation and adaptation, including precision agriculture, index-based insurance and early warning systems, can address food instability. For addressing the need for precise integration, scheduling of inputs for increased yield, imaging and associated analytics, drones and farm management software and applications can be used.

Biotechnology

Biotechnology research and development have already produced significant products on the market and will further have a pivotal role to play in encouraging and enhancing food production, considering the safety and environmental quality (Najafi and Lee, 2014). A high proportion of poor and food insecure people are living in developing countries and in rural areas. Therefore, biotechnology can:

1) increase the crops yield through introducing high-yielding varieties resistant to biotic and abiotic stresses;

2) reduce pest– associated losses; and

3) increase the nutritional values of foods which is a very important factor in rural areas. Producing herbicide tolerant crops is another benefit of biotechnology application in agriculture which can increase the crop yield.

One of the most recent programmatic responses to the level of food insecurity is food fortification (including biofortification), which is currently promoted and supported by many stakeholders: governments, researchers, donors, UN organizations, NGOs, foundations and private sector companies. Biofortification is a relatively "new strategy" that uses conventional breeding techniques and biotechnologies to reduce "anti-nutrient" or increase the micronutrient quantity of staples. As such, the innovation is seen as an opportunity to deliver "naturally" – vs processed – fortified foods to people living in rural areas with limited access to marketed fortified foods, more readily available in urban areas.

ii. Agricultural

Multiple cropping

Conservation agriculture (CA), based on crop diversity, soil cover and limited soil disturbance (Kassam et al., 2015), has been widely promoted as a solution to agricultural challenges. Mixed cropping is an agricultural system in which several different crops are grown in close proximity, in a rotation system, or both. It also refers to the planting of different crops in the same field during the same season. Sole cropping on the other hand is the planting of one crop per field per season while mono-cropping or monoculture, is the planting of a single crop in the same field for a succession of seasons or indefinitely. Multiple cropping systems thus consist of growing two or more cultivars or species with a spatial and temporal association (Gaba et al., 2015). Multiple cropping systems can produce crops at the same time as providing several ecosystem functions in the same space. The benefits of mixed cropping include better and more reliable yields, a smoother labour input profile, better control of pests, weeds and diseases and mixed cropping also supplies a diversity of subsistence materials for example foodstuffs like staples (maize in Zimbabwe) and long duration and drought resistant crops. Cereal–legume associations are a well-known example of a multiple cropping system based on complementary functioning that optimizes the use of nitrogen at field scale over a growing season.

Crop rotation

There are numerous ecological and economic benefits of using crop rotation. Different plant species interact with soil nutrients in particular ways, releasing and absorbing specific nutrient elements in unique proportions. Therefore, a well-planned rotation strategy helps improve soil fertility by either restoring depleted nutrients or using excess nutrients, balancing the soil's nutrient levels. Crop rotation affects not only the nutrient cycling in soil but also the recycling of plant residues, the formation and distribution of biopores, and the development of beneficial microbe. The prevalence of pests and diseases is easily reduced by disrupting the life cycles of pests that feed on similar plant species. Rotation and annual cover plants used within an integrated system reduce weed biomass and alter the species mix of weeds while decreasing pesticide use.

Water and soil conservation

Improved farm practices have to suit local ecological and socio-economic conditions. Soil and water management practices are highly site specific and technologies that are a success in one area might not prove useful in a different context. Therefore, it is important that farm practices are developed and adapted locally, by farmers. The role of farmers in research and extension

of agricultural practices needs to be strengthened so that appropriate technologies can be developed and disseminated (Singh et al., 2013). Resource poor farmers learn best from other farmers and prefer trying out technologies on a small scale first before adopting it on a larger area. Farmers can use a variety of simple and affordable water management techniques to increase their yields and reduce their vulnerability to erratic rainfall or drought. Effective water management through low water-based irrigation techniques like sprinkler, drip irrigation etc. are helpful in productivity enhancement of crops.

iii. Political and economic

Food programmes and aid assistance

Large-scale Child Supplementary Feeding Programmes (CSFPs) have been widely used in recent decades as a way of reducing or preventing malnutrition, particularly in severe droughts (Lauchlan., 2002). CSFP to combat child malnutrition during drought-induced emergencies is also effective in preventing an increase in malnutrition among children under five.

Cash and Voucher schemes

Vouchers provide access to pre-defined commodities or services. They can be exchanged in designated shops or in fairs and markets (European Commission, 2013). The vouchers may be denominated either in cash, commodity or service value. These are described respectively as value-based, commodity based or service-based vouchers. Cash and vouchers empower people with choice to address their essential needs in local markets, and findings show that vulnerable households which can make their own decisions, make choices that improve their food security and wellbeing. Cash transfers also have multiplier effects on the local economy. By enabling people to purchase food and other items locally, cash can help strengthen local markets, encourage smallholders to be more productive, and build national capacities.

School Meals

The provision of school meals by governments is an important intervention for meeting the Sustainable Development Goals (SDGs), as governments look to give children worldwide equal opportunities to maximise their education regardless of their families' economic situation. School meal policies achieve multiple policy objectives, including those related to the triple challenge facing food systems: ensuring food security and nutrition for a growing population, supporting the livelihoods of millions of farmers and others in the food chain, and doing so in an environmentally sustainable way.

Provision of school meals to provide nutrition for school children

Food insecurity among children affects their health, education and development (Lindberg, 2022). Healthy and balanced school meals can target nutrient deficiencies that, if left untreated, can impair students' ability to focus and retain information. Eating lunch at school has been positively associated with diet quality, food security and academic performance. Early food experiences are predictive of nutrition and eating behaviors later in life. Exposing children to healthy options at school can especially help the most disadvantaged increase their consumption of healthy foods in childhood and later on. Considering the prevalence of adolescent food insecurity and the consequences of food insecurity on current and future health, it is important to explore how strategies aimed at improving overall food security may address food insecurity among adolescents (Harper et al., 2022).

2.6   Research questions

Based on the literature review of the food and nutrition security framework presented in preceding sections, the following research questions were used to guide the analysis of the Rural Livelihoods Assessment, whose findings are presented in Chapter 4 of this report.

i.   What are the effects of child caring practices on child nutrition status? Variables-stunting, wasting, underweight.

ii.   What are the effects of water, sanitation and hygiene practices on child nutrition status?

iii.   What are the effects of shocks on child nutrition status and food security?

iv.   What are the effects of adopting agriculture technologies on food security status?

v.   What are the effects of social protection mitigation measures on availability, access and utilisation?

vi.   What is the impact of adaptive and absorptive coping strategies on food and nutrition security?

vii.   What is the impact of asset ownership on food and nutrition security?

Detailed methods used to conduct the analysis are presented in the methods section in Chapter 3.

Chapter 3   Methodology

The 2023 ZimVAC RLA assessment was conducted with the understanding of livelihoods within the context of vulnerability and resilience building. The assessment was a cross-sectional study whose design was guided and informed by the Food and Nutrition Security Framework (**Figure 1**) and the dimensions of food security propounded by Jones et al. (2013)[1] and adopted by the Government of Zimbabwe in the FNSP (GoZ, 2012). The assessment was also guided and informed by the resilience framework (**Figure 6**) to influence the early recovery of households affected by various shocks.
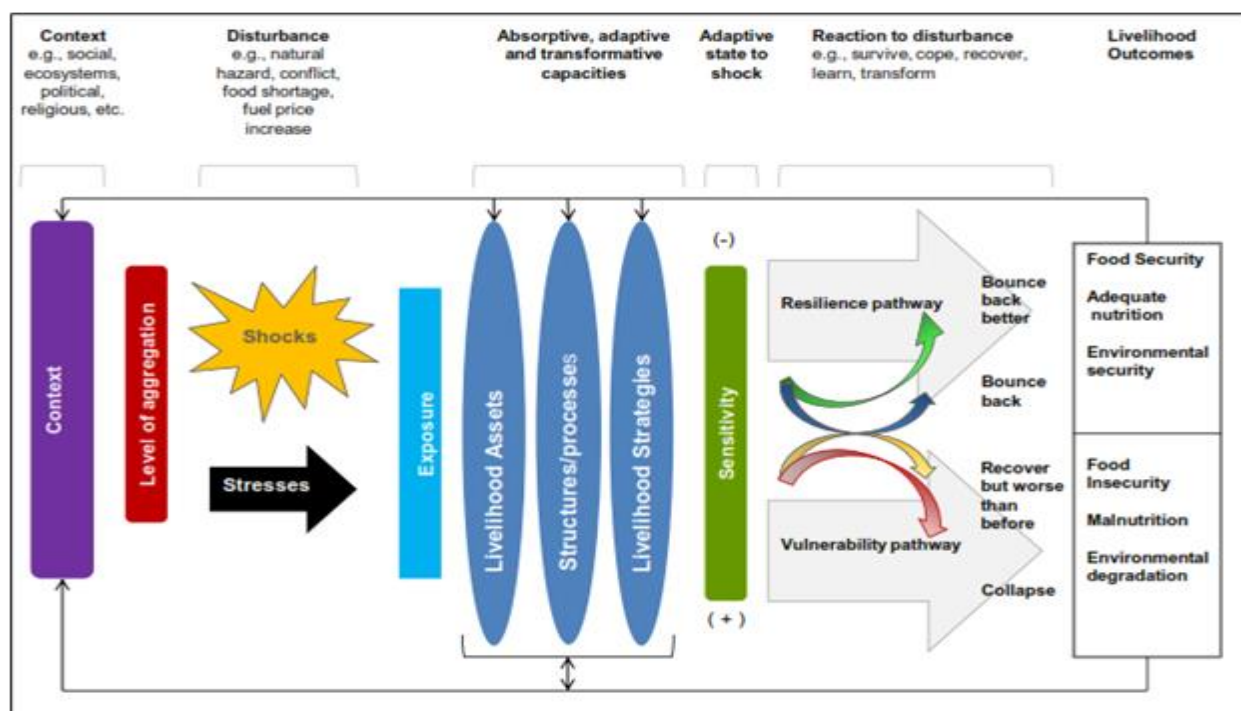
***Figure 6**. The Resilience Conceptual Framework (Béné et al., 2012)*

3.1 Data Generation Process

The 2023 ZimVAC RLA was informed by the multi-sectoral objectives generated by a multi-stakeholder consultation process. The assessments employed a structured household questionnaire, community focus group discussion questionnaire and Chiefs' key informant questionnaire as the three primary data collection instruments. ZimVAC national supervisors

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[1] Jones et al. (2013). What are we assessing when we measure food security? A compendium and review of current metrics. Advances in nutrition (Bethesda, Md.), 4(5), 481–505. https://doi.org/10.3945/an.113.004119

and enumerators were recruited from Government Ministries/departments, United Nations and Non-Governmental Organizations and underwent a 2-day training in all aspects of the assessment. The Ministry of Local Government, through the Provincial Development Coordinators' offices coordinated the recruitment of district level enumerators and mobilisation of provincial and district enumeration vehicles. Four enumerators were selected from each district for data collection.

The survey data was collected by using androids and CSPro software. Data analysis and report writing were conducted from 22 May to 2 June 2023. Various secondary data sources and field observations were used to contextualise the analysis and reporting. The data analysis and report writing were based on thematic areas of interest to all stakeholders. The Conceptual Framework presented in **Figure 7**, which is based on the Food and Nutrition Security Framework was used to structure the data analysis and report. The green arrows indicate some specific linkages, relationship analysed and presented in this report.
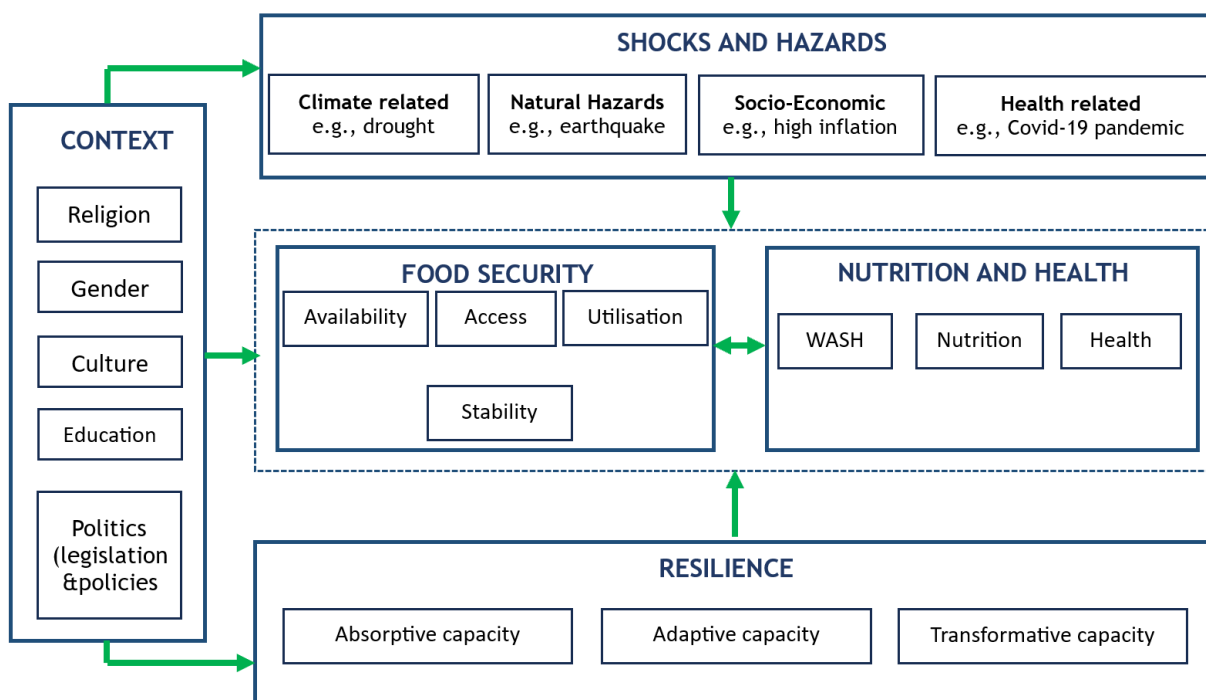
Figure 7. *Data analysis conceptual framework (FNC, 2023)*

3.2 Sample size determination and description

Household food insecurity prevalence was used as the key indicator to determine the sample to ensure 95% confidence level of statistical representativeness at district, provincial and national level. The survey sampling followed two staged cluster sampling at each of the 60 rural district level. First, 25 EAs were randomly selected based on PPS methodology. Secondly, 10 households were selected for interviews in each EA by using systematic random sampling from household lists available at the EA. A total of 250 households were interviewed per district, bringing the total sampled households to 15, 009 (**Table 1**).

Table 1. Number of sampled households per province

Province	Number of Sampled Households
Manicaland	1,748
Mashonaland Central	2,007
Mashonaland East	2,254
Mashonaland West	1,759
Matabeleland North	1,752
Matabeleland South	1,752
Midlands	2,007
Masvingo	1,730
National	15,009

3.3 Evaluation of treatment effects

Assessing the treatments effects of various measures on outcome variables of interest such as food security status of the household using the 2023 RLA data (see Section 10) is confounded by incomplete information arising from the self-selection of observations into treatment.[2],[3],[4] Propensity Score Matching (PSM) is used to reduce the confounding effects of observational

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[2] Austin, P. C. (2011) "An introduction to propensity score methods for reducing the effects of confounding in observational studies", Multivariate Behavioral Research, 46(3), 399-424. https://doi.org/10.1080/00273171.2011.568786

[3] Caliendo, M., & Kopeinig, S. (2008) "Some practical guidance for the implementation of propensity score matching," Journal of Economic Surveys, 22(1), 31–72. https://doi.org/10.1111/j.1467-6419.2007.00527.x

[4] Heckman, J. J., Ichimura, H., & Todd, P. E. (1997) "Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme," Review of Economic Studies, 64(4), 605-654. https://doi.org/10.2307/2971733

survey data as observational or non-randomized studies suffer from selection bias unlike Randomized Control Trials (RCTs).

We define an indicator variable, T_i, which takes the value of 1 for household i, if the household was treated and 0, otherwise. We also define the outcome variable such as food security of the household as Y_i. The counterfactual problem is that for each household we can only observe either Y_{i0}, or Y_{i1} when $T_i = 1$ and $T_i = 0$, respectively.

Propensity score matching techniques circumvent the counterfactual problem by matching $T_i = 1$ and $T_i = 0$ households using Pr $(T_i = 1| X)$ which is the probability of household i having $T_i = 1$ on the basis of observed covariates, X_i. In this report, we use nearest neighbour matching technique which chooses an individual from the comparison group for treated individual that is closest in terms of propensity score. We estimate the average treatment effect on the treated (ATT) that provides the impact of treatment on outcome variables as follows:

$$ATT = E(Y_{i1} \mid T_i = 1) – E\{E (Y_{i0} \mid T_i = 0, Pr (T_i =1|X) \mid T_i =1)\}t \qquad [2]$$

The validity of the ATT requires the conditional independence assumption that assignment to $T_i = 1$ or $T_i = 0$ is random after controlling for observed covariates X. [5], [6],[7] To examine treatment heterogeneity in the impact of $T_i = 1$ on the basis of the of a heterogenic factor such as G_i, which could be whether the household was affect by a shock or not, we separately estimate Average Treatment Effects on the Treated (ATT) from Equation 2.

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[5] Austin, P. C. (2009) "Type I error rates, coverage of confidence intervals, and variance estimation in propensity- score matched analyses", International Journal of Biostatistics, 5(1), 1557–4679. https://doi.org/10.2202/1557-4679.1146

[6] Banerjee, A. V., & Duflo, E. (2011). Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty. New York: Perseus Books.

[7] Huang, J., Oshima, K., & Kim, Y. (2010) "Does food insecurity affect parental characteristics and child behavior? Testing mediation effects." Soc Serv Rev, 84, 381–401. https://doi.org/10.1086/655821

Chapter 4   Results

This chapter presents information on the characteristics of the sampled population. These characteristics include sampled population size and demographics of the sampled population.

4.1   Sample size and background characteristics

A total of 15,009 households were sampled (**Table 1**), as compared to the 14 965 households sampled during the 2022 ZimVAC RLA. Mashonaland East province (2 254) had the highest number of surveyed households and Masvingo province (1 730) had the least. The results in Table 1 show that nationally, most of the sampled households were headed by males (67%) as compared to females (33%). These figures corroborate findings from the 2022 Zimbabwe Population and Household Census Report[8].

Disaggregating the data by province, Mashonaland West Province (76%) had the highest proportion of male headed households and Matabeleland South Province (44) had the highest proportion of female headed households. Regarding household size, the national average was 4.5 and at provincial level, the highest household size was recorded in Midlands Province (5) and the lowest (4.2) was recorded in Manicaland, Mashonaland Central and Mashonaland East provinces.

Table 2. Sample size, sex of household head and household size

Province	Sex of HH (%)		Household size
	Male	Female	
Manicaland	67	33	4.2
Mashonaland Central	73	27	4.2
Mashonaland East	66	34	4.2
Mashonaland West	76	24	4.3
Matabeleland North	65	35	4.7
Matabeleland South	56	44	4.5
Midlands	69	31	5.0
Masvingo	64	36	4.7
National	**67**	**33**	**4.5**

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[8] https://www.zimstat.co.zw/wp-content/uploads/Demography/Census/2022_PHC_Report_27012023_Final.pdf

Table 3 shows the results for the age of sampled household heads. At the national level, the average age of sampled household heads was 53.2. The highest average age of household head was reported in Matabeleland South province (57.9 years) and lowest in Mashonaland West Province (47.5 years). Disaggregating the data by age group, most of the household heads were 60 years and above and only 0.1% were within the 10 – 17 years of age. This latter result reflects a low proportion of child headed households, which is commendable.

Table 3. Age of household head

Province	Average age of Household head	Age Group of Household Head					
		10-17 years	18-29 years	30-39 years	40-49 years	50-59 years	60+ years
Manicaland	50.2	0.2	9.0	18.8	24.5	17.8	29.7
Mashonaland Central	53.1	0.0	11.5	20.9	24.9	15.7	27.0
Mashonaland East	51.5	0.2	9.7	18.2	21.7	15.8	34.3
Mashonaland West	47.5	0.1	13.1	23.1	23.4	17.4	22.7
Matabeleland North	56.9	0.1	5.1	14.3	21.4	18.2	40.8
Matabeleland South	57.9	0.2	6.6	15.2	20.5	16.8	40.8
Midlands	55.9	0.1	7.5	16.1	21.9	17.2	37.0
Masvingo	53.1	0.1	7.1	15.8	25.0	17.7	34.1
National	**53.2**	**0.1**	**8.8**	**17.8**	**22.9**	**17.0**	**33.3**

With respect to the education level attained by household head, the results in **Table 4** reveal that most of the household heads attained primary education (35.8%) as their highest level of education, followed by those who attained O' Level (34%). In summary, the results show that 89% of the sampled household heads were literate (primary to graduate and postgraduate educational levels). However, only 2.2% of the sampled household heads had attained tertiary level education. The Government of Zimbabwe is commended for its current efforts to increase access to tertiary education through the setting up of Vocational Training Centres (VTCs) and technical colleges in remote areas. This will help increase the proportion of household heads who attain tertiary education. More so, the programme is expected to boost rural development in line with country's Vision 2030 of an upper middle-income society.

Table 4. Education level of household head (%)

Province	Educational level of household head							
	None	Primary level	ZJC level	O' level	A' level	Diploma/ Certificate after primary	Diploma/ Certificate after secondary	Graduate/ Post-Graduate
Manicaland	6.6	34.0	14.3	39.2	1.9	0.7	1.8	1.1
Mashonaland Central	14.7	32.1	13.7	36.5	1.1	0.6	0.6	0.4
Mashonaland East	8.7	32.8	14.0	40.3	1.2	0.4	1.2	1.0
Mashonaland West	10.1	31.2	17.5	36.1	0.9	0.8	1.9	1.2
Matabeleland North	12.4	47.7	14.8	21.6	1.0	0.4	1.3	0.6
Matabeleland South	13.1	41.2	14.5	26.9	0.5	0.9	1.3	1.4
Midlands	9.1	33.6	16.4	36.7	1.4	0.9	1.1	0.4
Masvingo	12.1	35.8	15.7	31.8	1.1	0.5	1.7	1.0
National	**10.8**	**35.8**	**15.1**	**34.0**	**1.2**	**0.7**	**1.3**	**0.9**

4.2 Water, Hygiene and Sanitation (WASH)

Access to water, sanitation and hygiene is a major challenge in developing nations and more among the rural population. Limited access to safe drinking water and poor sanitation can lead to under nutrition, water borne diseases (Gaude and Dessai, 2019). Poor people living in rural areas of Zimbabwe are disproportionately affected by a lack of rural WASH, which generates a significant, yet preventable, disease burden. Under the Sustainable Development Goals, a new target was established, calling for universal access to adequate and equitable sanitation and hygiene, for increasing the focus on women and girls, and for ending open defecation by 2030 (World Bank, 2019). The WASH sector works closely with health and nutrition to address potential causes of waterborne diseases and malnutrition, and to reduce public health risks associated with poor water, sanitation and hygiene services and practices. Zimbabwe's WASH sector has key policies and strategies providing sector direction and clarification of roles, namely the National Water Policy (2013), the Water Act (Chapter 20:24), the ZINWA Act (Chapter 20:25), the Rural District Act (Chapter 29:13), the Urban Councils Act (Chapter 29:15), the Public Health Act (Chapter 15:17) and the National Sanitation and Hygiene Strategy (2018–2022). There is now increased clarity on the roles and responsibilities of the different actors and their institutions in the water and sanitation sector.

4.2.1 Status of access to improved water sources

As shown in **Table 5**, households in Matabeleland North had the highest proportion of households with access to improved water sources (87.2%) against a national average of 78.4%. Masvingo had the highest proportion of households with access to unimproved water sources (31.4%). Improved drinking water sources are those which, by nature of their design and construction, have the potential to deliver safe water. Mashonaland East recorded the highest proportion of households with access to basic drinking water sources (71.3%) i.e., drinking water from an improved source, provided collection time is not more than 30 minutes for a roundtrip including queuing.

