

THE DOUBLE BURDEN OF MALNUTRITION IN CHILDREN UNDER 5 YEARS IN ZIMBABWE

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THE DOUBLE BURDEN OF MALNUTRITION IN CHILDREN UNDER FIVE YEARS IN ZIMBABWE

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Master of Public Health**

by

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Zimbabwe

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LIST OF ABBREVIATIONS

ANC – Ante-natal care
ART – anti retroviral therapy
CAADP – Comprehensive, Africa, agriculture development program
CSB – Corn soy blend
DBM – Double burden of Malnutrition
EED – Environmental enteric disorder
FNC- Food and nutrition council
FNSP – Food and nutrition security policy
GDP – Gross domestic product
HIV – Human immunodeficiency virus
HNP – Health, Nutrition and Population
IUGR – Intra uterine growth retardation/ restriction
IYCF – infant and young child feeding
LBW – Low birth weight
LMIC – Low- and Middle-Income country
MAD – Minimum acceptable diet
MDD – Minimum dietary diversity
MMF – Minimum meal frequency
MOHCC- Ministry of Health and Child Care
MTCT – mother-to-child transmission
NCDs – Non communicable diseases
NNS – National Nutrition Survey
PNC- Post Natal Care
PLWHIV – People living with HIV
PMTCT – prevention of mother-to-child transmission
SBCC – Social and behavior change communication
SGA – Small for gestational age
SHINE – Sanitation and hygiene infant nutrition efficacy
SQ-LNS – small-quantity lipid based nutrient supplements
SUN – scaling up nutrition
TBM – Triple Burden of Malnutrition
WFP – World Food Program
ZDHS – Zimbabwe Demographic and health survey

ZMICS – Zimbabwe Multiple indicator cluster survey

ZNNS – Zimbabwe national nutrition strategy

ZimSTAT – Zimbabwe national statistics agency

ZimPICES – Zimbabwe Poverty, Income, Consumption and Expenditure Survey

ZimVAC- Zimbabwe vulnerability assessment committee

GLOSSARY OF TERMS

The following definitions which were obtained from literature were used in this thesis.

Early childbearing: Percentage of women age 20-24 years who had at least one live birth before age 18 (ZMICS,2014)

Food security: the state in which “all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO, 1996)

Grand Multi gravida: a woman who has had 6 or more previous pregnancies. (Miller-Keane, 2003)

Grand multi parity: a woman who has had ≥ 5 births (live or stillborn) at ≥ 20 weeks of gestation. (Abu-Heija AT, Chalabi HE, 1998)

Intra-uterine growth retardation/restriction: a rate of foetal growth that is less than normal considering the growth potential of that specific infant. (Sharma D, et al, 2016)

Literacy rate: the number of persons aged at least 15 years who have completed at least Grade 3 per 100 population per age category. (Zimbabwe National Statistics Agency)

Low birth weight: Percentage of births with a reported birth weight < 2.5 kilograms regardless of gestational age (ZDHS 2015)

Minimum acceptable diet: portion of children 6-23 months of age who receive a minimum acceptable diet (a combination of minimum meal frequency and minimum dietary diversity), apart from breastmilk. (WHO, 2009)

Minimum dietary diversity: proportion of children 6-23 months of age who receive foods from 4 or more food groups. (WHO, 2009)

Minimum meal frequency: Proportion of breastfed and non-breastfed children 6-23 months of age who receive solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more. (WHO, 2009)

Obesity: a disease associated with impaired functions related to alterations in the metabolism of steroid hormones, metabolic alterations including lipid and glucose levels, and increases in the turnover of free fatty acids that lead to insulin resistance syndrome (HNP discussion paper,2012)

Obesogenic: Factors tending to make individuals fat, such as environments that promote decreased physical activity and/or increased intake of energy dense foods. (HNP discussion paper-2012)

Open defecation: When human faeces are disposed of in open fields, solid waste, bushes, open bodies of water or other open spaces that are prone to human contact. (ZimVAC 2019)

Small for gestational age: birth weight less than two standard deviations below the mean or less than the 10th percentile of a population-specific birth weight for specific gestational age. (Sharma D, et al, 2016)

Stunting: Is also known as Linear Growth retardation and it is defined as short height for age or height that is more than 2 standard deviations below the World health Organization Child growth Standards (WHO, 2006).

Unemployment rate: the percentage of unemployed persons who are 15 years and above in the economically active population. (ZIM PICES,2017)

Unintended pregnancy: pregnancies that are reported to have been either unwanted (i.e., they occurred when no children, or no more children, were desired) or mistimed (i.e., they occurred earlier than desired) (Santelli JS, et al, 2003) (103)

Unmet need for family planning: Proportion of women who (1) are not pregnant and not postpartum amenorrhoeic and are considered fecund and want to postpone their next birth for 2 or more years or stop childbearing altogether but are not using a contraceptive method, or (2) have a mistimed or unwanted current pregnancy, or (3) are postpartum amenorrhoeic and their last birth in the last 2 years was mistimed or unwanted. (ZDHS, 2015)

ABSTRACT

INTRODUCTION: The double burden of Malnutrition is characterized by the co-existence of stunted and obese/overweight children. This is a public health issue due to the various non-communicable disease that are likely to be faced by stunted/obese children in adulthood. These reduce the quality of life of the adult and affect their economic productivity.

METHODOLOGY: This thesis is a literature review. Information was retrieved from various sources including peer reviewed articles, grey literature and surveys conducted in Zimbabwe. The framework used was adopted from Pérez-Escamilla R & Bermúdez O, 2012. Common search terms included stunting, overweight/obesity and double burden of malnutrition.

RESULTS: Zimbabwe has cultural myths which hinder the adoption of good IYCF practices, resulting in children receiving diets of poor nutritional value. The land reform program post-independence caused a decrease in agricultural produces, which has contributed to increase in food insecurity over the years. This has left only 47% of households in the rural areas consuming a minimum acceptable diet, affecting maternal health. Both overweight and obesity are associated with poverty in Zimbabwe. Poverty results in a lack of financial access to food and chronic hunger, hence stunting. Poverty also causes the poor to eat cheaper, obesogenic foods which result in excess weight gain and overweight/obesity.

DISCUSSION: The Double Burden of Malnutrition is mostly influenced by the inequities within a population, including gender, poverty, education as well as living environments. Girls enrollment into schools should be increased, especially in rural areas as well as the development of equity-based policies.

Key words: Double burden of Malnutrition, children, under 5, Zimbabwe

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INTRODUCTION

My name is Rumbidzai Ayesha Gwete and I am from Zimbabwe. I am a nutritionist and my most recent work experience was with Plan International Zimbabwe in Mutasa district, Manicaland Province (the eastern part of the country). I worked as a Monitoring and Evaluation Research Coordinator/Nutritionist for the Health and Nutrition Project that was being Implemented in the district. The project was funded by The World Food Program (WFP) and it was focused on reducing stunting of children under 2 years in the district as well as treatment of moderate acute malnutrition in children 6-59 months of age, pregnant and lactating women, TB patients and people living with HIV (PLWHIV). The main activity of the project was the monthly distribution of Corn Soy Blend (CSB) to the beneficiaries and this was coupled with anthropometric tracking of nutritional status of all beneficiaries.

Mutasa district is among the most fertile districts of the country, with good rainfall and thriving agriculture. The district has a variety of crops throughout the year, but it is also among the districts with the highest levels of stunting among children under 5 years, which signifies chronic undernutrition. I was always baffled at work by this as I couldn't imagine how a district that has good agricultural produce also have the highest rates of chronic undernutrition/stunting. Each food distribution session was also coupled with education about good infant and young child feeding practices as well as dietary diversification using locally available foods. While conversing with the mothers and care givers of children, they showed good comprehension of educational messages, but their children were still undernourished. However, childhood obesity is also prevalent within the district as well as the country, signifying inequalities in terms of food consumption and standards of living.

During my work, I always felt that stunting is a complex health problem that is not going to be solved by food supplementation alone. Food supplementation is a short-term intervention, but when donor funded programs end, the problem will persist again. This prompted me to do a master's in Public Health in order to better understand more of other risk factors for stunting that are health related.

Amongst children who are failing to have a nutritionally adequate diet and hence are stunted, there are children who are facing overweight/obesity. Like stunting, obese children are also likely to be obese in adult hood and pass on the obesity to their children, creating an intergenerational cycle of obesity. Both stunting and obesity are risk factors for the development of non-communicable diseases (NCDs) like cardiovascular diseases (CVDs), diabetes and hypertension. This is a public health issue of concern as NCDs are also on the global health agenda as they result in more health care expenses and they decrease the quality of life of the affected individual and family.

This drove me to choose the double burden of malnutrition as my topic in order to understand other risk factors for stunting, which are not related to food insecurity alongside with the driving factors for obesity in children.

The focus on children under 5 years is because children are the future for tomorrow. They are also one of the most vulnerable populations and effects of malnutrition will affect them in adulthood. It is important to give them a healthy start in life, enabling them to be educated, turning out to be economically productive adults. Economic productivity is the key to fighting against the inter-generational effects of stunting and poverty and it also improves the standards of living. Economic productivity within a population will help in the further development of a country.

I hope that this thesis will help to create equity-based policies within the country that will help to resolve the Double Burden of Malnutrition. I hope that my thesis will help to come up with sustainable, long-term interventions for the fight against the Double Burden of Malnutrition.

CHAPTER 1: BACKGROUND INFORMATION

1.1: GEOGRAPHY AND DEMOGRAPHY

Zimbabwe is a Lower-Middle Income Country (LMIC) that is in Southern Africa. It is a land locked country that is bordered by Botswana, South Africa, Zambia and Mozambique and is home to approximately 17 297 000 people (16). The population distribution is 52.9% females and 47.1% males. Zimbabwe is a country with a young population with 42.6% of the population being children under the age of 15 years as compared to 5.2% of adults above 65 years of age. This is an indication of a high fertility rate, with 4 children per woman (2) making 14.1% of the population comprising of children under the age of 5 years. On average, women in the rural areas have 1.7 more children as compared to their counterparts in the urban areas. According to the Zimbabwe National Statics Agency (ZIMSTAT) Poverty, Income, Consumption and Expenditure Survey (PICES), 69% of the population lives in rural areas and 31% live in the urban area (17). Most households are male headed (63.4%) and the average size of a household is 4.2 members (17). However, the rural population has a larger family size (4.5 persons) as compared to urban areas (3.4 people).

There are 16 official languages and hence tribes in Zimbabwe and English is recognized as the universal language of the country. Even though English is the most commonly used language in Zimbabwe 70% of the population is Shona speaking, 20% speaks Ndebele and the remaining population speaks other languages including Kalanga, Ndaou, chewa and sotho (58).

Table 1: Percent population distribution by age group and sex

Age group	Male	Female	Total
0-4	14.6	13.8	14.1
5-9	15.8	14.7	15.2
10-14	13.8	12.8	13.3
15-19	12.2	10.5	11.3
20-24	7.9	8.0	7.9
25-29	6.4	6.3	6.3
20-34	6.2	6.5	6.3
35-39	5.3	5.8	5.6
40-44	4.4	4.6	4.5
45-49	3.3	3.1	3.2
50-54	2.2	2.5	2.3
55-59	1.8	2.8	2.3
60-64	1.8	2.8	2.4
65+	4.5	5.8	5.2
Total	100	100	100

Source: ZimPICES, 2017 (17)

1.2 ECONOMY

The country has faced serious economic challenges in the past years, and it reached the highest ever inflation rates (95.41%) in 2009. This has resulted in a lot of people losing their jobs as factories were shut down due to lack of foreign currency to sustain businesses, causing high poverty levels as well as famine. The adoption of the United States Dollar in 2009 brought a bit of stability in the country. However, the country is currently facing another economic crisis due to poor governance, economic policies leading to a shortage of foreign currency, leaving many Zimbabweans worrisome about going back to the 2008 era. Zimbabwe's current Gross Domestic Product (GDP) is 19.37 United States billion dollars, which puts Zimbabwe among one of the Lower-middle Income Countries (14)

1.3 EDUCATION/LITERACY

Zimbabwe invested in education post -independence and this has resulted in the country having one of the highest adult literacy rates in Africa, with 88.6% literacy rate among adult population in 2014 (108). The 2017 ZIMSTAT PICES showed that only 0.8% of adults aged 21 years and above had not completed some form of education. More adults in the urban areas have completed secondary education (52.1%) as compared to 27.1% in rural areas. This shows an inequality in education to the rural population as they have less chance of completing secondary education, especially if they are females (23%) as compared to males (32%) (17).

