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ANALYSIS OF THE SUSTENANCE OF THE POSITIVE DEVIANCE HEARTH STRATEGY BY CAREGIVERS IN MUDZI DISTRICT, MASHONALAND EAST, ZIMBABWE

BY

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Abstract

Post-project studies to examine the sustainability of projects, are discussed but most times they are never implemented. Mudzi district gained from a behavior change community-based nutrition intervention called Positive Deviance Hearth from 2017 to 2020 under World Vision Zimbabwe in partnership with Ministry of Health and Child Care. The nutrition program aimed to identify key growth-promoting behaviors and offer participatory adult nutrition education. This study thus sought to determine whether behaviors learnt by caregivers during the intervention (2017-2020) were maintained in child care, three years after World Vision had left. A cross-sectional study was done on 122 households, 62 of which had been exposed to Positive Deviance Hearth trainings and 60 had no prior exposure to Positive Deviance Hearth. Measurements on nutritional status, one child per household born after the 2017-2020 PD Hearth intervention and one child per household from the unexposed group were done, while their mothers were interviewed. Data was collected and uploaded using KOBO collect software and analyzed using EPI info 7.The results showed that low weight for age was more common in children of caregivers who had never been exposed to Positive Deviance Hearth (8.0%) compared to (5.0%) for Positive Deviance Hearth participants. A double proportion of positive deviant mothers (17.7%) reported continuing feeding of breastmilk to their infants beyond one year mark compared to (8.3%) of the non-participants. Positive Deviance mothers reported feeding their children more frequently (3.1 meals per day) than their counterparts (2.7 meals per day). Extremely statistically significant differences were noted in dietary composition between Positive Deviance Hearth exposed group and Positive Deviance Hearth unexposed group ($p=0.003$ and $p=0.001$, respectively). The Positive Deviance Hearth trained mothers had a 44.4% less chance of having underweight children than those who were not on the program. Results showed no significant association between caregiver exposure to PD Hearth and underweight of children (OR= 0.6, 95%CI: 0.2 – 1.9, $p=0.348$). Study concludes that, infant growth-promoting behaviors that were discovered through Positive Deviance Hearth and put into practice during community based sessions continued to exist. Infants born later who were not directly exposed to the program grew better as a result of these sustained behaviors by their caregivers.

Keywords: Post-project, Positive Deviance Hearth, Caregivers, child care, nutritional status

Declaration

I declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.

Taonga Trish Magomo  01/04/24

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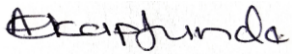
Dr. Abigail Kapfunde 

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List of Acronyms and Abbreviations

GAM	Global Acute Malnutrition
IYCF	Infant and Young Child Feeding
MoHCC	Ministry of Health and Child care
NGO	Non-Governmental Organization
PD	Positive Deviant
PD/Hearth	Positive Deviance Hearth
SAM	Severe Acute Malnutrition
UNICEF	United Nations International Children's Education Fund
WHO	World Health Organization
ZimVAC	Zimbabwe Vulnerability Assessment Committee

Definition of Key Terms

- Positive Deviance Hearth is a community-based behavior change program that aims to rehabilitate malnourished (identified as underweight) children in the context of their own homes (Tadesse, Ekström, & Berhane, 2016)
- Positive Deviants are individuals or groups whose uncommon behavior and strategies enable them to find better solutions to health problems than their peers. Positive Deviance aims to identify these behaviors and allow the rest of the community to learn from them (Mulenga, 2014)
- Hearth means fireplace (Macmillan dictionary)
- Future infants refers to children that were not yet born or brought to birth during Positive Deviance Hearth implementation period
- Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy or nutrients (Tadesse et al, 2016).
- Undernutrition includes wasting that is low weight-for-height, stunting that is low height-for-age and underweight which is low weight-for-age (Tadesse et al, 2016).
- Minimum Acceptable Diet is a composite indicator of minimum dietary diversity and minimum meal frequency. Proportion of children 6–24 months of age who received a minimum diversified diet and minimum meal frequency (apart from breast milk) (Scarpa et al, 2022).
- Minimum Dietary Diversity refers to children 6–24 months of age who consume from 4 or more of the 7 food groups (grains/tubers/roots, legumes/nuts, milk/diary product, eggs vitamin A rich, flesh foods and other fruits and vegetables) with 24 hours' dietary recall (Scarpa et al, 2022).

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CHAPTER 1 INTRODUCTION

1.1 Introduction

Efforts have been made at both national and global level to address malnutrition. Nevertheless, 149, 2 million children under 5 suffer from stunting and 45% of deaths in children under 5 are accounted to under nutrition most of whom are from low-middle income countries (World Health Organization [WHO], 2020). These numbers are likely to soar due to constraints in accessing nutritious diet and disruption of livelihoods due to COVID-19 pandemic (WHO, 2021). Despite efforts to address undernutrition through different interventions, policies and programs by the Ministry of Health and Child Care (MoHCC) as well as other private and international Non-Governmental Organizations (NGOs), it continues to cause unacceptably high levels of mortality and morbidity particularly in children under the age of 5 (Dukhi, 2020).

Noteworthy, limited studies and dialogue still remain as to the most effective yet sustainable approaches to address malnutrition in young children. Most studies focus on examining program efficiency and the gains attained during the implementation stage whereas post project studies to examine sustainability of projects in future are discussed but almost never implemented. Henceforth, there is need to assess sustainability of nutrition interventions when it comes to preventing malnutrition in order to improve future interventions. Recently, documentation of many Positive Deviance Hearth interventions has failed to meet adequate scientific pattern, and research findings of majority of such studies have not been disseminated in peer reviewed publications.

Resultantly this has weakened the strength of research evidence as many of the results of Positive Deviance Hearth studies are gathered from grey literature thus lacking in crucial

details and in-depth analysis (Sosanya, Adeosun, Okafor & Ifitezue, 2017). Proper documentation is imperative for providing empirical evidence that will initiate novel policies as well as innovative thinking. Furthermore, in light of Zimbabwe's current economic status there is need for researchers to create momentum on less costly community-based interventions such as the Positive Deviance Hearth Approach. The research can be informative for purposes of programming and aid the country to meet the global target to reduce malnutrition by 40% by the year 2030 as well as reduce on costs related to health care.

1.2 Background to the Study

The World Health Organization defines, nutrition as 'the intake of food, considered in relation to the body's dietary needs. In addition, good nutrition is a key determinant of health. In a scenario where there is an imbalance between the food consumption and dietary needs the resulting condition is malnutrition (WHO, 2019). Noteworthy the term malnutrition encompasses both over nutrition (obesity) and undernutrition (stunting, wasting, underweight, mineral and vitamin related malnutrition) (Dukhi, 2020; WHO 2019). This research however mainly focuses on the undernutrition aspect of malnutrition.

Mudzi district has been burdened with both acute and chronic malnutrition. In 2017 World Vision introduced a behavior change program called Positive Deviance Hearth to address malnutrition. The Positive Deviance Hearth approach (PD Hearth) aims to rehabilitate malnourished children through use of practices from "Positive Deviants" that is mothers in the community who have well-nourished children despite living in poverty (Bisits Bullen, 2011). This program is mainly anchored on behavior change in order to provide a platform for rehabilitation of underweight and wasted children without medical

complications, sustaining their rehabilitation and preventing future malnutrition. The program makes use of positive behaviors devised by other members of the community to overcome barriers to good health (Kang, Kim, Sinamo & Christian, 2017; Schooley &Morales, 2007).

World Vision in partnership with Ministry of Health and Child Care implemented this behavior change, community-based nutrition intervention in 7 wards of Mudzi district from 2017-2020 with the goal of curbing malnutrition in children under 5. Notable changes in rehabilitation rates of malnourished children were noted. The district also recorded a significant 50% decrease in Global Acute Malnutrition during the 3-year period of implementation.