Table 5. Status of access to improved water sources in the provinces **(%)**

Province	Drinking water sources		Drinking water Services			
	Unimproved water	Improved water	Basic	Limited	Unimproved	Surface water
Manicaland	19.2	80.8	70.1	10.8	16.9	2.3
Mashonaland Central	17.4	82.6	58.5	24.1	14.0	3.4
Mashonaland East	17.9	82.1	71.3	10.8	16.2	1.7
Mashonaland West	26.4	73.6	60.5	13.1	20.8	5.7
Matabeleland North	12.8	87.2	66.2	20.9	5.1	7.8
Matabeleland South	23.6	76.4	47.9	28.4	11.9	11.7
Midlands	25.1	74.9	56.9	18.0	18.9	6.2
Masvingo	31.4	68.6	48.6	20.1	25.8	5.6
National	**21.6**	**78.4**	**60.3**	**18.1**	**16.2**	**5.4**

Table 6 shows that Mashonaland East had the highest proportion (74.8%) of households with Improved sanitation. The national average on status for improved sanitation was 61.1 % showing a decrease from 66% recorded in 2022. Matabeleland North had the highest proportion of households practicing open defecation (52.6%). However, there was a slight increase in open defecation from the national average of 27% reported in 2022 to 28.6% in 2023.

Table 6. Sanitation practices in the 8 provinces of Zimbabwe (%)

Province	Sanitation facilities		Sanitation Services			
	Unimproved sanitation	*Improved sanitation*	*Basic*	*Limited*	*Unimproved*	*Open defecation*
Manicaland	28.7	71.3	58.9	12.4	15.4	13.3
Mash Central	33.3	66.8	53.6	13.2	20.1	13.2
Mash East	25.2	74.8	59.1	15.7	10.5	14.7
Mash West	45.5	54	40.6	13.9	12.5	33.0
Mat North	55.4	44.6	41.6	3.0	2.9	52.6
Mat South	41.8	58.2	53.7	4.5	5.7	36.1
Midlands	41.6	58.4	54.6	3.8	6.5	35.2
Masvingo	43.9	56.1	47.1	8.9	7.8	36.2
National	**38.9**	**61.1**	**51**	**9.6**	**10.3**	**28.6**

4.2.2 *Correlates of background characteristics and access to water sources*

Results in **Table 7** show that an increase in household head's age increased the likelihood of accessing improved drinking water by 0.10% at the 1% significance level. Female headed households had a 2.04% increased likelihood to access improved water as compared to their male counterparts. Education was a positive determinant of access to basic water services. A household headed by a resident with graduate level education was 14.5% more likely to have access to improved water and 21.2% more likely to have basic drinking water (**Table 7**). Higher educational achievement of an individual would mean more opportunities to get good salaried employment and enough financial resources for greater access to improved water. This means that household heads with a higher level of education are more aware and can receive training and education, which is significant in dealing with WASH issues.

Monthly income was a positive determinant of access to improved drinking waters sources. There was a 11.1% increased probability of access to improved drinking water as household income increased. Higher socio-economic classes are more likely to access improved water because they have the ability to purchase private alternative harvesting technologies during shortages. Those following the Zion religious sect were 9.73% less likely to have basic drinking water services. A similar trend was noted for the traditional religion followers who were 19.1%

less likely to have access to basic drinking water sources. Household size was a negative determinant on both access to basic drinking water and improved water services at 1% significance level. Generally, bigger household size means significant water needs and more expenses towards WASH related activities.

At provincial level, households in Masvingo province had poor access to drinking water sources as well as access to improved water. The households in Masvingo were 20.0% less likely to access basic water services compared to the reference province. A similar trend was noted with the same households being 11.5% less likely to access improved water.

Table 7. OLS Correlates of background characteristics and access to water sources

Background characteristics	Access to water	
	Basic (SDG)	Improved
Household head age [Years]	0.00105***	0.00104***
	(0.000323)	(0.000275)
Household head is female	0.00969	0.0204*
	(0.0137)	(0.0115)
Primary level	0.0312**	0.0382***
	(0.0142)	(0.0123)
ZJC level	0.0726***	0.0482***
	(0.0168)	(0.0146)
O' level	0.0986***	0.0842***
	(0.0160)	(0.0138)
A' level	0.138***	0.114***
	(0.0372)	(0.0299)
Diploma/Certificate after primary	0.179***	0.0844**
	(0.0459)	(0.0394)
Diploma/Certificate after secondary	0.180***	0.0947***
	(0.0336)	(0.0293)
Graduate/Post-Graduate	0.212***	0.145***
	(0.0370)	(0.0283)
Married living apart	-0.00384	-0.000525
	(0.0159)	(0.0135)
Divorced/separated	0.000693	-0.00795
	(0.0191)	(0.0162)
Widow/widower	0.0301*	0.0150
	(0.0161)	(0.0135)
Cohabiting	0.0261	0.0439
	(0.0880)	(0.0746)
Never married	-0.00535	0.00583
	(0.0269)	(0.0229)
Protestant	-0.0450**	-0.0176

	(0.0178)	(0.0143)
Pentecostal	-0.0268	-0.0326**
	(0.0174)	(0.0143)
Apostolic Sect	-0.0758***	-0.0545***
	(0.0153)	(0.0125)
Zion	-0.0973***	-0.0569***
	(0.0187)	(0.0155)
Other Christian	-0.0634***	-0.0227
	(0.0232)	(0.0189)
Islam	-0.0374	-0.0861*
	(0.0546)	(0.0470)
Traditional	-0.191***	-0.118***
	(0.0296)	(0.0259)
Other religion	-0.00121	0.0377
	(0.0367)	(0.0286)
No religion	-0.0676***	-0.0637***
	(0.0189)	(0.0156)
Monthly income [USD]	0.0204***	0.0111***
	(0.00247)	(0.00212)
Household size	-0.00912***	-0.00601***
	(0.00203)	(0.00173)
Household member has chronic illness	0.0112	0.0125
	(0.0107)	(0.00887)
Household member has disability	-0.0100	-0.00178
	(0.00746)	(0.00629)
Asset index [0 ≤ Asset index ≤31]	-0.00134	0.000932
	(0.00124)	(0.00105)
Mash Central	-0.0927***	0.0386***
	(0.0157)	(0.0129)
Mash East	0.0144	0.0120
	(0.0143)	(0.0124)
Mash West	-0.0931***	-0.0633***
	(0.0161)	(0.0142)
Mat North	-0.0147	0.0749***
	(0.0162)	(0.0127)
Mat South	-0.198***	-0.0356**
	(0.0166)	(0.0142)
Midlands	-0.130***	-0.0616***
	(0.0156)	(0.0136)
Masvingo	-0.200***	-0.115***
	(0.0163)	(0.0147)
Constant	0.594***	0.703***
	(0.0317)	(0.0270)
Observations	14,958	14,958
R-squared	0.051	0.032

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

4.2.3 Ordinary Least Squares (OLS) Correlates of background characteristics and sanitation practices

At 1% significance level, an increase by one year in age increased the likelihood of open defecation by 0.42% as shown in **Table 8**. A female headed household was 5.51% less likely to have improved sanitation. A primary level holder was 6.5% more likely to practice open defecation and 6.9% less likely to have improved sanitation at household level. The Zion Church followers had a 10.5% less likelihood of open defecation whilst traditional religious sect members were 17.6% less likely to have basic SDG sanitation facilities at the 1% confidence level. It is at the community level that religious groups have the most direct link to WASH outcomes. Churches have religious practices related to handwashing or cleansing. Some even have specific guidance related to sanitation issues. Zion, Apostolic sect and traditional religion were also positive determinants to improved sanitation.

Household size was a negative determinant for both basic sanitation and improved sanitation at household level. A household with a member who is disabled was 2.31% less likely to practice open defecation. A household with a higher asset index was 2.85% more likely to have basic sanitation facilities. At 1% significance level, Matabeleland North province was 39.2% likely to have improved sanitation level compared to the reference province. However, at national level Matabeleland North still has the highest proportion (52.6%) of households practicing open defecation. Masvingo province had a similar trend with an increased likelihood to have improved sanitation facilities at household level. However, Masvingo was also 14.4 % less likely to have basic SDG sanitation facilities at 1% significance level.

Table 8. OLS correlates of background characteristics and sanitation practices

Background characteristics	Sanitation		
	Basic (SDG)	Improved	Open defecation
Household head age [Years]	0.00542***	-0.00423***	0.00417***
	(0.000318)	(0.000282)	(0.000311)
Household head is female	0.0555***	-0.0551***	0.0611***
	(0.0137)	(0.0124)	(0.0134)
Primary level	0.0669***	-0.0690***	0.0652***
	(0.0138)	(0.0127)	(0.0138)
ZJC level	0.0979***	-0.103***	0.0849***
	(0.0163)	(0.0148)	(0.0162)
O' level	0.150***	-0.151***	0.165***
	(0.0156)	(0.0142)	(0.0154)
A' level	0.227***	-0.209***	0.254***
	(0.0396)	(0.0315)	(0.0360)

Diploma/Certificate after primary	0.216***	-0.210***	0.221***
	(0.0467)	(0.0279)	(0.0388)
Diploma/Certificate after secondary	0.240***	-0.244***	0.294***
	(0.0359)	(0.0249)	(0.0297)
Graduate/Post-Graduate	0.249***	-0.222***	0.288***
	(0.0397)	(0.0273)	(0.0301)
Married living apart	0.00587	-0.000941	0.00849
	(0.0159)	(0.0141)	(0.0154)
Divorced/separated	-0.0419**	0.0164	-0.0117
	(0.0190)	(0.0177)	(0.0191)
Widow/widower	0.00677	0.0233	-0.0104
	(0.0160)	(0.0143)	(0.0156)
Cohabiting	-0.00120	0.0712	-0.0167
	(0.0846)	(0.0841)	(0.0879)
Never married	0.0839***	-0.0459*	0.0442
	(0.0279)	(0.0263)	(0.0277)
Protestant	0.00319	-0.0138	0.0135
	(0.0175)	(0.0142)	(0.0164)
Pentecostal	-0.0360**	0.0125	-0.0154
	(0.0175)	(0.0143)	(0.0165)
Apostolic Sect	-0.0951***	0.0681***	-0.0819***
	(0.0153)	(0.0126)	(0.0145)
Zion	-0.101***	0.102***	-0.105***
	(0.0183)	(0.0163)	(0.0178)
Other Christian	-0.0310	0.0180	-0.00703
	(0.0234)	(0.0193)	(0.0219)
Islam	-0.185***	0.00596	-0.156***
	(0.0520)	(0.0420)	(0.0532)
Traditional	-0.176***	0.170***	-0.185***
	(0.0283)	(0.0263)	(0.0284)
Other religion	0.00448	-0.00406	0.0180
	(0.0397)	(0.0339)	(0.0373)
No religion	-0.113***	0.0823***	-0.0864***
	(0.0186)	(0.0162)	(0.0181)
Monthly income [USD]	0.00946***	-0.0229***	0.0205***
	(0.00244)	(0.00213)	(0.00240)
Household size	-0.000763	0.00326*	-0.00466**
	(0.00198)	(0.00175)	(0.00193)
Household member has chronic illness	0.00995	-0.0244***	0.0173*
	(0.0103)	(0.00905)	(0.0101)
Household member has disability	-0.0261***	0.0171***	-0.0231***
	(0.00729)	(0.00655)	(0.00713)
Asset index [0 ≤ Asset index ≤31]	0.0285***	-0.0165***	0.0196***
	(0.00122)	(0.00102)	(0.00117)
Mash Central	-0.0116	-0.0378***	-0.00233
	(0.0158)	(0.0114)	(0.0150)
Mash East	-0.0293*	0.0342***	0.0145

	(0.0151)	(0.0111)	(0.0139)
Mash West	-0.176***	0.195***	-0.164***
	(0.0157)	(0.0134)	(0.0155)
Mat North	-0.197***	0.392***	-0.267***
	(0.0161)	(0.0143)	(0.0158)
Mat South	-0.0823***	0.233***	-0.138***
	(0.0163)	(0.0141)	(0.0159)
Midlands	-0.0955***	0.251***	-0.162***
	(0.0156)	(0.0131)	(0.0150)
Masvingo	-0.144***	0.236***	-0.161***
	(0.0161)	(0.0138)	(0.0156)
Constant	0.0547*	0.599***	0.246***
	(0.0312)	(0.0270)	(0.0305)
Observations	14,925	14,925	14,925
R-squared	0.127	0.168	0.120

Robust standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1

4.2.4 OLS Correlates of background characteristics and hygiene practices

The results presented in **Table 9** show that at 5% significance level, a female headed household was 1.69% more likely to have a handwashing station. Graduate/post-graduate level holders have a higher likelihood of having basic hygienic facilities and 27.1% more likely to have a handwashing station at household level. A widow/widower was 2.46% less likely to have basic hygiene practices and 3.57 % less likely to have a handwashing station. The Apostolic sect followers were 3.89% less likely to have a handwashing station. Those belonging to Traditional religion were also 4.51% less likely to have a household handwashing facility, at 1% significance level. Religious faith and culture can strongly influence hand hygiene behaviour in communities and potentially affect compliance with best practices. Hand hygiene can be practised for hygienic reasons, ritual reasons during religious ceremonies, and symbolic reasons in specific everyday life situations.

A household with a family member who is disabled was 1.77% less likely to have a handwashing facility. Such stigma and discrimination can result in people with disabilities being excluded from participating in WASH decision processes as well as the planning, development, and implementation of services and programmes. Households in Midlands Province were 3.01% less likely to have basic hygiene practices and similarly, 5.51% less likely to have a handwashing facility at 1% significance level.

Table 9. OLS Correlates of background characteristics and hygiene practices

Background characteristics	Hygiene	
	Basic (SDG)	Handwashing

		station
Household head age [Years]	0.000770***	0.00129***
	(0.000129)	(0.000174)
Household head is female [1 if Yes, 0 if No]	0.00945*	0.0169**
	(0.00548)	(0.00743)
Primary level	-0.00191	-0.000136
	(0.00517)	(0.00728)
ZJC level	0.00574	0.0134
	(0.00638)	(0.00883)
O' level	0.0124**	0.0187**
	(0.00621)	(0.00850)
A' level	0.0640***	0.0592**
	(0.0224)	(0.0252)
Diploma/Certificate after primary	0.0436	0.0310
	(0.0293)	(0.0337)
Diploma/Certificate after secondary	0.0833***	0.133***
	(0.0240)	(0.0298)
Graduate/Post-Graduate	0.206***	0.271***
	(0.0382)	(0.0424)
Married living apart	-0.00652	-0.0171*
	(0.00672)	(0.00877)
Divorced/separated	-0.0125*	-0.0209**
	(0.00693)	(0.00976)
Widow/widower	-0.0246***	-0.0357***
	(0.00635)	(0.00870)
Cohabiting	0.00456	-0.0332
	(0.0334)	(0.0325)
Never married	0.00190	-0.0125
	(0.0111)	(0.0139)
Protestant	0.00642	0.00303
	(0.00889)	(0.0117)
Pentecostal	-0.00572	-0.0162
	(0.00836)	(0.0111)
Apostolic Sect	-0.0191***	-0.0389***
	(0.00731)	(0.00982)
Zion	-0.0131	-0.0199*
	(0.00830)	(0.0114)
Islam	-0.00205	0.0139
	(0.0251)	(0.0353)
Traditional	-0.0253**	-0.0451***
	(0.0109)	(0.0150)
Other religion	-0.0220	-0.0457**
	(0.0149)	(0.0195)
No religion	-0.0261***	-0.0447***
	(0.00819)	(0.0111)
Monthly income [USD]	0.00262**	0.00597***
	(0.00106)	(0.00136)
Household size	-0.00420***	-0.00634***
	(0.000885)	(0.00116)
Household member has chronic illness	0.00283	0.00538
	(0.00421)	(0.00579)
Household member has disability	-0.00892***	-0.0177***
	(0.00278)	(0.00373)
Asset index [0 ≤ Asset index ≤31]	0.00234***	0.00320***
	(0.000622)	(0.000788)

Mash Central	0.00974	0.00210
	(0.00675)	(0.00872)
Mash East	-0.00891	-0.0137
	(0.00619)	(0.00837)
Mash West	-0.0102	-0.0115
	(0.00650)	(0.00889)
Mat North	0.00948	0.0104
	(0.00721)	(0.00944)
Mat South	0.00994	0.0223**
	(0.00740)	(0.00987)
Midlands	-0.0301***	-0.0551***
	(0.00553)	(0.00754)
Masvingo	-0.0176***	-0.0165*
	(0.00629)	(0.00888)
Constant	0.00451	0.0168
	(0.0140)	(0.0184)
Observations	14,958	14,958
R-squared	0.035	0.043

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

4.3 FOOD SAFETY

Ensuring food safety is key to preventing food borne illnesses which are contracted through consumption of unsafe foods (Fasoro et al., 2016). Improper handling of food can result in consumers contracting foodborne illnesses. An estimated 600 million – almost 1 in 10 people in the world – fall ill after eating contaminated food and 420 000 die every year, resulting in the loss of 33 million healthy life years (DALYs) (WHO. 2022). Ensuring food safety is key to preventing food borne illnesses which are contracted from consumption of unsafe foods. Poor food hygiene is likely to be an important contributor to high rates of infectious diseases in resource-poor settings. According to some estimates, up to 70% of diarrheal episodes in developing countries are caused by pathogens transmitted through food (Gautam et al., 2021). Gaining access to healthy and affordable food can be a challenge for rural residents. Many rural areas lack food retailers and are considered food deserts: areas with limited supplies of fresh, affordable foods. Moreover, reliable information on the extent and the magnitude of food microbiological contamination in rural areas is not available because of the absence or the deficiency of foodborne disease surveillance (Nguz, 2007).

4.3.1 Food safety practices - descriptive analysis

As shown in **Table 10**, only 3,3 % of the households assessed purchased food which had expired, or which was undergoing spoilage due to its reduced price. This increases the risk of microbial contamination and compromises the sensory attributes of food. The dissemination of information is still limited given that only 12.5% of the households received information on food safety issues.

Table 10. Summary of food safety practices

Variable	Yes [Y]	No [N]	Don't know
	Mean	Mean	Mean
Purchased food which had expired or was undergoing spoilage due to its reduced price	3.3	89.3	7.4
Unknowingly ever bought spoiled food/ expired or food that is already going bad from the shops	4.0	88.0	8.0
Household received information on food safety issues	12.5	82.7	4.7

Figure 8 shows that health workers (6.2%) and radio stations (4.7%) are playing a major role in the dissemination of information on food safety issues. The print media had the least contribution to information dissemination. Internet and social media had limited contribution given low internet coverage in the nation as well as connectivity challenges normally experienced in the remote areas.
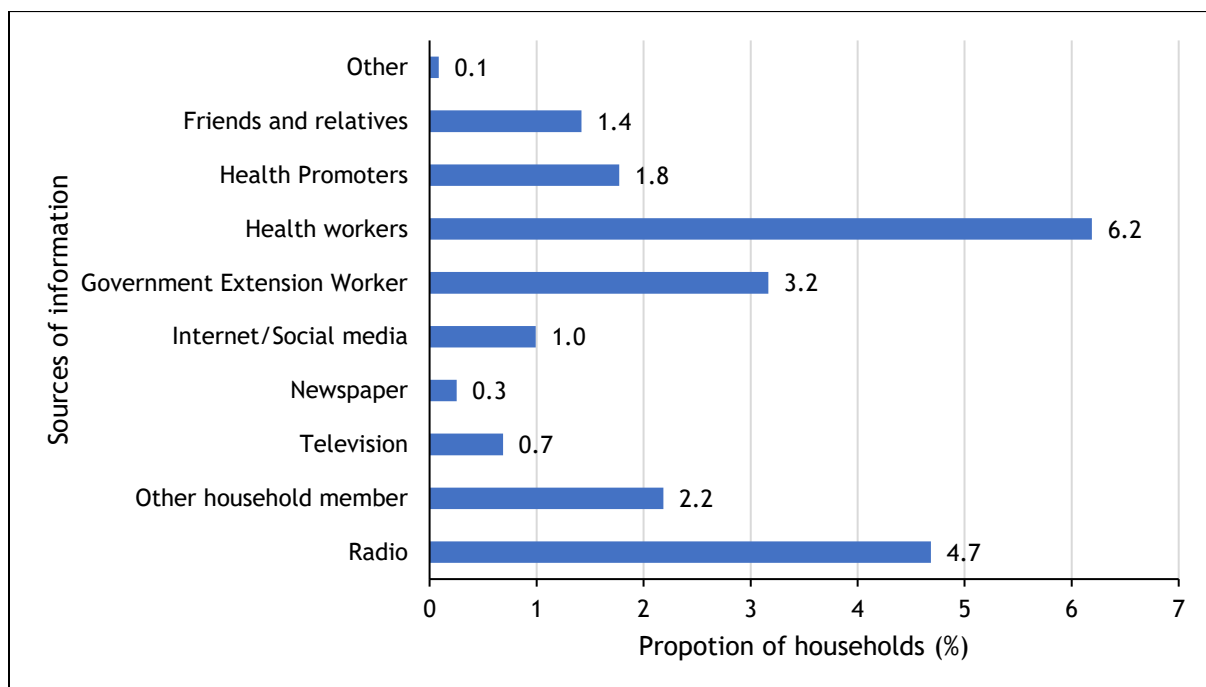
Figure 8. Sources of information on food safety issues

4.4 BIOFORTIFICATION

Biofortification is a food-systems approach to improving nutrition. Biofortification represents one promising strategy to enhance the availability of vitamins and minerals for people whose diets are dominated by micronutrient-poor staple food crops. It involves the identification of varieties of a crop that naturally contain high densities of certain micronutrients. Plant breeders use these varieties to develop new, productive and 'biofortified' crop lines for farmers to grow, market and consume (Global Panel. 2015). Biofortified crops are particularly advantageous for improving rural food systems, where diets of farming families are heavily dependent on own-produced or locally procured staple crops; where the prevalence of deficiencies in vitamin A, iron, and zinc is high; and where other year-around nutrition interventions including diverse diets, commercially fortified foods, or micronutrient supplements are often inaccessible, unaffordable or both (Birol et al., 2021). Target micronutrient levels for biofortified crops are set to meet the specific dietary needs of women and children, based on existing consumption patterns. Scientific research and published evidence show that when consumed regularly, biofortified crops significantly reduce micronutrient deficiencies and improve health, including through improved physical and cognitive performance and reduced illness. Biofortification puts a solution in the hands of farmers, combining the micronutrient trait with other agronomic and consumption traits that farmers prefer (Bouis and Saltzman A., 2017).

The Zimbabwean Government launched a Fortification Strategy due to higher deficiency rates of micronutrients. Biofortification was incorporated as a food-based solution to malnutrition (Muvhuringi and Chigede, 2021). To date, biofortification efforts in Zimbabwe and neighbouring countries have involved the promotion of Provitamin A maize, Quality Protein Maize (QPM), Orange Fleshed Sweet Potato (OFSP) and zinc and iron enriched beans.

4.4.1 Consumption of biofortified foods in Zimbabwe

As shown in **Table 11**, Manicaland province had the highest proportion (10.3%) of households consuming Orange/Vitamin A maize compared to a national average of 5.0%. Beans (HIB or NUA45) and Orange Fleshed Sweet Potaato (OFSP) were least consumed in Matabeleland North province, at 3.0% and 1.5% respectively. Mashonaland East had a higher proportion of households consuming OFSP (12.3%), compared to a national average of 2.1%.

Table 11. Consumption of biofortified foods in the 8 provinces of Zimbabwe

Province	Biofortified foods			
	Orange/Vitamin A Maize (VAM)	Beans (HIB or NUA45)	Orange Fleshed Sweet Potato (OFSP)	Other
Manicaland	10.3	12.5	5.1	2.5
Mashonaland Central	2.9	10.0	5.8	4.4
Mashonaland East	5.5	11.1	12.3	3.8
Mashonaland West	3.3	4.2	3.8	4.9
Matabeleland North	5.5	3.0	1.5	7.6
Matabeleland South	5.5	4.0	2.1	3.4
Midlands	2.1	5.4	4.4	7.7
Masvingo	5.0	7.6	11.2	4.6
National	5.0	7.4	6.0	4.9

4.4.2 Inferential analysis of biofortification

Table 12 shows that at the 5% significance level, a female headed household was 1.77% more likely to consume OFSP. A graduate/post-graduate level headed household was 6.38% more likely to consume OFSP. Dissemination of information and communication between scientists, farmers, and consumers on biofortification requires a common understanding on nutrition education issues. Protestants were less likely to consume biofortified beans, maize or sweet potatoes. At 1% significance level, protestants are 3.59% less likely to consume biofortified beans and 3.93% less likely to consume OFSP. At 10% significance level the protestants were less likely to consume orange maize. Households belonging to the Traditional religion were 4.26% less likely to consume beans at 1% significance level and 2.15% less likely to consume biofortified maize at 10% significance level.