Table 2: Percent distribution of population 21 years and above by highest level of education completed

Sex	None	Some Primary	Primary	Some Secondary	Secondary	Short-cycle tertiary	Bachelors Program	Masters and above	Not stated	Total
Male	0.5	14.9	20.4	17.9	36.8	5.8	2.0	0.3	1.4	100.0
Female	1.0	21.1	22.9	19.6	28.2	4.4	1.2	0.1	1.5	100.0
Both sexes	0.8	18.2	21.7	18.8	32.1	5.0	1.6	0.2	1.5	100.0

NB. Some Primary = zero to grade 6, Primary =Grade 7, Some Secondary= Form 1-3 Secondary=Form 4 -6. Source: ZimPICES, 2017 (17)

91.3% of the population aged 15 years and above are literate according to the ZIMSTAT PICES. Males have a higher literacy rate (94%) as compared to females (89%), and this shows inequality in education for the females. The highest literacy rate of 97.9% is among the 25-29 years age group for both sexes (17). For both sexes, the rural counterparts had lower literacy as compared to the urban population, and this also shows inequality in education for rural population. The literacy rate declines with increasing age, showing that the older generation did not have good chances of going to school. The younger age group (15-19) has a lower literacy rate as compared to the 35-39 age group, showing a decline in school enrollment of this age group due to various reasons e.g poverty and pregnancy.

Table 3: Literacy rates for population 15 years and above by Age group and sex

Age group	Male	Female	Total
15-19	96.4	97.3	96.8
20-24	97.2	97.8	97.5
25-29	97.7	98.0	97.9
30-34	97.4	97.1	97.2
35-39	98.0	96.4	97.2
40-44	97.3	95.6	96.4
45-49	96.3	91.3	93.8
50-54	93.8	74.6	82.4
55-59	84.7	68.7	75.0
60-64	82.4	65.0	71.9
65+	68.0	48.7	56.9
Not stated	0.0	20.4	17.8
Total	94.0	89.0	91.3

Source: ZimPICES,2017 (17)

1.4 EMPLOYMENT RATE AND POVERTY

26.6% of the adults in the country depend on monthly salaries as a main source of income (17). This indicates a high unemployment rate as only 26.6% of the adult population have salaries, implying formal employment. There is less formal employment in the rural areas with 67% of households in the rural areas selling their own agricultural produce as a source of income, as compared to 63.9% in the urban areas who receive salaries/wages. However, unemployment is higher in the urban area as compared to the rural areas, 23.3% vs 1.3% respectively. In the rural area, most people are communal and resettlement farmers, hence they create their own employment, reflecting the low level of unemployment in the rural areas (17).

1.5 HEALTH SYSTEM STRUCTURE

The main governing body of health-related issues in Zimbabwe is the Ministry of Health and Child Care (MOHCC), which envisions the highest possible health quality of life for all citizens (59). The health system of the country almost collapsed during the economic downfall of the country in 2008, but it made a recovery during 2009-2012 when the country's economy began to recover. The current national health strategy's purpose is to address the gaps and maintain gains made this far by comprehensively responding to the burden of disease and strengthening the overall health system. This will allow for delivery of quality health services to all the citizens of Zimbabwe. However, despite this strategy, the current economic growth challenges are hindering the success of the strategy. Government fiscal space is predicted to shrink, and this increases dependency on external support towards the funding of the health infrastructure including retainment of health workers, medicines and commodities supply as well as distribution, among other activities (59).

In 2013, the former president of Zimbabwe launched the Food and Nutrition Security Policy (FNSP) which aims to "promote and ensure adequate food and nutrition security for all people at all times in Zimbabwe, particularly amongst the most vulnerable and in line with cultural norms and values as well as the concept of rebuilding and maintaining family dignity"(60). This led to the development of the National Nutrition Strategy (NNS) by the Food and Nutrition Council (FNC) and the policy aims to tackle the various nutritional related diseases in the country, including those of children under five years of age. The Zimbabwe National Nutrition Strategy was Published in 2014 with an end tenure of 2018 and it has 6 key result areas that cut across the nutritional needs of the various population subgroups including children under 5 years of age, adolescents and pregnant and lactating women. Action plans that are specific towards children under the age of five years are:

- Ensuring that all health institutions provide the standard Infant and Young Child Feeding (IYCF) package which includes multiple micronutrient supplementation, education on dietary diversity, nutrition interventions in emergencies, WASH, (prevention of mother to child transmission (PMTCT) and other aspects.
- Increasing the coverage of community IYCF counselling from 44% to 100% of districts and at least 90% of the wards per district.
- Increasing the coverage of growth monitoring and promotion for all children under 5 years (61).

1.6 CONTRACEPTIVE COVERAGE

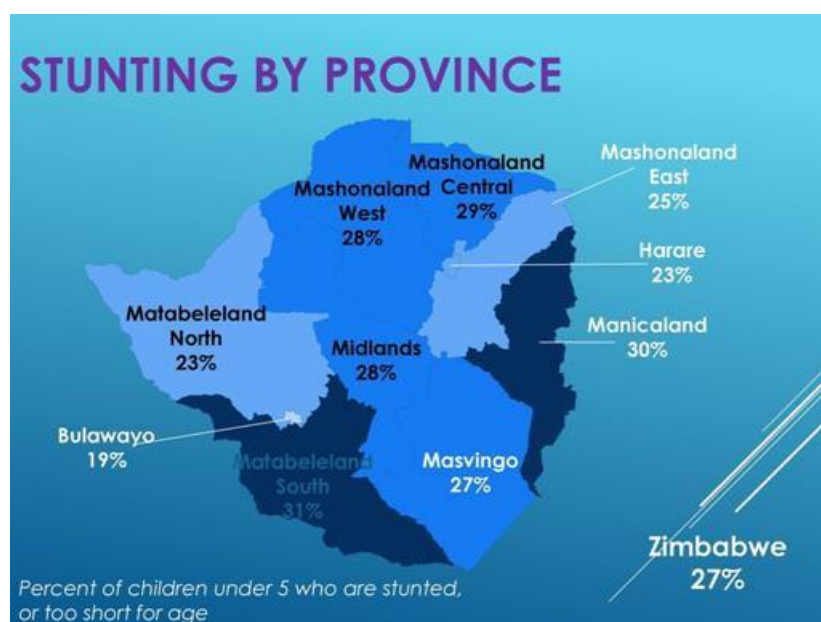
According to ZDHS 2015, 66% of married women who are in the 15-49 years age range are currently using a modern method of contraceptives for family planning. The same proportion (66%) of sexually active unmarried women are also using modern contraceptives (2). Even though contraceptive usage was seen to increase with increase in education and wealth, the coverage is also relatively high among the poor (62%) and those without education (49%). ZDHS 2015 also showed that More urban women use contraceptives for family planning as compared to rural women (71% vs 63%). In 2015, unmet need for family planning among married women aged 15-49 is at 10%. Of these, 6% have an unmet need for birth spacing and the remaining 4% have an unmet need for

limiting the number of children they have. Unmet need for family planning decreases with education of women. Married women who have more than a secondary education have 5% unmet need as compared to those with primary and no education at 13% and 22% respectively (2). High fertility rates are due to the average use of contraception as almost half of the married women do not use contraception. This is especially true for women who are not educated.

1.7 NUTRITIONAL STATUS OF CHILDREN UNDER 5

Like other developing countries, Zimbabwe is battling with childhood malnutrition. Malnutrition is defined as “insufficient, excessive or imbalance consumption of dietary energy and nutrients. It shows in different forms, such as under nutrition, over nutrition and micronutrients malnutrition” (12). There are 4 categories of malnutrition, which are wasting, underweight, stunting and overweight/obesity. Stunting signifies chronic undernutrition and it is also known as linear growth retardation/faltering (19) and it is characterized by a short height for age or a Z-score of -2 or lower (18). The 2015 Zimbabwe Demographic Health Survey (ZDHS) revealed that 27% of children under 5 years are stunted in the country (2). Even though the stunting rates have been declining (from 35% in 2005/6 to 27% in 2015), the current prevalence signifies medium stunting levels according to WHO classification shown in table 4 below. Regardless of medium classification a 27% prevalence, 1 in every 3 children is stunted, making it a grave issue of public health concern.

Figure 1: Map of stunting prevalence by province in Zimbabwe



SOURCE: ZDHS 2015

Table 4: Classification for assessing severity of stunting in children under 5 years

Severity	Prevalence (%)
Low	<20
Medium	20-29
High	30-39
Very high	>40

Source: WHO 2019 (21)

2.6% of children under 5 years are overweight in the country (5) and this is characterized by an increased weight for height. An overweight child has a higher probability of being overweight in adulthood, leading to a wide range of disabilities and disease that are coupled with overweight and obesity including cardiovascular diseases and diabetes. Obese women are at risk of delivering pre-term babies with low birth weight, pre-disposing the babies to an early risk of undernutrition. Obese children and adolescents are at risk of suffering from both short-term and long-term health concerns, of important to note are cardiovascular diseases (mainly heart disease and stroke), diabetes, musculoskeletal disorders and cancers (endometrium, breast and colon) (1). It has also been shown that in Zimbabwe, children who live in urban areas are at higher risk of being obese as compared to those that live rural areas (OR = 3.19, 95% CI: 2.18–4.66, p = 0.000) (6)

Table 5: Prevalence of under 5 Obesity by province in Zimbabwe

Province	Overweight/obesity %
Manicaland	4.5
Mashonaland Central	2.2
Mashonaland East	2.7
Mashonaland West	2.7
Mashonaland North	2.1
Mashonaland South	1.7
Midlands	2.1
Masvingo	3.1
National	2.6

Source: ZNNS 2018 (5)

Table 6: Classification for assessing severity of overweight/obesity in children under 5 years

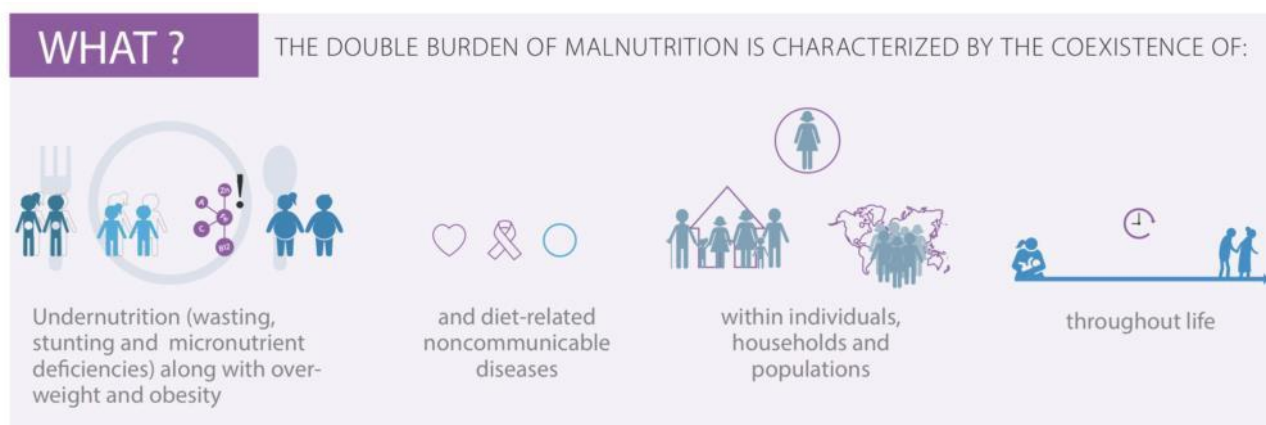
Severity	Prevalence
Very low	<2.5%
Low	2.5% - <5%
Medium	5% - <10%
High	10% - <15%
Very high	>15%

Source: De Onis, et al, 2019 (90)

A chronically undernourished child is also at risk of developing more illnesses and has reduced recovery possibilities as compared to a healthy child. A study that was conducted by Mutsigiri-Murewanhema F, et al (7), showed that being undernourished is allied with mortality to severe malaria (OR 10.3), 95% CI (1.04, 98.49). Many childhood illnesses are exacerbated by undernutrition, and their reduced physical growth puts them at risk of mortality during childhood (33). Stunted children have an increased risk of death from Infectious diseases (36,37) and global estimates revealed that stunting accounts for 17% of child deaths (38).

This co-existence of both stunted and overweight/obese creates the DBM in children under 5 years.