Though the district still ranked as highly food insecure a notable decrease in prevalence of Global Acute Malnutrition from 5% in 2017 to 2.5 in 2021, stunting from 32% which was above the WHO threshold to 26% and cases of Severe Acute Malnutrition from 2.5 to nil was noted (Zimbabwe National Nutrition Survey, 2018; Zimbabwe Vulnerability Assessment Committee [ZimVAC] report, 2021). The aforementioned decline was also noted despite continued depreciation in food security and poor water and sanitation hygiene conditions (Zimbabwe Vulnerability Assessment Committee [ZimVAC] report, 2021).

Noteworthy, there has been an increase in coverage of nutrition education and access to health-related information to 56% and 92% respectively (ZimVAC report, 2021). These above-mentioned factors are all identified in the UNICEF conceptual framework for malnutrition as underlying causes and variables related to malnutrition.

However, on the downside the 2022 ZimVAC report recorded high values of Moderate and Severe Acute Malnutrition above the 5% threshold and the Global Acute Malnutrition at 14%. Speculation henceforth of the reduction in malnutrition from 2017 to 2020 could rise from that caregivers were adopting positive deviant behaviors and applying them in child care. This study therefore sought to conduct a post project research and examine whether the caregivers sustained the Positive Deviant behaviors from the period 2017-2020, two years later in future infants.

In light of the Zimbabwean country's current economic status community nutrition interventions such as Positive Deviance Hearth can be economically sound when it comes to addressing malnutrition. Use of PD hearth functions such as decentralized growth monitoring, Infant and Young Child Feeding counselling, participatory health and hygiene education and public motivation to collaborate and combat malnutrition can bring to light an economically sound and long-standing solution to this burden of malnutrition in the country and its detrimental effects on individuals and nation at large.

Conversely, the food insecurity aspect of Mudzi district provided an avenue to explore on whether caregivers can sustain the acquired Positive Deviant behaviors in future infants after withdrawal of support from World Vision in the presence of such hindrance. Therefore, given the benefits PD hearth was able to achieve during implementation it was pertinent to examine the ability of mothers or caregivers under this resource constrained setting to sustain adopted Positive Deviant behaviors in infants born to them after the 2017 to 2020 period thus preventing malnutrition in younger siblings and improving child nutritional status overall.

1.3 Statement of the Problem

Post-project studies to examine the sustainability of projects, are discussed but most times they are never implemented. Mudzi district gained from a behavior change community-based nutrition intervention called Positive Deviance Hearth from 2017 to 2020 under World Vision Zimbabwe in partnership with Ministry of Health and Child Care. Significant changes in prevalence of malnutrition were noted at end of program evaluation (GAM from 5% to 2.5%) as well as knowledge in child care practices among caregivers (56% coverage of district population) (ZimVAC, 2021).

Nevertheless, the district has continuously been burdened by excessive droughts leading to high levels of food insecurity deterring most households from having access to diverse diets. ZimVAC report for 2022 recorded high values of Moderate and Severe Acute Malnutrition above the 5% threshold and the Global Acute Malnutrition at 14%. This study thus sought to bridge the gap currently existing in post project studies by examining whether there was sustenance of Positive Deviance Hearth behaviors of 2017 to 2020 among mothers and caregivers in child care of future infants born after the period of intervention under such a resource constrained background.

1.4 Research Objectives

1.4.1 Main Objective

To determine sustainability of Positive Deviance Hearth Intervention behaviors adopted by mothers and/or caregivers of children 6 to 23 months old in Mudzi District, 2023.

1.4.2 Specific Objectives

- To assess the proportion of caregivers who still utilize the Positive Deviance Hearth Intervention behaviors they adopted in 2023.

- To determine the proportion of infants, 12 to 23 months on continued breastfeeding at one year in Mudzi District in 2023.
- To determine the proportion of infants, 6 to 23 months receiving the Minimum Acceptable Diet in Mudzi District in 2023.
- To assess the prevalence of underweight (weight for age) in infants, 6 to 23 months in Mudzi District in 2023.

1.4.3 Research Questions

What proportion of caregivers still utilize the Positive Deviance Hearth intervention behaviors they adopted?

What proportion of infants of Positive Deviance Hearth participants born after 2020 is on continued breastfeeding beyond one year?

What proportion of infants 6 to 23 months is receiving the Minimum acceptable diet compared to non-participants?

What is the prevalence of underweight in infants born to 2017 to 2020 Positive Deviance Hearth Participants in comparison to those of non-participants in Mudzi district?

1.5 Assumptions/ Hypotheses

H0: Positive Deviance Hearth strategy does not improve nutritional status of future infants.

1.6 Significance of the Study

1.6.1 To Public Health

Positive Deviance behaviors can positively alter the nutrition landscape for children by preventing malnutrition from the onset, thereby having a ripple effect especially for

younger siblings. Sustained benefits from positive deviance have been described in Uganda (67.5% of PD/Hearth participants attained recovery after 26 days); malnutrition cure rates improved from 59.5% to 72.7% within 2 years (Brackett, 2007). Henceforth if successfully integrated into national policies and strategies in the country there is increased possibility of achieving the 2030 Global Nutrition targets of improving nutritional status and addressing prevalence of malnutrition.

1.6.2 To Zimbabwe and other Low-income countries globally

Positive Deviance Hearth is associated with low costs of behavior change strategies ($15 per household per annum) whilst the benefits are high (US$53–153/DALY saved) in comparison to treatment of SAM (cost - US$200/child/episode, benefit - US$41/DALY saved (World Vision, 2011). Cost analyses of the Positive Deviance Hearth approach in various settings have provided evidence of its affordability (Klaas, Baik & McNulty, 2014). If the outcome of its sustenance is significant this will inform Zimbabwean policy makers whether the intervention can be scaled up. Additional ripple benefits being the ability to cut down on health care costs that are associated with development of Non-Communicable Diseases in later adult stages such as diabetes as a result of chronic malnutrition during childhood. Moreover, it will also save citizens from being subjected to poverty as a result of high out-of-pocket costs incurred in trying to access health care and treatment.

1.6.3 To the researcher

The research will broaden the scope of knowledge of the researcher when it comes to examining post project studies and sustainability of community based public health

interventions under resource constrained setting. Moreover, identify gaps in those interventions and recommend solutions to improve the interventions. In addition, it equips the researcher with knowledge to advocate for policy making and review with regards to community nutrition interventions and also join the global talks on effectively addressing malnutrition in low income and highly food insecure countries.

1.6.4 To the institution

The sustenance of adopted healthy behaviors in community-based nutrition interventions through PD Hearth in addressing malnutrition and even other public health problems is an under explored area in the Zimbabwean context as well as in the African region. Henceforth the obtained results might be used as references by other scholars who might want to undertake associated work. The research might also provide an eye opener to gaps in related studies yet to be explored.

1.7 Delimitation of the Study

The study was conducted in the 7 wards in Mudzi district that World vision implemented Positive Deviance Hearth during the period from 2017 to 2020. The study sample was drawn from population comprising of 1940 Positive Deviant Hearth participants with children born after 2020. A Cross- sectional approach on a cohort was employed.

1.8 Limitation of the study

The study has certain limitations to it. The comparison population was chosen from the same 7 wards where Positive Deviance Hearth Strategy had been implemented a few years back. This means that the comparison group shared the same geographical location with the caregivers that had been trained in Positive Deviance Hearth and as such, chances of

data contamination are probably high. This is because as neighbors, untrained caregivers could copy certain behaviors from Positive Deviance Hearth trained mothers and incorporate them in child care. Selecting comparison group from different wards than the ones where Positive Deviance Hearth had been implemented would have been preferred but however other factors would then cease to be constant and controlled such as the similarity in terms of sociodemographic, geography, coping mechanisms and food security.

An additional constraint is that attention was solely directed towards obtaining data from households who had participated in Positive Deviance Hearth from 2017-2020 and later bore another child after this period, which greatly resulted in smaller sample due to loss to follow up as well as relocation of some households who fitted the inclusion criteria. Henceforth the small sample at times failed to give statistically powerful results for instance with regards to comparison of underweight prevalence between groups, the power to detect significant findings was limited. Nevertheless, given the restrictions of the research setting, attaining a bigger sample size for this study was not viable.