Monthly income was a positive determinant in the consumption of both biofortified maize and OFSP. As monthly income increased, at 1% significance level, the likelihood of consumption of biofortified beans and OFSP was 0.9% and 1% more respectively. A household with a family member who has a chronic illness was 1.46% less likely to consume OFSP. However, a family with a disabled family member was more likely to consume both biofortified maize and OFSP.

At provincial level, consumption of OFSP was higher in Mashonaland East. The likelihood of OFSP consumption in Mashonaland East was 7.33% higher than the reference province, Manicaland. Consumption of biofortified beans and maize was less likely in Matabeleland and Midlands. At

the 1% significance level, there was an 8.48% less likelihood of consuming biofortified beans and 8.04% less likelihood of consuming biofortified maize in Midlands.

Table 12. OLS Correlates of background characteristics and biofortification consumption

Background characteristics	Biofortified foods		
	Beans	Maize	Sweet potato
Household head age [Years]	-9.38e-05	-0.000196	-0.000264*
	(0.000168)	(0.000139)	(0.000150)
Household head is female	0.00302	0.00744	0.0177**
	(0.00771)	(0.00709)	(0.00732)
Primary level	0.0200***	0.0114*	0.0183***
	(0.00611)	(0.00584)	(0.00552)
ZJC level	0.0359***	0.0120*	0.0313***
	(0.00802)	(0.00708)	(0.00732)
O' level	0.0397***	0.0205***	0.0303***
	(0.00732)	(0.00679)	(0.00648)
A' level	0.0525**	0.0199	0.0314
	(0.0243)	(0.0184)	(0.0200)
Diploma/Certificate after primary	0.0632**	0.0312	0.0284
	(0.0321)	(0.0239)	(0.0261)
Diploma/Certificate after secondary	0.0329	-0.00673	0.00228
	(0.0212)	(0.0134)	(0.0170)
Graduate/Post-Graduate	0.0365	0.0291	0.0638**
	(0.0272)	(0.0226)	(0.0276)
Married living apart	-0.00354	0.00106	-0.00448
	(0.00894)	(0.00759)	(0.00816)
Divorced/separated	-0.00802	0.00477	-0.0113
	(0.0100)	(0.00985)	(0.00935)
Widow/widower	0.0110	-0.00659	-0.000310
	(0.00902)	(0.00827)	(0.00829)
Cohabiting	0.0528	-0.0177	0.0476
	(0.0574)	(0.0352)	(0.0564)
Never married	-0.0139	0.00205	-0.00549
	(0.0125)	(0.0135)	(0.0124)
Protestant	-0.0359***	-0.0143*	-0.0393***
	(0.0100)	(0.00795)	(0.00917)
Pentecostal	0.0112	0.00392	-0.000991
	(0.0109)	(0.00849)	(0.00983)
Apostolic Sect	-0.0119	-0.00732	-0.0111
	(0.00924)	(0.00725)	(0.00860)
Zion	-0.0157	0.00821	-0.0171*
	(0.0100)	(0.00889)	(0.00932)
Other Christian	0.00230	0.0215*	-0.000686
	(0.0142)	(0.0127)	(0.0129)
Islam	0.0222	0.00485	0.0102
	(0.0361)	(0.0238)	(0.0304)
Traditional	-0.0426***	-0.0215*	-0.0108
	(0.0134)	(0.0110)	(0.0145)
Other religion	0.0443*	0.0474**	0.0171
	(0.0266)	(0.0239)	(0.0223)
No religion	-0.0376***	-0.00151	-0.0196**

	(0.00993)	(0.00872)	(0.00933)
Monthly income [USD]	0.00938***	-0.000747	0.00979***
	(0.00129)	(0.00113)	(0.00115)
Household size	-0.000313	6.36e-05	-0.000285
	(0.00108)	(0.000982)	(0.000983)
Household member has chronic illness	-0.00660	-1.53e-05	-0.0146***
	(0.00548)	(0.00496)	(0.00482)
Household member has disability	0.00664*	0.0167***	0.0189***
	(0.00366)	(0.00358)	(0.00375)
Asset index [0 ≤ Asset index ≤31]	0.00153**	-0.000420	0.00152**
	(0.000727)	(0.000594)	(0.000652)
Mash Central	-0.0168	-0.0700***	0.0111
	(0.0104)	(0.00834)	(0.00751)
Mash East	-0.0107	-0.0448***	0.0733***
	(0.0103)	(0.00873)	(0.00868)
Mash West	-0.0833***	-0.0670***	-0.0160**
	(0.00929)	(0.00852)	(0.00708)
Mat North	-0.0848***	-0.0486***	-0.0278***
	(0.00897)	(0.00911)	(0.00620)
Mat South	-0.0777***	-0.0506***	-0.0285***
	(0.00925)	(0.00912)	(0.00633)
Midlands	-0.0717***	-0.0804***	-0.00686
	(0.00938)	(0.00792)	(0.00705)
Masvingo	-0.0473***	-0.0528***	0.0609***
	(0.0101)	(0.00898)	(0.00917)
Constant	0.0617***	0.101***	-0.00164
	(0.0176)	(0.0158)	(0.0148)
Observations	14,958	14,958	14,958
R-squared	0.030	0.017	0.039

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

4.5 Shocks

An understanding of the types of shocks that disrupt and negatively impact rural household food security is of critical importance to develop relevant and targeted food security emergency preparedness policies and responses. For example, economic shocks such as food price increases, loss of employment, and reduced income are all associated with increased food insecurity (Onyango et al., 2021). Economic, social, and environmental shocks prolong and exacerbate the severity of acute food insecurity (Mutea et al., 2022). This is because these shocks lead to loss of real income and assets and ultimately reduce households' ability to maintain food security. Climate related shocks are known to affect all the four dimensions of food security, e.g., crop yields (availability); food prices, agricultural household income and economic resources (access); malnutrition (utilization) and resource-based conflict (stability) (Ilboudo Nébié et al., 2021). If ignored, these shocks may have unpleasant effects on food security in all its forms (Mutea et al., 2022). In this section, the different types of shocks

experienced by the surveyed households and the correlates of background characteristics and propensity to experience shocks are presented.

4.5.1 Types of shocks and stressors experienced

The most common shocks experienced by the surveyed households include cash shortage (54.9%), prolonged mid-season dry spell (45%), sharp cereal price increase (27.8%), crop pest (26.4%), high charges for mobile money or swipe (23.1%), livestock deaths (21.7%) and livestock diseases (20.9%) (**Table 13**). Except for the shock from high charges for mobile money or swipe, the highest proportion of households that experienced the shocks highlighted above were in Masvingo province. This finding can be the reason why Masvingo province was one of the districts with a high proportion of households that received social protection support from both government and UN/NGOs (see Section 4.9.1 on social protection).

The ripple effect of climate change, e.g., prolonged mid-season dry spells, could be the reason for the several other shocks experienced, e.g., sharp cereal price increase, livestock deaths etc. The impact of droughts on sharp price increases for staple food is well documented (Mukherjee & Ouattara, 2021). The damaging effect of climate change (droughts and floods) on agriculture, which include threats for food safety, harvest losses, death of livestock and increase in the numbers of invasive species, pests, and diseases is well documented (Barrios et al., 2008; Mall et al., 2017; Mukherjee & Ouattara, 2021).

Table 13. Types of shocks and stressors experienced (%)

	Type of shock or hazard	Manicaland	Mash Central	Mash East	Mash West	Mat North	Mat South	Midlands	Masvingo	**National**
1	Cash shortage	49.8	57.1	56.3	51.8	50.8	47.3	56.7	69.1	**54.9**
2	Drought/ Prolonged mid-season dry spell	29.0	20.1	28.1	37.6	58.8	71.9	51.0	71.4	**45.0**
3	Cereal price changes-sharp increase	26.8	20.0	20.1	20.1	29.5	32.1	24.1	53.8	**27.8**
4	Crop pests	28.7	27.4	22.7	20.1	15.3	16.2	24.6	57.8	**26.4**
5	Being charged more for using mobile money or swipe	32.0	23.1	24.8	20.4	14.6	13.1	28.3	27.5	**23.1**
6	Livestock deaths	17.4	17.0	20.6	18.4	15.8	18.2	27.0	39.3	**21.7**
7	Livestock diseases	18.0	16.1	19.4	20.0	15.2	14.0	26.8	38.0	**20.9**
8	Waterlogging	6.0	20.3	7.1	15.9	12.7	5.8	22.4	5.4	**12.1**

#	Shock								
9	Chronic illness (e.g., HIV/AIDS, Cancer, TB, BP, etc.)	12.0	11.7	13.3	9.9	11.9	12.6	10.5	11.0	**11.7**
10	Human wildlife conflict	12.2	10.7	5.2	11.0	9.6	14.6	8.2	15.1	**10.6**
11	Livestock price changes-sharp drop	5.4	5.9	3.8	2.7	5.8	8.2	7.4	12.7	**6.4**
12	Other Health related (diarrheal, cholera, typhoid, malaria, measles, etc.)	3.9	12.5	5.7	9.4	2.7	2.3	1.9	3.5	**5.3**
13	Gender Based Violence	2.6	4.3	4.7	4.9	2.5	2.6	2.0	3.1	**3.4**
14	Divorce/separation	2.1	3.2	3.2	3.9	2.0	1.8	2.3	2.1	**2.6**
15	Veld fires	1.1	3.0	3.5	4.8	0.6	1.4	0.9	1.0	**2.1**
16	Death of main income earner in the household	1.4	1.4	2.1	2.0	2.6	3.0	1.7	2.0	**2.0**
17	Hailstorm	3.6	2.1	1.6	2.2	1.4	0.8	0.9	2.3	**1.9**
18	Conflict/social unrest	1.3	0.5	1.2	3.6	1.5	2.3	2.4	1.0	**1.7**
19	Loss of employment by key household member	1.0	0.7	1.4	1.6	1.5	2.5	0.6	1.4	**1.3**
20	Other Shocks	0.3	0.3	0.5	2.3	0.5	1.1	2.6	0.9	**1.1**
21	Floods	0.9	0.9	1.0	0.8	0.7	0.3	0.8	2.3	**1.0**

4.5.2 Correlates of background characteristics and propensity to experience shocks

Age, sex, marital status, religion and education level of household head, household size, monthly income, asset ownership, and household location were associated with likelihood of the household experiencing shocks. For example, at the 1% level of significance, elderly headed households were associated with increased vulnerability to crop pests (0.07%), prolonged mid season dry spells (0.08%), livestock deaths (0.15%) and a 0.16% reduced vulnerability to cash shortage, *ceteris paribus*. All things being constant, female headed households were associated with a 5.35% reduced vulnerability to experience cash shortages at the 1% level of significance. Furthermore, increasing income of household head by 1% at the 1% level of significance, reduced the likelihood of a household being vulnerable to cash shortages, crop pests, prlonged mid season dry spells and waterlogging by 2.08%, 1.66%, 1.66% and 0.62% respectively, *ceteris paribus*.

Surprisingly, the results reveal that at the 1% level of significance, increasing asset index by one was associated with increased vulnerability to crop pests by 1.62%, prolonged mid season dry spells by 0.63%, waterlogging by 0.64% and livestock deaths by 2.39%. This finding is in disagreement with available evidence in literature, which postulate that a wide asset base widens livelihood options and reduces vulnerability to shocks (Kamal, 2014; Ibrahim et al., 2018). We can however attribute this finding to the fact that in the surveyed households, assets are mainly owned by the elderly (**Table 16**) who are already vulnerable to shocks as shown in **Table 14**.

Table 14. Correlates of background characteristics and propensity to experience shocks

Background characteristics	Cash shortage (I)	Crop pests (II)	Drought (III)	Waterlogging (IV)	Livestock deaths (V)
Household head age [Years]	-0.00165***	0.000778***	0.000888***	-0.000412*	0.00156***
	(0.000334)	(0.000279)	(0.000312)	(0.000216)	(0.000265)
Household head is female [1 if Yes, 0 if No]	-0.0535***	-0.0146	0.0234*	0.0102	0.00436
	(0.0144)	(0.0112)	(0.0129)	(0.00819)	(0.0108)
Primary level	0.0281**	0.0523***	-0.00343	0.00214	0.0304***
	(0.0143)	(0.0123)	(0.0132)	(0.00917)	(0.0117)
ZJC level	0.000827	0.00858	-0.0271*	0.000144	0.0177
	(0.0170)	(0.0144)	(0.0157)	(0.0110)	(0.0137)
O' level	-0.0105	0.0332**	-0.0273*	-0.0159	0.0315**
	(0.0162)	(0.0139)	(0.0149)	(0.0104)	(0.0131)
A' level	-0.0846**	-0.0142	-0.108***	-0.0263	-0.0363
	(0.0398)	(0.0313)	(0.0366)	(0.0245)	(0.0273)
Diploma/Certificate after primary	-0.0530	0.0409	-0.137***	0.0252	-0.0163
	(0.0527)	(0.0437)	(0.0495)	(0.0375)	(0.0380)
Diploma/Certificate after secondary	-0.0147	0.0295	-0.0531	0.00222	-0.0440
	(0.0385)	(0.0324)	(0.0363)	(0.0245)	(0.0274)
Graduate/Post-Graduate	0.00546	-0.00336	-0.0706*	-0.0283	0.0121
	(0.0458)	(0.0381)	(0.0419)	(0.0261)	(0.0386)
Married living apart	0.00851	-0.0132	-0.0173	-0.0214**	-0.0130
	(0.0163)	(0.0136)	(0.0151)	(0.00943)	(0.0127)
Divorced/separated	0.0400**	-0.0273*	-0.0214	-0.0364***	-0.0274**
	(0.0200)	(0.0150)	(0.0176)	(0.0117)	(0.0138)
Widow/widower	0.0440***	0.00406	-0.0245	-0.0265***	-0.00668
	(0.0168)	(0.0136)	(0.0153)	(0.00988)	(0.0133)
Cohabiting	-0.0251	0.0828	0.0615	-0.0872***	0.0372
	(0.0880)	(0.0718)	(0.0813)	(0.0124)	(0.0692)
Never married	0.00599	-0.0158	-0.0142	-0.0427***	0.0210
	(0.0286)	(0.0200)	(0.0268)	(0.0139)	(0.0193)
Protestant	0.0192	-0.0500***	0.00916	-0.0197	-0.0565***
	(0.0191)	(0.0167)	(0.0180)	(0.0127)	(0.0159)
Pentecostal	0.0244	-0.0345**	0.0232	0.000878	-0.0243
	(0.0186)	(0.0163)	(0.0175)	(0.0126)	(0.0155)

Apostolic Sect	0.0362**	-0.0184	0.0248	-0.00892	-0.00517
	(0.0164)	(0.0146)	(0.0153)	(0.0111)	(0.0139)
Zion	0.00451	-0.0265	0.0773***	-0.0122	0.000194
	(0.0194)	(0.0167)	(0.0181)	(0.0126)	(0.0165)
Other Christian	0.000638	-0.0336	-0.00723	-0.0414***	-0.0747***
	(0.0247)	(0.0206)	(0.0225)	(0.0146)	(0.0191)
Islam	0.0880	-0.153***	-0.0267	0.0256	-0.0818**
	(0.0550)	(0.0377)	(0.0498)	(0.0432)	(0.0389)
Traditional	0.102***	0.00644	0.00661	-0.00528	-0.000449
	(0.0292)	(0.0274)	(0.0262)	(0.0198)	(0.0250)
Other religion	-0.0467	-0.0578*	0.0106	-0.0217	-0.0842***
	(0.0417)	(0.0329)	(0.0368)	(0.0263)	(0.0295)
No religion	0.0724***	-0.0317*	0.0413**	-0.0301**	-0.0384**
	(0.0197)	(0.0169)	(0.0184)	(0.0130)	(0.0157)
Monthly income [USD]	-0.0208***	-0.0166***	-0.0166***	-0.00622***	-0.00255
	(0.00253)	(0.00223)	(0.00240)	(0.00173)	(0.00201)
Household size	0.0147***	0.00994***	0.0178***	0.00395***	0.00916***
	(0.00209)	(0.00178)	(0.00195)	(0.00134)	(0.00173)
Household member has chronic illness [1 if Yes, 0 if No]	0.0461***	0.00288	-0.0108	0.00482	0.0223**
	(0.0109)	(0.00935)	(0.0102)	(0.00713)	(0.00923)
Household member has disability [1 if Yes, 0 if No]	0.0335***	0.00446	0.00971	0.00112	0.0215***
	(0.00754)	(0.00626)	(0.00690)	(0.00452)	(0.00635)
Asset index [0 ≤ Asset index ≤31]	0.00210	0.0162***	0.00637***	0.00643***	0.0239***
	(0.00131)	(0.00110)	(0.00121)	(0.000873)	(0.00108)
Mashonaland Central	0.0541***	-0.0158	-0.0992***	0.138***	-0.00498
	(0.0164)	(0.0146)	(0.0143)	(0.0108)	(0.0123)
Mashonaland East	0.0564***	-0.0761***	-0.0151	0.00577	0.00652
	(0.0159)	(0.0138)	(0.0145)	(0.00801)	(0.0121)
Mashonaland West	0.0129	-0.0875***	0.0883***	0.0947***	-0.000376
	(0.0170)	(0.0143)	(0.0159)	(0.0107)	(0.0127)
Matabeleland North	-0.0114	-0.161***	0.260***	0.0576***	-0.0517***
	(0.0171)	(0.0140)	(0.0163)	(0.0101)	(0.0126)
Matabeleland South	-0.0380**	-0.148***	0.394***	-0.00584	-0.0319**
	(0.0174)	(0.0142)	(0.0158)	(0.00846)	(0.0133)
Midlands	0.0598***	-0.0685***	0.197***	0.153***	0.0540***
	(0.0164)	(0.0145)	(0.0157)	(0.0110)	(0.0131)
Masvingo	0.191***	0.271***	0.396***	-0.0154*	0.183***
	(0.0164)	(0.0159)	(0.0155)	(0.00811)	(0.0146)
Constant	0.551***	0.176***	0.199***	0.0755***	-0.0836***
	(0.0333)	(0.0283)	(0.0309)	(0.0211)	(0.0263)
Observations	14,958	14,958	14,958	14,958	14,958
R-squared	0.032	0.105	0.161	0.050	0.092

4.6 ASSET OWNERSHIP AND FOOD AND NUTRITION SECURITY

Of the various components of a livelihood, the most complex is the portfolio of assets out of which people construct their living, which includes both tangible assets and resources, and intangible assets such as claims and access. There are five different types of assets owned by

individuals to build their livelihoods which consists of natural, social, human, physical and financial assets (Ibrahim et al., 2018). Households use capital assets to construct livelihood strategies and generate well-being outcomes. The ability of households to engage in a type of livelihood strategy is influenced by their capital assets. Often different capital assets are associated with different livelihood strategies which determine food security outcomes. Lack of access to assets may prevent households from engaging in strategies that generate more benefit. A common situation in the poorest households is that they do not have sufficient capital assets to realign their livelihoods towards goals beyond basic survival (Manlosa *et al.*, 2019).

In this section, findings on asset ownership of the surveyed households are presented. Moreso, the association of background characteristics and asset ownership is also presented.

4.6.1 Asset ownership by rural households in Zimbabwe

Table 15 shows that a significant number of households own a hoe with Matabeleland North being the highest at 93%. The least owned assets included threshers (0.1%), walking motorized tillers (0.2%), peanut butter producing machine (0.3%), shellers (0.4%) and welding machines (0.4%). Household assets used to carry various commodities within the homestead were found at relatively low proportions. Scotch carts, wheelbarrows, bicycles, vehicles, motorcycles and tractors had the following proportions respectively 31.3; 31.2; 18.5; 4.1; 2.0 and 0.7. Phone ownership was relatively high across all provinces with an average of 72.6%.

Table 15. Asset ownership by rural households **(%)**

Household asset	Province								National
	Manicaland	*Mash Central*	*Mash East*	*Mash West*	*Mat North*	*Mat South*	*Midlands*	*Masvingo*	
Hoe	92.1	92.7	90.2	88.0	93.0	90.1	91.0	90.6	**91.0**
Axe	77.2	84.2	80.9	78.2	87.8	84.2	84.7	75.6	**81.7**
Telephone (including Mobile phones)	69.6	60.4	81.1	72.5	68.0	79.8	69.4	80.1	**72.6**
Spade or shovel	47.9	35.1	57.8	47.1	63.9	59.4	56.4	58.3	**53.1**
Plough (oxen pulled)	31.8	34.0	35.2	36.2	46.3	46.7	55.7	52.1	**42.1**
Sickle	40.0	39.5	40.7	42.6	43.5	32.0	44.6	51.3	**41.7**
Radio	33.8	40.4	42.2	50.2	37.6	38.0	40.4	29.9	**39.2**
Pick-axe	31.4	22.8	26.5	33.9	37.7	26.8	41.4	38.0	**32.1**
Scotch cart	19.7	29.5	23.2	29.9	38.8	38.3	43.1	28.8	**31.3**
Wheelbarrow	28.9	14.8	29.8	22.2	36.4	45.5	39.5	34.6	**31.2**

Solar system	24.9	24.6	28.7	28.5	33.2	31.2	31.0	21.3	**28.0**
Knapsack sprayer	19.1	32.0	25.7	31.6	15.2	10.7	23.4	19.4	**22.5**
Bicycle	8.8	11.8	18.7	18.9	25.9	33.6	15.0	17.1	**18.5**
Television	9.4	16.2	16.1	22.1	12.4	13.9	12.5	7.6	**13.9**
Cultivator, ridger, planter	1.9	4.0	4.2	5.9	3.4	3.6	6.4	3.8	**4.2**
Vehicle	3.2	3.7	4.6	5.6	3.1	5.5	4.1	2.4	**4.1**
Water pump	1.2	3.0	5.5	4.0	2.1	1.5	2.0	2.3	**2.8**
Pruning/cutting shears	3.8	1.3	2.8	2.3	3.4	1.6	2.9	3.6	**2.7**
Sewing machine	3.5	2.1	3.1	2.5	2.7	2.1	2.9	1.9	**2.6**
Motorcycle	1.0	3.3	2.1	3.5	1.1	2.0	1.5	1.3	**2.0**
Traditional/modern beehive	2.8	2.7	2.9	2.4	0.3	0.5	1.4	1.6	**1.9**
Shop or Grain Mill	0.8	1.7	1.4	3.0	1.3	1.0	1.7	1.9	**1.6**
Other specify	0.9	2.6	1.2	1.9	0.5	1.2	2.2	1.2	**1.5**
Tractor	0.4	0.8	0.7	0.8	0.7	0.5	0.7	0.6	**0.7**
Welding machine	0.3	0.2	0.5	0.7	0.4	0.5	0.3	0.3	**0.4**
Sheller	0.2	0.4	0.5	0.6	0.5	0.2	0.3	0.4	**0.4**
Peanut butter producing machine	0.1	0.2	0.6	0.2	0.2	0.3	0.3	0.3	**0.3**
Walking motorized tiller	0.3	0.0	0.2	0.2	0.3	0.2	0.1	0.2	**0.2**
Thresher	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	**0.1**
Maputi gun	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.2	**0.1**
Freeze-it is making machine	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.1	**0.1**

4.6.2 *OLS correlates of background characteristics, asset ownership and household income*

The results in **Table 16** show the OLS correlates of background characteristics, asset ownership and household income. The results in Column (I) reveal that age, sex, education level, religion and marital status of household head, household size, location of household, presence of household member with disability or chronic illness are determinates of asset township. For example, the results show that at the 1% level of significance, increasing the age of household head by one year was associated with a 6.32% increase in the probability of the household owing assets, *ceteris paribus*. Similarly, increasing the educational level of household head was associated with an increase in the probability of the household owning assets, same as the effect of increasing household size by one member, which was associated with a 27.2% chance of the household owning assets, all things being constant. However, at the 1% level of

significance, female headed households had a 25.3% reduced chance of owning assets as compared to their male counterparts, same as households headed by divorcees and widowers, whose chance of owning assets was reduced by almost 100% for both instances at the 1% level of significance, *ceteris paribus*.