Figure 2: What is the Double Burden of Malnutrition



Source: WHO,2017 (99)

CHAPTER 2: PROBLEM STATEMENT, JUSTIFICATION, OBJECTIVES AND METHODOLOGY

2.1 PROBLEM STATEMENT

Stunting was chosen as the form of under-nutrition as it is a result of chronic undernutrition (happens over a long period of time) and it reflects the collective effects of undernutrition and infections since and even before birth (1). In my opinion, it is the hardest form of undernutrition to tackle due to its chronic nature. It has the highest prevalence of undernutrition the country when comparing with wasting and underweight (2). A stunted child has a low height for age and the chronic undernutrition results in impaired brain development and reduced cognitive function (39). The ability to learn well is reduced, school performance decreases and this in turn makes them a less productive adult (3).

Stunted children are also at high risk of being obese in future as well as well as suffering from various non-communicable diseases, physical morbidity and premature mortality in adulthood (4). Stunting is linked with poor socio-economic conditions within the population/country and it increases the risk of frequent/early exposure to illness (20). A decline in stunting was seen to be associated with wealth and education as most of the decline was in urban areas among children whose households are in the richest wealth Quintile. These children also had mothers or primary care givers who had secondary/higher education (62).

The DBM is therefore expected to contribute towards an increase in morbidity and mortality of non-communicable disease. The rise in non-communicable disease further strains the health system of Zimbabwe which is not advanced and is poorly equipped in terms of infrastructure, technology and human resources for health to deal with these diseases (8). The DBM is a perpetuating cycle that can be passed on from generation to generation, making it even harder to fight against stunting and overweight/obesity (9).

2.2 JUSTIFICATION

The Double Burden of Malnutrition (DBM) is the co-existence of under-nutrition and over nutrition within a population, community or family. It shows a nutritional imbalance, i.e. some people have too little to eat while some have too much to eat or an imbalance of dietary intake in both contexts, resulting in under-nutrition and over nutrition (11). This reflects the inequity in food consumption within Zimbabwe with the needy having too little

to eat and the rich having too much to eat. Malnutrition (Bad Nutrition) is a diet related condition that is prevalent all over the world and it is defined as "is insufficient, excessive or imbalance consumption of dietary energy and nutrients. It manifests in different forms, such as under nutrition, over nutrition and micronutrients malnutrition" (12). The DBM is prevalent worldwide and it affects all regions in different ways (13). It is a common health problem in Zimbabwe as well as Southern Africa. This topic was chosen as it is gaining worldwide recognition and stunting prevalence of children under 5 years in Zimbabwe is 27%, placing it among the countries with medium stunting levels of stunting according to the WHO classification (21). Across the provinces within the country, the prevalence ranges from 19% -31%, implying that in some parts of the country, one out of every 3 children are stunted, and hence one out of every 3 adults is going to be having a less economically productive life.

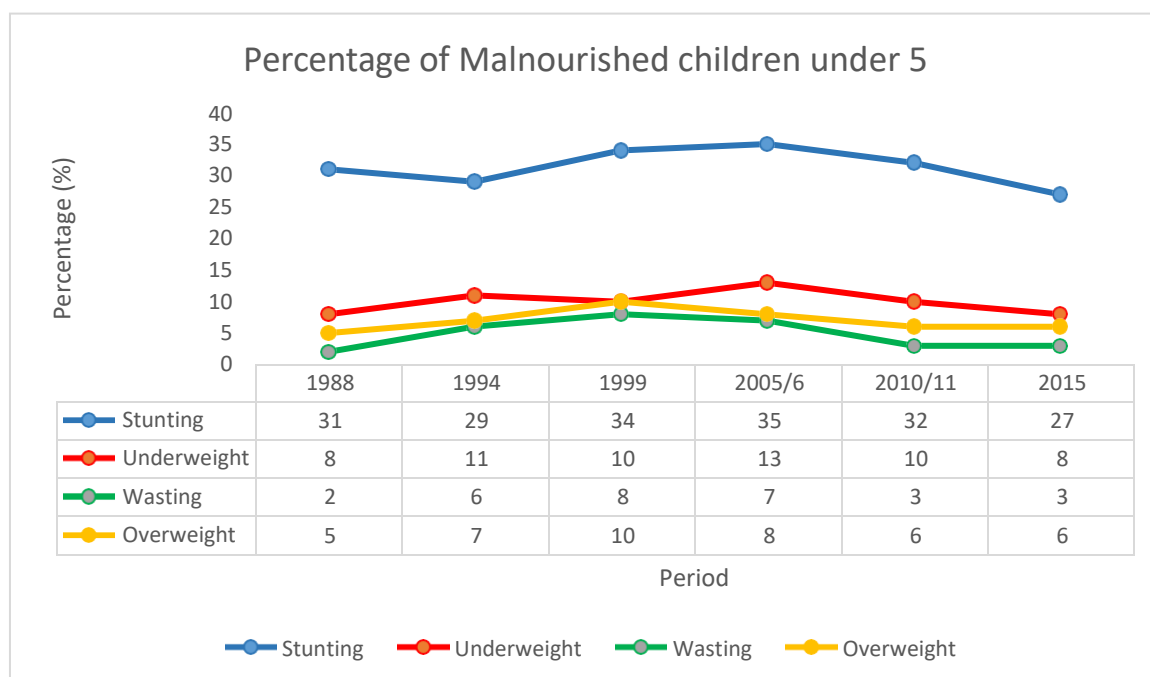
The national prevalence of overweight/ obesity in children under 5 is 2.6% (5), showing a decline from 6% in 2015 (2). Even though this is a low prevalence, obese children are more likely to be obese in adulthood, increasing their risk of various non-communicable diseases which reduce the quality of life of the individual. Childhood obesity therefore still needs to be addressed for brighter future outcomes of the children. Table 5 above shows that the eastern part of the province has the highest prevalence of under 5 obesity and this is logical as it the part of the country that thriving agricultural activities as well as good rainfall. This is however the same province that also has one of the highest prevalence of chronic undernutrition/ stunting (figure 1 above) and hence is a cause for concern that requires more research.

The nutrition in the life cycle approach plays a key role in the outcome of nutritional status of children. This is because the nutritional status of the child depends on the status of the mother while the baby is in-utero. A woman of childbearing age who was malnourished and stunted in childhood has a high risk of also giving birth to a malnourished or low birth weight baby. If the baby is a girl, she is likely to continue the cycle and be stunted in adulthood. This creates an-intergenerational cycle of undernutrition which is hard to break. (10,40).

The DBM within children is also influenced by the feeding practices that are adopted by parents and care givers and hence this thesis aims to provide informed recommendations on better feeding practices for children as well as women of childbearing age, to reduce the disparities between the overweight and the stunted population.

Therefore, identifying the causes as well as the consequences of the DBM will help to give evidence informed recommendations on how to fight against the DBM. As shown in figure 3 below, both stunting and obesity have been decreasing over the past decades. This is possibly attributable to the various commitments made by the country towards the improvement of nutrition and agriculture. These include scaling up nutrition (SUN), Comprehensive Africa, Agriculture Development Program (CAADP), and nutrition policies (105). Further research is needed to look closer into the factors associated with the decline of both stunting and obesity in children. As shown in figure 3 below, the prevalence of both stunting and obesity has been declining over the past decades, and this thesis will help in making recommendations that's will contribute towards the further reduction of the double burden of malnutrition within the country.

Figure 3: Trends in nutritional status of children



Source: ZDHS 2015 (2)

2.3: OBJECTIVES

2.3.1 : General Objective

To explore the factors associated with the Double Burden of Malnutrition in children under 5 years of age in Zimbabwe as well as their consequences in order to give recommendations on how to address the problem.

2.3.2 : Specific Objectives

1. To identify the driving forces of the Double Burden of Malnutrition in children under 5 years of age In Zimbabwe
2. Evaluate the current nutrition policies for the country with respect to the Double Burden of Malnutrition
3. To explore strategies that have been adopted by other countries to address the Double Burden of Malnutrition
4. Discuss the foreseen health problems associated with the Double Burden of Malnutrition and what this means for Zimbabwe
5. Give recommendations to the Ministry of Health and Child Care and other key stakeholders in Zimbabwe on strategies to undertake to address the Double Burden of Malnutrition

2.4: METHODS

This thesis is a literature review exploring the drivers of the double burden of malnutrition in children under 5 years in Zimbabwe. Various search engines like google, google scholar,

and PubMed and VU library were used to search for literature. Some key search terms are double/dual burden of malnutrition in children under 5 years in Zimbabwe/Southern Africa, over and under nutrition in Zimbabwe/ Southern Africa, Nutrition Transition in Zimbabwe, obesity/overweight in children under 5 years, stunting in children under 5 years in Zimbabwe, consequences of stunting in children, consequences of obesity in children.

The drivers of the DBM will be discussed using the framework below by Perez-Escamilla R, et al, (2018). This framework was chosen as it uses a nutrition in the life cycle approach that shows how nutrition at different stages of life can result in stunting or overweight in children under 5 years of age. The framework also touches on external environment and how it contributes towards the behaviour of an adult subsequently resulting in a stunted or overweight child. The framework also touches on biological aspects that result in either stunted or overweight babies and this reflects the inter-generational effects of a mother who is stunted or overweight/obese.

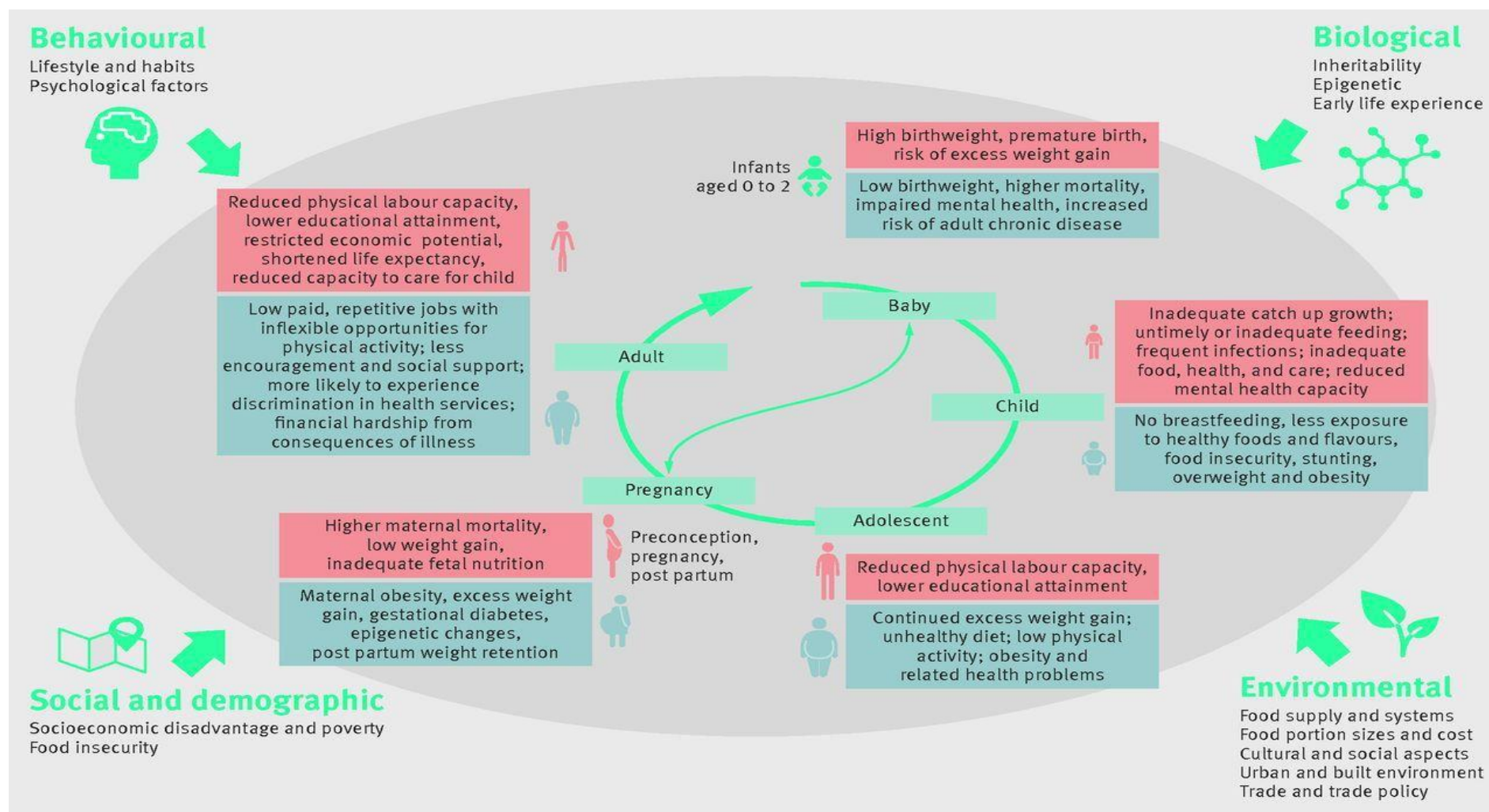
2.4.1 : inclusion and exclusion criteria

All relevant articles that were published during the period of 2000 till current were included in the literature review. Only those that were in English as well as grey literature were used. However, there were some exceptions that were made for the ACC/SCN 2nd report on the world nutrition situation as well as a study that was conducted from 1991 through 2008 on changes in obesity patterns from the poor to the rich. These had literature that was vital to the thesis. Any other article that fell outside this inclusion criteria was excluded from the literature review.