In addition most of the assessments entailed determining point prevalence rather than being observational. This poses the risk of producing over estimated results from self-reporting as participants may report that they are undertaking certain behaviors which they know to be ideal while they actually are not.

The study also failed to decode other confounding factors that could influence some parts of the results of the study for instance the issue of whether participants were beneficiaries of other social protection programs which then boosted their socio-economic status as well

as their food security status such as being part of the World Food Program Social and Humanitarian Food assistance program that was ongoing when data was collected.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1 Introduction

The chapter will provide a comprehensive review of related literature on current situation analysis of child undernutrition in Zimbabwe, other low-income African countries and global trends at large. The concept of Infant and Young Child Feeding in context of developing countries shall be discussed. Research findings of Positive Deviant Hearth programs and or similar approaches under different settings as well as successes, gains and weakness in other countries. The objectives of the Positive Deviance program shall be laid out and their feasibility in under developed settings discussed.

2.2 Theoretical Framework

The UNICEF Conceptual Framework for the Determinants of Child Nutritional Status signifies adequate diet quality and good health as primary requisites for child growth. This conceptual framework recognizes the importance of good maternal care practices, maternal knowledge, access to health services, and access to healthy foods in child growth (Smith & Haddad, 2000).

The UNICEF conceptual framework also bears recognition that the underlying causes of malnutrition are influenced by the financial and human resources available as well as organization capacity that are often determined by national policies, politics, and financial resources allocated towards child health (Engle et al., 1999; Smith & Haddad, 2000; UNICEF, 1990). This study's literature review follows the UNICEF conceptual framework for nutrition, looking at the global nutrition situation and then draws attention to proximal determinants of malnutrition, and interventions. Specific consideration is given to IYCF practices and the PD/hearth approach.

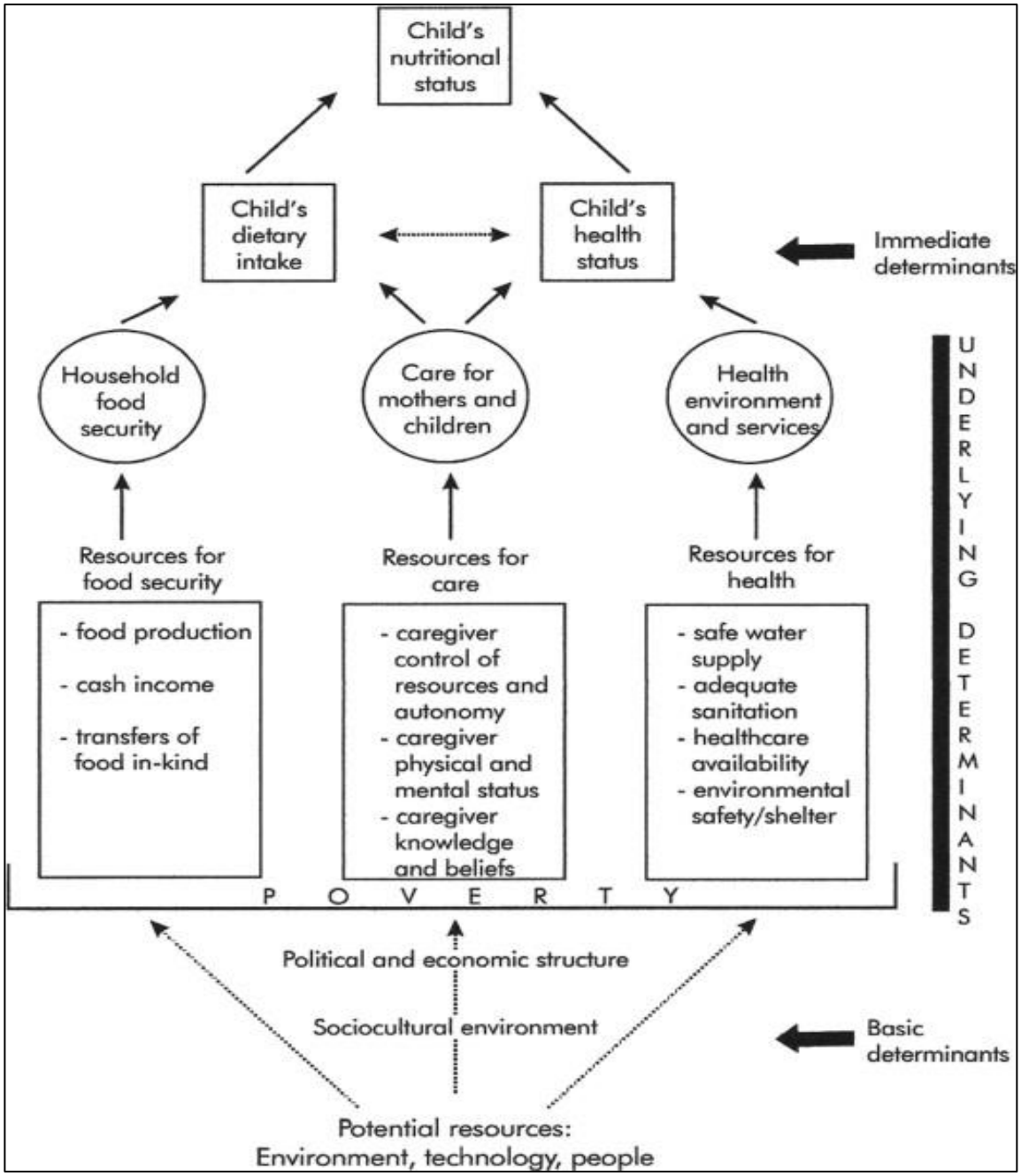

Figure 1: UNICEF conceptual framework for child nutritional status

2.3 Relevance of the theoretical framework

A few decades ago, UNICEF launched the main initiative to promote and elucidate the notion of care in connection to the nutrition of young children. Figure 1 illustrates the conceptual framework that was part of the UNICEF nutrition strategy (UNICEF, 1990), which identified food, health and care as the root causes of undernutrition in young children. As each was acknowledged as being necessary but insufficient on its own to improve the nutritional status of young children, a conceptual framework was developed to guide the community-wide "Triple A" process of assessment, analysis, and action (Shrimpton, 2020).

Role of care from the caregiver has often been ignored when it comes to its influence on child nutritional status. For instance, in spite of the ability to assess nutritional status through growth monitoring, it is almost difficult to assess causes of growth failure in the cases of malnutrition. Hence, the conceptual framework, comes in to help communities in determining for themselves what measures to take to ensure the care of mothers and children in order to promote normal and healthy development in children. This comes after increased acknowledgement in nutrition programs that development cannot occur solely through top-down or bottom-up approaches, but rather requires an integration of both (Shrimpton, 2020).

Community-based nutrition programs must be tailored to the unique needs of the local community. Particularly, they must identify local solutions for subpar breastfeeding and poor supplementary feeding, which are common issues among mothers and children. This is where this conceptual framework becomes more relevant to this study in relation to the Positive Deviance Hearth strategy. Initially, community-based programs were built

around health sector-promoted program thrusts like immunization. Later, these interventions were expanded to include the Essential Nutrition Actions (WHO, 2013). These were ultimately termed nutrition-specific interventions as alluded by Bhutta in Shrimpton (2020). The inclusion of additional industries like social security and sanitation led to the development of nutrition sensitive programs.

Meanwhile, national nutrition workforce strategy and implementation plan was deemed an essential component of any national nutrition plan. As the importance of capacity development in public health nutrition programs increase the need for management tools to be able to measure whether such efforts are on track become evident. It is likely that capacity development initiatives will not be sustainable or effective if they solely focus on the labor level, neglecting to take into account the community, organizational, and systemic aspects. A national nutrition workforce strategy should include such extensive capacity building initiatives. This strategy should be measured using a variety of indicators, as well as level of nutrition training at community level (Shrimpton, 2020). This can thus ensure that nutrition targets are met.