Regarding correlation of background characteristics and monthly income (Column II), the results in Table **Table 16** show that age of household head was not a determinant of household income but sex, education level, marital status, and religion of household head and household location were determinants of household income. In particular, female headed households were associated with a 0.39% reduction in monthly income as compared to male headed households at the 1% level of significance and all things being constant.

Unlike households in the base province of Manicaland, households in Mashonaland Central and Matabeleland North provinces were associated with a 9.88% and 9.50% reduction in monthly incomes at the 5% and 10% levels of significance respectively.

Table 16. OLS correlates of background characteristics, asset ownership and household income

Background characteristics	Asset index [0 ≤ Asset index ≤31]	ln (Monthly income)
	(I)	(II)
Household head age [Years]	0.0632***	0.000392
	(0.00214)	(0.00110)
Household head is female [1 if Yes, 0 if No]	-0.253***	-0.185***
	(0.0936)	(0.0466)
Primary level	0.952***	0.343***
	(0.0858)	(0.0503)
ZJC level	1.324***	0.476***
	(0.104)	(0.0588)
O' level	1.764***	0.769***
	(0.0999)	(0.0566)
A' level	1.240***	1.229***
	(0.280)	(0.125)
Diploma/Certificate after primary	2.700***	1.860***
	(0.394)	(0.147)
Diploma/Certificate after secondary	2.656***	2.119***
	(0.285)	(0.105)
Graduate/Post-Graduate	3.695***	2.205***
	(0.448)	(0.121)
Married living apart	-0.0677	0.218***
	(0.109)	(0.0521)
Divorced/separated	-1.312***	-0.0786
	(0.121)	(0.0628)
Widow/widower	-0.994***	-0.0931*

	(0.109)	(0.0555)
Cohabiting	-0.998*	-0.0238
	(0.566)	(0.254)
Never married	-0.176	0.0144
	(0.181)	(0.0908)
Protestant	0.210	0.00418
	(0.130)	(0.0629)
Pentecostal	-0.380***	-0.00293
	(0.125)	(0.0629)
Apostolic Sect	-0.273**	-0.171***
	(0.110)	(0.0553)
Zion	-0.292**	-0.171***
	(0.127)	(0.0641)
Other Christian	-0.221	-0.137*
	(0.163)	(0.0828)
Islam	-0.906***	-0.0639
	(0.326)	(0.177)
Traditional	-0.317*	-0.0339
	(0.190)	(0.0995)
Other religion	-0.559**	-0.0972
	(0.281)	(0.132)
No religion	-0.937***	-0.297***
	(0.129)	(0.0668)
Household size	0.272***	0.0186***
	(0.0141)	(0.00721)
Household member has chronic illness [1 if Yes, 0 if No]	0.134*	0.105***
	(0.0715)	(0.0370)
Household member has disability [1 if Yes, 0 if No]	-0.352***	-0.143***
	(0.0477)	(0.0262)
Mash Central	0.360***	-0.0988*
	(0.104)	(0.0560)
Mash East	0.898***	0.0143
	(0.100)	(0.0488)
Mash West	1.095***	0.540***
	(0.112)	(0.0557)
Mat North	0.943***	-0.0950*
	(0.106)	(0.0529)
Mat South	1.106***	0.0577
	(0.109)	(0.0528)
Midlands	0.876***	0.172***
	(0.104)	(0.0477)
Masvingo	0.841***	0.172***
	(0.105)	(0.0496)
Constant	1.009***	3.534***
	(0.204)	(0.106)
Observations	14,958	14,958
R-squared	0.162	0.088

4.7 CHILD NUTRITION STATUS

In this section the descriptive and inferential analyses are presented. All forms of childhood malnutrition remain the world's most fundamental challenges for improved human development. Stunting is a complex biological indicator, but it is one that uniquely captures the deep-rooted causes of childhood malnutrition. It reflects the persistent poverty and repeated insults to the growing child. Stunting is related to many factors, including socioeconomic status, dietary intake, water sanitation and hygiene, infections, maternal nutritional status, micronutrient deficiencies and the environment. A low family income and poor living conditions increase the risk of child stunting for many reasons such as increased food insecurity, low access to health care, unhealthy environments and a high risk of infections.

A multi sectoral approach is therefore the most effective measure to address stunting. Stunting is a commonly used indicator that reflects larger structural and interrelated issues related to the lack of access to adequate food and nutrient intake as well as poor health conditions. On a population basis, high levels of stunting are associated with poor socioeconomic conditions and increased risk of frequent and early exposure to adverse conditions such as illness and/or inappropriate feeding practices. Similarly, a decrease in the national stunting rate is usually indicative of improvements in overall socioeconomic conditions of a country. While wasting is an indicator of acute malnutrition reflecting a recent insult to the child's growing body (acute illness or acute hunger), being underweight is an indicator of both chronic and acute malnutrition. By examining the various predictors of stunting, underweight and wasting ie dietary, environmental, and socio-economic factors specific to Zimbabwe, this report section seeks to shed light on the complex and multifaceted nature of malnutrition within the Zimbabwean context.

4.7.1   *Prevalence of stunting, wasting, under weight*

Table 17 presents the national prevalence of stunting, wasting and underweight. The results reveal a high stunting prevalence of 26%. Prevalence of underweight and wasting was 8.5% and 4.1% respectively. Stunting was significantly higher in males (28%) than females (24.2%), at 5% level of significance (*p*=0.000). Similarly, underweight was higher among males compared to females (*p*=0.037).

Table 17. National prevalence of stunting, wasting and underweight (%)

Variable	Total n(%)	Male n(%)	Female n(%)	P value
Not stunted	4820 (73.9)	2293 (71.9)	2527 (75.7)	0.000*
stunted	1705 (26.1)	896 (28.1)	809 (24.3)	
Not underweight	6148 (91.5)	2998 (90.7)	3150 (92.2)	0.037*
Underweight	574 (8.5)	306 (9.3)	268 (7.8)	
Not wasted	6290 (95.9)	3084 (95.6)	3206 (96.2)	0.226
wasted	267 (4.1)	141 (4.4)	126 (3.8)	

Table 18 presents the height-for-age z-scores (HAZ), weight-for-age z-scores (WAZ) and weight-for-height z-scores (WHZ). The mean WAZ and WHZ for females were significantly higher than for males (*p*=0.010 and *p*=0.017 respectively).

Table 18. Anthropometric variables

Variable	Total	Male	Female	P value[1]	95%CI
HAZ	0.26±0.44	-1.255±1.4	-1.136±1.4	0.309	-0.188, -0.05
WAZ	0.09±0.3	-0.59±1.1	-0.524±1.1	0.010*	-0.12, -0.012
WHZ	0.04±0.2	0.09±1.2	0.11±1.2	0.017*	-0.08, 0.04

HAZ males n=3189 and females n=3336, WAZ-males n=3304, female n=3418, WHZ males n=3225 and females n=3332. [1]Independent samples T test

4.7.1.1   *Association between stunting and various selected indicators*

Table 19 presents results of the association between stunting and demographic variables. There was a significant association between stunting and province of origin (p<0.05), stunting and marital status (p<0.05). Stunting was significantly higher among children from Manicaland (33.6%).Additionally, although not statistically significant, the results showed higher stunting levels in households where parents were both formally and informally employed, female headed households, households practising traditional religion and those whose household head had a Diploma/certificate after primary qualification.

Table 19. Association between stunting, and selected demographic variables

Variable	Total	Not stunted n(%)	Stunted n(%)	P value*
National prevalence		4820 (73.9)	1705 (26.1)	
Province				

Manicaland	536 (8.2)	356 (66.4)	180 (33.6)	0.000*
Mash Central	936 (14.3)	708 (75.6)	228 (24.4)	
Mash East	1122 (17.2)	851 (75.8)	271 (24.2)	
Mash West	809 (12.4)	587 (72.6)	222 (27.4)	
Matabeleland North	642 (9.8)	436 (67.9)	206 (32.1)	
Matabeleland South	764 (11.7)	578 (72.6)	186 (24.3)	
Midlands	1063 (16.3)	807 (75.9)	256 (24.1)	
Masvingo	653 (10.0)	497 (76.1)	156 (24.1)	
Household head gender				
Male	2985 (88.5)	2234 (74.8)	751 (25.2)	0.689
Female	387 (11.5)	286 (73.9)	101 (26.1)	
Household Head marital status[1]				
Married living together	2728 (81.0)	2062 (75.6)	666 (24.4)	0.034*
Married living apart	270 (8.0)	186 (68.9)	84 (31.1)	
Divorced/Separated	66 (2.0)	51 (77.3)	15 (22.7)	
Widow/Widower	285 (85.0)	206 (72.3)	79 (27.7)	
Never married	14 (0.4)	8 (57.1)	6 (42.9)	
Household Head Employment Status[2]				
Not Employed	2174 (64.7)	1631 (75.0)	543 (25.0)	0.076
Formally employed	423 (12.6)	319 (75.4)	104 (24.6)	
Informally employed	743 (22.1)	550 (74.0)	193 (26.0)	
Both (formally & informally employed)	20 (0.6)	10 (50.0)	10 (50.0)	
Household Head Education Level attained[2]				
None	165 (4.9)	121 (73.3)	44 (26.7)	0.857
Primary	1024 (30.5)	772 (75.4)	252 (24.6)	
ZJC	509 (15.1)	374 (73.5)	135 (26.5)	
O level	1531 (45.6)	1150 (75.1)	381 (24.9)	
A level	58 (1.7)	43 (74.1)	15 (25.9)	
Diploma/Certificate after primary	18 (0.5)	11 (61.1)	7 (38.9)	
Diploma/Certificate after secondary	33 (1.0)	24 (72.7)	9 (27.3)	
Graduate/Post-Graduate	22 (0.7)	15 (68.2)	7 (31.8)	
Religion[3]				
Roman Catholic	323 (5.0)	253 (78.3)	70 (21.7)	0.335
Protestant	645 (9.9)	491 (76.1)	154 (23.9)	
Pentecostal	805 (12.3)	595 (73.9)	210 (26.1)	
Apostolic Sect	2946 (45.1)	2147 (72.9)	799 (27.1)	
Zion	755 (11.6)	551 (73.0)	204 (27.0)	
Other Christian	222 (3.4)	166 (74.8)	56 (25.2)	
Islam	32 (0.5)	25 (78.1)	7 (21.9)	
Traditional	103 (1.6)	73 (70.1)	30 (29.9)	
Other religion	54 (0.8)	46 (85.2)	8 (14.8)	
No religion	628 (9.6)	464 (73.9)	164 (26.1)	
Don't know	12 (0.2)	9 (75.0)	3 (25.0)	
Median Age of Household Head	43 [34, 55]	43 [34, 55]	43 [34, 55]	0.714

Notes: Total sample size is [1] n= 3366, [2]n=3360, [3]n=6525 unless stated. The final column shows the results of CHI square test for significance. Fisher's test used in cell counts less than 5. Except for Household age head which show Mann Whitney U Test. Level of significance is set at $p<0.05$

The diet quality of children was generally poor, with only 4 % receiving adequate age-appropriate diets. **Table 20** presents the results of the association between stunting and selected diet quality and childcare practices. Stunting was statistically significantly higher among children who had not been "ever breastfed" (30.6%, *p*=0.048). Though not statistically significant, results also showed slightly higher prevalence of stunting from households with low HDDS, poor FCS and moderate and severe hunger.

Table 20. Association between stunting, and selected diet quality, care practices variables

Variable	Total	Not stunted n(%)	Stunted n(%)	P value*
Ever breastfed				
No	271 (12.2)	188 (69.4)	83 (30.6)	0.048*
Yes	1948 (87.5)	1485 (76.2)	463 (23.8)	
Don't know	7 (0.3)	5 (71.4)	2 (28.6)	
MMF[1]				
Inadequate	1695 (77.4)	1304 (76.9)	391 (23.1)	0.709
Adequate	494 (22.6)	384 (77.7)	110 (22.3)	
MDD[1]				
Below cutoff	2010 (91.8)	1545 (76.9)	465 (23.1)	0.356
Above cutoff	179 (8.2)	143 (79.9)	36 (20.1)	
MAD[1]				
Below cutoff	2113 (96.5)	1629 (77.1)	484 (22.9)	0.913
Above cutoff	76 (3.5)	59 (77.6)	17 (22.4)	
HDDS[2]				
0-2 food groups	290 (5.7)	220 (75.9)	70 (24.1)	0.760
3-4 food groups	1004 (19.6)	738 (73.5)	266 (26.5)	
5 food groups	1012 (19.8)	747 (73.8)	265 (26.2)	
6-12 food groups	2806 (54.9)	2099 (74.8)	707 (25.2)	
MDD-W[2]				
Below cutoff	4684 (91.6)	3485 (74.4)	1199 (25.6)	0.953
Above cutoff	428 (8.4)	319 (74.5)	109 (25.5)	
FCS[3]				
Poor	802 (4.3)	588 (73.3)	214 (26.7)	0.566
Borderline	1512 (25.1)	1123 (74.3)	389 (25.7)	
Acceptable	2791 (70.6)	2088 (74,8)	703 (25.2)	
HHS[2]				
No or little hunger in HH	4305 (84.2)	3207 (74.5)	1098 (25.5)	0.953
Moderate Hunger in HH	745 (14.6)	551 (74.0)	194 (26.0)	
Severe Hunger in HH	62 (1.2)	46 (74.2)	16 (25.8)	

[1]n=2189, [2]n-5112, [3]n-5105. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Level of significance is set at p<0.05

There was no statistically significant association between stunting and the majority of the WASH variables besides the type of main water source at 5% level of significance (**Table 21**). Stunting prevalence was significantly higher among children from households using water "piped into neighbour " as the primary source (33.6%, p=0.017). Though not significant, stunting was higher

among children from households with an undefined flush system i.e., "flush to don't know where".

Table 21. Association between stunting, and selected WASH variables

Variable	Total	Not stunted n(%)	Stunted n(%)	P value*
Main Source of water				
Piped into dwelling	87 (1.7)	71 (81.6)	16 (18.4)	0.017*
Piped into yard or plot	122 (2.4)	81 (66.4)	41 (33.6)	
Piped into public tap or standpipe	414 (8.1)	301 (72.7)	113 (27.3)	
Piped into neighbour	59 (1.2)	39 (66.1)	20 (33.9)	
Borehole/tubewell	2225 (43.6)	1672 (75.1)	553 (24.9)	
Protected well	1025 (20.1)	778 (75.9)	247 (24.1)	
Un protected well	669 (13.1)	474 (70.9)	195 (29.1)	
Protected spring	45 (0.9)	32 (71.1)	13 (28.9)	
unprotected spring	57 (1.1)	40 (70.2)	17 (29.8)	
Surface water	269 (5.3)	199 (74.0)	70 (26.0)	
Sand Abstraction	110 (2.2)	92 (83.6)	18 (16.4)	
Other	15	13 (86.7)	2 (13.3)	
Water treatment before use				
No	4949 (97.1)	3685 (74.5)	1264 (25.5)	0.586
Yes	149 (2.9)	108 (72.5)	41 (27.5	
Toilet facility				
Flush pour to piped sewer system	34 (0.7)	28 (82.4)	6 (17.6)	0.411
Flush/pour to septic tank	70 (1.4)	56 (80.0)	14 (20.0)	
Flush/pour to pit latrine	69 (1.4)	52 (75.4)	17 (24.6)	
Flush/pour to open drain	25 (0.5)	21 (84.0)	4 (16.0)	
Flush to don't know where	3 (0.1)	2 (66.7)	1 (33.3)	
Ventilated improved pit latrine	978 (19.2)	754 (77.1)	224 (22.9)	
Pit latrine with slab	1684 (33.0)	1240 (73.6)	444 (26.4)	
Pit latrine without slab (open pit)	490 (9.6)	347 (70.8)	143 (29.2)	
Composting toilet	113 (2.2)	84 (74.3)	29 (25.7)	
No facility/bush/field	1572 (30.8)	1165 (74.1)	407 (25.9)	
Bucket	5 (0.1)	4 (80.0)	1 (20.0)	
Other	45 (0.9)	33 (73.3)	12 (26.7)	
Shared toilet facility				
No	2805 (80.4)	2092 (74.6)	713 (25.4)	0.930
Yes	685 (19.6)	512 (74.7)	173 (25.3)	
Handwashing station				
No	4837 (94.6)	3600 (74.4)	1237 (25.6)	0.928
Yes	275 (5.4)	204 (74.2)	71 (25.8)	
Water for handwashing				
Absent	4900 (95.9)	3649 (74.5)	1251 (25.5)	0.658
Present	212 (4.1)	155 (73.1)	57 (26.9)	
Presence of soap and detergent				
Absent	4956 (96.9)	3689 (74.4)	1267 (25.6)	0.840
Present	156 (3.1)	115 (73.7)	41 (26.3)	

Notes: Total sample size is 5112 unless stated. The final column shows the results of CHI square test for significance. Fisher's test used in cell counts less than 5. Level of significance is set at p<0.05

Table 22 presents results of the association between stunting and selected social protection variables. Prevalence of stunting was higher among children who were receiving support from NGOs (28.8%, *p*=0.056) possibly due to targeting. This validates the selection criteria of most development partners. Stunting was also highest in children from households that were not receiving support from within the community (26.0% *p*=0.042). Regardless of lack of significance, stunting was higher among children who did not belong to a care group.

Table 22. Association between stunting, and selected social protection variables

Variable	Total	Not stunted n(%)	Stunted n(%)	P value*
Care-group membership				
No	4002 (83.7)	2940 (73.5)	1062 (26.5)	0.376
Yes	496 (10.4)	374 (75.4)	122 (24.6)	
Don't know	285 (6.0)	218 (76.5)	67 (23.5)	
Support from Government				
No	1776 (34.7)	1307 (73.6)	469 (26.4)	0.326
Yes	3336 (65.3)	2497 (74.9)	839 (25.1)	
Support from NGO				
No	4522 (88.5)	3384 (74.8)	1138 (25.2)	0.056
Yes	590 (11.5)	420 (71.2)	170 (28.8)	
Support from churches				
No	5054 (98.9)	3758 (74.4)	1296 (25.6)	0.390
Yes	58 (1.1)	46 (79.3)	12 (20.7)	
Support from relatives within the community				
No	4705 (92.0)	3484 (74.0)	1221 (26.0)	0.042*
Yes	407 (8.0)	320 (78.6)	87 (21.4)	
Support from relatives outside the community (urban)				
No	4681 (91.6)	3491 (74.6)	1190 (25.4)	0.373
Yes	431 (8.4)	313 (72.6)	118 (27.4)	
Support from relatives outside Zimbabwe				
No	4797 (93.8)	3572 (74.5)	1225 (25.5)	0.749
Yes	315 (6.2)	232 (73.7)	83 (26.3)	
Support from other				
No	5079 (99.4)	3780 (74.4)	1299 (25.6)	0.842
Yes	33 (0.6)	24 (72.7)	9 (27.3)	

Notes: Total sample size is 5112 unless stated. The final column shows the results of CHI square test for significance. Fisher's test used in cell counts less than 5. Level of significance is set at p<0.05

Stunting was higher among children from households that had experienced divorce/separation (33.7% *p*=0.013), had experienced cash shortage (26.8%, *p*=0.077), did not experience livestock price changes (25.9%, *p*=0.028) and those experiencing hailstorms (39.2% *p*=0.001) (**Table 23**). There was no statistical significance association between stunting prevalence and the rest of

the shocks reported to have been experienced by households at the 5% or 10% level of significance.

Table 23. Association between stunting, and selected shocks

Variable	Total	Not stunted n(%)	Stunted n(%)	*P* value*
Chronic Illness				
No	4624 (90.5)	3448 (74.6)	1176 (25.4)	0.436
Yes	488 (9.5)	356 (73.0)	132 (27.0)	
Other health condition				
No	4775 (93.4)	3547 (74.3)	1228 (25.7)	0.421
Yes	337 (6.6)	257 (76.3)	80 (23.7)	
Gender based violence				
No	4907 (96.0)	3652 (74.4)	1255 (25.6)	0.929
Yes	205 (4.0)	152 (74.1)	53 (25.9)	
Divorce/separation				
No	4940 (96.6)	3690 (74.7)	1250 (25.3)	0.013*
Yes	172 (3.4)	114 (66.3)	58 (33.7)	
Death of main income holder				
No	5040 (98.6)	3745 (74.3)	1295 (25.7)	0.140
Yes	72 (1.4)	59 (81.9)	13 (18.1)	
Loss of employment of Key household earner				
No	5045 (98.7)	3750 (74.3)	1295 (25.7)	0.243
Yes	67 (1.3)	54 (80.6)	13 (19.4)	
Cash shortage				
No	2238 (43.8)	1638 (73.2)	600 (26.8)	0.077*
Yes	2874 (56.2)	2166 (75.4)	708 (24.6)	
Being charged more for using mobile/ swipe				
No	3847 (75.3)	2864 (74.4)	983 (25.6)	0.922
Swipe	1265 (24.7)	940 (74.3)	325 (25.7)	
Cereal Price Increase				
No	3697 (78.0)	2763 (74.7)	934 (25.3)	0.392
Yes	1041 (22.0)	1041 (73.6)	374 (26.4)	
Livestock Price changes				
No	4802 (94)	3557 (74.1)	1245 (25.9)	0.028*
Yes	310 (6)	247 (79.7)	63 (20.3)	
Livestock disease				
No	4095 (80.1)	3047 (74.4)	1048 (25.6)	0.986
Yes	1017 (19.9)	757 (74.4)	260 (25.6)	
Livestock deaths				
No	4024 (78.7)	2986 (74.2)	1038 (25.8)	0.511
Yes	1088 (21.3)	818 (75.2)	270 (24.8)	
Crop pests				
No	3739 (73.1)	2791 (74.6)	948 (25.4)	0.530
Yes	1373 (26.9)	1013 (73.8)	360 (26.2)	
Prolonged drought				
No	2866 (56.1)	2151 (75.1)	715 (24.9)	0.237
Yes	2246 (43.9)	1653 (73.6)	593 (26.4)	
Hailstorm				

No	5010 (98.0)	3742 (74.7)	1268 (25.3)	0.001*			
Yes	102 (2.0)	62 (60.8)	40 (39.2)				
Flooding							
No	5055 (98.9)	3757 (74.3)	1298 (25.7)	0.162			
Yes	57 (1.1)	47 (82.5)	10 (17.5)				
Waterlogging							
No	4421 (86.5)	3304 (74.7)	1117 (25.3)	0.183			
Yes	691 (13.5)	500 (72.4)	191 (27.6)				
Human wildlife conflict							
No	4555 (89.1)	3379 (74.2)	1176 (25.8)	0.279			
Yes	557 (10.9)	425 (76.3)	132 (23.7)				
Conflict/ Social Unrest							
No	5028 (98.4)	3740 (74.4)	1288 (25.6)	0.707			
Yes	84 (1.6)	64 (76.2)	20 (23.8)				
Veld Fires							
No	5014 (98.1)	3729 (74.4)	1285 (25.6)	0.628			
Yes	98 (1.9)	75 (76.5)	23 (23.5)				
Other							
No	5064 (99.1)	3765 (74.3)	1299 (25.7)	0.275			
Yes	48 (0.9)	39 (81.3)	9 (18.8)				

Notes: Total sample size is 5112 unless stated. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Level of significance is set at p<0.05

4.7.1.2   *Predictors of stunting - Inferential analysis*

The results presented in **Table 24** show that receiving support from an NGO was a significant negative predictor of stunting at 5% level of significance. A child from a household that got support from an NGO was 0.53 times less likely to be stunted (OR= 0.526 95% CI 0.375-0.931).