Table 7: Literature search strategy

Objectives	Source	Key words/Concepts
1. Discuss the driving forces of the double burden of malnutrition in children under 5 years of age In Zimbabwe	Google scholar, PubMed	Childhood obesity/overweight, chronic undernutrition/stunting, biological factors, environmental factors, maternal lifestyle or habit, paternal lifestyle or habit, intergenerational transmission/risk factors, dietary/nutritional behaviours or lifestyle, social status or economic/income status or educational level, health environment
2. Evaluate the current nutrition policies for the country with respect to the Double burden of Malnutrition	Ministry of health website, Google, other health institutional websites	Zimbabwe health policy, national health strategy, national nutrition strategy, child malnutrition policy, obesity/overweight health policies
3. To explore strategies that have been adopted by other countries to address the Double Burden of Malnutrition	Google, WHO guidelines, institutional or country specific action plans,	Obesity/overweight reduction, combating chronic undernutrition, action plans, policy recommendations, global guidelines
4. Discuss the foreseen health problems associated with the Double burden of Malnutrition and what this means for Zimbabwe	Google, PubMed,	Consequences, implications, foreseen problems, stunting/chronic undernutrition, obesity/overweight, health implications

Figure 4: Framework- The double Burden of Malnutrition through the life cycle and across generations and shared drivers



Source: Perez-Escamilla R, Bermudez O. 2012 (11)

CHAPTER 3: STUDY RESULTS/FINDINGS AND DISCUSSION

3.1 BEHAVIORAL FACTORS

3.1.1 : Family Planning/contraceptive use

Improving some maternal/family behaviours has been shown to have positive effects on the nutritional outcome of the children (30). Using modern contraceptives helps couples to decide when and how many children to have and this reduces pregnancies and hence child births. Family planning therefore helps couples to choose to have a child at their most healthy time in life (32). Lack of family planning can affect maternal and hence child health and nutritional status in a variety of direct and indirect ways (30,32). Poor family planning can lead to shorter birth spacing and a higher number of pregnancies which will eventually result in "poor maternal, new-born and child health outcomes" (31,). Poor birth spacing and/or multi gravida/grand multiparity causes a recurrent loss of both micronutrients and macronutrients from the woman's body throughout the gestational as well as breastfeeding periods (33) and puts the woman at risk of being underweight. This puts the baby at risk of "intra-uterine growth retardation (IUGR), low birth weight (LBW), premature birth as well as small birth size/small for gestational age (SGA)" (30) which are pre-disposing factors for stunting and poor physical growth after birth (34). LBW is defined as birth weight of less than 2500kgs regardless of gestational age (2). A study that was done by Rana M,J, et al, in India showed that children were at higher risk of being stunted if they were born to women with 3 births in less than 3 years of birth spacing (53.1%, $P < 0.01$) as compared to women with 1 birth with more than 2 years of birth spacing (32.5%) (30). Infants who are born SGA at term "have a 2-fold increase in the odds of stunting" (35) and infants who are born both preterm and SGA have "over a 4-fold increase in the odds of stunting" (35)

Family planning is also an important indirect determinant of under-five nutritional outcomes due to its influence on infant and young child feeding Practices (32). Well-spaced births give mothers more resources, energy and time to breastfeed adequately as well as feed their infants and young children, resulting in improved nutritional outcomes for their children. Chronic undernutrition (stunting) can occur in a child whose mother has a lot of children, resulting in too little time and attention given to her children along with poor feeding practices both in terms of quality and quantity. When a woman becomes pregnant soon after giving birth, she may prematurely wean the older infant (41), and my experience working with the rural women in Zimbabwe has proved this to be true.

Family planning reduces the risk of maternal death due to unintended pregnancy that can result in unsafe abortions. It also reduces the occurrence of high-risk pregnancies that affect the nutritional status of both the mother and the child. Maternal deaths reduction result in positive outcomes on infant and young child nutrition as the mothers would be alive to care for them (32).

Adolescents who use contraception can reduce unintended pregnancies and stay enrolled in school completing their education. Pregnant adolescents drop out of school and have reduced probability of going back to school (48). Research has shown that educated women are more productive, empowered and have more control over resources as compared to their non-educated counterparts, allowing them to make better choices for good nutritional outcomes of their children (32). Increased maternal education has been shown to reduce the odds of stunting, wasting and underweight in 3 Sub-Saharan African countries including Zimbabwe, with significant differences showing with higher educational levels. The odds of stunting of children were reduced by 49% among Zimbabwean women with senior secondary education (49). Better educated mothers are also more likely to maintain their own nutritional status, and reduce the risk of LBW, SGA and pre-term babies (32). An educated woman has an increased social status, mobility/access to markets, decision making power about household resource allocation, financial autonomy as well as exposure to nutrition information and resources. All these factors are directly linked to improvements in measures of child nutrition indices including stunting (50).

Adolescents and young women face challenges in accessing modern contraceptives due to stigma, lack of decision-making power, confidentiality and affordability (42). Even when adolescents go to a health facility to get contraceptives, they will be discriminated for having sex too early by health workers, hence they end up engaging in unsafe sex, which may result in unintended pregnancies. Adolescence represents a crucial period of growth and development that needs adequate nutritional intake, and it is also a window of opportunity for undernourished populations to catch up with growth (43). Pregnancy in adolescents can cause a competition for nutrients between the mother and the foetus and can have adverse consequences for both, and this is pronounced in settings where chronic malnutrition is prevalent. Studies have shown that linear growth (gaining in height) ceases when an adolescent is pregnant as a way of adjusting and coping due to the increased energy needs (44). Pregnancy during adolescents also increases the risk of "preterm birth, LBW and SGA" which are known to be pre-disposing factors for stunting (33, 34,45,46). Children born to adolescent mothers 12-14 years of age have a 51% increased risk of being stunted while those born to mothers 15-17 years have a 34% increased risk of stunting (47).

3.1.2 : Maternal eating habits

Environmental exposures from the time of conception makes one susceptible to both stunting and obesity as well as chronic diseases associated with this in later life. Nutritional deficiencies during pregnancy triggers a set of hormonal, anatomical and physiological changes to adapt towards surviving in a "resource poor" environment (66). After birth, in a "resource rich" environment, these changes will not be reversed, and the adaptations may contribute towards the development of obesity in childhood. Women who face challenges meeting their nutritional requirements during pregnancy expose their babies to the hormonal changes that happen in-utero. These babies will have increased risk of being obese when in food secure environments. The national proportion of women of childbearing age in the rural areas who are consuming a minimum dietary diversity (that is consumption of at least 5 food groups out of 7) as shown by ZimVAC 2019 is 43% (88). Even though this is an improvement from the 40% reported in 2017, it is very worrisome as only half the women are having a diversified diet. Their unborn babies are exposed to early micronutrient deficiencies as well as various other nutrients that are required for optimal linear growth. Only 44.7% of women of childbearing age are consuming protein rich food (88), and protein is the main nutrient that is required for optimal linear growth of the foetus in-utero. This means that if these women were to fall pregnant, their babies would likely suffer from IUGR and have increased chances of being stunted.

The DBM is also influenced by nutrition in the life cycle approach. A person has different nutritional requirements at different stages of growth in life. During pregnancy, the nutrient needs of the body are increased to cater for the growing foetus. Inadequate dietary intake will therefore affect the growth of the baby in-utero. What happens to the mother during pregnancy is likely to affect the unborn baby. Maternal literacy and social status therefore play an important role in what the mother eats while she is pregnant, and they have an impact on the nutritional status of the baby. Studies that were conducted on women of childbearing age who live in socioeconomic challenging conditions have shown that the risk of intergenerational transmission of both stunting and obesity is increased in these conditions (24,25,26).

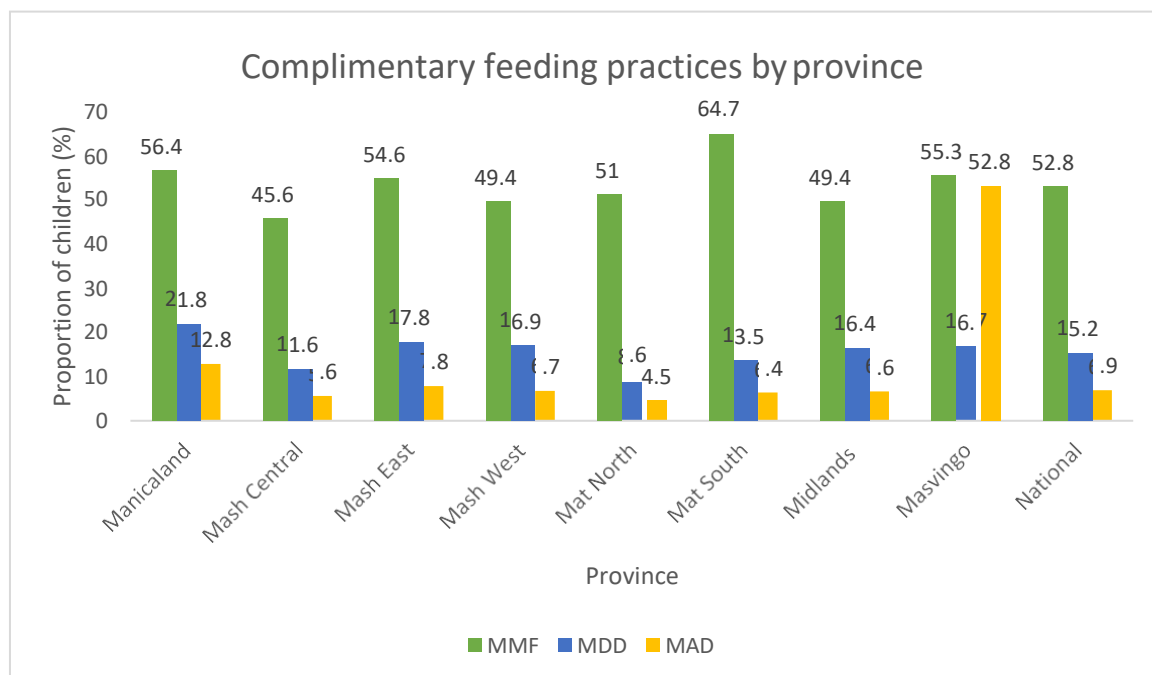
3.1.3 : Infant and young child feeding practices

Breastfeeding has a protective effect against later development of obesity and hence chronic diseases (69,70). This is especially true for exclusive breastfeeding as the normal growth in terms of weight gain for exclusively breastfed babies is much slower than that for bottle fed babies. Exclusive breastfeeding is when a baby in the 0-6 month old age group receives only breastmilk as food (104). An infant that is exclusively bottle-fed for

the first 6 months of life has 20% chance of being overweight/obese as compared to an infant that is exclusively breastfed for the first 6 months of life. Hence the growth pattern for the future is programmed during the first 6 months of a baby's life. Formula milk has higher protein content as compared to breastmilk and this causes obesity by stimulating insulin release as well as programming higher insulin release in the long term (100). Breastfeeding has a dose-response relationship, that is the more a child is breastfed, the less risk of that child being obese as they grow up. A child that is breastfed for a longer duration (up to 2 years and beyond) has reduced chances of being obese as they grow up. Breastfeeding is a protective factor against obesity for children who have a high risk of being obese (101). According to the 2015 ZDHS, 48% of infants under 6 months of age are being exclusively breastfed. The median duration for exclusive breastfeeding was found to be 2.3 months (2), and this reflects poor exclusive breastfeeding within the country. Majority of infants are losing out on the protective effects of exclusive breastfeeding against obesity.