2.4 Child Undernutrition in African Countries and Global Perspectives

Over the years a number of nutrition programs and interventions have been spear headed and implemented globally and across the African continent with the goal of fighting malnutrition particularly in children under 5 (Brackett, 2007). Epidemiologists have alluded that millions of children are dying annually due to underweight that is about 45% of deaths (Black et al., 2013; Joint Monitoring Estimates, 2020).

The cases have been noted to be more significant in developing countries where 80% of the global burden of malnutrition is noted (Fentahun, Wubshet & Tariku, 2016). Slightly

underweight children are twice likely to die, whereas the extreme cases, which is those severely underweight are five to eight times more likely to die in comparison to well-nourished children (Dukhi, 2020). This more so due to the fact that underweight children are more susceptible to infectious diseases (Seetha et al., 2018; WHO 2021).

Malnutrition occurs in different forms classified under two categories namely: Over nutrition and under nutrition. According to Tadesse et al., (2016), undernutrition manifests as wasting or low weight for height (acute malnutrition), stunting or low height for age (chronic malnutrition), underweight or low weight for age, and mineral and vitamin deficiencies. Over nutrition embraces overweight, obesity and diet related non-communicable diseases (NCDs) such as diabetes mellitus, heart disease, some forms of cancer and stroke (Tadesse et al., 2016). However, this study is more oriented towards the under-nutrition category with underweight that is low weight for height as the primary indicator under study. As of 2008, 8.8 million global deaths recorded in children under 5 years old were due to underweight, of which 93% happened in Africa and Asia (Black et al., 2008; Black et al., 2013).

If malnutrition is eliminated it is projected that 32% of global burden of diseases would have been alleviated (WHO, 2019). In developing countries progress towards tackling malnutrition in its various forms remains relatively slow. Zimbabwe despite currently being on track with regards to meeting global targets for 2030 the inconsistency of malnutrition trends over the years is of concern. Possible causes could be poor household food security and disruption of livelihoods, poverty as well as other socioeconomic factors (WHO, 2019).

The nutritional status of children in Zimbabwe has shown deterioration with the minimum acceptable diet in young children having gone down to a record low at 2.1%, which was a decline from 6.9% recorded in 2019 according to ZimVAC assessment (Zimbabwe Situation Report, 2021). The trends in prevalence of malnutrition in Zimbabwe have continued to fluctuate over the years and this lack of consistent decline poses a great threat in achieving the 2030 target of 40% reduction of malnutrition levels hence the need to identify sustainable nutrition interventions to address future malnutrition.

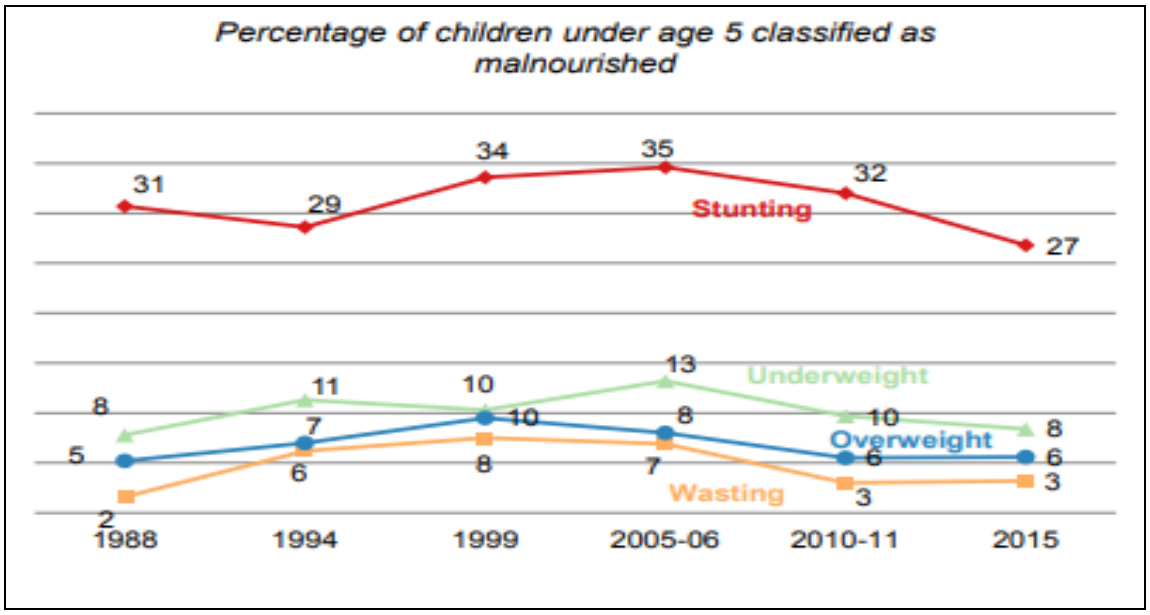

Figure 2: Trends of malnutrition in children under 5 in Zimbabwe over the years

Undernutrition continues to greatly contribute to the global disease burden as more than one-third of child deaths worldwide are being attributed to undernutrition (Global Nutrition Report, 2018). Common causes of undernutrition are mentioned below.

2.4.1 Inadequate quantity of food

Food shortages may be acute (sudden/sharp) or chronic (long-lasting) and arise as a result of poverty, natural disaster for instance the El Nino phenomenon or conflicts, which may

lead to the displacement of people from their homes and disruption of food supplies. The Food and Agriculture Organization (FAO) estimated that about 800 million were food insecure globally in the year 2014 this number steadily decreased to 663 million in 2017 but COVID-19 pandemic and rise in conflict affected countries might have reversed this progress. ZimVAC 2020 report alluded that 56% of the Zimbabwean rural population are food insecure all this being attributed to the erratic rainfall patterns, high food prices, pests and diseases and disruption of livelihoods by the COVID-19 pandemic. Thus, impeding the goal to "end hunger" and improve nutrition by 2030.

It is also imperative to note that the study site Mudzi district has been burdened with high levels of chronic food insecurity exacerbated by El Nino droughts and siltation of water bodies over the years (ZimVAC, 2020). Meanwhile, the Positive Deviance approach has been recommended in areas with food security (Baik, 2019). Noteworthy, this was not the case in Mudzi District. This alone thus presents a gap to study the sustenance of the adopted behaviors by caregivers where the program has already been successfully implemented yet in a setting with food insecurity as a barrier. ZimVAC report (2022) signifies that 48% of households in Mudzi district are food insecure.

2.4.2 Inadequate quality of food

More often poor households may not have access to the variety of foods that will provide all the necessary vitamins and minerals in their diet. Moreover, they may also lack the knowledge needed to make sound choices about the food they eat or provide to their children (Tesfaye, 2009) This is substantiated by 2023 ZimVAC assessments, where nutritional content when purchasing food for household consumption should be a prerequisite factor considered, but only 6% of Zimbabwean households took this into

account (ZimVAC, 2023). Rather 55% of households were mainly influenced by price of food when it came to decision making of what to purchase.

A child's ability to survive, grow, develop, and learn is greatly hampered by a poor nutrition. A child's quickly growing body and brain can be irrevocably be harmed by diets deficient in key vitamins and minerals during the first two years of life. Stunting, wasting, and micronutrient deficiencies can also exacerbate this. Children who consume meals heavy in fat, sugar, or salt may develop unhealthy eating habits, become overweight, or develop disorders linked to diet (ZimVAC report, 2023).

Studies have also shown that there is high prevalence of malnutrition in children under 5 belonging to mothers or primary care givers without education (Seligman, Laraia & Kushel, 2010; Tesfaye, 2009). Zimbabwe Vulnerability Assessment Committee reports corroborates this as they have indicated decrease in mortality rates with increase in mother’s level of education. Reports have associated Mudzi district with 0% of households having access to minimum acceptable diet this in turn increases the risk of malnutrition among children under 5 (ZimVAC, 2021). As of 2023 only 1.3% of children in the 6 to 23 months category in Zimbabwe had access to minimum acceptable diet (ZimVAC report, 2023).