Table 24. Predictors of stunting

Variables	β	S.E.	df	Sig.	Exp(β)	95% C.I. for EXP(β) Lower	Upper
Mashonaland Central (1)	.518	.357	1	.147	1.679	.834	3.383
Mashonaland East (2)	.018	.336	1	.957	1.018	.528	1.966
Mashonaland West (3)	-.064	.346	1	.853	.938	.476	1.849
Mat North (4)	-.101	.358	1	.778	.904	.448	1.824
Mat South (5)	.274	.379	1	.470	1.315	.626	2.764
Midlands (6)	-.085	.363	1	.815	.919	.451	1.871
Masvingo (7)	.134	.331	1	.687	1.143	.597	2.189
Married living together			4	.401			
Married living apart	-1.018	1.033	1	.325	.361	.048	2.737
Divorced/Separated	-.664	1.062	1	.532	.515	.064	4.129
Widow/Widower	-1.551	1.167	1	.184	.212	.022	2.086
Never married	-1.230	1.066	1	.248	.292	.036	2.361
Not Employed			3	.048			
Formally employed	-.635	.917	1	.489	.530	.088	3.199
Informally employed	-.969	.936	1	.300	.379	.061	2.376
Both formally & informally employed	-.257	.919	1	.780	.774	.128	4.684
Ever breastfed (no)			2	.540			

Ever breastfed (yes)	-1.149	1.452	1	.429	.317	.018	5.453
Ever breastfed (don't know)	-1.307	1.439	1	.364	.271	.016	4.543
MDD	.423	.301	1	.161	1.526	.846	2.753
MMF	.043	.194	1	.824	1.044	.713	1.528
UN/NGO	-.526	.232	1	.023*	.591	.375	.931
Divorce	-.448	.427	1	.293	.639	.277	1.473
Cash shortage	.173	.160	1	.281	1.189	.868	1.627
Hailstorm	-.636	.474	1	.180	.530	.209	1.342
Constant	2.615	2.137	1	.221	13.661		

4.7.2 Underweight

4.7.2.1   Association between underweight and various selected indicators

Underweight is a composite indicator malnutrition. . It reflects a combination of both acute and chronic malnutrition. **Table 25** presents the association between various selected demographic variables. Underweight was only significantly associated with province (p=0.000). The median age of household head was lower for underweight children (41 years) than household head for the 'normal' child (43 years). This was significant at the 1% level (**Table 25**).

Table 25. Association between underweight, and selected demographic variables

Variable	Total	Not underweight n(%)	Underweight n(%)	P value*
National prevalence	6722	6148 (91.5)	574 (8.5)	
Province				
Manicaland	575 (8.6)	540 (93.9)	35 (6.1)	0.000*
Mash Central	948 (14.1)	869 (91.7)	79 (8.3)	
Mash East	1162 (17.3)	1066 (91.7)	96 (8.3)	
Mash West	827 (12.3)	730 (88.3)	97 (11.7)	
Matabeleland North	677 (10.1)	621 (91.7)	56 (8.3)	
Matabeleland South	782 (11.6)	698 (89.3)	84 (10.7)	
Midlands	1086 (16.2)	998 (91.9)	88 (8.1)	
Masvingo	665 (9.9)	626 (94.1)	39 (5.9)	
Household head gender				
Male	3078 (88.6)	2820 (91.6)	258 (8.4)	0.326
Female	396 (11.4)	357 (90.2)	39 (9.8)	
Household Head marital status[1]				
Married living together	2811 (81.1)	2573 (91.5)	238 (8.5)	0.255
Married living apart	282 (8.1)	261 (92.6)	21 (7.4)	
Divorced/Separated	66 (1.9)	56 (84.8)	10 (15.2)	
Widow/Widower	292 (8.4)	266 (91.1)	26 (8.9)	
Co-habiting	3 (0.1)	2 (66.7)	1 (33.3)	
Never married	14 (0.4)	13 (92.9)	1 (7.1)	

Household Head Employment Status[2]				
Not Employed	2235 (64.6)	2041 (91.3)	194 (8.7)	0.760
Formally employed	444 (12.8)	402 (90.5)	42 (9.5)	
Informally employed	762 (22.0)	703 (92.3)	59 (7.7)	
Both (formally & informally employed)	21 (0.6)	19 (90.5)	2 (9.5)	
Household Head Education Level attained[2]				
None	167 (4.8)	152 (91.0)	15 (9.0)	0.361
Primary	1055 (1055)	970 (91.9)	85 (8.1)	
ZJC	524 (15.1)	468 (89.3)	56 (10.7)	
O level	1579 (45.6)	1452 (92.0)	127 (8.0)	
A level	61 (1.8)	57 (93.4)	4 (6.6)	
Diploma/Certificate after primary	18 (0.5)	16 (88.9)	2 (11.1)	
Diploma/Certificate after secondary	35 (1.0)	29 (82.9)	6 (17.1)	
Graduate/Post-Graduate	23 (0.7)	21 (91.3)	2 (8.7)	
Religion[3]				
Roman Catholic	329 (4.9)	312 (94.8)	17 (5.2)	0.132
Protestant	663 (9.9)	613 (92.5)	50 (7.5)	
Pentecostal	836 (12.4)	756 (90.4)	80 (9.6)	
Apostolic Sect	3039 (45.2)	2767 (91.0)	272 (9.0)	
Zion	767 (11.4)	707 (92.2)	60 (7.8)	
Other Christian	236 (3.5)	208 (88.1)	28 (11.9)	
Islam	33 (0.5)	32 (97.0)	1 (3.0)	
Traditional	104 (1.5)	94 (90.4)	10 (9.6)	
Other religion	55 (0.8)	48 (87.3)	7 (12.7)	
No religion	648 (9.8)	600 (92.6)	48 (7.4)	
Don't know	12 (0.2)	11 (91.7)	1 (8.3)	
Median Age of Household Head	42 [34; 54]	43 [34; 54]	41 [32; 52]	0.094
Median Household income	70 [26.2; 180]	70 [26.2; 190]	70 [26.2; 178.8]	0.310

Notes: Total sample size is 6722 unless stated. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Except for Household head age which show Mann Whitney U Test. Level of significance is set at p<0.05

Underweight prevalence was consistently higher in all children with poor diet quality indicators. There was a significant association between underweight and HDDS (p=0.042) and FCS (p=0.035). There was a higher proportion of underweight children with inadequate meal frequency, low household dietary diversity score, and poor food consumption score (**Table 26**).

Table 26. Association between underweight, and selected diet quality, care practices variables

Variable	Total	Not underweight n(%)	Underweight n(%)	P value*
Ever breastfed[1]				

No	278 (12.1)	249 (89.6)	29 (10.4)	0.100
Yes	2018 (87.6)	1875 (92.9)	143 (7.1)	
Don't know	8 (0.3)	8 (100)	0 (0)	
MMF[1]				
Inadequate	1756 (77.4)	1635 (93.1)	121 (6.9)	0.709
Adequate	514 (22.6)	481 (93.6)	33 (6.4)	
MDD[1]				
Below cutoff	2079 (91.6)	1939 (93.3)	140 (6.7)	0.754
Above cutoff	191 (8.4)	177 (92.7)	14 (7.3)	
MAD[1]				
Below cutoff	2189 (96.4)	2042 (93.3)	147 (6.7)	0.498
Above cutoff	81 (3.6)	74 (91.4)	7 (8.6)	
HDDS[2]				
0-2 food groups	298 (5.7)	265 (88.9)	33 (11.1)	0.046*
3-4 food groups	1031 (19.6)	934 (90.6)	97 (9.4)	
5 food groups	1035 (19.7)	939 (90.7)	96 (9.3)	
6-12 food groups	2896 (55.1)	2678 (92.5)	218 (7.5)	
MDD-W[2]				
Below cutoff	4818 (91.6)	4419 (91.7)	399 (8.3)	0.169
Above cutoff	442 (8.4)	397 (89.9)	45 (10.2)	
FCS[3]				
Poor	823 (15.7)	735 (89.3)	88 (10.7)	0.035*
Borderline	1554 (29.6)	1434 (92.3)	120 (7.7)	
Acceptable	2876 (54.7)	2641 (91.8)	235 (8.2)	
HHS[2]				
No or little hunger	4433 (84.3)	4067 (91.7)	366 (8.3)	0.335
Moderate hunger	764 (14.5)	694 (90.8)	70 (9.2)	
Severe hunger	63 (1.2)	55 (87.3)	8 (12.7)	

[1]n=2270, [2]n-5260, [3]n-5260. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Level of significance is set at p<0.05

There was a significant association between underweight and cough prevalence (p=0.007). Underweight prevalence was higher in children who had experienced a cough 2 weeks before the survey (significant). Underweight was also higher in children who had diarrhoea, fever, no access to nutrition and health information (**Table 27**).

Table 27. Association between underweight, and selected disease prevalence and access to health service indicators

Variable	Total	Not underweight n(%)	Underweight n(%)	P value*
Diarrhoea				
No	5926 (88.2)	5428 (91.6)	498 (8.4)	0.443
Yes	775 (11.5)	700 (90.3)	75 (9.7)	
Don't know	18 (0.3)	17 (94.4)	1 (5.6)	
Cough				
No	4864 (72.4)	4479 (92.1)	385 (7.9)	0.007*
Yes	1847 (27.5)	1658 (89.8)	189 (10.2)	
Don't know	8 (0.1)	8 (100)	0 (0)	

Fever

No	5499 (81.8)	5040 (91.7)	459 (8.3)	0.301
Yes	1212 (18.0)	1097 (90.5)	115 (9.5)	
Don't know	8 (0.1)	8 (100)	0 (0)	

Vitamin A dose

No	708 (10.5)	656 (92.7)	52 (7.3)	0.621
Yes (card)	4178 (62.2)	3810 (91.2)	368 (8.8)	
Yes (no card)	1593 (23.7)	1460 (91.7)	133 (8.3)	
Dont know	239 (3.6)	218 (91.2)	21 (8.8)	

Access to nutrition information

No	1429 (27.3)	1292 (90.4)	137 (9.6)	0.075
Yes	3813 (72.7)	3506 (91.9)	307 (8.1)	

Access to health-related information

No	969 (18.5)	876 (90.4)	93 (9.6)	0.163
Yes	4273 (81.5)	3922 (91.8)	351 (8.2)	

Access to services of VHW

No	630 (12.0)	581 (92.2)	49 (7.8)	0.506
Yes	4612 (88.0)	4217 (91.4)	395 (8.6)	

n=6719 and 5242

There was no significant association between underweight and WASH indicators (**Table 28**).

Table 28. Association between underweight, and selected WASH variables

Variable	Total	Not underweight n(%)	Underweight n(%)	P value*
Main Source of water				
Piped into dwelling	92 (1.8)	84 (91.3)	8 (8.7)	0.800
Piped into yard or plot	125 (2.4)	117 (93.6)	8 (6.4)	
Piped into public tap or standpipe	431 (8.2)	401 (93.0)	30 (7.0)	
Piped into neighbour	61 (1.2)	53 (86.9)	8 (13.1)	
Borehole/tubewell	2295 (43.7)	2094 (91.2)	201 (8.8)	
Protected well	1054 (20.1)	973 (92.3)	81 (7.7)	
Un protected well	682 (13.0)	618 (90.6)	64 (9.4)	
Protected spring	46 (0.9)	43 (93.5)	3 (6.5)	
unprotected spring	59 (1.1)	54 (91.5)	5 (8.5)	
Surface water	276 (5.3)	253 (91.7)	23 (8.3)	
Tanker Truck	2 (0)	2 (100)	0 (0)	
Water Kiosk	1 (0)	1 (100)	0 (0)	
Sand Abstraction	109 (2.1)	99 (90.8)	10 (9.2)	
Other	15 (0.3	12 (80.0)	3 (20)	
Water treatment before use				
No	5094 (97.1)	4663 (91.5)	431 (8.5)	0.968
Yes	152 (2.9)	139 (91.4)	13 (8.6)	
Toilet facility				
Flush pour to piped sewer system	36 (0.7)	34 (94.4)	5.6 (0.5)	0.896
Flush/pour to septic tank	73 (1.4)	68 (93.2)	5 (6.8)	
Flush/pour to pit latrine	73 (1.4)	68 (93.2)	5 (6.8)	
Flush/pour to open drain	25 (0.5)	23 (92.0)	2 (8.0)	

Flush to don't know where	3 (0.1)	3 (100)	0 (0)	
Ventilated improved pit latrine	999 (19.0)	918 (91.9)	81 (8.1)	
Pit latrine with slab	1742 (33.2)	1594 (91.5)	148 (8.5)	
Pit latrine without slab (open pit)	505 (9.6)	454 (89.9)	51 (10.1)	
Composting toilet	117 (2.2)	108 (92.3)	9 (7.7)	
No facility/bush/field	1611 (30.7)	1475 (91.6)	136 (8.4)	
Bucket	5 (0.1)	4 (80.0)	1 (20.0)	
Hanging Toilet	11 (0.2)	9 (81.8)	2 (18.2)	
Other	46 (0.9)	44 (95.7)	2 (4.3)	
Shared toilet facility				
No	2892 (80.4)	2646 (91.5)	246 (8.5)	0.811
Yes	705 (19.6)	647 (91.8)	58 (8.2)	
Handwashing station				
No	4974 (94.6)	4554 (91.6)	420 (8.4)	0.975
Yes	286 (5.4)	262 (91.6)	24 (8.4)	
Water for handwashing				
Absent	5038 (95.8)	4610 (91.5)	428 (8.5)	0.499
Present	222 (4.2)	206 (92.8)	16 (7.2)	
Presence of soap and detergent				
Absent	5097 (96.9)	4665 (91.5)	432 (8.5)	0.615
Present	163 (3.1)	151 (92.6)	12 (7.4)	

Notes: Total sample size is 5260 unless stated. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Level of significance is set at p<0.05

Though underweight was higher in households with support (Care-group membership, NGOs and churches) probably through targeting and screening. This relationship was not statistically significant. There was no significant association between underweight and the rest of the social protection indicators with slightly higher prevalence of wasting in most households with no support from the community and relatives (**Table 29**).

Table 29. Association between underweight, and selected social protection variables

Variable	Total	Not underweight n(%)	Underweight n(%)	P value*
Care-group membership				
No	4119 (83.8)	3771 (91.6)	348 (8.4)	0.522
Yes	508 (10.3)	458 (90.2)	50 (9.8)	
Don't know	262 (90.7)	262 (90.7)	27 (9.3)	
Support from Government				
No	1827 (34.7)	1671 (91.5)	156 (8.5)	0.853
Yes	3433 (65.3)	3145 (91.6)	288 (8.4)	
Support from NGO				
No	4649 (88.4)	4263 (91.7)	386 (8.3)	0.320
Yes	611 (11.6)	553 (90.5)	58 (9.5)	
Support from churches				
No	5200 (98.9)	4765 (91.6)	435 (8.4)	0.060
Yes	60 (1.1)	51 (85.0)	9 (15.0)	
Support from relatives within the community				

No	4820 (91.6)	4410 (91.5)	410 (8.5)	0.574
Yes	440 (8.4)	406 (92.3)	34 (7.7)	
Support from relatives outside the community (urban)				
No	4847 (92.1)	4428 (91.4)	419 (8.6)	0.069
Yes	413 (7.9)	388 (93.9)	25 (6.1)	
Support from relatives outside Zimbabwe				
No	4943 (94.0)	4524 (91.5)	419 (8.5)	0.714
Yes	317 (6.0)	292 (92.1)	25 (7.9)	
Support from other				
No	5226 (99.4)	4785 (91.6)	441 (8.4)	0.936
Yes	34 (0.6)	31 (91.2)	3 (8.8)	

Notes: Total sample size is 5260 unless stated. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Level of significance is set at p<0.05

There was an association between shocks experienced by a household and presence of a child with underweight in that household. Only households who reported having experienced 'other shocks' had a statistically significant higher proportion of underweight children, 16% vs 8.4% (**Table 30**). In overall, households experiencing the following shocks had higher proportion of underweight children; waterlogging, floods, hailstorm, livestock disease, livestock deaths, cash shortage, loss of employment, divorce/separation, gender-based violence, chronic disease (**Table 30**).

Table 30. Association between underweight, and selected shocks

Variable	Total	Not underweight n(%)	Underweight n(%)	P value*
Chronic Illness				
No	4759 (90.5)	4358 (91.6)	401 (8.4)	0.904
Yes	501 (9.5)	458 (91.4)	43 (8.6)	
Other health condition				
No	4918 (93.5)	4501 (91.5)	417 (8.5)	0.707
Yes	342 (6.5)	315 (92.1)	27 (7.9)	
Gender based violence				
No	5049 (96.0)	4623 (91.6)	426 (8.4)	0.962
Yes	211 (4.0)	193 (91.5)	18 (8.5)	
Divorce/separation				
No	5083 (96.6)	4659 (91.7)	424 (8.3)	0.164
Yes	177 (3.4)	157 (88.7)	20 (11.3)	
Death of main income holder				
No	5181 (98.5)	4739 (91.5)	442 (8.5)	0.057
Yes	79 (1.5)	77 (97.5)	2 (2.5)	
Loss of employment of Key household earner				
No	5190 (98.7)	4752 (91.6)	438 (8.4)	0.968
Yes	70 (1.3)	64 (91.4)	6 (8.6)	
Cash shortage				
No	2297 (43.7)	2106 (91.7)	191 (8.3)	0.772
Yes	2963 (56.3)	2710 (91.5)	253 (8.5)	
Being charged more for using mobile/ swipe				

No	3964 (75.4)	3630 (91.6)	334 (8.4)	0.945
Yes	1296 (24.6)	1186 (91.5)	110 (8.5)	
Cereal price change				
No	3810 (72.4)	3476 (91.2)	334 (8.8)	0.169
Yes	1450 (27.6)	1340 (92.4)	110 (7.6)	
Livestock Price change				
No	4937 (93.9)	4514 (91.4)	423 (8.6)	0.196
Yes	323 (6.1)	302 (93.5)	21 (6.5)	
Livestock disease				
No	4211 (80.1)	3862 (91.7)	349 (8.3)	0.423
Yes	1049 (19.9)	954 (90.9)	95 (9.1)	
Livestock deaths				
No	4144 (78.8)	3797 (91.6)	347 (8.4)	0.734
Yes	1116 (21.2)	1019 (91.3)	97 (8.7)	
Crop pests				
No	3849 (73.2)	3518 (91.4)	331 (8.6)	0.494
Yes	1411 (26.8)	1298 (92.0)	113 (8.0)	
Prolonged drought				
No	2949 (56.1)	2688 (91.1)	261 (8.9)	0.338
Yes	2311 (43.9)	2128 (92.1)	183 (7.9)	
Hailstorm				
No	5153 (98.0)	4719 (91.6)	434 (8.4)	0.734
Yes	107 (2.0)	97 (90.7)	10 (9.3)	
Flooding				
No	5202 (98.9)	4763 (91.6)	439 (8.4)	0.961
Yes	58 (1.1)	53 (91.4)	5 (8.6)	
Waterlogging				
No	4558 (86.7)	4182 (91.8)	376 (8.2)	0.202
Yes	702 (13.3)	634 (90.3)	68 (9.7)	
Human wildlife conflict				
No	4694 (89.2)	4295 (91.5)	399 (8.5)	0.657
Yes	566 (10.8)	521 (92.0)	45 (8.0)	
Conflict/ Social Unrest				
No	5173 (98.3)	4734 (91.5)	439 (8.5)	0.362
Yes	87 (1.7)	82 (94.3)	5 (5.7)	
Veld Fires				
No	5162 (98.1)	4727 (91.6)	435 (8.4)	0.790
Yes	98 (1.9)	89 (90.8)	9 (9.2)	
Other				
No	5210 (99)	4774 (91.6)	436 (8.4)	0.053
Yes	50 (1.0)	42 (84.0)	8 (16.0)	

Notes: Total sample size is 5260 unless stated. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Level of significance is set at p<0.05

4.7.2.2 *Predictors of underweight - Inferential analysis*

The odds of underweight were significantly increased if the child was in Mashonaland West and Matabeleland South, (**Table 31**) [OR 2.06 95% CI 1.33; 3.2] and [OR 1.96 95% CI 1.3; 3.1] respectively.

Table 31. Predictors of wasting

Variable	B	S.E.	df	Sig.	OR	95% C.I.for OR Lower	Upper
Manicaland	.117	.265	1	.658	1.125	.669	1.891
Mash Central	.269	.229	1	.239	1.309	.836	2.049
Mash East	.374	.223	1	.094	1.454	.938	2.253
Mash West	.723	.222	1	.001*	2.061	1.334	3.185
Matabeleland North	.319	.246	1	.195	1.375	.849	2.226
Matabeleland South	.674	.228	1	.003*	1.961	1.255	3.065
Midlands	.380	.226	1	.093	1.462	.938	2.278
MMF	.317	.197	1	.107	1.373	.934	2.019
HDDS 0-2 food groups			3	.414			
HDDS 3-4 food groups	.252	.232	1	.277	1.287	.817	2.027
HDDS 5 food groups	.185	.152	1	.222	1.204	.894	1.621
HDDS 6-12 food groups	.205	.138	1	.137	1.228	.937	1.610
FCS poor			2	.178			
FCS borderline	.147	.164	1	.371	1.158	.840	1.596
FCS acceptable	-.138	.127	1	.277	.871	.679	1.117
Constant	-3.150	.267	1	.000	.043		

4.7.3 Wasting

4.7.3.1 *Association between wasting and various selected indicators*

Wasting is an indicator of acute malnutrition. It is a reflection of a more recent attack to the health and or nutrition status of the child. Concerning demographics there was a significant association between wasting and province (p=0.000) (**Table 32**). There was no significant association between wasting and other demographic variables such as education status of head of household, marital status, religion, and employment.

Table 32. Association between wasting, and selected demographic variables

Variable	Total	Not wasted n(%)	Wasted n(%)	P value*
National Prevalence	6557	6290 (95.9)	267 (4.1)	
Province				
Manicaland	554 (8.4)	533 (96.2)	21 (3.8)	0.000
Mash Central	935 (14.3)	878 (93.9)	57 (6.1)	
Mash East	1120 (17.1)	1068 (95.4)	52 (4.6)	
Mash West	812 (12.4)	786 (96.8)	26 (3.2)	
Matabeleland North	648 (9.9)	614 (94.8)	34 (5.2)	
Matabeleland South	767 (11.7)	733 (95.6)	34 (4.4)	
Midlands	1072 (16.3)	1041 (97.1)	31 (2.9)	
Masvingo	649 (9.9)	637 (98.2)	1.2 (1.8)	
Household head gender				
Male	2992 (88.5)	2862 (95.7)	130 (4.3)	0.350
Female	390 (11.5)	377 (96.7)	13 (3.3)	

Household Head marital status[1]

Married living together	2732 (80.9)	2608 (95.5)	124 (4.5)	0.097
Married living apart	276 (8.2)	272 (98.6)	4 (1.4)	
Divorced/Separated	63 (1.9)	58 (92.1)	5 (7.9)	
Widow/Widower	288 (8.5)	279 (96.9)	9 (3.1)	
Co-habiting	3 (0.1)	3 (100)	0 (0)	
Never married	14 (0.4)	13 (92.9)	1 (7.1)	

Household Head Employment Status[2]

Not Employed	2180 (64.7)	2088 (95.8)	92 (4.2)	0.974
Formally employed	434(12.9)	414 (95.4)	20 (4.6)	
Informally employed	736 (21.8)	706 (95.9)	30 (4.1)	
Both (formally & informally employed)	20 (0.6)	19 (95.0)	1 (5.0)	

Household Head Education Level attained[2]

None	162 (4.8)	150 (92.6)	12 (7.4)	0.280
Primary	1030 (30.6)	995 (96.6)	35 (3.4)	
ZJC	507 (15.0)	481 (94.9)	26 (5.1)	
O level	1541 (45.7)	1475 (95.7)	66 (4.3)	
A level	57 (1.7)	56 (98.2)	1 (1.8)	
Diploma/Certificate after primary	18 (0.5)	17 (94.4)	1 (5.6)	
Diploma/Certificate after secondary	33 (1.0)	32 (97.0)	1 (3.0)	
Graduate/Post-Graduate	22 (0.7)	21 (95.5)	1 (4.5)	

Religion[3]

Roman Catholic	324 (4.9)	313 (96.6)	11 (3.4)	0.947
Protestant	649 (9.9)	625 (96.3)	24 (3.7)	
Pentecostal	816 (12.4)	782 (95.8)	34 (4.2)	
Apostolic Sect	2960 (45.1)	2834 (95.7)	126 (4.3)	
Zion	749 (11.4)	718 (95.9)	31 (4.1)	
Other Christian	227 (3.5)	215 (94.7)	12 (5.3)	
Islam	33 (0.5)	33 (100)	0 (0)	
Traditional	100 (1.5)	96 (96.0)	4 (4.0)	
Other religion	55 (0.8)	53 (96.4)	2 (3.6)	
No religion	632 (9.6)	609 (96.4)	23 (3.6)	
Don't know	12 (0.2)	12 (100)	0 (0)	
Median Age of HH	42 [34; 54]	43[34; 54]	41[33; 53]	0.212
Median HH income	70 [26.2; 180]	70 [26.2; 188.5]	95[26.2; 200]	0.714

Notes: Total sample size is 6557 unless stated. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Except for Household age head which show Mann Whitney U Test. Level of significance is set at $p<0.05$

There was a significant association between wasting and women's minimum dietary diversity, food consumption score and household hunger score. A higher proportion of wasted children were found in households with a poor FCS and Severe Hunger (HHS). Conversely there was a higher proportion of wasted children in households with women above the cutoff for minimum dietary diversity. This could be due to poor intra household food distribution.