The introduction of complimentary food at 6 months of age marks the beginning of a critical period in a child's life. If a child is not fed well, both in terms of the quality and quantity of the food, there is a high risk for growth failure during this period (74). Complimentary feeds that are of poor nutritional quality and/or inappropriate feeding practices to children 6-24 months of age are some of the most common causes of chronic undernutrition/stunting in children, and hence this is where most interventions need to be targeted. Trials of improved practices that were conducted in rural Zimbabwe revealed that poor dietary diversity as well as low energy diets were the most common problems related to infant and young child feeding (75,76). As shown by figure 5 below, only 6.9% of rural children in Zimbabwe received a minimum acceptable diet (MAD) while 15.2% had the recommended minimum diversified diet (MDD) and 52.8% had the recommended minimum meal frequency (MMF) (88). This means that almost all the children in Zimbabwe who are in the 6-24 months age group are receiving sub-standard meals. The 6-24 months age group falls within the 1000 days window of opportunity period, which is the period from conception up to when the child is 2 years old. During this period, the child's brain begins to grow and develop, and hence poor inadequate feeding places the child at risk of impaired brain development and children are at high risk of chronic undernutrition/stunting (106).

Figure 5: Complimentary feeding practices by Province



Source: ZimVAC 2019 (88)

The Sanitation Hygiene Infant Nutrition Efficacy (SHINE) trial that was done in rural Zimbabwe revealed that at baseline, none of the infants that were recruited into the trial were receiving a diet that was nutritionally adequate. The nutrient densities were below the recommended standard for a variety of nutrients including Iron, vitamin A and Zinc, with iron lacking the most in the diets (75,77). This already marks the beginning of chronic undernutrition/stunting coupled with various micronutrient deficiencies. At baseline of the study, the recruited mothers were giving their infants broth from vegetables and meat dishes as they believed that the child was unable to chew the food (75). Children were not receiving the nutrients that are found in meat and vegetables which are vital for linear growth, e.g. proteins. This reflects that in some instances, chronic undernutrition is not caused by a shortage of food, but rather by inadequate knowledge of how to prepare the food and make it palatable for the baby to eat. Children end up eating nutritionally inadequate food because their mothers do not know that they can mash or puree the food for the baby. The SHINE trial recorded positive results in terms of IYCF practices after the mothers were taught how to prepare food for their babies. The percentage of infants meeting their iron requirement increased from 0% to 68% and all the infants received enough fat and vitamin A (75). This was attributable to both the educational sessions that were being given to the mothers as well as the supplementation of infant's feeds with Small Quantity Lipid-based supplements (SQ-LNS).

Only 6.9% of rural children among the sampled households received a minimum acceptable diet (a measure of both minimum dietary diversity and minimum meal frequency) during complementary feeding. 52.8% of the children received a minimum meal frequency while 15.2% received a minimum dietary diversity (88). Children in these households in rural areas have nutritionally inadequate diets during the complimentary feeding period. This is a cause of concern as only half the children are getting the number of meals they are supposed to have per day while only 15.2% are eating a variety of foods (88). Infants are therefore at risk of developing various micronutrient deficiencies along with stunting due to poor feeding practices.

A study that was done in South Africa revealed that children who were introduced to complementary food at a very early age (between 0 and 3 months) were at high risk of either being stunted or being obese. This is because the complimentary food they received was high in energy and carbohydrates, but it was poor in protein and other essential nutrients which are needed for linear growth (78). A continuation of this diet throughout their childhood will therefore cause obesity in children and due to cultural beliefs, that claim bigger children are healthier, the mothers would not perceive this to be a problem.

3.2 BIOLOGICAL FACTORS

A child's nutritional outcome can be influenced by the nutritional or biological status of one or both parents. Excessive paternal body weight was associated with an increased risk of obesity in children (23). Overweight pregnant women are at risk of excessive weight gain during pregnancy, development of gestational diabetes as well as delivering prematurely or large for gestational age babies. Babies that are born to overweight women also have increased chances of being obese as they grow up and mature. Women can therefore pass on the risk of overweight/obesity to their children, and this persists later in life and can be passed on to the next generation (9,27). IUGR has also been shown to be linked to maternal stunting, too little weight gain during pregnancy as well as maternal undernutrition. A child who had IUGR is also at risk of being stunted as they grow (11,18), and just like obesity, stunting can also be passed on from one generation to the next. A stunted child is however also at risk of being obese (28,29) and possibly passing on obesity to the next generation.

Mamabolo et al revealed that children who were found to be stunted in their study also had significantly shorter mothers as compared to the non-stunted children (78,79). This could be due to genetics that is short stature is common within the family, or it could reflect the intergenerational transmission of stunting. The mothers of these children may also have been stunted in their childhood or could have faced IUGR. Maternal body size

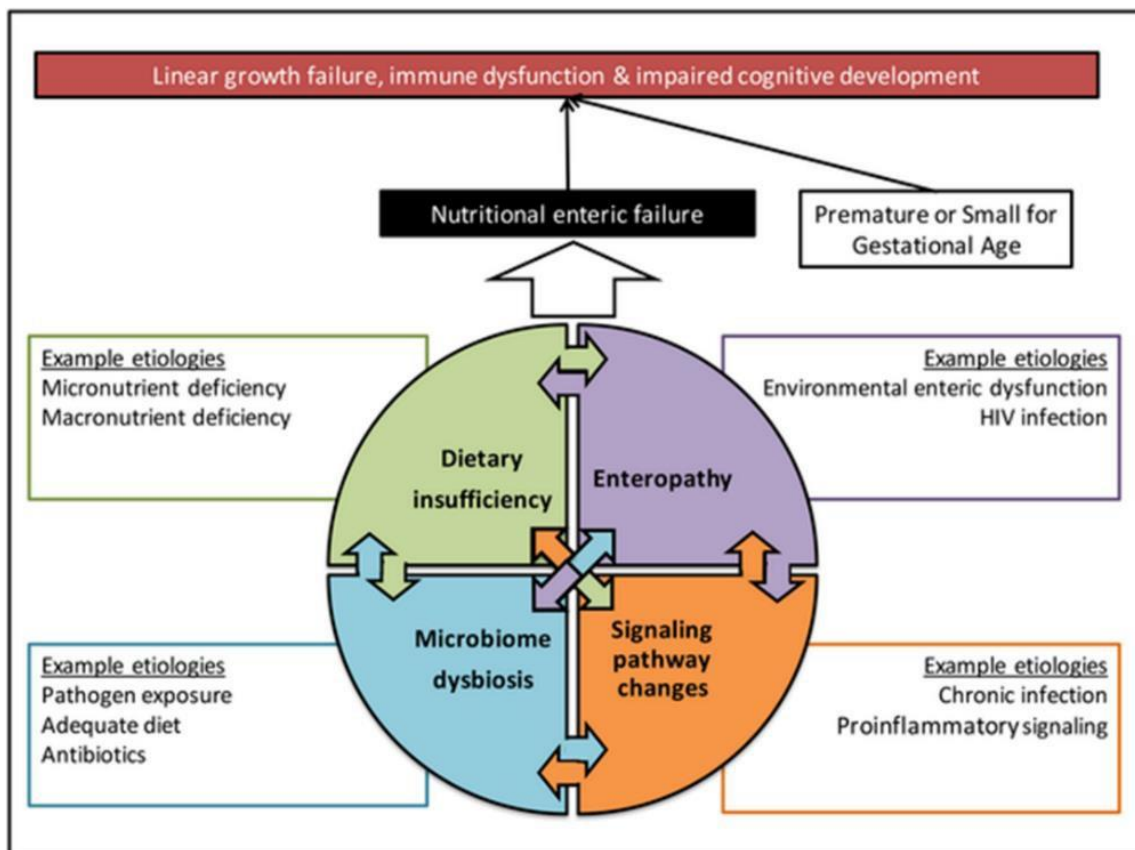
also has an influence on birth weight of the baby. Babies who are born with LBW will most likely experience growth failure as they grow up, therefore girls who are born with LBW will turn out to be small adult women, and hence the inter-generational cycle of stunting begins. Five years prior to the 2015 ZDHS, a total of 82% of the live births had recorded birth weights, and of these, 10% had LBW (2). This 10% of babies are therefore most likely going to grow up to be small adults and pass on the effects of LBW to their children.

3.3 ENVIRONMENTAL FACTORS

3.3.1 : Environmental Enteric Dysfunction

Children who live in environments with poor sanitation are at risk of suffering from Environmental Enteric Dysfunction (EED). EED is a condition in which the structure and functioning of the small intestines is disrupted (the villi are shortened, and blunt and crypt depth is increased). This leads to a series of mechanisms that contribute towards growth failure and stunting including gut and systemic inflammation (53,54), heightened permeability, intestinal leaking, bacterial translocation and nutrient malabsorption (51) while increasing metabolic demand. EED is related to parasitic and microbial contamination of both food and water and it can occur as a result of “frequent, low inoculum exposure to a range of pathogens” (52). EED is seasonal and it is most common during the rainy season (from December to January) (53).

Figure 6: Various aetiologies that cause nutritional enteric failure and hence linear growth failure in children



Source: Tickell K.D, Walson JL, 2016 (57)

Figure 6 above diagram shows that EED is not the only environmental disorder that causes growth failure in children. Other environmental factors include dietary insufficiency that is

too little food to eat or food of poor nutritional value, Microbiome dysbiosis which is exposure to bacteria and pathogens and chronic infections which cause changes in signalling pathways and metabolism.

3.3.2 : HIV Infection

Another environmental aetiology that is of importance to note from figure 6 above is HIV infection in infants as well as women.

When pregnant women do not go for anti-natal care (ANC) services, they miss the mandatory screening of Human immunodeficiency virus (HIV) for pregnant women as well as initiation on anti-retroviral therapy (ART) if tested positive. 80% of women have ever been tested for HIV (2), which leaves high chances of mother-to-child transmission (MTCT) of HIV either during pregnancy, delivery or breastfeeding (95) for the 20% who have never been tested if they fall pregnant. MTCT is the second most common mode of transmission of HIV in Zimbabwe, after heterosexual sex (2). Women who do not have an education are less likely to get tested

16.7% of women aged 15-49 years are HIV positive in Zimbabwe (2) hence their nutritional status is compromised especially during pregnancy and lactation. HIV positive individuals have increased metabolic demands due to the infection. This is further increased during pregnancy and lactation as the fetus or baby will also be acquiring its nutrients from the mother's body/breastmilk. HIV infection coupled with inadequate dietary intake increase the risk for LBW and IUGR, which are factors associated with stunting. A recent study also found that the use of ART is also associated with LBW and preterm births. Women who took Zidovudine (ZDV) based ART treatment had significantly higher rates of adverse pregnancy outcomes as compared to women who take ZDV alone (40.0% vs. 27.5%, $P < 0.001$). They had more LBWs and pre-term deliveries (23.0% vs. 12.0%, $P < 0.001$) and (20.5% vs. 13.1%, $P < 0.001$) respectively (107), which are risk factors associated with stunting.

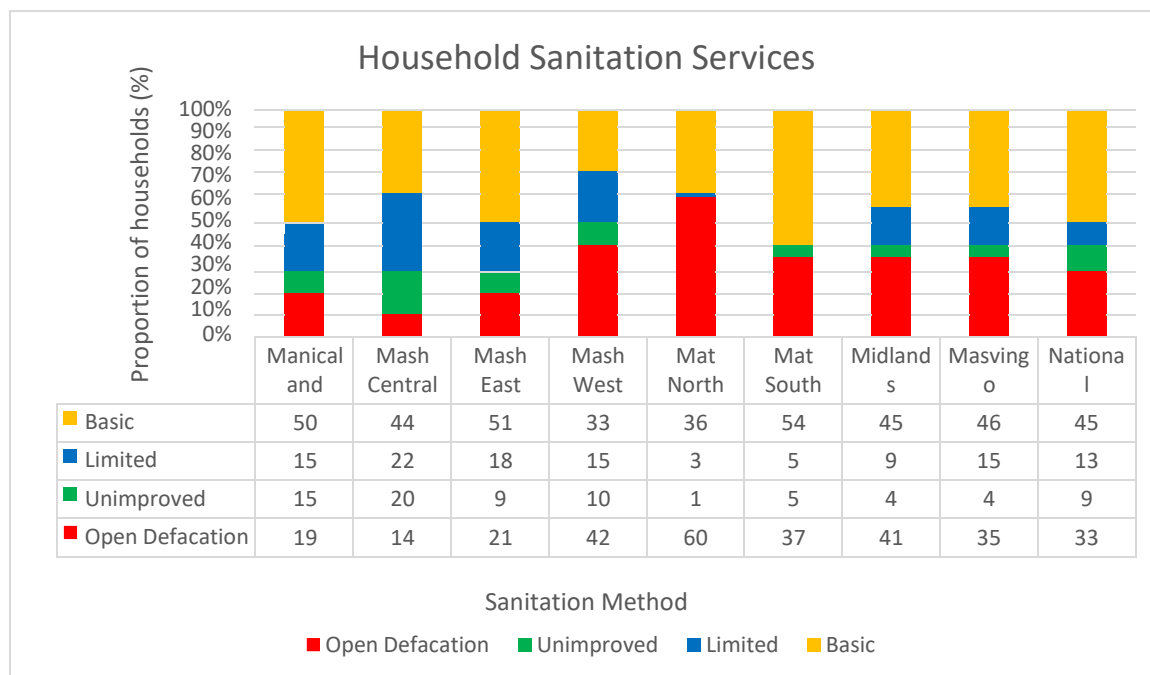
HIV clustering in families reduces caring time for children and affects the quality of parenting and nutritional value of meals (96). The mental health of the families is also affected as well as economic productivity. HIV positive infants and children have increased metabolic needs too and they are susceptible to not meeting their development potential. A study that was done in South Africa and Malawi highlighted that HIV positive children were more stunted (58.8%) as compared to negative children (27.4%). Even though this study was done among children of school going age, the results could also be reflective of HIV effects on children under 5 years of age. HIV increases the metabolic needs of the body, an in environments of food insecurity, chronic undernutrition due to HIV infection metabolic needs can make the child stunted. The HIV positive children were found to be having reduced physical as well as cognitive aptitudes as the virus can attack the central nervous system, destroy neuronal tissues and consequently impair neurodevelopment (97,98). When these children grow up, they have reduced school performance, affecting their productivity in adulthood. This can be a grave issue for a country that has high rates of HIV among children as it hinders the economic growth of the country in the upcoming years.