In a study conducted in Zimbabwe, food insecurity and malnutrition were significantly predicted by socioeconomic status (wealth index) and housing status. Economic status has been shown to hold a significant impact on the amount and variety of food available in the home (Lukwa et al., 2020). The majority of food insecure and malnourished children are witnessed from low-income rural households. Since the majority of people live in poverty in rural areas, where food insecurity and malnutrition are common phenomena, it

becomes particularly concerning when one assesses feasibility of successful sustenance of Positive Deviance Hearth behaviors (Owoaje et al., 2014). The prevalence of food insecurity has even increased after World Vision concluded its implementation of Positive Deviance Hearth in Mudzi district in 2020. Results from the vulnerability assessment indicated that 26% of rural population were food insecure. The Zimbabwean government emerged as the main source of food assistance (9.2%) followed by development partners (5.3%) and churches (2.2%) (ZIMVAC, 2023).

Study findings by Lukwa et al. (2020), indicated a rise in malnutrition among low-income households, which is consistent with Zimbabwe's growing wealth gap. Thus, this suggests that although food security was addressed to a certain extend and children were somehow eating, it was not a healthy diet. Findings from other African nations corroborated this notion (Dafursa & Gebremedhin, 2019; Lukwa et al., 2020; Owoaje et al., 2014). The impoverished, who were primarily from rural areas of Zimbabwe, were disproportionately affected by the differences in food insecurity and malnutrition that existed within subpopulations.

Given how poverty affects malnutrition, the health system plays a critical role in reducing this suffering by offering vital medical services but PD Hearth even offers a less costly solution to poverty and malnutrition. Whereby, in contrast to treating SAM, which has costs of US$200/child/episode and benefits of US$41/DALY saved, Positive Deviance Hearth is linked to low costs of behavior modification methods ($15 per home annually), but the benefits are substantial (US$53–153/DALY saved) (World Vision, 2011). The affordability of the Positive Deviance Hearth approach has been demonstrated by cost evaluations conducted in a variety of settings (Klaas, Baik & McNulty, 2014).

In order to solve various nutritional difficulties, results from studies indicate that food insecurity and malnutrition should be addressed concurrently (Lukwa et al., 2020). It is of paramount importance to remember that food insecurity and malnutrition among children in Zimbabwe are more complex issues that should not be sole centered on diet and nutrition. Instead, a larger social and economic background influenced by the children's residential location shapes these two child health issues.

2.4.3 Infections

Infections have been associated with reduced appetite, increased energy and nutrient utilization as a means to fight infection and limited ability to absorb or retain nutrients as a consequence of diarrhea and/or intestinal parasites. However, incidence of these diarrheal diseases and subsequent mortality rates can be curbed by monitoring malnutrition (Malekafzali, 2000). On another note, Mudzi district is among one of the districts that still has high levels of practicing open defecation which weakens the sanitary and hygienic conditions of communities and increases risk of incidences of diarrheal diseases.

A proportion of 28% of the district's population are still practicing open defecation (ZimVAC report, 2021). This greatly increases the risk of undernutrition in light of the strong interrelationship that exist between diarrheal disease and malnutrition (Seetha et al., 2018). Unfortunately, infants and young children because of their need for extra nutrition for growth and development as well as comparatively limited energy reserves, they remain the most vulnerable (WHO, 2021). Consequently, undernutrition can have drastic as well as various implications on child's development and survival in the short and long term.

The World Health Organization (2003) discovered that illnesses produced by contaminated food and water have a substantial impact on various health issues. Despite efforts to reduce food-related illnesses, they are reportedly on the rise (Wandolo, 2018). According to the Centers for Disease Control and Prevention [CDC] (2005), poor hygiene practices, inadequate cooking, unsuitable keeping temperatures, contaminated equipment, and poor personal hygiene all play a substantial role in the spread of diarrheal illnesses among both adults and children.

Symptoms may vary by individual and location, but typically include moderate gastroenteritis to life-threatening neurologic, hepatic, and renal syndromes (Hughes, 2000; Wandolo, 2018). The most prevalent disease-causing organisms include *Escherichia coli 0157:H7, Salmonella, Campylobacter,* and *Staphylococcus*, among others (CDC, 2004; Wandolo, 2018). Some of these microbes have the ability to mutate and reappear as different microorganisms. This characteristic, frequently detected in *Salmonella enteritidis* and *Escherichia coli 0157:H7*, impede the reduction of diarrheal illnesses and infections caused by contaminated water and food.

Most African countries face significant difficulty in distributing and maintaining an appropriate supply of portable water (Green, 2003). Furthermore, inadequate sanitation as well as Water and Sanitation and Hygiene (WASH) related infrastructure have been linked to lower hygienic standards in homes and environment, causing food and water to be contaminated (Wandolo, 2018). The majority of Zimbabweans, lack proper informed training and knowledge in food preparation and handling, even in spite of the existence of laws governing food safety and standards. Studies indicate that even though caregivers may be aware that handwashing before food handling and preparation is critical they still

might not do it. Some of the reasons being water shortages or long distances that need to be travelled in search of water and failure to properly dispose child feaces as some households lack infrastructure such as Blair toilets.

This is countersigned by research finding that indicated low knowledge with regards to recommended food safety measures amongst Zimbabwean households. Only 42% of Zimbabwean households recognized use of safe water and raw materials as a recommended food safety measure to prevent infections and diarrheal illnesses in homes (ZimVAC report, 2023). Furthermore only half (50%) consistently observed proper sanitary and personal hygiene during food preparation. This percentage however is not statistically significant when it comes to addressing malnutrition and diarrheal illnesses and may need to be increased to 80% (ZimVAC report, 2023).

Nevertheless in light of all the aforementioned in relation to PD Hearth these may also pose as barriers to successful sustenance of utilization of learned behaviors

2.5 Determinants of Malnutrition

Studies have come up giving a number of factors that can lead to malnutrition or exacerbate prevalence of malnutrition in children under five. Limited resources as well as a lack of sufficient nutrition knowledge have been coined as some of these factors, and as a result, poverty has more often than not been linked to malnutrition (Bisits Bullen, 2011; Brackett, 2007; Okochil, 2016). Meanwhile, there is contradicting evidence indicating that despite progressive global poverty reduction efforts over the past years, the economic gains inevitably have not translated into improved nutrition (Okochil, 2016; Webb & Lapping, 2002).

Discoveries from a study done in Makueni by Macharia et al. (2005) corroborates the above as stunting among children remained a problem even though community development and capacity building in particular poverty eradication support was given by World Vision Kenya (Macharia et al., 2005; Okochil, 2016). Instead of outcomes expected after controlling for socio-economic status, no significant difference in the nutritional status of children covered under World Vision program and the control was observed.

Hence one might speculate that evidence indicating linkage between child malnutrition and poverty has been distorted (Appoh & Krekling, 2005; Okochil, 2016). For instance, for an area with chronic drought situations like Mudzi District, food shortages are bound to occur thus resulting in inadequate dietary intake over the long term. Nevertheless, there are households with children who are well-nourished in the district referred to as "Positive Deviants" even though they are also poor. Determining caregivers' nutritional knowledge on Infant and Young Child Feeding and understanding how it influences their behaviors when it comes to child care and consequently their nutritional status is of paramount importance when it comes to addressing future malnutrition (Okochil, 2016).

Most African countries are characterized by patriarchal societies where nutrition and child care are primary responsibilities of women. However, studies have alluded that lack of awareness and capacity building among women for decision making can be the cause for ill infant feeding practices (Okochil, 2016). Poor infant feeding practices directly or indirectly lead to undernutrition in children under 5. Caregivers' knowledge relatively affects the quality of caregiver's feeding behavior as well as the complementary diet prepared by the caregiver for the child. A study in Rwanda also identified the following as proximal determinants of malnutrition (Brackett, 2007).