Table 33. Association between wasting, and selected diet quality, care practices variables

Variable	Total	Not wasted n(%)	Wasted n(%)	P value*
Ever breastfed				
No	278 (12.7)	262 (94.2)	16 (5.8)	0.762
Yes	1896 (86.9)	1795 (94.7)	101 (5.3)	
Don't know	8 (0.4)	(100)	0 (0)	
MMF[1]				
Inadequate	1658 (77.3)	1570 (94.7)	88 (5.3)	0.468
Adequate	487 922.7)	457 (93.8)	30 (6.2)	
MDD[1]				
Below cutoff	1960 (91.4)	1857 (94.7)	103 (5.3)	0.104
Above cutoff	185 (8.6)	170 (91.9)	15 (8.1)	
MAD[1]				
Below cutoff	2068 (96.4)	1957 (94.6)	111 (5.4)	0.159
Above cutoff	77 (3.6)	70 (90.9)	7 (9.1)	
HDDS[2]				
0-2 food groups	288 (5.6)	270 (93.8)	18 (6.3)	0.127
3-4 food groups	1005 (19.6)	955 (95)	50 (5.0)	
5 food groups	1017 (19.8)	979 (96.3)	38 (3.7)	
6-12 food groups	2825 (55.0)	2715 (96.1)	110 (3.9)	
MDD-W[2]				
Below cutoff	4702 (91.6)	4513 (96)	189 (4.0)	0.028*
Above cutoff	433 (8.4)	406 (93.8)	27 (6.2)	
FCS[3]				
Poor	802 (15.6)	754 (94)	48 (6.0)	0.013*
Borderline	1514 (29.5)	1462 (96.6)	52 (3.4)	
Acceptable	2812 (54.8)	2697 (95.9)	115 (4.1)	
HHS[2]				
No or little hunger in HH	4325 (84.2)	4158 (96.1)	167 (3.9)	0.002*
Moderate Hunger in HH	748 (14.6)	706 (94.4)	42 (5.6)	
Severe Hunger in HH	62 (1.2)	55 (88.7)	7 (11.3)	

[1]n=2145, [2]n-5112, [3]n-5105. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Level of significance is set at p<0.05

There was a significant association between wasting and diarrhoea prevalence (p=0.043), cough prevalence (p=0.005), vitamin a dose (p=0.001) and access to nutrition information (p=0.020). There was a higher proportion of children who were wasted and had experienced cough, fever (not significant) and diarrhoea in the days preceding the survey. Children whose households had no access to nutrition information (significant p=0.020) and health information (not significant) had a higher prevalence of wasting (Table 35).

Table 34. Association between wasting, and selected disease prevalence and access to health service indicators

Variable	Total	Not wasted n(%)	Wasted n(%)	P value*
Diarrhoea				

No	5775 (88.1)	5552 (96.1)	223 (3.9)	0.043*
Yes	761 (11.6)	718 (94.3)	43 (5.7)	
Don't know	18 (0.3)	18 (100)	0 (0)	
Cough				
No	4749 (72.5)	4579 (96.4)	170 (3.6)	0.005*
Yes	1797 (27.4)	1701 (94.7)	96 (5.3)	
Don't know	8 (0.1)	8 (100)	0 (0)	
Fever				
No	5357 (81.7)	5149 (96.1)	208 (3.9)	0.245
Yes	1189 (18.1)	1131 (95.1)	58 (4.9)	
Don't know	8 (0.1)	8 (100)	0 (0)	
Vitamin A dose				0.001*
No	682 (10.4)	659 (96.6)	23 (3.4)	
Yes (card)	4064 (62.0)	3869 (95.2)	195 (4.8)	
Yes (no card)	1572 (24)	1528 (97.2)	44 (2.8)	
Done know	235 (3.6)	231 (98.3)	4 (1.7)	
Access to nutrition information				
No	1399 (27.3)	1325 (94.7)	74 (5.3)	0.020*
Yes	3718 (72.7)	3576 (96.2)	142 (3.8)	
Access to health-related information				
No	945 (18.5)	900 (95.2)	45 (4.8)	0.360
Yes	4172 (81.5)	4001 (95.9)	171 (4.1)	
Access to services of VHW				
No	615 (12.0)	591 (96.1)	24 (3.9)	0.675
Yes	4502 (88.0)	4310 (95.8)	192 (4.3)	

Though wasting prevalence was higher in households with no handwashing station and no water at the handwashing station, there was no significant association between wasting and WASH indicators (**Table 35**).

Table 35. Association between wasting, and selected WASH variables

Variable	Total	Not wasted n(%)	Wasted n(%)	P value*
Main Source of water				
Piped into dwelling	87 (1.7)	83 (95.4)	4 (4.6)	0.977
Piped into yard or plot	120 (2.3)	116 (96.7)	4 (3.3)	
Piped into public tap or standpipe	417 (8.1)	398 (95.4)	19 (4.6)	
Piped into neighbour	61 (1.2)	57 (93.4)	4 (6.6)	
Borehole/tubewell	2245 (43.8)	2144 (95.5)	101 (4.5)	
Protected well	1030 (20.1)	990 (96.1)	40 (3.9)	
Un protected well	667 (13.0)	645 (96.7)	22 (3.3)	
Protected spring	45 (0.9)	43 (95.6)	2 (4.4)	
unprotected spring	58 (1.1)	57 (98.3)	1 (1.7)	
Surface water	267 (5.2)	254 (95.1)	13 (4.9)	
Tanker Truck	2 (0)	2 (100)	0 (0)	
Water Kiosk	1 (0)	1 (100)	0 (0)	
Sand Abstraction	108 (2.1)	103 (95.4)	5 (4.6)	
Other	15 (0.3)	14 (93.3)	1 (6.7)	
Water treatment before use				

No	4971 (97.1)	4763 (95.8)	208 (4.2)	0.490
Yes	150 (2.9)	142 (94.7)	8 (5.3)	
Toilet facility				
Flush pour to piped sewer system	34 (0.7)	32 (94.1)	2 (5.9)	0.475
Flush/pour to septic tank	69 (1.3)	64 (92.8)	5 (7.2)	
Flush/pour to pit latrine	70 (1.4)	69 (98.6)	1 (1.4)	
Flush/pour to open drain	25 (0.5)	24 (96.0)	1 (4.0)	
Flush to don't know where	3 (0.1)	3 (100)	0 (0)	
Ventilated improved pit latrine	984 (19.2)	954 (97.0)	30 (3.0)	
Pit latrine with slab	1697 (33.1)	1621 (95.5)	76 (4.5)	
Pit latrine without slab (open pit)	494 (9.6)	470 (95.1)	24 (4.9)	
Composting toilet	112 (2.2)	107 (95.5)	5 (4.5)	
No facility/bush/field	1572 (30.7)	1502 (95.5)	70 (4.5)	
Bucket	5 (0.1)	4 (80)	1 (20)	
Hanging Toilet	11 (0.2)	11 (100)	0 (0)	
Other	45 (0.9)	44 (97.8)	1 (2.2)	
Shared toilet facility				
No	2829 (80.6)	2712 (95.9)	117 (4.1)	0.897
Yes	683 (19.4)	654 (95.8)	29 (4.2)	
Handwashing station				
No	4860 (94.6)	4654 (95.8)	206 (4.2)	0.628
Yes	275 (5.4)	265 (96.4)	10 (3.6)	
Water for handwashing				
Absent	4922 (95.9)	4714 (95.8)	208 (4.2)	0.738
Present	213 (4.1)	205 (96.2)	8 (3.8)	
Presence of soap and detergent				
Absent	4980 (97.0)	4772 (95.8)	208 (4.2)	0.548
Present	155 (3.0)	147 (94.8)	8 (5.2)	

Notes: Total sample size is 5135 unless stated. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Level of significance is set at p<0.05

Though wasting was higher in households with mostly no support. This relationship was not statistically significant. There was also no association between wasting and the rest of the social protection indicators (Table 37).

Table 36. Association between wasting, and selected social protection variables

Variable	Total	Not wasted n(%)	Wasted n(%)	P value*
Care-group membership				
No	3998 (83.7)	3818 (95.5)	180 (4.5)	0.287
Yes	497 (10.4)	468 (94.2)	29 (5.8)	
Don't know	280 (5.9)	270 (96.4)	10 (3.6)	
Support from Government				
No	1785 (34.8)	1707 (95.6)	78 (4.4)	0.670
Yes	3350 (65.2)	3212 (95.9)	138 (4.1)	
Support from NGO				
No	4543 (88.5)	4356 (95.9)	187 (4.1)	0.372
Yes	592 (11.5)	563 (95.1)	29 (4.9)	
Support from churches				
No	5079 (98.9)	4868 (95.8)	211 (4.2)	0.077
Yes	56 (1.1)	51 (91.1)	5 (8.9)	
Support from relatives within the community				

No	4701 (91.5)	4497 (95.7)	204 (4.3)	0.118
Yes	434 (8.5)	422 (97.2)	12 (2.8)	
Support from relatives outside the community (urban)				
No	4729 (92.1)	4525 (95.7)	204 (4.3)	0.191
Yes	406 (7.9)	394 (97.0)	12 (3.0)	
Support from relatives outside Zimbabwe				
No	4826 (94.0)	4621 (95.8)	205 (4.2)	0.559
Yes	309 (6.0)	298 (96.4)	11 (3.6)	
Support from other				
No	5102 (99.4)	4889 (95.8)	213 (4.2)	0.161
Yes	33 (0.6)	30 (90.9)	3 (9.1)	

Notes: Total sample size is 5135 unless stated. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Level of significance is set at p<0.05

Households experiencing the following shocks had a higher proportion of wasted children; chronic illness, other health condition, gender-based violence, death of income holder, loss of employment of key household member, cash shortage, livestock disease, waterlogging, veld fires (**Table 37**).

Table 37. Association between wasting, and selected shocks

Variable	Total	Not wasted n(%)	Wasted n(%)	P value*
Chronic Illness				
No	4646 (90.5)	4452 (95.8)	194 (4.2)	0.735
Yes	467 (9.5)	467 (95.5)	22 (4.5)	
Other health condition				
No	4800 (93.5)	4603 (95.9)	197 (4.1)	0.167
Yes	335 (6.5)	316 (94.3)	19 (5.7)	
Gender based violence				
No	4926 (95.9)	4726 (95.9)	200 (4.1)	0.011*
Yes	209 (4.1)	193 (92.3)	16 (7.7)	
Divorce/separation				
No	4959 (96.6)	4750 (95.8)	209 (4.2)	0.878
Yes	176 (3.4)	169 (96.0)	7 (4.0)	
Death of main income holder				
No	5060 (98.5)	4849 (95.8)	211 (4.2)	0.285
Yes	75 (1.5)	70 (93.3)	5 (6.7)	
Loss of employment of Key household earner				
No	5066 (98.7)	4853 (95.8)	213 (4.2)	0.953
Yes	69 (1.3)	66 (95.8)	3 (4.3)	
Cash shortage				
No	2241 (43.6)	2156 (96.2)	85 (3.8)	0.194
Yes	2894 (56.4)	2763 (95.5)	131 (4.5)	
Being charged more for using mobile/ swipe				
No	3860 (75.2)	3696 (95.8)	164 (4.2)	0.793
Yes	1275 (24.8)	1223 (95.9)	52 (4.1)	
Cereal price change				
No	3716 (72.4)	3547 (95.5)	169 (4.5)	0.049*
Yes	1419 (27.6)	1372 (96.7)	47 (3.3)	
Livestock Price change				

No	4815 (93.8)	4611 (95.8)	204 (4.2)	0.674
Yes	320 (6.2)	308 (96.3)	12 (3.8)	
Livestock disease				
No	4104 (79.9)	3939 (96.0)	165 (4.0)	0.185
Yes	1031 (20.1)	980 (95.1)	51 (4.9)	
Livestock deaths				
No	4037 (78.6)	3866 (95.8)	171 (4.2)	0.841
Yes	1098 (21.4)	1053 (95.9)	45 (4.1)	
Crop pests				
No	3754 (73.1)	3594 (95.7)	160 (4.3)	0.743
Yes	1381 (26.9)	1325 (95.9)	56 (4.1)	
Prolonged mid season dry spell				
No	2783 (55.9)	2743 (95.5)	130 (4.5)	0.200
Yes	2262 (44.1)	2176 (96.2)	86 (3.8)	
Hailstorm				
No	5031 (98.0)	4817 (95.7)	214 (4.3)	0.241
Yes	104 (2.0)	102 (98.1)	2 (1.9)	
Flooding				
No	5078 (98.9)	4863 (95.8)	215 (4.2)	0.354
Yes	57 (1.1)	56 (98.2)	1 (1.8)	
Waterlogging				
No	4445 (86.6)	4263 (95.9)	182 (4.1)	0.310
Yes	690 (13.4)	656 (95.1)	34 (4.9)	
Human wildlife conflict				
No	4579 (89.2)	4386 (95.8)	193 (4.2)	0.931
Yes	556 (10.8)	533 (95.9)	23 (4.1)	
Conflict/ Social Unrest				
No	5051 (98.4)	4835 (95.7)	216 (4.3)	0.053
Yes	84 (1.6)	84 (100)	0 (0)	
Veld Fires				
No	5036 (98.1)	4827 (95.8)	209 (4.2)	0.152
Yes	99 (1.9)	92 (92.9)	7 (7.1)	
Other				
No	5085 (99.0)	4871 (95.8)	214 (4.2)	0.942
Yes	50 (1.0)	48 (96.0)	2 (4.0)	

Notes: Total sample size is 5135 unless stated. The final column shows the results of CHI square test for significance. Fishers test used in cell counts less than 5. Level of significance is set at p<0.05

4.7.3.2   Determinants of wasting - Inferential analysis

The odds of wasting were significantly reduced if the child was in Mashonaland Central, Mashonaland East, Mashonaland West, Matabeleland South and Midlands, had adequate MDD, were in category 1 and 2 of HHS i.e., (no hunger and moderate hunger). The odds were higher if the child was from a household with no access to nutrition information [OR 1.44 95% CI 1.44; 1.068] (**Table 38**).

Table 38. Predictors of wasting

Variables	B	S.E.	df	Sig.	OR	95% C.I.for OR Lower	Upper
Mashonaland Central (1)	.884	.410	1	.031	2.421	1.083	5.412
Mashonaland East (2)	1.071	.374	1	.004*	2.918	1.401	6.077
Mashonaland West (3)	.834	.378	1	.027*	2.303	1.097	4.834
Mat North (4)	.369	.412	1	.370	1.446	.646	3.241
Mat South (5)	.954	.394	1	.015*	2.595	1.199	5.615
Midlands (6)	.946	.389	1	.015*	2.576	1.203	5.519
Masvingo (7)	.195	.410	1	.634	1.216	.545	2.713
MMF	-.258	.228	1	.258	.773	.494	1.208
MDD	-.681	.306	1	.026*	.506	.278	.922
HHS-no hunger			2	.002*			
HHS-moderate hunger	-1.312	.427	1	.002*	.269	.117	.622
HHS severe hunger	-.920	.446	1	.039*	.399	.166	.954
Cereal price	.313	.174	1	.071	1.367	.973	1.922
Vitamin A_no			3	.014*			
Vitamin A_yes with card	.790	.629	1	.209	2.204	.643	7.559
Vitamin A_yes without card	1.029	.592	1	.082	2.798	.877	8.925
Vitamin A_dont know	.478	.610	1	.434	1.613	.488	5.334
Nutrition Information	.367	.154	1	.017*	1.443	1.068	1.950
FCS	-.072	.097	1	.458	.931	.770	1.125
Constant	-2.798	.882	1	.002	.061		

4.8 FOOD SECURITY

Food and nutrition security can be defined as the situation 'when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life' (Simelane & Worth, 2020). Food and nutrition security not only carries significant benefits for human health, but also serves as the basis to achieve sustained economic growth (FAO, 2005). More so, food security is central to both short- and long-term economic growth and it needs to be a central part in a larger cross-sectoral strategy at the national, regional and global levels (Timmer, 2005). As such, food and nutrition security is one of the national priorities of the Government of Zimbabwe's National Development Strategy 1 (2021 – 2025). In this section, the food security status of the surveyed rural households is presented.

4.8.1   Background characteristics of food insecure households

The results presented in **Table 39** reveal that 26% of the surveyed households were food insecure. Before controlling for confounding factors, food insecure households had the following characteristics: headed by lowly educated (none to primary level education) household heads, married and living together couples, members of the Apostolic Sect, and large household size. Other the other hand, food secure households had the following characteristics: headed by educated or elderly persons, members of the Roman Catholic or Protestant religion, had higher monthly income and had many assets (high asset index).

Table 39. Background characteristics by food security status of the household

Variable	Household is food secure?			Difference
	Total	Yes [Y]	No [N]	[Y – N]
Observations # (%)		28	72	
Household head age [Years]	51.42	54.44	51.11	3.32***
Household head is female [1 if Yes, 0 if No]	0.328	0.327	0.328	-0.002
None	0.085	0.054	0.088	-0.033***
Primary level	0.338	0.302	0.341	-0.039**
ZJC level	0.160	0.150	0.161	-0.011
O' level	0.382	0.437	0.377	0.060***
A' level	0.017	0.025	0.017	0.008
Diploma/Certificate after primary	0.004	0.006	0.003	0.002
Diploma/Certificate after secondary	0.009	0.015	0.009	0.007
Graduate/Post-Graduate	0.005	0.011	0.004	0.007*
Married living together	0.600	0.530	0.607	-0.076***
Married living apart	0.081	0.090	0.080	0.010
Divorced/separated	0.065	0.061	0.066	-0.005
Widow/widower	0.227	0.265	0.223	0.042***
Cohabiting	0.002	0.001	0.002	0.000
Never married	0.024	0.044	0.022	0.022
Roman Catholic	0.074	0.110	0.070	0.040***
Protestant	0.110	0.132	0.107	0.025***
Pentecostal	0.127	0.143	0.126	0.017*
Apostolic Sect	0.386	0.332	0.391	-0.059***
Zion	0.115	0.101	0.117	-0.016
Other Christian	0.042	0.047	0.041	0.006*

Islam	0.006	0.004	0.006	-0.001
Traditional	0.024	0.025	0.024	0.001
Other religion	0.011	0.010	0.011	-0.001
No religion	0.104	0.089	0.105	-0.016
Monthly income [USD]	136.61	220.50	128.32	92.18***
Household size	4.461	3.060	4.603	-1.543***
Household member has chronic illness [1 if Yes, 0 if No]	0.185	0.183	0.185	-0.002
Household member has disability [1 if Yes, 0 if No]	0.236	0.238	0.236	0.002
Asset index [0 ≤ Asset index ≤31]	6.722	8.461	6.545	1.916***

Notes: Total sample size is 14,988. The final column shows the results of two-tailed t-test for the difference in the means. ***, **, and * indicate the 1, 5, and 10 percent levels of significance

4.8.2 *Inferential analysis: correlates of background characteristics and food security outcomes*

Table 40 presents the correlates of background characteristics and food security outcomes. The table reveals that all things being constant, increasing the age of household head by one year at the 1% level of significance was associated with a positive household food security status. In particular, increasing age of household head by one year was associated with an increase in FCS by 0.04 points and HDDS by 0.003 points and a decrease in rCSI by 0.02 points, coping behaviour by 0.002 points, and food insecurity by 0.1%. In addition, the results show that increasing the education level of household head had a similar effect on all the food security indicators, that is, it was associated with a decrease in food insecurity. Similarly, at the 1% level of significance, increasing household income by 1% and household asset ownership increased the probability of the household being food secure by 1.23% and 1.46%, respectively. At the 5% level of significance, female headed households had a lower (0.06-points) coping behaviour and were marginally statistically associated with food insecurity as compared to their male counterparts, *ceteris paribus*.

The results further indicate that increasing household size by one member and having a member with disability increased the probability of the households being food insecure. For example, increasing household size by one member at the 1% level of significance increased the probability of the household being food insecure by 3.42% and by 1.11% for households with a member with disability, *ceteris paribus*. All things being constant, households in Mashonaland Central, Mashonaland East, Mashonaland West, Matabeleland South, and Midlands provinces had

a reduced likelihood of being food secure at the 1% level of significance as compared to the base Province of Manicaland.