3.3.3: Soil transmitted helminths

Human roundworms, whipworms and hookworms are some of the most common types of soil transmitted helminths that cause millions of infections every year. Soil transmitted helminths are common in areas of poor sanitation, that is areas where human and even infant/child faeces are not disposed of properly and treated (91), and hence they come into contact with people living in that area. One gram of fresh human faeces from a person who is infected with worms could be carrying 10-10 000 helminth eggs, which can be transmitted to children via faecal-oral route. Children who therefore live in areas where open defecation is practiced are at risk of soil transmitted helminths infections and hence consequent growth faltering as well as anaemia. Pregnant women are also at risk of

developing anaemia due to soil transmitted helminths (92). In Zimbabwe, 33% of the rural population practice open defecation while 9% use unimproved sanitation facilities as shown by figure 7 below (88), which are facilities that do not ensure the hygienic separation of human excreta from human contact. These include the use of pit latrines without slabs, bucket latrines as well as hanging latrines. The high rates of open defecation reach up to 60% in Matabeleland North province, and such extremely high rates of open defecation are making children under 5 years vulnerable and at risk of contracting soil transmitted helminths and hence growth faltering (see annex 3 for sanitation ladder).

Figure 7: Household Sanitation services



Source: ZimVAC 2019 (88)

Unhygienic environments also increase the risk of diarrhoeal disease among children under 5 years, and diarrhoeal episodes in the first few months after birth increase the prevalence of stunting at 24 months of age (56). When a child has recurrent bouts/episodes of diarrhoea, they suffer from malabsorption of nutrients because food that is eaten is quickly lost in stool before it is digested and absorbed into the body. The probability of being stunted at 24 months increases with 2.5% per every episode of diarrhoea experienced by a child and 25% of all children aged 24 months who were stunted had 5 or more episodes of diarrhoeas in their first 2 years of life (81). However, some authors refute the association between diarrhoea and stunting as they say that the child can easily catch up on growth after diarrhoeal episodes (82). Therefore, the association between diarrhoea and childhood stunting still needs to be investigated further.

3.3.3: Food security

Food security is defined as the state in which “all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (89). Food insecurity is therefore present if one or more of the above conditions is absent. There are four dimensions of food security which are availability of food, access to the food, utilisation of food by the body as well as stability of food availability, access and utilisation over a long time period.

Food security and livelihoods in Zimbabwe as well as other countries are affected by highly variable rainfall as well as seasons. Different parts of the country receive different amounts of rain and the country is divided into 5 agro-ecological regions according to rainfall received. The trend in rainfall received decreases from region 1 to 5 with region 1 receiving the most rainfall and region 5 receiving the least (84) (see annex 1). The food security status therefore varies within the different agro-ecological regions of Zimbabwe, depending on the amount of rainfall received and hence agricultural produce yielded.

Zimbabwe used to be the second largest food producer in southern Africa before independence (85) when over 6000 white large-scale commercial farmers owned over 15.5 million hectares of land, mostly in agro-ecological regions 1 and 2 which thrived in agricultural produce. Post-independence, the new government embarked on a land reform program that aimed to give land ownership back to black native Zimbabweans who had land allocation in poor agricultural soils in agro-ecological regions 4 and 5 (86). I think this marked the beginning of the downfall of the agricultural sector of the country. The reallocation of land to unexperienced black farmers resulted in reduced crop yields nationwide and over the years, this has contributed towards the decline in agricultural produce and food insecurity. This caused a nationwide shortage of basic food commodities and slowly contributed towards the increase in food prices. The country that was once the second largest producer of food now must import maize and other basic grains from other countries in order to feed its population. The decline in agricultural productivity was also worsened by the rise in agricultural inputs (87), leaving most farmers unable to afford seed and fertilisers and other basic inputs for their lands. Most lands are therefore now lying idle and unproductive or they are yielding smaller quantities of crops as compared to the past.

The Zimbabwe Vulnerability Assessment Committee (ZimVAC) of 2019 showed that the proportion of households in rural areas that are consuming an acceptable diet among the sampled households is 47% and this is a decline from 55% in 2018 (88). This shows food insecurity among half the population living in rural areas, reflecting the increasing trend in food insecurity. 29% of the households were consuming a borderline diet while 24% were having a poor diet (an increase from 20% in 2018). It was estimated that 59% of the rural households were food insecure during the peak hunger period from January to March 2019. Children who are born/stay in food insecure households are at risk of being stunted due to the competition for food and the poor dietary quality and diversity of the meals that they eat.

The nutrition transition has also led to an increased demand of grain as feed for livestock (due to the large increase in consumption of animal products), leaving little for consumption by humans especially for the poor (66). Drought as well as increase in food prices and climate change have also contributed towards food insecurity over the past couple of years and this has left the urban poor population to eat low quality food, which is obesogenic.

3.4 SOCIAL AND DEMOGRAPHIC

3.4.1 : Nutrition Transition

Urbanisation as well as economic growth have resulted in a nutrition transition, which is when a population changes its dietary pattern as well as nutrient intake (64). This implies that traditional, high fibre plant-based foods have been replaced with foods from animal sources which are rich in fat as well as processed and sugary foods. The means of preparation have also changed with the addition of fats to food. The traditional snacks like nuts and seeds have also been replaced with energy dense snack foods like biscuits and crisps (67). Nutrition transition directly affects the nutritional status of a child.

Nutrition transition coupled with a sedentary lifestyle (reduced physical activity) (63) has led to a shift in disease burden from undernutrition to overweight/obese chronic diseases. Obesity/overweight used to be considered as a disease of the western affluent countries. However, as the gross national product of a country increases, obesity becomes more prominent in the lower socioeconomic class, affecting the poor people who are unable to avoid obesogenic foods due to the costs associated with healthy food (65,66,71,72). Urbanisation brings with it an increase in technology which also reduces energy expenditure as some of the labour-intensive jobs are replaced with machines for example farming and mining. Reduced physical activity is also because of the changes in transportation as modern means of transport are easily available giving less opportunities for people to walk (68,73).

The national prevalence of overweight/obesity in Zimbabwe among women aged 14-59 years is 35% (2), and this implies that 35% of women (1 out of every 3 women) are at risk of excessive weight gain during pregnancy and hence giving birth to overweight babies (9,27). 13% of men are also obese/overweight (2) and paternal obesity is also a risk factor for a baby to be born overweight (23).

3.4.2 : Cultural/Social Beliefs and practices

Zimbabwe has many cultural/social beliefs that hinder the adoption of good IYCF practices especially in the rural areas. The SHINE trial revealed that most women who were recruited into the study had poor child feeding practices, some of which were influenced by culture. Some stated that they were told not to feed the eggs to the baby because it will make the teeth fall out and the baby will also have seizures (75). Eggs are one of the most common and easily available protein sources in rural areas due to local rearing of chickens, and such myths result in children having inadequate diets that compromise their health and yet the food is available. The women also believed that giving thin porridge is better as compared to the thick one as it makes it easier for babies to swallow. Infants were being fed porridge which was watery and of very poor nutritional value.

Social and cultural beliefs can also influence the outcome of obesity in children. Mothers associated children who are plump with good health and they believed that the bigger the child, the better the health. If a child is lean and slim, the mother would feed the child extra food for weight gain for the child to be bigger and healthier, as per their opinion (83). Having a mother who works was also associated with childhood obesity (78). This means that working mothers have financial resources to buy food for their children and hence food is always readily available, contributing to obesity.

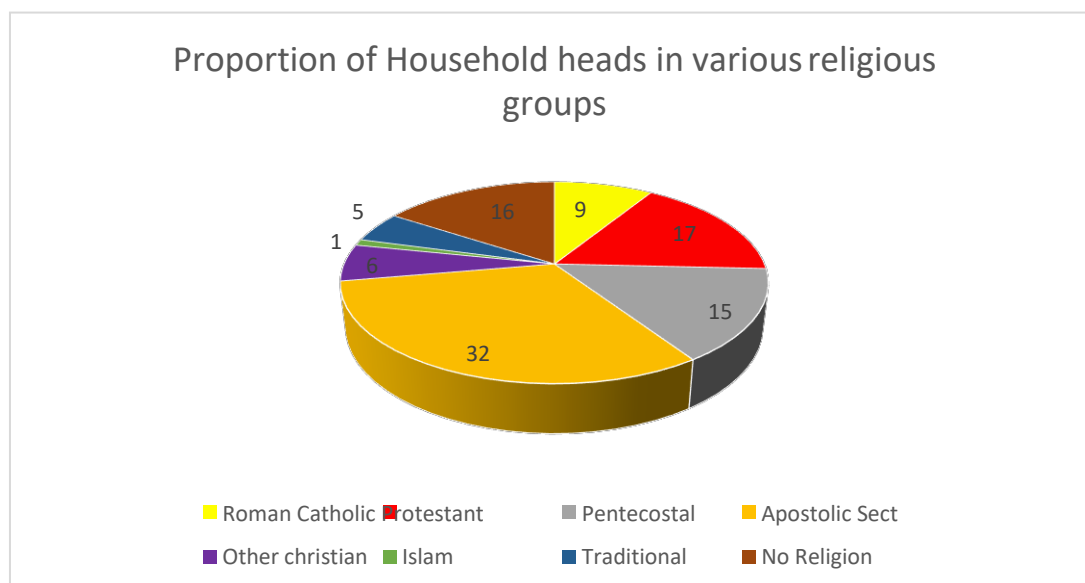
Religion can be another cultural variable in the outcome of the nutritional status of children, due to its influence on health care seeking behaviour. Zimbabwe is home to the Apostolic religion, which is a Christian denomination whose doctrine is against the use of modern medicine, including immunisation of children. As shown in figure 8 below, it is the biggest denomination in Zimbabwe with 32% of household heads in Zimbabwe (figure 8 below) being members of the church (102). Assuming that members of a household follow the same religious practice as that of the household head, this implies that 32% of the population in the country are members of the church. The health care seeking behaviour of its members is influenced by the church doctrine as well as the level of adherence to the doctrines by its members. The very conservative members totally shun the use of modern medicine and the church doctrine emphasises faith/spiritual healing in times of sickness, with sanctions imposed to perpetrators which include confessions as well as shaming.

The use of modern medicine is associated with having weak faith in the healing powers of God and they are considered to elevate man above God. Ill health is believed to be associated to spiritual factors and hence the strong reinforcement of faith healing (94), and this sometimes has strong consequences on health outcomes. This is especially true for children under 5 years of age who are very vulnerable to a lot of illnesses, particularly when they are not immunised. Their children are susceptible to a wide range of infectious

diseases, which can have negative impacts on their health and cause chronic undernutrition/stunting.