2.5.1 Child feeding practices

How often a child is fed and composition of meal fed. Breastfeeding is another aspect of this determinant examining when breastfeeding was initiated, the duration of breastfeeding, and the number of times a child has received anything to eat in the last 24 hours. All have been shown to be associated with nutritional status (Brackett, 2007). In a study done in Manicaland province of Zimbabwe by Mhlanga et al. (2015) it was found that unfavorable cultural and religious traditions, negative peer pressure, negative influences from in-laws, as well as myths and misconceptions are the biggest obstacles to exclusive breastfeeding. The low percentage of exclusively breastfed babies is mainly brought about by negative perceptions and attitudes such as laziness, lack of interest, perceived inadequacy of breast milk, perceived inability to produce enough breast milk, dissatisfaction with low male support, and perceived disempowerment of women in making important decisions regarding infant feeding. In order to raise awareness and change attitudes, community social mobilization should be strengthened and involve both men and women, as well as other influential members of each family (Mhlanga et al., 2015).

2.5.2 Health-seeking behaviors

Children under the age of five are primarily cared for by their mothers. Their preoccupation with health both before and after becoming pregnant appears to affect the likelihood that the unborn baby will survive the first five years of life. Hence, it is the obligation of women to visit health care facilities whenever they are accessible and readily available in order to receive the necessary medical attention to encourage good health and safeguard both their own and their child's lives during pregnancy, labor, and delivery

(Chadoka-Mutanda & Odimegwu, 2016). These include vaccination/immunization practices as well as actions a mother is taking in her household to prevent diseases such as malaria or diarrhea. Notably, preventive and curative activities pertinent to infectious diseases in young children are associated with nutritional status (Brackett, 2007).

In accordance with estimates, 45% of newborns pass prematurely within the first month of their lives due to infections, birth asphyxia, complications associated with premature birth, or problems during the intrapartum period (Black et al., 2010; UNICEF, 2015). More than half of the fatalities that transpire after the first thirty days of life and before the age of five years are caused by pneumonia, malnutrition, diarrhea, and malaria (Black et al., 2013). It is possible to prevent all of these causes of death if proper health seeking behaviors are observed by caregivers (Chadoka-Mutanda & Odimegwu, 2016). Preventing early childhood deaths requires skilled care both during and after pregnancy and delivery (UNICEF, 2015). Proper care of newborns includes cleaning and drying them after birth, allowing skin-to-skin contact to provide warmth, immediately and exclusively breastfeeding them for six months, and most importantly immunizing them (Chadoka-Mutanda & Odimegwu, 2016). Studies have demonstrated that exclusive breastfeeding, safe drinking water, immunizations, and good sanitation can lower the number of children who die from pneumonia and diarrhea (UNICEF, 2013).

Meanwhile Mudzi District has got a large chunk of population that belong to the Marange Apostolic sect whose religious beliefs deters proper health seeking behaviors. According to Maguranyanga (2011) there is a great inclination to spiritualize everything particularly medical problems since illnesses and diseases are thought to have spiritual and religious connotations. These kinds of ideas about sickness tend to diminish the relevance of health

care simultaneously promoting the misguided predisposition towards healing through faith. As a result, some members refuse to receive contemporary medical attention, which can have fatal consequences for their health.

The members of the Apostolic believe that Mweya bestows healing abilities and spiritual endowments, which are then used to aid in childbirth, promote maternal and child health, and heal the ill. The emphasis on the "Apostolic healthcare system," which is religiously constituted and justified as exalting the action of God or the Holy Spirit, as well as the strong belief in faith healing, healing rituals, prayer, and the power of Vapostori, are therefore due to this. The ultra-conservative apostolic groups exalt man above God and consider the current healthcare system to be profane and heathen. As such, the use of contemporary medical treatments and medications is hampered by the ideas held by ultra-conservative Apostolic members also hold differing opinions about the adoption of modern maternity and child healthcare facilities and mandatory vaccination programs, notwithstanding the harsh opinions of ultra-conservative groups who base their opinions on their rigid theological doctrines (Maguranyanga, 2011).

Due to objections by their leaders, members of these groups secretly use contemporary healthcare services and embrace outreach programs that allow them to receive medical care. This presents a gap for Positive Deviance Hearth to make meaningful changes on appropriate health care of infants and mothers. On the other hand, findings from most of the key informants from the Apostolic sect in a study funded by UNICEF on Apostolic Religion, utilization of Maternal and Child Health Services in Zimbabwe supported the need for legislative enforcement of mandatory childhood vaccination laws and policy recommendations in order to improve public health, lower the rate of vaccine-preventable

illnesses and deaths, and investigate strategies for promoting professionally assisted childbirth among expectant mothers in order to reduce complications and deaths related to pregnancy and maternal health (Maguranyanga, 2011).

2.5.3 Health knowledge

According to Brackett (2007) health knowledge was seen to be highly related to health-seeking behaviors. For instance the following questions when answered determine the behavior that will be followed. Does a mother recognize the signs of malaria, diarrhea, HIV/AIDS? Does the mother know to regularly wash her hands? Does she know how to properly feed nutritious meals at regular intervals to her children and moreover whether or not she actually can afford to do so? (Brackett, 2007).

2.5.4 Pre-natal/birthing care

This defines care given to the mother before she gives birth and during the birth of her child. Proper pre-natal care and birthing care have been associated with increased health and nutrition level of the mother, which in turn impacts the health and nutrition level of the child (Brackett, 2007). Though this study shall not delve much on this since it is outside the scope of this study

2.6 Infant and Young Child Feeding in developing countries

Infant and young child feeding (IYCF) practices directly impact the health and nutritional status of children. Cultivating good IYCF practices in caregivers of children 0–23 months of age is crucial to improved child nutritional and health status as well as development. Key paths to preventing malnutrition include exclusive breastfeeding for the first 2 years of life, diverse and nutritious foods during childhood, healthy environments, access to basic services such as water, hygiene, health and sanitation, as well as pregnant and

lactating women having proper maternal nutrition before, during and after the respective phases (Dukhi 2020; Global Nutrition report, 2018)**.**

The aforementioned arose after realizing that some of the main factors contributing to malnutrition included poor nutrition, feeding practices, education and occupation of parent/caregiver, residence, household income as well as nutrition knowledge of mother (Seligman et al, 2010). Studies have alluded that nutrition education for the mother is imperative, since mothers can utilize knowledge acquired for better care of their children and equip them with necessary skills required for childcare (Dukhi, 2020; Seligman et al, 2010). Moreover, it improves mothers' feeding practices, increase their nutritional needs awareness, as well as a chance of influencing and changing beliefs regarding medicine and disease (Tesfaye, 2009). As such the Positive Deviance Intervention realizes these key paths and incorporates all these key aspects in trainings during the hearth sessions.

2.7 Factors affecting infant and young child nutrition

2.7.1 Duration of breast feeding

It is recommended that children below 6 months be exclusively breastfed and complementary foods be offered together with continued breast feeding for 2 years (Okochil, 2016). This is substantiated by the World Health organization which states that the health, development, and nutritional status of children under two years old are directly impacted by infant and young child feeding (IYCF) practices, which in turn has an impact on child survival.

It is essential to enhance IYCF practices for infants 0–23 months old in order to promote better nutrition, health, and development. Breastfeeding should begin as soon as possible after delivery ideally within an hour then continue exclusively for six months, and then be

supplemented with food for at least two years, according to World Health Organization (WHO) recommendations (ZimVAC report, 2023). Assessing caregiver's knowledge and practices on these issues will help the identify behaviors that caregivers would be practicing in relation to the nutritional status outcome of the child.

2.7.2 Complementary feeding

As a child grows beyond 6 months, an infant's need for energy and nutrients starts to exceed what is provided by breast milk hence the need to introduce complementary foods to meet those needs. The transition of infant from breast milk only to consumption of other foods to meet increased energy and nutrient is referred to as complementary feeding (WHO, 2001). Complementary foods have to be appropriately introduced at around the age of 6 months, otherwise if not may lead to growth faltering (Okochil, 2016).