Table 40. Correlates of background characteristics and food security outcomes

VARIABLES	HHS	FCS	rCSI	Coping behaviour	HDDS	Food insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)
Household head age [Years]	-0.000695	0.0415***	-0.0220***	-0.00235***	0.00312**	-0.00113***
	(0.000737)	(0.0124)	(0.00818)	(0.000685)	(0.00123)	(0.000188)
Household head is female [1 if Yes, 0 if No]	-0.0149	-0.145	-0.0155	-0.0613**	0.0381	0.0184**
	(0.0323)	(0.527)	(0.338)	(0.0292)	(0.0570)	(0.00878)
Primary level	-0.0700**	2.087***	-1.359***	0.0613**	0.273***	-0.0221***
	(0.0345)	(0.519)	(0.383)	(0.0302)	(0.0555)	(0.00770)
ZJC level	-0.0667*	2.111***	-1.176***	0.0186	0.291***	-0.0218**
	(0.0390)	(0.618)	(0.446)	(0.0355)	(0.0649)	(0.00928)
O' level	-0.104***	3.008***	-2.102***	0.00776	0.429***	-0.0307***
	(0.0379)	(0.594)	(0.424)	(0.0339)	(0.0628)	(0.00888)
A' level	-0.172**	5.906***	-3.493***	-0.0897	0.567***	-0.0931***
	(0.0761)	(1.677)	(0.770)	(0.0739)	(0.158)	(0.0271)
Diploma/Certificate after primary	-0.223***	8.867***	-3.490***	-0.230***	0.521***	-0.0302
	(0.0662)	(2.201)	(0.888)	(0.0781)	(0.195)	(0.0357)
Diploma/Certificate after secondary	-0.313***	11.94***	-3.841***	-0.143**	0.711***	-0.0702**
	(0.0491)	(1.541)	(0.707)	(0.0669)	(0.130)	(0.0274)
Graduate/Post-Graduate	-0.215***	11.05***	-3.232***	-0.186***	0.813***	-0.116***
	(0.0579)	(1.857)	(0.738)	(0.0690)	(0.169)	(0.0370)
Married living apart	-0.0390	-0.615	-0.596	-0.0333	-0.0104	-0.0166*
	(0.0324)	(0.612)	(0.383)	(0.0321)	(0.0607)	(0.00940)
Divorced/separated	0.0777*	-0.813	0.709	0.0222	-0.0299	-0.0132
	(0.0451)	(0.700)	(0.473)	(0.0398)	(0.0779)	(0.0116)
Widow/widower	0.0218	0.291	-0.554	0.0416	0.0376	-0.0289***
	(0.0384)	(0.625)	(0.403)	(0.0345)	(0.0658)	(0.0103)
Cohabiting	0.296	2.330	5.097	0.513**	-0.118	0.00310
	(0.284)	(3.795)	(3.472)	(0.203)	(0.351)	(0.0505)
Never married	0.0756	0.559	0.654	-0.0159	0.0480	-0.0675***
	(0.0709)	(1.023)	(0.755)	(0.0537)	(0.110)	(0.0197)
Protestant	0.0718*	1.214	0.361	0.140***	-0.0320	0.0240**
	(0.0401)	(0.746)	(0.426)	(0.0372)	(0.0712)	(0.0122)
Pentecostal	0.0494	0.698	0.466	0.0823**	-0.0384	0.00899
	(0.0374)	(0.724)	(0.418)	(0.0361)	(0.0693)	(0.0119)
Apostolic Sect	0.0240	-0.467	1.062***	0.106***	-0.130**	0.0201*
	(0.0325)	(0.636)	(0.360)	(0.0315)	(0.0615)	(0.0106)
Zion	0.0542	-0.361	0.628	0.0288	-0.113	0.0139
	(0.0399)	(0.739)	(0.451)	(0.0375)	(0.0729)	(0.0118)
Other Christian	0.0364	3.453***	0.150	0.0746	0.123	0.0131
	(0.0496)	(0.955)	(0.568)	(0.0475)	(0.0931)	(0.0151)
Islam	0.233**	0.479	0.745	0.0517	-0.0718	0.0397
	(0.119)	(2.126)	(1.084)	(0.104)	(0.234)	(0.0300)
Traditional	0.339***	-1.696	1.955***	0.221***	-0.405***	0.0171

	(1)	(2)	(3)	(4)	(5)	(6)
	(0.0748)	(1.092)	(0.687)	(0.0619)	(0.119)	(0.0175)
Other religion	0.0554	-2.306	-0.0585	0.133	-0.417***	0.0220
	(0.0996)	(1.463)	(1.054)	(0.0812)	(0.151)	(0.0234)
No religion	0.100**	-1.601**	1.466***	0.0584	-0.334***	0.0342***
	(0.0411)	(0.746)	(0.460)	(0.0381)	(0.0741)	(0.0121)
Monthly income [USD]	-0.0595***	2.734***	-0.715***	-0.0262***	0.271***	-0.0123***
	(0.00553)	(0.0956)	(0.0618)	(0.00508)	(0.00953)	(0.00144)
Household size	0.0300***	-0.200**	0.737***	0.0534***	-0.0222***	0.0342***
	(0.00454)	(0.0805)	(0.0518)	(0.00425)	(0.00780)	(0.00123)
Household member has chronic illness [1 if Yes, 0 if No]	0.0236	-0.418	0.174	0.0380*	0.00470	0.0102*
	(0.0242)	(0.398)	(0.269)	(0.0229)	(0.0405)	(0.00608)
Household member has disability [1 if Yes, 0 if No]	0.0899***	-0.993***	1.795***	0.0853***	-0.0983***	0.0111***
	(0.0194)	(0.266)	(0.208)	(0.0162)	(0.0287)	(0.00413)
Asset index [0 ≤ Asset index ≤31]	-0.0533***	1.364***	-0.619***	-0.0205***	0.119***	-0.0146***
	(0.00261)	(0.0494)	(0.0302)	(0.00251)	(0.00489)	(0.000846)
Mashonaland Central	0.184***	-1.162**	-0.533	-0.0500	-0.471***	-0.0290***
	(0.0303)	(0.563)	(0.333)	(0.0314)	(0.0610)	(0.00862)
Mashonaland East	0.0164	3.970***	1.111***	0.122***	0.541***	-0.0249***
	(0.0267)	(0.559)	(0.341)	(0.0306)	(0.0574)	(0.00854)
Mashonaland West	0.321***	0.267	1.262***	0.168***	-0.359***	-0.0604***
	(0.0310)	(0.597)	(0.351)	(0.0337)	(0.0624)	(0.00980)
Matabeleland North	0.266***	1.615**	1.568***	-0.0498	-0.249***	0.00506
	(0.0341)	(0.645)	(0.402)	(0.0328)	(0.0668)	(0.00827)
Matabeleland South	0.179***	1.207**	3.517***	-0.0477	-0.639***	-0.0283***
	(0.0327)	(0.615)	(0.408)	(0.0332)	(0.0627)	(0.00930)
Midlands	0.264***	6.800***	1.172***	0.267***	0.157***	-0.0266***
	(0.0359)	(0.616)	(0.392)	(0.0348)	(0.0597)	(0.00851)
Masvingo	0.145***	0.841	2.549***	0.228***	-0.237***	-0.00941
	(0.0303)	(0.601)	(0.369)	(0.0341)	(0.0634)	(0.00872)
Constant	0.866***	22.77***	12.48***	1.637***	3.632***	0.991***
	(0.0721)	(1.229)	(0.811)	(0.0666)	(0.125)	(0.0187)
Observations	14,958	14,936	14,958	14,914	14,958	14,958
R-squared	0.072	0.198	0.086	0.041	0.186	0.107

In summary, vulnerable households with high propensity to be food insecure and might need food assistance and social protection services include those headed by females, live with a member hwo is chronically ill, have a member with disability, large size households and households that have no religion, are of the traditional religion and those of the Apostolic sect.

4.9 SOCIAL PROTECTION AND FOOD SECURITY

Food and nutrition security can be affected by several factors such as shocks and hazards as indicated in the Food and Nutrition Security Framework presented in **Figure 1**. In such

circumstances where shocks and hazards impact on food insecurity, social protection programmes are key to mitigate the food insecurity situation. In this section, findings on sources, forms and impact of social protection on food and nutrition security are presented.

4.9.1 Sources of social protection

The results displayed in Table 9 reveal that at least 73.5% of the survey households received social protection support. The Government of Zimbabwe (65.7%), followed by UN/NGOs (11.8%) and relatives from outside the community (10%) were the main sources of social protection. Disaggregating the data by province, households in Midlands province (73.1%) received the highest support from Government and Matabeleland South province received the least (54.3%). Social protection support from UN/NGOS was mainly directed towards households in Matabeleland North (17.5%) and Masvingo provinces (16.6%).

Table 41. Sources of Social Protection

Province	Any form of support	Government or NGO	Government	NGO/UN	Churches	Relatives outside the community	Relatives within the community	Relatives outside Zimbabwe
Manicaland	69.0	65.1	63.0	12.0	1.7	9.4	5.5	3.1
Mashonaland Central	76.4	74.0	71.1	13.0	1.5	4.8	6.1	1.5
Mashonaland East	74.5	69.3	66.9	14.5	1.5	11.5	7.2	4.8
Mashonaland West	71.6	68.4	67.6	3.5	1.8	6.3	5.5	2.1
Matabeleland North	71.7	66.2	61.6	17.5	1.4	8.6	7.9	9.3
Matabeleland South	67.6	58.7	54.3	12.3	1.3	9.5	10.7	17.9
Midlands	79.5	74.2	73.1	4.8	0.8	10.4	6.5	6.5
Masvingo	76.6	68.5	65.4	16.6	2.1	19.6	17.2	11.0
Total	73.5	68.3	65.7	11.8	1.5	10.0	8.2	6.8

4.9.2 Forms of social protection support from government and UN/NGOs

Table 42 shows that social protection from government was mainly in the form of food assistance (29.2%), followed by the provision of crop inputs support (54.6%). Matabeleland North Province (40.5%) and Midlands Province (39.9%) received the most food assistance as compared

to the other province. Regarding crop input support, the highest support was in Mashonaland Central Province (66.6%) followed by Midlands Province (62.4%).

Table 42. Forms of social protection support from Government

Province	Food	Crop inputs	Education assistance	Livestock support: Teak grease	Other	Cash transfers	Vouchers
Manicaland	25.8	52.1	1.5	1.5	0.6	0.6	0.2
Mashonaland Central	21.8	66.6	2.9	1.1	1.5	0.3	0.2
Mashonaland East	20.0	61.4	3.8	1.1	0.7	0.6	0.2
Mashonaland West	26.7	61.6	1.4	2.2	4.3	0.4	0.3
Matabeleland North	40.5	37.6	2.6	0.4	0.9	0.7	0.1
Matabeleland South	30.2	38.6	4.1	5.3	3.9	1.1	0.3
Midlands	39.9	62.4	1.1	3.3	1.3	0.5	0.1
Masvingo	30.9	51.6	5.1	6.6	4.3	0.9	0.2
National	29.2	54.6	2.8	2.6	2.1	0.6	0.2

On the other hand, social protection support from UN/NGOs was mainly in the form of food assistance (9%) followed by crop input support (1.6%). As expected and similar to Government support, food assistance was mainly in Matabeleland North (14.8%) (**Table 43**).

Table 43. Forms of social protection support from UN/NGOs

Province	Food	Crop inputs	Other	Education assistance	WASH hardware (inputs)	Cash transfers	Vouchers
Manicaland	8.3	1.7	1.3	0.6	0.7	0.2	0.2
Mashonaland Central	8.2	3.9	1.4	0.4	0.6	0.1	0.1
Mashonaland East	13.6	1.4	0.5	0.4	0.0	0.2	0.0
Mashonaland West	1.3	0.5	1.9	0.2	0.6	0.0	0.1
Matabeleland North	14.8	1.7	2.3	1.1	0.2	0.6	0.0
Matabeleland South	9.6	1.5	1.3	1.1	0.2	0.5	0.0
Midlands	1.5	1.2	2.0	0.6	0.7	0.8	0.0
Masvingo	14.7	1.0	2.3	0.2	0.3	0.5	0.1
National	9.0	1.6	1.6	0.6	0.4	0.4	0.1

4.9.3   Target groups for government social protection programmes

Table 44 reveals that government social protection programmes were mainly targeting households (60%) and followed at a distant by the elderly (8.7%) in the community. On the other hand, UN/NGOs social protection programmes were mainly targeted at households (9.2%) (**Table 45**). However, the coverage of UN/NGOs social protection programmes was very low as compared to the 66% by government. This is expected as UN/NGOs only play a complementary role, as it is the primary responsibility of the Government to feed its own people.

Table 44. Target groups for government social protection programmes

Province	Households	Elderly	Orphans	School Children	Other	HIV/AIDS affected	Adolescents	Under-fives	Women	Pregnant Lactating mothers	Persons Living with Disability (PLWDs)
Manicaland	60.3	6.4	1.9	1.3	2.2	0.1	0.3	0.1	0.5	0.0	0.1
Mash Central	69.7	4.6	1.6	1.9	0.8	0.2	0.0	0.0	0.6	0.2	0.0
Mashonaland East	63.6	4.9	0.9	3.0	0.6	0.4	0.0	0.0	0.2	0.0	0.2
Mashonaland West	64.9	5.7	0.3	1.1	0.6	0.4	0.0	0.0	0.1	0.2	0.1
Matabeleland North	45.5	16.7	1.9	2.5	2.3	2.1	0.0	0.2	0.6	0.2	0.3
Matabeleland South	43.9	16.3	5.9	2.8	1.6	0.5	0.2	0.1	0.2	0.1	0.0
Midlands	68.1	9.6	4.5	0.9	6.3	0.5	0.0	0.1	0.4	0.0	0.0
Masvingo	60.5	6.8	2.8	4.2	1.3	0.5	0.0	0.5	0.7	0.2	0.5
National	**60.0**	**8.7**	**2.4**	**2.2**	**2.0**	**0.6**	**0.1**	**0.1**	**0.4**	**0.1**	**0.1**

Table 45. Target groups for UN/NGOs social protection programmes

Province	Households	Elderly	School Children	Orphans	Under-fives	Other	Women	Pregnant Lactating mothers	Persons Living with Disability (PLWDs)	HIV/AIDS	Adolescents
Manicaland	10.4	0.4	0.3	0.3	0.4	0.3	0.3	0.2	0.0	0.1	0.1
Mashonaland Central	11.6	0.6	0.8	0.3	0.1	0.0	0.2	0.0	0.0	0.1	0.1
Mashonaland East	10.8	2.2	0.3	0.4	0.0	1.2	0.1	0.1	0.0	0.0	0.0
Mashonaland West	2.7	0.9	0.2	0.2	0.0	0.1	0.1	0.1	0.0	0.1	0.0
Matabeleland North	12.2	2.7	2.2	0.2	2.0	0.9	0.7	1.1	0.1	0.2	0.1
Matabeleland South	9.4	4.0	1.0	1.7	1.9	0.6	0.7	1.8	0.0	0.2	0.2
Midlands	4.2	0.2	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Masvingo	12.1	3.5	0.5	2.5	0.8	1.4	2.5	0.1	1.8	0.6	0.1
National	**9.2**	**1.8**	**0.7**	**0.7**	**0.6**	**0.6**	**0.5**	**0.4**	**0.2**	**0.2**	**0.1**

4.9.4 Correlates of background characteristics and access to support from the government

Table 46 shows the correlation between household background characteristics and access to social protection support from Government. The results show that elderly headed households, female headed households, large size households, households with a member with a chronic condition, households with high asset index, households with lowly educated heads (primary, ZJC and O' Level education), and households in Mashonaland central, Mashonaland West and Midlands province had a high propensity to receive social protection support from Government. In particular, increasing the age of household head by one year was associated with a 0.52% probability of the household receiving social protection at the 1% level of significance, *ceteris paribus*. More so, all things being constant, female headed households had a 4.07% chance of receiving social protection support from Government as compared to their male counterparts at the 1% level of significance.

Comparing the characteristics of households that had high propensity to receive social protection and those with high likelihood to be food insecure as presented in Section 5.2.2 and Table 6, there is need to also prioritise households with a member with disability and those of the Apostolic sect as these households had high probability of being food insecure.

Table 46. Correlates of background characteristics and access to support from the government

Background characteristics	OLS (I)	Probit (II)	Logit (III)
Household head age [Years]	0.00517***	0.0151***	0.0252***
	(0.000303)	(0.000931)	(0.00157)
Household head is female [1 if Yes, 0 if No]	0.0407***	0.115***	0.184***
	(0.0135)	(0.0388)	(0.0641)
Primary level	0.0472***	0.156***	0.256***
	(0.0131)	(0.0411)	(0.0700)
ZJC level	0.0312**	0.0995**	0.168**
	(0.0158)	(0.0479)	(0.0810)
O' level	0.0426***	0.134***	0.218***
	(0.0150)	(0.0455)	(0.0768)
A' level	-0.0509	-0.122	-0.193
	(0.0376)	(0.105)	(0.170)
Diploma/Certificate after primary	-0.0783	-0.216	-0.362
	(0.0487)	(0.139)	(0.229)
Diploma/Certificate after secondary	-0.0660*	-0.172*	-0.285*

	(0.0360)	(0.101)	(0.166)
Graduate/Post-Graduate	-0.153***	-0.424***	-0.691***
	(0.0432)	(0.124)	(0.209)
Married living apart	-0.0555***	-0.152***	-0.242***
	(0.0157)	(0.0432)	(0.0705)
Divorced/separated	-0.0652***	-0.175***	-0.270***
	(0.0190)	(0.0523)	(0.0854)
Widow/widower	0.0148	0.0412	0.0864
	(0.0154)	(0.0463)	(0.0776)
Cohabiting	-0.234***	-0.662***	-1.054**
	(0.0770)	(0.251)	(0.413)
Never married	-0.0498*	-0.104	-0.147
	(0.0271)	(0.0747)	(0.124)
Protestant	0.0182	0.0679	0.109
	(0.0166)	(0.0544)	(0.0922)
Pentecostal	-0.0228	-0.0637	-0.117
	(0.0166)	(0.0516)	(0.0864)
Apostolic Sect	0.00775	0.0202	0.0260
	(0.0145)	(0.0461)	(0.0776)
Zion	-0.0139	-0.0396	-0.0712
	(0.0176)	(0.0538)	(0.0902)
Other Christian	-0.0733***	-0.219***	-0.370***
	(0.0226)	(0.0674)	(0.112)
Islam	0.00107	-0.00550	-0.00859
	(0.0496)	(0.157)	(0.262)
Traditional	0.0175	0.0493	0.0763
	(0.0270)	(0.0832)	(0.138)
Other religion	-0.124***	-0.351***	-0.581***
	(0.0387)	(0.110)	(0.181)
No religion	-0.0163	-0.0438	-0.0804
	(0.0179)	(0.0544)	(0.0907)
Monthly income [USD]	-0.0155***	-0.0441***	-0.0750***
	(0.00235)	(0.00719)	(0.0122)
Household size	0.0188***	0.0559***	0.0950***
	(0.00190)	(0.00612)	(0.0105)
Household member has chronic illness [1 ifYes, 0 ifNo]	0.0161*	0.0480	0.0847
	(0.00971)	(0.0310)	(0.0524)
Household member has disability [1 if Yes, 0 if No]	0.00691	0.0326	0.0617
	(0.00648)	(0.0229)	(0.0400)
Asset index [0 ≤ Asset index ≤31]	0.0196***	0.0578***	0.0995***
	(0.00121)	(0.00383)	(0.00653)
Mash Central	0.0755***	0.217***	0.370***
	(0.0149)	(0.0448)	(0.0744)
Mash East	0.00270	0.00805	0.00811
	(0.0143)	(0.0424)	(0.0699)
Mash West	0.0543***	0.165***	0.270***
	(0.0151)	(0.0454)	(0.0745)
Mat North	-0.0677***	-0.212***	-0.349***
	(0.0159)	(0.0457)	(0.0754)
Mat South	-0.133***	-0.388***	-0.645***
	(0.0161)	(0.0460)	(0.0758)
Midlands	0.0423***	0.128***	0.224***
	(0.0146)	(0.0449)	(0.0749)
Masvingo	-0.0146	-0.0486	-0.0829
	(0.0155)	(0.0456)	(0.0753)

Constant	0.202***	-0.916***	-1.551***
	(0.0305)	(0.0925)	(0.155)
Observations	14,958	14,958	14,958
R-squared	0.110		

Robust standard errors in parentheses -*** p<0.01, ** p<0.05, * p<0.1

Table 47 shows the Correlates of background characteristics and access to support from the UN/NGOs. Similar to the results on variables correlated to receiving government support, the results in table 15 reveal that elderly headed households, large size households, households with high asset index, households with low income, and households in Masvingo and Matabeleland North provinces had a high propensity to receive social protection support from Government.

In particular, increasing the age of household head by one year was associated with a 0.109% probability of the household receiving social protection at the 1% level of significance, *ceteris paribus*.

Table 47. Correlates of background characteristics and access to support from the UN/NGOs

Background characteristics	OLS	Probit	Logit
	(I)	(II)	(III)
Household head age [Years]	0.00109***	0.00605***	0.0117***
	(0.000215)	(0.00114)	(0.00214)
Household head is female [1 if Yes, 0 if No]	0.0131	0.0787	0.156*
	(0.00892)	(0.0496)	(0.0939)
Primary level	-0.0165	-0.0649	-0.113
	(0.0103)	(0.0463)	(0.0843)
ZJC level	-0.00396	0.000522	0.00170
	(0.0118)	(0.0559)	(0.103)
O' level	-0.0207*	-0.0997*	-0.175*
	(0.0111)	(0.0542)	(0.101)
A' level	-0.00140	0.00944	0.0126
	(0.0248)	(0.145)	(0.280)
Diploma/Certificate after primary	-0.0130	-0.0755	-0.0893
	(0.0296)	(0.184)	(0.355)
Diploma/Certificate after secondary	-0.0549***	-0.379**	-0.839**
	(0.0184)	(0.172)	(0.362)
Graduate/Post-Graduate	-0.0129	-0.105	-0.145
	(0.0257)	(0.161)	(0.310)
Married living apart	-0.00356	-0.0240	-0.0329
	(0.00995)	(0.0570)	(0.108)
Divorced/separated	-0.00731	-0.0602	-0.107
	(0.0116)	(0.0703)	(0.135)
Widow/widower	-9.56e-05	-0.00875	-0.0257
	(0.0110)	(0.0571)	(0.107)
Cohabiting	-0.0988***		

	(0.0136)		
Never married	-0.0144	-0.157	-0.318
	(0.0140)	(0.112)	(0.227)
Protestant	-0.0179	-0.0860	-0.154
	(0.0128)	(0.0627)	(0.116)
Pentecostal	-0.0337***	-0.188***	-0.336***
	(0.0122)	(0.0630)	(0.118)
Apostolic Sect	-0.0165	-0.0745	-0.143
	(0.0112)	(0.0539)	(0.0998)
Zion	0.0143	0.0537	0.0961
	(0.0138)	(0.0631)	(0.116)
Other Christian	-0.0546***	-0.317***	-0.597***
	(0.0152)	(0.0889)	(0.171)
Islam	-0.0921***	-0.592**	-1.153**
	(0.0258)	(0.247)	(0.527)
Traditional	-0.0290	-0.154	-0.263
	(0.0195)	(0.101)	(0.190)
Other religion	-0.0586**	-0.343**	-0.700**
	(0.0231)	(0.166)	(0.329)
No religion	-0.0381***	-0.217***	-0.419***
	(0.0128)	(0.0698)	(0.133)
Monthly income [USD]	-0.0173***	-0.0897***	-0.165***
	(0.00167)	(0.00817)	(0.0149)
Household size	0.00964***	0.0521***	0.0919***
	(0.00143)	(0.00677)	(0.0124)
Household member has chronic illness [1 if Yes, 0 if No]	0.00426	0.0266	0.0397
	(0.00759)	(0.0366)	(0.0677)
Household member has disability [1 if Yes, 0 if No]	0.00448	0.0166	0.0222
	(0.00545)	(0.0238)	(0.0431)
Asset index [0 ≤ Asset index ≤31]	0.00553***	0.0306***	0.0562***
	(0.000793)	(0.00428)	(0.00784)
Mash Central	0.00839	0.0493	0.0769
	(0.0109)	(0.0545)	(0.102)
Mash East	0.0181*	0.0751	0.144
	(0.0105)	(0.0515)	(0.0957)
Mash West	-0.0749***	-0.587***	-1.251***
	(0.00896)	(0.0710)	(0.151)
Mat North	0.0304**	0.129**	0.223**
	(0.0120)	(0.0547)	(0.101)
Mat South	-0.0197*	-0.103*	-0.203*
	(0.0111)	(0.0575)	(0.108)
Midlands	-0.0904***	-0.602***	-1.193***
	(0.00915)	(0.0633)	(0.129)
Masvingo	0.0268**	0.113**	0.198*
	(0.0118)	(0.0548)	(0.102)
Constant	0.0933***	-1.414***	-2.448***
	(0.0213)	(0.111)	(0.206)
Observations	14,958	14,930	14,930
R-squared	0.049		

Robust standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1

4.10 ADOPTION OF AGRICULTURAL TECHNOLOGIES

Agricultural technologies have long been promoted by governments and development organizations as effective ways to increase farm productivity and reduce poverty (Pérez-Escamilla, 2017). Technological change has been the major driving force for increasing agricultural productivity and promoting agriculture development in developing countries. 'Agricultural technology' is a broad term that is used here to describe equipment, genetic material, farming techniques, and agricultural inputs that have been developed to improve the effectiveness of agriculture poverty (Ruzzante et al., 2021). Adoption of improved agricultural technologies remains to be a promising strategy to achieve food security and poverty reduction in many developing countries (Ruzzante et al., 2021). Evidence in literature has shown that adoption of improved technologies has a positive and significant effect on the welfare of households, and it also contributes to improved food security (Wordofa et al., 2021). For example, increased consumption expenditures, as well as growth in household assets, have also been linked to the adoption of various crop and livestock technologies.

In this section, the adoption of agricultural technologies such as certified seeds, community seed banks, improved varieties, growing climate resilient crops such as traditional grains and practicing integrated pest management by the surveyed rural households in Zimbabwe are discussed.

4.10.1 Adoption of improved cropping technologies and practices
The descriptive results presented in

Table 48 show that use of quality certified seeds (47.3%), practising pfumvudza/intwasa (47.1%) and crop rotation (31.8%) were the most adopted improved cropping technologies by rural households in Zimbabwe. At provincial level, use of quality certified seeds was mostly adopted in Mashonaland East (64.3%), Masvingo (56.7%), and Midlands (51.1%) provinces. Pfumvudza/Intwasa was mainly practised in Mashonaland East (56.9%), Masvingo (56.4%), and Midlands (56%) provinces.

Table 48. Adoption of improved cropping technologies

Province	Quality certified seeds	Pfumvudza/ Intwasa	Crop rotation	Intercropping	Compost / Organic fertilizer	Growing traditional grains (sorghum, millet, etc.)	Improved varieties	Mulching
Manicaland	50.8	49.9	23.7	21.7	14.1	8.9	16.0	15.5
Mash Central	48.4	40.5	32.9	14.6	10.4	9.4	11.2	14.3
Mash East	64.3	56.9	33.7	15.0	14.2	11.8	16.2	14.7
Mash West	35.7	41.6	27.6	10.7	11.8	2.0	9.6	6.5
Mat North	35.4	37.0	29.6	18.2	18.9	26.1	15.6	5.5
Mat South	30.1	35.2	28.5	19.0	9.4	26.2	12.3	6.4
Midlands	51.1	56.0	38.9	33.0	20.5	10.9	12.8	9.5
Masvingo	56.7	56.4	37.5	25.8	15.3	20.1	10.4	4.4
National	47.3	47.1	31.8	19.7	14.4	14.2	13.1	9.9

4.10.2 Adoption of improved livestock technologies and practices

The results in **Table 49** reveal that dipping (40.5%), deworming (20.9%) and use of improved animal shelter (20.7%) were the most adopted improved livestock technologies and practices. Disaggregating the data by province, dipping was most common in Midlands (51%) and was lowest in Mashonaland West (29.3%) province. Adoption of deworming was highest in Midlands (28%) and lowest in Mashonaland West province (10.7%).