Cultures that allow polygamy as well as child marriages, result in larger than usual households. Ten-point one percent of women in the 15-49-year age group were in a polygamous union/marriage (110). A child born to a mother who is in a polygamous marriage is susceptible to stunting due to the competition for food between the women in the same marriage as well as their children. Child marriages result in an early age of first pregnancy, and consequently also cause grand- multi gravida (109). The 2014 Multiple Indicator Cluster Survey (MICS) showed that at 22.4% of women aged 20-24 had at least 1 live birth before they were 18 years old (110). Twenty-four-point five percent of young women between the age 15-49 years were already married or in a union and 32.8% of women aged 20-49 years were married before they were 18 years old (1 in every 3 women). The high rates of child marriage result in pregnancies in underdeveloped bodies, which as discussed in the chapters above, has negative effects for both the mother and the child. Child marriages are usually coupled with lack of decision-making power for the woman, and at times gender based/ intimate partner violence. A study that was conducted in Zimbabwe showed that women who reported emotional abuse during their pregnancy gave birth to more LBW babies ($p < 0.002$) as compared to those who did not report physical abuse. These women also had more negative outcomes of pregnancy (LBW, pre-term delivery and caesarean section) ($p < 0.004$) (113)

Figure 8: Proportion of various religious groups in Zimbabwe



Source: UNICEF 2014 (102)

3.4.3 : Household Demography

A study that was done in South Africa revealed that children who are born into households with a big family size or with several other children under 5 years are also at risk of being stunted. A large household size increases the competition for food among its members (78) and acquiring food for the entire family is also a challenge especially in resources constrained settings. Children born to student mothers were also found to be at risk of stunting due to reduced family income as well as the inadequate caring time that the child receives from the mother. Children with student mothers are left in the hands of a babysitter/carer who might have insufficient knowledge on how to feed a baby properly. These children were also living in one of the poorest provinces in South Africa (Limpopo Province) and the province has high unemployment rate, high prevalence of illiteracy, low

levels of electrification, poor sanitation as well as high household density and all these factors are linked to stunting (80).

The 2015 ZDHS also discovered that urban children are more than 2-times likely to receive a minimum acceptable diet as compared to their rural counterparts (13% vs 6% respectively). Urban children are therefore at an advantage as they have higher chances of having a diversified diet due to their place of residency. The highest proportion of children who had minimum acceptable diets were in Bulawayo (23%) and Harare (15%) (2) and these are the largest cities in the country. This could be attributable to increase in household income as well as education which enables families to know how to feed their children as well as give them financial resources to buy a variety of food. This makes children who reside in urban areas less likely to be stunted as compared to their rural counterparts. 28% of children between 18-23 months who live in urban areas were stunted as compared to 43% of children in the same age group who live in rural areas (93). Households with richest wealth quintiles have lower prevalence of stunting (15%) as compared to households from the poor wealth quintiles (30%) and this signifies that stunting is therefore also associated with poverty.

3.5: DISCUSSION

It's been confirmed that family planning has significant benefits towards maternal health and hence the health and nutritional outcome of babies/children. Birth spacing gives time for women's bodies to recover from the previous pregnancy and replace essential nutrients in the body. This results in better nutritional outcomes such as good birth weight and it also reduces risk factors for LBW and IUGR. Birth spacing has been shown to be effective in reducing the prevalence of under-five stunting through the reduction of the above-mentioned risk factors. Expanding the use of family planning can also result in the decline of maternal deaths due to pregnancy related complications as well as preventing high risk and high parity births. Since women/mothers are the main child carers as well as purchasers and cooks of food, a reduction in maternal deaths would mean that more mothers are alive to take care of their babies and children for better nutritional outcomes. The provision of contraceptive services to adolescents and young women will enable them to use their rights to decide when to have a baby. This allows them to have children when they are both emotionally and physically mature, with added advantage to the nutritional status of both the mother and the baby. Contraceptives also enable adolescents to avoid falling pregnant and hence they stay in school, acquiring an education.

Education has been seen to be an important factor in the fight against both stunting and obesity. Educated adolescent girls turn into educated mothers and child bearers who can seek employment and earn an income. This allows them to buy healthy foods for their babies avoiding both obesogenic and nutritionally inadequate feeds. Alleviating poverty is also fundamental in the fight against stunting. Evidence suggests that stunting levels are low in wealthy countries and a decrease in the prevalence of stunting is an indicator of improving socio-economic conditions within the country. It is therefore important for the country to work on poverty reduction mechanisms as this also helps to improve the living condition of the citizens of Zimbabwe. The poor households would be better able to buy no-obesogenic foods and eat healthy, and hence poverty reduction helps to combat both stunting and overweight/obesity

Stunting in children is associated with living in unhygienic environments that are related to poverty, that is conditions of poor water and sanitation. These conditions result in high prevalence of infectious diseases which negatively impact the growth of children. Alleviating poverty also gives women equal opportunities to go to school and acquire an education. Maternal literacy is an important factor in the fight against stunting as educated mothers can seek employment and hence, they have financial resources to provide a nutritionally adequate diet for their families. Education also empowers women and helps them to understand the recommended good IYCF practices, enabling them to feed their

babies and children with nutritionally adequate foods that will promote growth and good health.

A child with a shorter height at 1 year of age as well as increased body weight is at risk of being both stunted and overweight/obese at the same time. Living in a household with a large family size, that is more than 9 people, having a working or a student mother as well as a diet that is rich in carbohydrates and poor in proteins are also other risk factors for co-existence of stunting and overweight/obesity in a child. Keeping children on diets that are rich in carbohydrates but poor in proteins results in excess weight gain coupled by poor linear growth. Maternal obesity is a risk factor for childhood obesity, just as maternal stunting/short height is a risk factor for childhood stunting. It is therefore important to also address maternal health and nutritional status during pregnancy in order to improve the nutritional status of the baby. I think that if a child is born into an environment where fast/obesogenic foods are regularly eaten and is given these foods to eat, that child is at risk of excessive weight gain and hence being obese/overweight.

Maternal HIV status is also associated with the birth and hence nutritional outcome of the baby. Even though ART treatment is used in the prevention of mother-to-child transmission (PMTCT) of HIV, the use of ART has been shown to be associated with LBW and pre-term delivery, both of which are risk factors for stunting. If ART is not used, then babies are likely to be get infected with HIV during pregnancy, delivery of breastfeeding. HIV positive children, just like pregnant women, have increased energy requirements which render them susceptible to growth failure in food insecure environments.

Zimbabwe has some communities that have cultural and social beliefs that hinder good IYCF practices. This usually happens in the rural communities and children are not fed various healthy foods, especially those that are rich in proteins like eggs and organ meats. These are the foods that are crucial, and they are needed to build new muscles for growth in children. Other cultural practices like early marriage have negative impacts on the nutritional status of children. Religion can be an important determinant of behaviour and hence adoption of some recommended practices. The apostolic sect church shuns the use of modern methods of treatment as well as seeking health care or health related services. Women who are therefore members of the apostolic sect church cannot adopt public health measures that promote good maternal and consequently child health, for example family planning and going for antenatal and postnatal care. Apostolic sect women therefore have more children on average as compared to other women from other Christian denominations due to their non-use of contraceptives. This can also cause poor birth spacing, which affects the nutritional status of both the mother and the child. When they do not go for ANC, they miss out on the iron-folate supplementation that is given to every pregnant woman to boost iron levels in the blood. They also lose out on mandatory HIV testing for pregnant women, placing their baby of at risk of contracting HIV either in-utero or during delivery and breastfeeding. Thirty two percent of the households in Zimbabwe belong to the apostolic sect church and this means that one out of every 3 households in Zimbabwe follows the church doctrine. Even though the level of adherence to the doctrine differs from household to household, children who are under five years of age who live in these households are at risk of being stunted as well as facing the intergenerational cycle of stunting and poverty.

Stunting/ chronic undernutrition is a result of chronic hunger, that is hunger or food insecurity that happens over a long period of time. The food security situation of the country varies according to the agro-ecological regions of the country. The drier regions are therefore expected to be more food insecure and hence have a higher prevalence of stunting as compared to the wetter regions of the country. However, as shown by the ZDHS 2015, stunting is highest in the eastern part of the country, which is also the part that lies in agro-ecological region 1. This part of the country receives the highest rainfall and therefore has good agricultural productivity and higher crop yields and is expected to

have less food insecurity. More research is therefore needed to identify the risk factors of stunting in this region such as selling of agricultural produce.

However, the framework that was used also has its limitations. Factors relating to industrialisation and food processing are missing from the framework and in my opinion, these are the ones that have a wider impact on causing overweight/obesity. The industrialisation of the world has resulted in many food factories that produce processed foods that sometimes have added fats and sugars, making them more obesogenic. Industries also hydrogenate healthy unsaturated fats, making them more saturated and hence less healthy. More so, they are used in the manufacturing of common snacks as they enhance the flavour and taste of the snacks, making the snacks favourable. The food industry is also manufacturing processed foods that require little to no time to prepare before consumption, making it convenient for working mothers to easily prepare meals. However, these foods are usually of poor nutritional value. Supermarkets are also on the increase in developing countries, providing people with access to processed and refined foods. Healthy snacks like fruits are usually sold at a more expensive price as compared to the unhealthy foods like crisps and biscuits (which are what are usually given to children as snacks), forcing people to go for the more affordable, unhealthy options. These industries also embark on extensive marketing and advertisement of their products, which encourage consumers to buy. Some advertisements are specifically directed towards children, as they know that parents will tend to buy what their child wants.

3.6 STRATEGIES UNDERTAKEN BY OTHER COUNTRIES IN THE REDUCTION OF THE DBM

- **Bangladesh** reduced levels of stunting from 58.5% to 40.2% from 1997 to 2011. This reflects an annual reduction of 1.3% and a total percentage change of 31.3%. Bangladesh achieved these goals without the implementation of any nutrition strategies or achievements. They did this by addressing nutrition sensitive factors through economic and social development. Economic development was characterised by wealth accumulation at the household level. Improvements of maternal and paternal education were also seen to be important factors. This was done through implementing secondary school stipend policies especially for girls. ANC and post-natal care (PNC) utilisation were also improved through the engagement of the private sector as well as expansion of NGO and Government maternal healthcare services. This consequently helped to reduce fertility rates as well as increase birth spacing. The country also increased its agricultural productivity during the dry season by planting a rice breed that thrives during the drier seasons. This helped to reduce any intrahousehold food rationing which subsequently affects the nutritional status of mothers and children (112).
- **Brazil** also reduced stunting through the improvement of socio-economic conditions in the country. This consequently resulted in an improvement of the living conditions and hence the health status of the population. The number of people living on less than 1.25USD per day was reduced from 25.6% to 4.8% from 1990-2008. Children under 5 stunting prevalence dropped from 31.7% in 1974 to 7.1% in 2007. These gains were made possible through increasing minimum wage and hence improving purchasing power of families, increasing female education rates, upscaling maternal and child health services, improvement of water and sanitation systems as well as improving quality and quantity of food produced by small farms. These strategies were coupled with political leadership, decentralisation, civil society engagement and policies and programs that improved access to social services (114).

CHAPTER 4: CONCLUSION AND RECOMMENDATIONS

4.1: CONCLUSION

Economic development in Zimbabwe as well as urbanisation has led to the nutrition transition in which diets are now energy dense but remain nutrient poor. This is also coupled by a decrease in physical activity as sedentary lifestyles are on the increase. The economic development has led to a decrease in the levels of stunting over the past years, but it has however also contributed towards overweight and obesity, creating a dual burden of malnutrition with the health systems having to cope with both chronic undernutrition/stunting and obesity/overweight related chronic diseases. Tackling stunting is a priority which must be done especially during the first 1000 days of a child's life as that is the window of opportunity when correctional actions taken are bound to work. A stunted child can catch up on growth within his/her first 2 years of life, after which they become stunted for life. The main drivers of under nutrition, including chronic undernutrition/stunting, are associated with poverty which is also related to low levels of education, especially among girls and women. This is especially true for girls who then grow up to be mothers and hence primary caregivers of children under five years of age. The enrolment of girls into schools in the rural areas was lower as compared to males, as well as girls in the urban areas. There is therefore a need to increase school enrolment of girls especially in rural areas. Living conditions that have economic, social and gender inequities increase the risk of intergenerational transmission of stunting and overweight/obesity.

Chronic undernutrition has many immediate and underlying causes and therefore requires multisectoral approaches to solve it. Chronic undernutrition/stunting in childhood will result in an adult of small stature with limited economical productivity. This leads to the intergenerational cycle of poverty and undernutrition, which can be passed on through generations. Overweight/obesity also impairs the child's possible contributions to the society and childhood obesity predisposes the child to chronic diseases later in life.

The DBM therefore requires innovative ways of addressing food insecurity and hunger without contributing towards the growing burden of overweight/obesity. Parents acknowledge the importance of health, growth and intelligence in their children; hence they should be fully informed about the interventions being carried out for them to be involved and take ownership of their children's health. This can help to bring messages on good IYCF across to the parents and guardians and ensure adherence to teachings. Even though nutrition education is effective in improving infant dietary quality, SQ-LNS are still required to close key micronutrient gaps in foods especially iron, zinc and calcium. However, supplementing iron to iron rich children could also increase their risk of malaria infection as well as diarrhoea. SQ-LNS can also be used to supplement food for lactating women for the benefit of their babies who are still on exclusive breastfeeding.