In order to ensure that child nutritional needs are met complementary foods should be timely meaning that they are introduced when the need for energy and nutrients exceeds what can be provided through exclusive breastfeeding (WHO, 2001). Foods should also be adequate meaning that they provide sufficient energy, protein and micronutrients to meet a growing child's nutritional needs. Safe, meaning that they are hygienically stored and prepared, and fed with clean hands using clean utensils. Moreover, foods should be properly fed implying that they are given consistent with a child's signals of appetite and satiety, and that meal frequency and feeding are suitable for age (Okochil, 2016).

The World Health Organization recommends that caregivers should take active care in the feeding of infants by being alert to the child's cues for hunger and also encouraging the child to eat. Positive Deviance Hearth realizes the importance of complementary feeding and the need for meals to be nutritionally dense in order to provide adequate protein,

energy and micronutrient to meet a child's nutritional needs (Okochil, 2016). A study of the nutrient content of PD hearth meals given to children in PD studies around the world in comparison to the WHO feeding guide shows that they are even more nutrition dense to hasten rehabilitation rates of malnourished children as shown in Table 1 and Table 2. The complementary guide further stresses the need to feed more than 3 different types of foods daily, including one animal food-fish, eggs, meat or liver from a bowl size of 250ml.

Table 1: Recommended complementary feeding guide (WHO, 2000).

Age of child	**Recommended feeding frequency (meals/snacks)**	**Amount of energy needed daily from complementary foods**	**Amount of complementary foods in local measures**
6 to 8 months	2-3 times	200kcals	1/2 bowl of solid/semi-solid food two times per day plus 1-2 nutritious snacks
9 to 11 months	3-4 times	300kcals	1/2 bowl of solid/semi-solid food two times per day plus 1-2 nutritious snacks
12 to 24 months	3-4 times	550kcals	1 full bowl of solid food three times per day plus 1-2 nutritious snacks

Table 2 : Positive Deviance Hearth menu nutrient content in different countries

Food type	Quantity (g)	Calories (kcal)	Protein (g)	Vitamin A (mcg RAE)	Vitamin c (mg)	Iron (mg)	Zinc (mg)	Cost (USD)
Hearth menu nutrient requirements for 7-36months	250-300	600-800	25-27	300	15-25	8-Oct	3-May	n/a
RNI for 7-12 months	N/A	608-844	11	400	30	18.6*	8.4**	n/a
RNI for 13-36 months	N/A	900-1400	13	400	30	11.6*	8.3**	
Hearth meal in a Bangladesh village	291	645	25	400	53	20	4	0.17
Hearth meal in a Burundi village	287	607	28	318	23	8.7	7.8	0.18
Hearth meal in a DRC village	237	627	25	763	37	11	7.5	0.2

2.7.3 Caregiver nutritional knowledge, attitude and practices in relation to Infant and Young Child Feeding

According to Gumucio, (2011) knowledge denotes comprehension of a concept or a set of understandings for instance, caregiver's ability to know the number of meals per day that should be given to child, the composition of the diet or meal, the recommended period for exclusive breastfeeding as well as how to care for a seek child. Attitude describes

behavior choices made by a caregiver when subjected to a certain stimulus, for instance health seeking behaviors when a child is suffering from diarrhea (Gumucio, 2011).

Meanwhile, practice is related to actioning of the behavior adopted as witnessed in the diverse diet a caregiver feeds their child using resources at their disposal. Behavior/practices are considered an expression of knowledge and these practices translate food security and health care into a child's well-being (Engle et al., 2000). A caregiver's level of nutritional knowledge has been seen to influence dietary quality. Nutritional knowledge, enables caregivers to provide care with limited resources. Studies denote that feeding patterns are not simply because of household food availability but rather also the caregiver's nutritional knowledge (Sethi, Kashyap, Seth & Agarwal, 2003).

2.8 WHO Indicators for assessing Infant and Young Child Feeding practices

Indicators are of paramount importance particularly with regards to assessment of caregivers' nutritional practices. After reviewing its anthropometric measurement criteria in 1993, which had been in use since the latter half of the 1970s, the World Health Organization (WHO) concluded that new standards were required in order to assess early childhood growth with greater precision. The WHO thus proposed new anthropometric standards for measuring malnutrition in children in the summer of 2006, following the completion of a thorough cross-sectional research study in a wide range of different cultural settings and boundaries between ethnic groups including Ghana, Norway, Brazil, Oman, India, and the USA (Brackett, 2007) . Though standards for measuring malnutrition changed indicators however remained the same that is; length/height-for-age; weight-for-age; weight-for-length; and body mass index for age. Currently, there has been still no publicly accessible version of a further set of apprised indicators from WHO which should

encompass arm circumference-for-age, head circumference-for-age, subscapular skinfold-for-age, and triceps skinfold-for-age (Brackett, 2007)

At the moment, height-for-age, which indicates stunting, weight-for-age, which indicates underweight, and weight-for-length/height, which indicates wasting, are the three most widely used metrics to quantify child malnutrition (Brackett, 2007). Weight-for-age is the most often used metric to assess malnourished children in poor countries, mainly because it is the most straightforward to gather data on in a consistent way across a range of contexts (USAID, 2002). Thus based on this background this study also employed underweight as the primary indicator for child nutritional status. A child is classified as moderately malnourished if their weight-for-age Z-score (WAZ) is more than two standard deviations ($Z > -2$) over the median weight-for-age of the NCHS/WHO criterion for fed children. Severe malnourished children will be more than three standard deviations ($Z > -3$) distant from the median (WHO, 2006).

Through integrating certain healthy behaviors for instance, breastfeeding standards, receiving quality health child care, not smoking, and many others into the selection criteria for study participants, the new WHO updates to anthropometric standards are now somewhat innovative because they are prescriptive in nature. The World Health Organization (2006) asserts that previous approaches have typically been descriptive rather than prescriptive, meaning that specific standards and goals for healthy behavior that have an impact on the nutritional status of children were not extensively explored. For example, the most recent approach, in contrast to the former standard, which was based on formula-fed children, employs nursing or breast feeding as the physiological norm and the breastfed baby as the healthy growth model.

It's possible that older growth charts led to a classification of infants as underweight a greater percentage of the time than overweight, which may have contributed to additional health problems such childhood obesity and, later in life, cardiovascular disease and type 2 diabetes (WHO, 2006). Going forward estimates of the number of malnourished children worldwide will be impacted by these revised standards for evaluating malnutrition. Estimates of stunting (low height-for-age) are predicted to be higher throughout childhood due to variations in the suggested patterns of growth between the previous and current standards, particularly during early childhood. Additionally, it is speculated that the prevalence of underweight and wasting cases is predicted to rise primarily among infants. The degree of weight-for-age improvements is the indicator of the effectiveness of dietary interventions in many child survival programs, such as the Positive Deviance/Hearth program (Bracket, 2007).Some among the indicators listed by WHO for assessing IYCF practices which are relevant to this study are outlined below.

2.8.1 Continued breastfeeding 12–23 months

WHO Global Strategy for Infant and Young Child Feeding recommends continued breastfeeding for two years or beyond (Roche, 2011). Studies postulate that continued breastfeeding is of crucial importance during illness. Sick children often have little appetite for solid food hence continued breastfeeding can aid in dehydration prevention while also providing the nutrients required for recovery (WHO, 2008). The World Health Organization (2008) emphasizes that continued breastfeeding could prevent half of all deaths caused by infectious diseases between six and 23 months of age. In Zimbabwe although proportion of caregivers who exclusively breastfed their children for the first 6 months greatly increased from 49.3% in 2020 to 78.4% in 2023 this was not the case with

regards to continued breastfeeding beyond one year. A great decline was noted from 94.3% in 2020 to 54.3% in 2023 with respect to continued breastfeeding from 12 to 23 months (ZimVAC report, 2023).