Table 49. Adoption of improved livestock technologies

Province	Dipping	Deworming	Improved animal shelters	Improved livestock breeds	Castration	Spraying livestock at home or other practice to control ticks	Home vaccinations	Routine vaccinations by Veterinary Officer
Manicaland	30.5	24.0	20.2	22.5	12.4	4.4	9.8	8.0
Mash Central	41.7	22.2	15.7	23.3	8.8	6.5	11.5	5.6
Mash East	34.3	21.3	24.1	24.5	6.7	14.2	8.9	6.7
Mash West	29.3	10.7	21.4	8.1	3.5	12.3	5.8	4.9
Mat North	44.3	23.2	21.1	10.8	15.5	8.3	9.2	5.5
Mat South	43.4	24.6	19.6	12.2	23.9	8.0	9.9	14.4
Midlands	51.0	28.0	19.8	17.6	23.1	12.3	13.2	13.1
Masvingo	49.8	12.4	23.5	9.4	10.6	12.8	10.6	8.6
National	40.5	20.9	20.7	16.5	12.9	10.0	9.9	8.3

4.10.3 Ordinary Least Squares (OLS) correlates of background characteristics and adoption of improved cropping technologies and practices

Table 50 presents OLS correlates of background characteristics and adoption of quality certified seeds, Pfumvudza/Intwasa, crop rotation, and growing of traditional grains. The results reveal an association between age and education level of household head and adoption of cropping technologies. In particular, at the 1% level of significance, increasing the age of household head by one year increased the likelihood of the household adopting the use of quality certified seeds by 0.129%, practicsing Pfumvudza/Intwasa by 0.224% and use of crop rotation by 0.193%, all things being constant. However, all things being constant, increasing the age of household head by one-year reduced the probability of the household growing traditional grains.

The influence of education level of household head on adoption of quality certified seeds, Pfumvudza/Intwasa, crop rotation, and growing of traditional grains was similar to that of increasing age of household head. For example, **Table 50** shows that households headed by heads who attained a diploma/certificate after O' Level were 7.88% more likely to use quality certified seeds at the 5% level of significance and 7.25% less likely to grow traditional grains at the 1% level of significance, *ceteris paribus*. Moreover, at the 1% level of significance, households headed by graduates/post-graduates had a 11.3% probability of not growing traditional grains.

Increasing income of household head by 1% reduced the propensity of the household practising Pfumvudza/Intwaza and cop rotation by 0.5% and1.64% respectively. Surprisingly, increasing income of household head by 1% reduced the probability of the household growingtraditional grains by 0.894% at the 1% level of significance.

Furthermore, the results show that large size households, households with high asset index, households located in Mashonaland East, Matabeleland North, Matabeleland South, and Masvingo provinces had an increased likelihood of growing traditional grains.

Table 50. Ordinary Least Squares (OLS) correlates of background characteristics and adoption of quality certified seeds

VARIABLES	Quality certified seeds	Pfumvudza/ Intwasa	Crop rotation	Growing of traditional

				grains
	(I)	(II)	(III)	(IV)
Household head age [Years]	0.00129***	0.00224***	0.00193***	-0.000526**
	(0.000319)	(0.000328)	(0.000308)	(0.000232)
Household head is female	0.00585	0.00101	-0.00293	0.00792
	(0.0135)	(0.0140)	(0.0129)	(0.00987)
Primary level	0.0245*	0.0401***	0.0576***	-0.0182*
	(0.0139)	(0.0142)	(0.0130)	(0.0105)
ZJC level	0.0174	0.0449***	0.0721***	-0.0339***
	(0.0165)	(0.0167)	(0.0156)	(0.0122)
O' level	0.0573***	0.0413***	0.0729***	-0.0653***
	(0.0157)	(0.0160)	(0.0148)	(0.0115)
A' level	-0.0163	-0.0365	0.0699*	-0.0726***
	(0.0389)	(0.0391)	(0.0361)	(0.0239)
Diploma/Certificate after primary	0.189***	-0.0643	0.0976**	-0.0937***
	(0.0479)	(0.0485)	(0.0491)	(0.0298)
Diploma/Certificate after secondary	0.0788**	-0.0177	0.0607*	-0.0725***
	(0.0359)	(0.0365)	(0.0348)	(0.0240)
Graduate/Post-Graduate	0.0456	-0.0436	-0.00311	-0.113***
	(0.0447)	(0.0436)	(0.0399)	(0.0257)
Married living apart	-0.0111	0.0193	-0.0198	0.0109
	(0.0156)	(0.0162)	(0.0148)	(0.0115)
Divorced/separated	-0.0527***	-0.0135	-0.0420**	-0.0104
	(0.0187)	(0.0191)	(0.0173)	(0.0131)
Widow/widower	-0.0100	0.0350**	0.00121	-0.0177
	(0.0161)	(0.0165)	(0.0154)	(0.0117)
Cohabiting	-0.0319	-0.0189	-0.167***	-0.0270
	(0.0831)	(0.0891)	(0.0564)	(0.0581)
Never married	-0.0434*	0.0361	-0.0191	-0.0336*
	(0.0253)	(0.0265)	(0.0239)	(0.0186)
Protestant	0.00176	0.0125	0.0426**	-0.00701
	(0.0185)	(0.0189)	(0.0181)	(0.0122)
Pentecostal	-0.0108	0.0299	-0.0118	0.00443
	(0.0181)	(0.0184)	(0.0172)	(0.0122)
Apostolic Sect	0.000780	0.0250	0.0124	0.00848
	(0.0159)	(0.0162)	(0.0153)	(0.0106)
Zion	-0.0291	0.00506	0.0270	0.0473***
	(0.0187)	(0.0191)	(0.0182)	(0.0141)
Other Christian	-0.0390	0.0245	-0.0586***	0.0503***
	(0.0238)	(0.0244)	(0.0219)	(0.0176)
Islam	-0.191***	-0.117**	-0.0286	0.0225
	(0.0528)	(0.0522)	(0.0466)	(0.0330)
Traditional	-0.0307	0.0110	0.0272	0.0597***
	(0.0285)	(0.0303)	(0.0275)	(0.0224)
Other religion	0.0364	-0.0143	-0.0394	0.0397
	(0.0399)	(0.0384)	(0.0362)	(0.0304)
No religion	0.00532	-0.0125	0.0282	0.0258**
	(0.0189)	(0.0193)	(0.0183)	(0.0131)

Monthly income [USD]	-0.00502**	-0.0164***	-0.00362	-0.00894***
	(0.00245)	(0.00250)	(0.00235)	(0.00171)
Household size	0.00354*	0.0200***	-0.00302	0.00443***
	(0.00200)	(0.00207)	(0.00193)	(0.00145)
Household member has chronic illness	0.00699	0.0150	-0.0335***	-0.0120
	(0.0105)	(0.0109)	(0.0101)	(0.00773)
Household member has disability	-0.0273***	-0.00870	-0.0180***	0.00750
	(0.00713)	(0.00739)	(0.00697)	(0.00542)
Asset index [0 ≤ Asset index ≤31]	0.0313***	0.0158***	0.0242***	0.0127***
	(0.00122)	(0.00129)	(0.00119)	(0.000882)
Mashonaland Central	-0.0233	-0.0878***	0.0890***	-0.00112
	(0.0161)	(0.0162)	(0.0146)	(0.00962)
Mashonaland East	0.104***	0.0537***	0.0726***	0.0211**
	(0.0150)	(0.0156)	(0.0141)	(0.00972)
Mashonaland West	-0.172***	-0.0733***	0.0232	-0.0777***
	(0.0160)	(0.0166)	(0.0146)	(0.00796)
Matabeleland North	-0.181***	-0.161***	0.0317**	0.141***
	(0.0162)	(0.0167)	(0.0151)	(0.0126)
Matabeleland South	-0.234***	-0.175***	0.0239	0.145***
	(0.0162)	(0.0168)	(0.0150)	(0.0126)
Midlands	-0.0403**	0.0232	0.118***	0.00265
	(0.0157)	(0.0164)	(0.0148)	(0.00990)
Masvingo	0.0329**	0.0391**	0.114***	0.0886***
	(0.0163)	(0.0168)	(0.0153)	(0.0118)
Constant	0.243***	0.212***	-0.0307	0.0866***
	(0.0316)	(0.0326)	(0.0299)	(0.0222)
Observations	14,958	14,958	14,958	14,958
R-squared	0.111	0.065	0.056	0.075

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.11 TREATMENT EFFECTS

This section investigates the treatment effects of various treatment measures using propensity score matching techniques described in Section 2.4 of this report. Section 8.2 evaluates the treatment effects of government support on food security, whereas Section 8.3 evaluates the treatment effects of various shocks.

4.11.1   Impact of government support on food security

Table 51 shows that receiving government support was associated with improvement in household food security status. Column (I) shows that all things being equal, receiving support from the government reduced the household hunger scale by 0.0414 points at the 10% level of significance. On the other hand, Column (V) of the table shows that receiving support from the government wass ceteris paribus associated with an improvement in the household dietary diversity score of 0.0899 at the 5% level of significance. Finally, Column (VI) shows holding all things constant, government support reduced the probability that the household was food insecure by 6.12% at the 1% level of significance.

Table 51. PSM estimates of treatment effects of government support

Variables	HHS	FCS	RCSI	LCSI	HDDS	Food insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)
Treatment effect	-0.0414*	0.216	0.249	-0.0124	0.0899**	-0.0612***
	(0.0215)	(0.428)	(0.251)	(0.0220)	(0.0415)	(0.00892)
Observations	14,958	14,936	14,958	14,914	14,958	14,958

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

4.11.2   Impact of selected shocks on food security

Cash shortages

Table 52 shows that experiencing cash shortages had deleterious effects on household food security all things being held constant. Columns (I) to (VI) of the table shows that experiencing cash shortages was harmful to all the six indicators of food security considered.

Table 52. PSM estimates of treatment effects of cash shortages

Variables	HHS	FCS	RCSI	LCSI	HDDS	Food

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						insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)
Treatment effect	0.0571***	-1.176***	2.343***	0.188***	-0.139***	0.0432***
	(0.0210)	(0.357)	(0.231)	(0.0193)	(0.0369)	(0.00820)
Observations	14,958	14,936	14,958	14,914	14,958	14,958

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Crop pests

Table 53 shows that experiencing crop pests ceteris paribus reduced the household propensity to be food secure all things being held constant. Columns (I) to (VI) of the table shows that experiencing crop pests wass harmful to all the six indicators of food security considered. Column (VI) of the table shows that all things being equal increases the probability that the household wass food insecure by 4.78% at the 1% level of significance.

Table 53. PSM estimates of treatment effects of crop pests

Variables	HHS	FCS	RCSI	LCSI	HDDS	Food insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)
Treatment effect	-0.0515**	-0.889**	1.141***	0.115***	-0.106**	0.0478***
	(0.0256)	(0.432)	(0.301)	(0.0250)	(0.0434)	(0.0109)
Observations	14,958	14,936	14,958	14,914	14,958	14,958

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Prolonged Mid Season Dry Spells

Table 54 shows that prolonged mid season dry spells increased the probability that the household was food insecure all things being equal at the 1% level of significance. Column (VI) of the table shows that at the 1% level of significance experiencing prolonged mid season dry spell increased the household propensity to be food insecure by 6.55% all things being equal.

Table 54. PSM estimates of treatment effects of drought

Variables	HHS	FCS	RCSI	LCSI	HDDS	Food insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)

VARIABLES						
Treatment effect	0.0991***	-1.909***	3.166***	0.232***	-0.166***	0.0655***
	(0.0213)	(0.402)	(0.252)	(0.0211)	(0.0400)	(0.00930)
Observations	14,958	14,936	14,958	14,914	14,958	14,958

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

4.11.3   Impact of selected CSA

Quality certified seeds

Table 55 shows the impact of the adoption of quality certified seeds on food security in rural Zimbabwe. The results show that adopting quality certified seeds ceteris paribus improved the household hunger scale (Column (I)), food consumption score (Column (II)) and the household dietary diversity score (Column (V)). Column (I) shows that adoption of quality certified seeds reduced the household hunger scale by 0.0828 points all things being equal.

Table 55. *PSM estimates of the treatment of quality certified seeds*

VARIABLES	HHS	FCS	RCSI	LCSI	HDDS	Food insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)
Treatment effect	-0.0828***	1.795***	0.215	-0.00657	0.0947**	-0.00187
	(0.0220)	(0.369)	(0.255)	(0.0208)	(0.0384)	(0.00866)
Observations	14,958	14,936	14,958	14,914	14,958	14,958

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Community Seed Bank

Table 56 shows the PSM estimates of the treatment effects of community seed banks food security indicators. Column (I), contrary to conformity, community seed banks were associated with increases in the household hunger scale. Columns (II) and (V) however show that adopting community seed banks improved the food consumption score and the household dietary diversity score.

Table 56. PSM estimates of the treatment of Community seed bank

VARIABLES	HHS	FCS	RCSI	LCSI	HDDS	Food insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)

Treatment effect	0.120**	2.424***	-0.750	0.0373	0.199**	-0.00435
	(0.0604)	(0.836)	(0.550)	(0.0486)	(0.0965)	(0.0188)
Observations	14,958	14,936	14,958	14,914	14,958	14,958

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Adapted, suitable improved varieties

Table 57 shows that adoption of adapted, suitable improved varieties ceteris paribus was associated with improvements in all the food security indicators under consideration.

Table 57. PSM estimates of the treatment Adapted, Suitable Improved varieties

VARIABLES	HHS	FCS	RCSI	LCSI	HDDS	Food insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)
Treatment effect	-0.105***	1.059*	-1.464***	-0.0601*	0.284***	-0.0271*
	(0.0326)	(0.605)	(0.348)	(0.0325)	(0.0633)	(0.0141)
Observations	14,958	14,936	14,958	14,914	14,958	14,958

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Traditional Grains

Table 58 shows the PSM estimates of the adoption of traditional grains on food security indicators. The table displays qualitatively similar results with those on the community seed banks. Column (I) of the table shows that all things being equal adoption of traditional grains was associated with 0.107 points increase in the household hunger scale at the 5% level of significance. Column (VI) also shows that at the 5% level of significance, adoption of traditional grains was also associated with an increase in the probability (3.46%) that the household was food insecure all things being held constant.

Table 58. PSM estimates of the treatment of traditional grains

VARIABLES	HHS	FCS	RCSI	LCSI	HDDS	Food insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)
Treatment effect	0.107**	0.466	2.788***	0.205***	-0.0610	0.0346**
	(0.0465)	(0.748)	(0.621)	(0.0383)	(0.0994)	(0.0155)
Observations	14,958	14,936	14,958	14,914	14,958	14,958

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Crop Rotation

Save for the household hunger scale, **Table 59** shows that adopting crop rotation, *ceteris paribus* improved all indicators of food security.

Table 59. PSM estimates of the treatment of crop rotation

VARIABLES	HHS	FCS	RCSI	LCSI	HDDS	Food insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)
Treatment effect	0.0261	1.483***	1.090***	0.0990***	0.143***	0.0166*
	(0.0254)	(0.413)	(0.279)	(0.0231)	(0.0433)	(0.00943)
Observations	14,958	14,936	14,958	14,914	14,958	14,958

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Pfumvudza/ Intwasa

Table 60 shows that implementation of Pfumvudza/ Intwasa was associated with improvements in all indicators of food security save for food insecurity at the 1% level of significance all things being equal. Column (I) shows that *ceteris paribus,* adopting Pfumvudza/ Intwasa reduced the household hunger scale by 0.0889 points at the 1% level of significance. Columns (II) and (V) show that Pfumvudza/ Intwasa improved food consumption score and the household dietary diversity score whereas Column (III) and (IV) show that adoption reduces negative consumption and livelihoods coping.

Table 60. PSM estimates of the treatment of pfumvudza/intwasa

VARIABLES	HHS	FCS	RCSI	LCSI	HDDS	Food insecurity
	(I)	(II)	(III)	(IV)	(V)	(VI)
Treatment effect	-0.0889***	1.017***	-1.683***	-0.0790***	0.121***	0.0110
	(0.0209)	(0.378)	(0.234)	(0.0200)	(0.0394)	(0.00821)
Observations	14,958	14,936	14,958	14,914	14,958	14,958

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Chapter 5   Overall Discussion

The overall purpose of the assessment presented in this report was to provide insights into the livelihoods status of rural households in Zimbabwe for the purpose of informing policy formulation and programming appropriate interventions. Based on the data analysis framework used, shown in **Figure 7** and earlier explained in Section 3.1, the findings from the assessment show the interlinkage of all the four dimensions of food security as previously illustrated in the literature review section (Section 2.1).

The results presented in this report reveal that food insecure households, were those headed by females, lowly educated household heads, married and living together couples, members of the Apostolic Sect, and large size households. Apparently, households with these same characteristics were found to be also vulnerable to shocks (refer to Section 4.5.2). With reference to social protection programmes, the findings are that targeting for social protection assistance is already selecting some of these vulnerable households. However, other vulnerable households that need to be targeted as revealed in this report are households with a member with a chronic condition and those with a member living with disability. These findings are well aligned with other studies previously reported in literature (Hackett et al., 2010; Abdu et al., 2018; Soldavini et al., 2019; Tarasuk et al., 2019; Adams & Jumpah, 2021).

However, the findings that households with assets were more vulnerable to food insecurity and shocks and that these households were being prioritised to receive social protection assistance, disagree with findings reported in literature. According to Herrera et al. (2021), households such as those owning assets and expected to be food secure and resilient to shocks, may also have existing vulnerabilities that elevate their risk of worse food insecurity. In this case, findings from this assessment revealed that households owning assets are those headed by the elderly who would have accumulated assets over time. However, the elderly though they own assets, they are likely not able to fully utilize some of these assets due to old age, making them vulnerable to food insecurity and to shocks. Hence, the households owning assets were being prioritised in social protection programmes as indicated in Section 4.9.

The same scenario above can be used to explain why certain religious groups / denominations were found to be associated with vulnerability to shocks and food insecurity. In particular, households that are members of the Apostolic sect were associated with food insecurity, high

vulnerability to shocks and several other negative child nutrition outcomes. However, these households already have existing vulnerability in the form of large household size, which elevates their risk of food insecurity and vulnerability to shocks, and not just the mere fact that they belong to a certain religion.

The educational level of household head was another determinant of the negative food security outcomes and household vulnerability to causes of food insecurity, e.g., shocks. This finding corroborates several other findings in literature (Hadley et al., 2011; Mutisya et al., 2016; Mortazavi et al., 2021; Santos et al., 2022), which reported a similar effect of education level of household head on food and nutrition security outcomes.

The impact of shocks on food and nutrition insecurity is also evident from the findings presented in this report. The most common shocks indicated can be divided into economic and climate induced shocks. It is becoming evident that the effects of climate change can no longer be ignored, and sustainable measures need to be put in place to build resilience and reduce the impact of climate change. It is encouraging that the adoption of improved agricultural technologies both as a way to improve agricultural productivity and adapt to climate change is on the increase. From the findings presented in this report, adopted agricultural technologies and practices include the use of certified seeds, practising Pfumvudza / Intwasa, and growing climate resilient crops such as traditional grains were some common improved technologies and practices adopted by rural households.

The multifaceted nature of causes of food insecurity needs a multisectoral response as there is no single solution to solve the problem. It is impressive that the cocktail of mitigation measures that are from a multisectoral approach implemented by the Government and its development partners had a positive effect. The results on treatment effects presented in Section 4.11 of this report show that social protection programmes by both the Government and UN/NGOs had a positive impact as the programmes were associated with reduced food and nutrition insecurities. Similarly, the adopted agricultural technologies and practices were associated with reduced food and nutrition insecurities.

Chapter 6   Recommendations

Based on the results presented in

Chapter 4   Results and discussion in

Chapter 5   **Overall Discussion** of this report, the following recommendations are put forward.

Mitigating against household vulnerability to economic and climate related shocks

The impact of economic shocks (54.9% of the sampled households experienced cash shortage, 27.8% experienced sharp cereal price increase, and 23.1% experienced high charges for mobile money or swipe) and climate related shocks (45% experienced prolonged mid-season dry spell) is contributing negatively on household food and nutrition security status of rural households.

i. There is a need for the Government to continue on the current path of putting in place economic measures that reduce the cost of transactions and the need to use hard cash. The results presented in this report revealed that 54.9% of the sampled rural households experienced cash shortages, meaning that the bulk of transactions in rural areas require hard cash (cash economy). Moreover, the high charges for use of mobile money or swipe transfers (23.1%) are also a cause for concern. Therefore, there is a need for a holistic approach towards solving these economic challenges.

ii. Most rural households depend on rain-fed agriculture and with the worsening impact of climate change, e.g., increased frequency and incidence of prolonged mid season dry spells, most rural households, especially those in dry regions, are increasingly becoming vulnerable to food insecurity due to climate change. The Government is commended for the Accelerated Irrigation Rehabilitation and Development programme, through which it has started resuscitating communal irrigation schemes nationwide. These irrigation schemes will not only boost agricultural production, but also livestock production. The Government is urged to prioritise the dry regions to mitigating the effect of prolonged mid season dry spells on both crops and livestock production.

Improving access to post-secondary education

Educational status is recognised to be associated with household food insecurity and is an essential determinant of food production, access and utilisation. According to Mango et al. (2014) and Mutisya et al. (2016), in the rural context, education influences food and nutrition security through access to information on best agricultural production, nutrition and sanitation; increased efficiency, hence increased production and better decision making. However, the findings presented in this report show that although the literacy rate is good, 89%, only 2.2% of

the sampled household heads had attained tertiary level education. More so, the result revealed low education of household head as a determinant of most negative food and nutrition security outcomes.

i. Whilst the Government is commended for its current efforts to set up Vocational Training Centres (VTCs) and technical colleges in rural areas, there is need to increase access to such technical and vocational colleges in all corners of the country. These technical and vocational colleges will help empower both the youths and elderly with knowledge and skills they can use to improve productivity, including agricultural productivity, and subsequently their livelihoods.

ii. The setting up of vocational and technical colleges in rural areas can also help mitigate against the challenges of drug abuse by the youth, curb rural urban migration and also help modernise and industrialise rural areas through setting up of home-based industries by the trained and skilled youths.

Improving childing nutrition status

Stunting continues to be a challenge. The results revealed that the prevalence of stunting is at 26.1% against the NDS1 set target of 19% for 2023. The results show that the stunting rate is drifting in the negative direction from the set target. The challenge is mainly in Manicaland (33.6%) and Matabeleland North (31.3%) provinces. In Manicaland the situation is dire as the rate is increasing, in 2022 it was on 32.2%. Although not statistically significant, the results showed higher stunting levels in female headed households, households practising traditional religion and those whose household head had a diploma/certificate after primary qualification.

i. There is need for an aggressive drive on nutrition education targeting single headed households, lowly educated household heads and female headed households. Our findings also revealed that stunting was higher among children from households that had experienced divorce/separation and this is a cause for concern, vis-à-vis the high number of divorce rates in the country. Nutrition education therefore becomes a key determinant of child nutrition status. Government is encouraged to increase support towards the role of Village Health Workers, who have a broad range of roles and responsibilities from prevention and health promotion to treating common conditions.

ii. The Government is also encouraged to target children and improve the nutrition sensitivity of its social protection programmes. For example, this can be done through ensuring that all feeding programmes follow the 4-star diet recommendation.

iii. There is need to expand the care-group model and support the existing ones through capacity building. The results presented in this report revealed that regardless of lack of significance, stunting was low among households which belonged to or participated in a Care Group. More so, evidence from the Livelihoods and Food Security programme (LFSP) piloted in 9 rural districts in Zimbabwe showed positive associations between participation in care groups and nutrition knowledge, nutrition behavior, nutrition practices and dietary diversity.

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