There is a need to develop equity focused policies as well as community capacity building including education about healthy eating and good IYCF. Both stunting and obesity should be prioritised rather than focusing on stunting alone. Solving one problem only could possibly worsen the other, for example alleviating poverty could also mean that people would have more money to buy food and hence contribute towards overweight/obesity. The multiple causal pathways of EED need multifaceted interventions in order to address the problem. The low use of improved sanitary facilities in rural areas requires further investigations into possible social-cultural barriers that could be hindering use of sanitary facilities.

The DBM can give birth to/contribute towards the triple burden of malnutrition which also includes micro-nutrient deficiencies e.g iron deficiencies which cause anaemia. The TBM can also be within a household, population or even at individual level. Addressing the various inequities and inequalities within the country is also crucial in addressing the DBM. They are also the reason for the differences seen in dietary intake, quality and pattern

within a population, causing an unequal burden of disease and morbidity. Cultural and religious beliefs are also key to addressing some of the inequities within the country.

4.2 : RECOMMENDATIONS

- The Ministry of Health and Child Care (MOHCC) should upscale and continue to integrate the coverage of contraceptive services throughout the country, especially among adolescents and young women. This can be done through social and behaviour change communication (SBCC) with communities and community leaders.
- The MOHCC and other stakeholder ministries should work towards improving water and sanitation across the country especially in rural areas to reduce under 5 exposure to unsanitary environments. This includes education campaigns to stop open defecation as well as community initiatives to sink boreholes.
- The MOHCC and other health related organisations should start to implement measures for the reduction of childhood obesity and stunting by promoting good IYCF practices.
- Interventions for adults that tackle obesity should also be implemented e.g having physical fitness days at work and promoting healthy eating habits. This is especially true for women and men of child-bearing age.
- The MOHCC should start distribution of SQ-LNS to all children within the country, especially in rural areas. This should be done alongside with nutrition SBCC in rural areas especially around foods that are regarded as culturally inappropriate for IYCF by various communities.
- Further research should be conducted to investigate the association between the apostolic religion and the outcome of children's nutritional status.
- The ministry of Agriculture should put into place measures that increase agricultural productivity and hence improve food security. This includes seed and fertiliser subsidies. The promotion of drought resilient crops in the drier regions should also be upscaled.
- The MOHCC and Ministry of Justice, Legal and Parliamentary Affairs should develop and implement policies targeted towards the manufacture and marketing of obesogenic foods by food industries.

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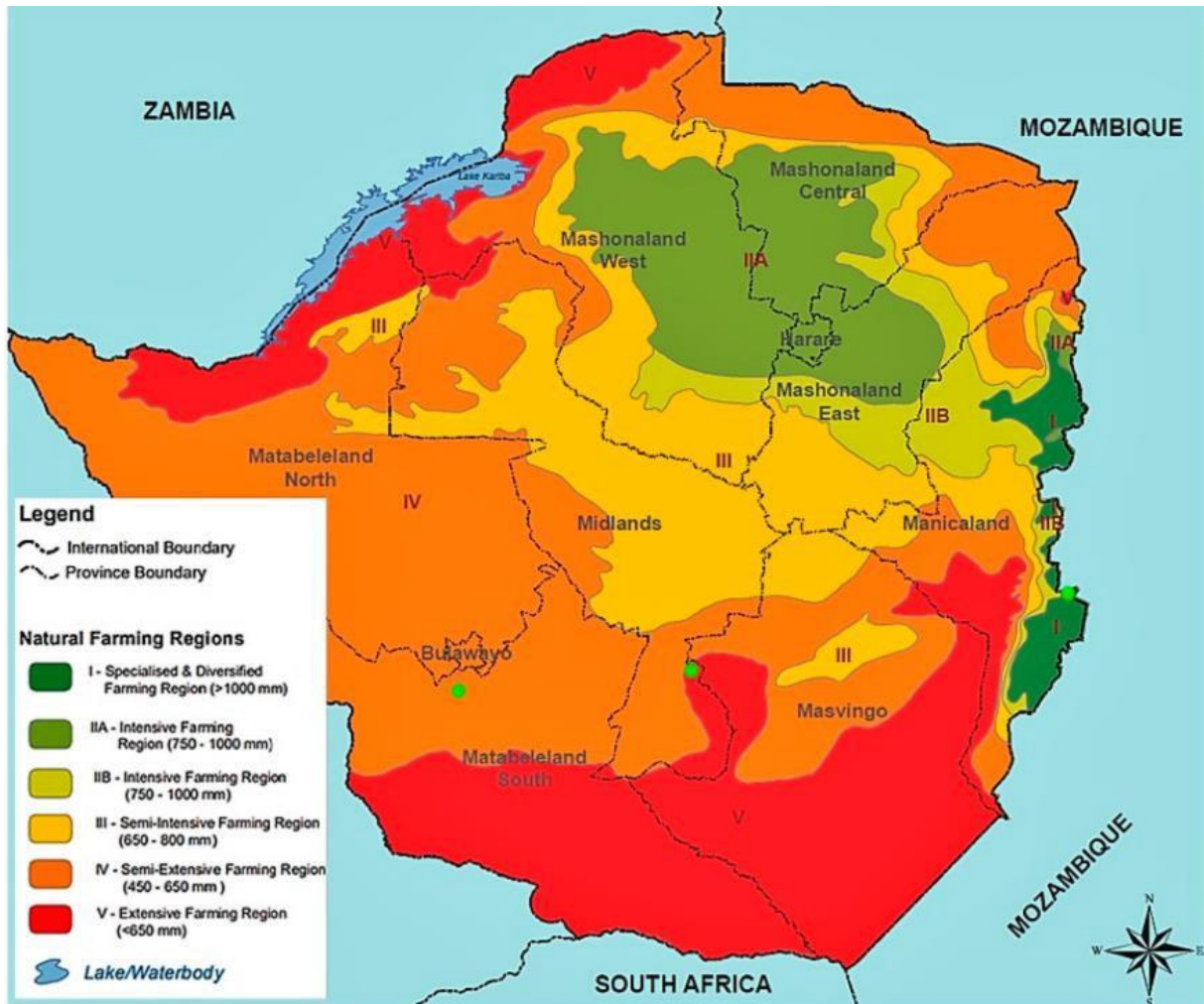
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PHILIPPIANS 4 VS 13: FOR I CAN DO ALL THINGS THROUGH CHRIST WHO STRENGTHENS ME.

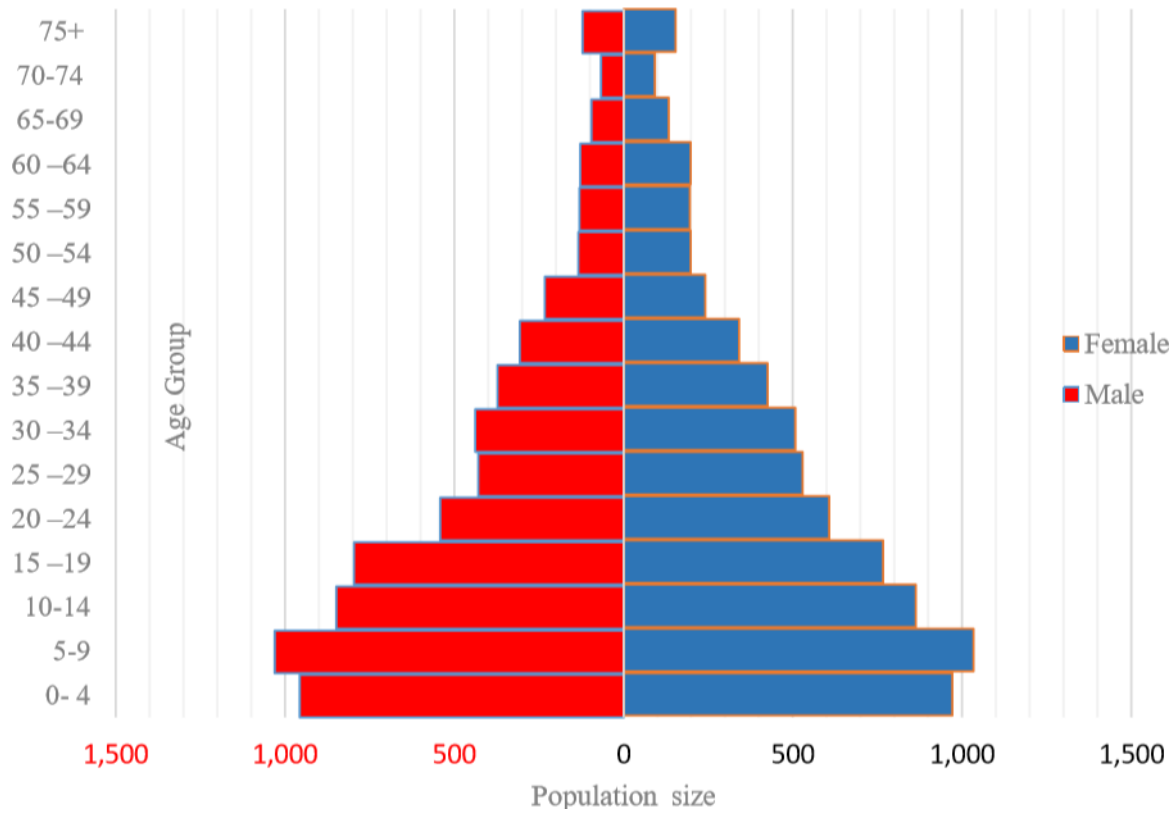
ANNEX

Annex 1: Map of Zimbabwe (including agro-ecological regions)



Source: OCHA 2009 (<https://reliefweb.int/map/zimbabwe/zimbabwe-agro-ecological-zones-map-05-oct-2009>)

Annex 2: Zimbabwe population pyramid



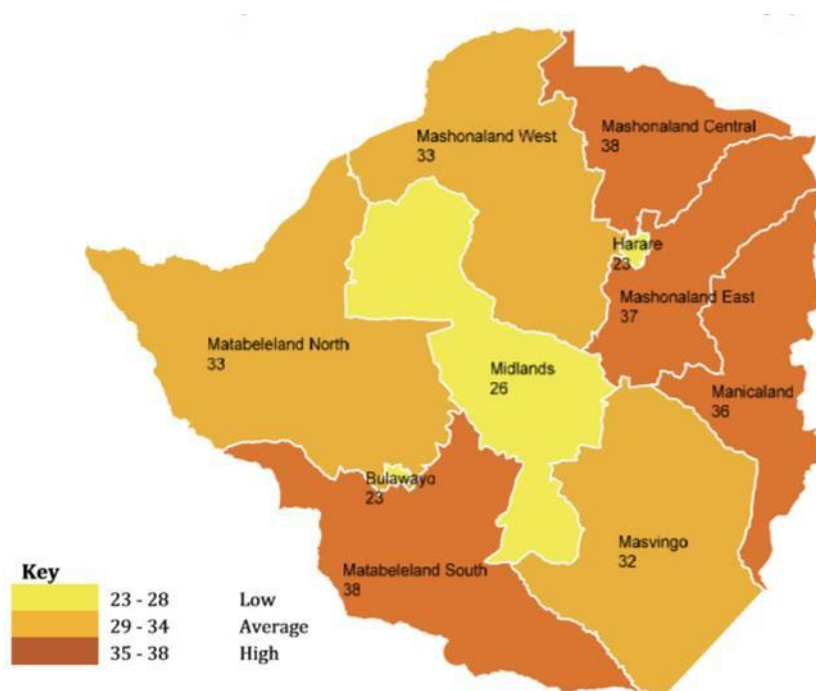
Source: ZimSTAT PICES 2017

Annex 3: Ladder for Sanitation

Service level	Definition
Basic sanitation facilities	These are improved sanitation facilities which are also not shared with other households. They include the use of pour/flush toilet, upgradable blair toilet, pit latrine with slab and blair ventilated improved pit latrine (BVIP)
Limited sanitation facilities	These are improved facilities that are shared between 2 or more households
Unimproved sanitation facilities	These facilities do not guarantee the hygienic separation of human faeces from human contact. They include the use of hanging latrines, bucket latrines as well as pit latrines without a slab/platform.
Open defecation	When human faeces are disposed of in open fields, solid waste, bushes, open bodies of water or other open spaces that are prone to human contact.

Source: ZimVAC 2019 (88)

Annex 4: Distribution of Apostolic sect Church across the country



Source (UNICEF 2015) (102)