Indicator definition: percentage of children 12–23 months of age who were fed breast milk during the previous day.

Numerator: children 12–23 months of age who were fed breast milk during the previous day.

Denominator: children 12–23 months of age.

2.8.2 Minimum dietary diversity 6–23 months

Diverse food groups are linked to better linear development among young children (WHO, 2008). Deficiencies in micro nutrients may be more likely in a diet low in diversity, which could be detrimental to a child's mental and physical growth. A study alludes that little or no consumption of nutrient-dense foods such legumes, dairy products, fruits and vegetables between six months and 23 months of age is associated with stunting (Chinyemba & Ajayi, 2021).

One of the biggest barriers to children's survival, growth, development, and learning is a poor nutrition. Diets deficient in vital vitamins and minerals during the first couple of years of life may increase the likelihood of stunting, wasting, and micronutrient deficiencies as well as cause irreparable damages to the child's quickly developing body as well as brain (WHO, 2008; Anino, 2015; ZimVAC report, 2023). In contrast, foods heavy in sugar, salt, and saturated fat can lead to youngsters adopting unhealthy eating

behaviors, thus becoming overweight, and developing other over nutrition dietary conditions (Chinyemba & Ajayi, 2021).

WHO guiding principles for feeding the breastfed child and non-breastfed child recommend that children aged 6–23 months be fed a variety of foods to ensure that nutrient needs are met (WHO, 2008). These guidelines inform the indicators and definitions that are mentioned below.

Indicator definition**:** percentage of children 6–23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day.

Numerator: children 6–23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day. The eight food groups used for tabulation of this indicator are: 1. breast milk; 2. grains, roots, tubers and plantains; 3. pulses (beans, peas, lentils), nuts and seeds; 4. Dairy products (milk, infant formula, yogurt, cheese); 5. Flesh foods (meat, fish, poultry, organ meats); 6. Eggs; 7. Vitamin-A rich fruits and vegetables; and 8. Other fruits and vegetables.

Denominator**:** children 6–23 months of age.

2.8.3 Minimum meal frequency 6–23 months

Table 1 above depicts the recommendations of complementary feeding from WHO. Feeding meals less frequently than recommended can affect total energy and micronutrient intake resulting in growth faltering, stunting and micronutrient deficiencies. The ZimVAC report of 2023 alludes that only 30.1% of children in the age range of 6 to 23 months managed to consume a minimum meal frequency (ZimVAC report, 2023). This is considerably low and shows that Zimbabwe as a country is still a long way when it

comes to addressing issues to do with food security and malnutrition as a greater chunk (70%) of households with children 6 to 23 months are failing to consume recommended number of meals per day. Meanwhile, when compared to other care approaches, studies have shown that that feeding frequency greatly or significantly contributes to weight growth (Anino, 2015).

Indicator definition: percentage of children 6–23 months of age who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) at least the minimum number of times during the previous day.

Numerator: children 6–23 months of age who consumed solid, semi-solid or soft foods at least the minimum number of times during the previous day.

The minimum number of times is defined using WHO recommendations as in Table 1.

Denominator: children 6–23 months of age

2.8.4 Minimum acceptable diet for 6–23 months olds

WHO guiding principles on feeding the breastfed child and the non-breastfed child recommend that children aged 6–23 months be fed meals at an appropriate frequency and in a sufficient variety to ensure, respectively, that energy and nutrient needs are met (WHO, 2008). This indicator adopts information from minimum dietary diversity and minimum meal frequency, with the extra requirement that non-breastfed children should have received milk at least twice on the previous day. The minimum acceptable diet is defined as receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day for breast fed children whereas for non-breastfed

children; receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day as well as at least two milk feeds.

Indicator definition: percentage of children 6–23 months of age who consumed a minimum acceptable diet during the previous day.

Numerator: children 6–23 months of age who consumed a minimum acceptable diet during the previous day.

Denominator: children 6–23 months of age

2.9 Positive Deviance Hearth Programs

2.9.1 The Positive Deviance Hearth Strategy

Positive deviance hearth strategy has been employed in maternal and child programs that address malnutrition since the 1970s where it originated in Haiti (Schooley & Morales, 2007). This common intervention aims to address childhood malnutrition through bringing mothers or caregivers together to practice new feeding and caring behaviors under the encouragement of community volunteers. The model draws strength from the realization that in resource constrained communities some members there-in, employ unique valuable practices for them and their offspring to experience better nutrition in comparison to their similarly impoverished neighbors (Schooley & Morales, 2007).

Although field research on the Positive Deviance strategy to combat hunger is very new, it has been written about since 1967 (Chinyemba & Ajayi, 2021). The majority of Asian and African nations have embraced the PD/hearth strategy in an effort to lower the rate of malnutrition (BisitsBullen, 2011).A study conducted in Malawi using the PD/hearth approach to look at the outcomes of food safety, hygiene, and nutrition training created

by the Child Survival Collaborations and Resources Group (CORE) Nutrition Working Group suggested a steady improvement in mothers' eating habits and sanitation behaviors as well as a reduction in undernutrition in their children (Seetha et al, 2019). Additionally, children who were monitored for a period of six months after graduating from hearth sessions in Migori County showed improvement in weight increase, according to a study conducted in Kenya (Anino, 2015).

The positive deviance hearth approach takes a developmental perspective to the community, henceforth it is thus adopted in most settings. This strategy is different from conventional "community need based" strategies in that it places less emphasis on identifying needs and the outside resources required to address those needs (BisitsBullen, 2011). Instead, PD/hearth aims to pinpoint and maximize already-existing community resources and remedies in order to assist underweight children in the community. This is one of the study's goals, which is to evaluate how taught or adopted PD/hearth behaviors affect underweight among children under five, ages 6 to 24 months who are born later after hearth sessions have been stopped.

Positive Deviance approach identifies “Positive Deviants”. These are individuals who have similar socio-economic characteristics to other members of the community yet they are able to device ways to overcome barriers and practice positive behaviors without aid from external interventions (Bisits Bullen, 2011). Their unique practices and behaviors in the aspects of childcare, feeding and health seeking are identified and then strengthened and scaled up to the entire community. The “positive deviants” are encouraged to socialize and share these behaviors thus promoting their adoption by other community members (Mackintosh, 2002). These Positive Deviance behaviors are likely to be affordable,

acceptable, and sustainable by the wider community because their peers are already practicing them.

Recognizing positive deviants promotes long-lasting behavioral change in the community because it allows mothers like them to use local resources to nourish their young ones effectively while gaining knowledge from their example of behavior in an atmosphere that has significance to them culturally (Brackett, 2007). Families with minimal exposure to healthcare resources are provided with the opportunity to adopt more healthy lifestyles, and once they do, communities typically lobby for improved accessibility of an array of healthcare services. Despite having been designed by UNICEF in the late 1980s, the PD/Hearth may function as a starting point for community mobilization against malnutrition and complement more expansive frameworks like the ENA (Brackett, 2007; Sillan, 2001).

The "Hearth" component of PD/Hearth refers to sessions that are held in homes to help rehabilitate children who are moderately to severely malnourished. Focusing on families with undernourished children, the intervention offers local positive deviant practices and encourages other child-healthy behaviors including breastfeeding, regular feedings, and cleanliness (Brackett, 2007). Volunteers from the local community lead hearth sessions, which take place in homes. These sessions include techniques for changing behavior such as community mobilization, negotiation, adult learning, safe atmosphere and discussions, peer support, counseling, and skill development (Anino 2015; Morrow, 2001). Prior to commencing hearth sessions, children ought to ideally be taken to the nearby health center for vaccines, vitamin supplements, and deworming (Brackett, 2007). In order to set up a

functional and vibrant growth monitoring system within the community, PD/Hearth also collaborates with the local health promoters (Welch, 2001).

The impact of certain nutrition interventions in underdeveloped countries has not received much attention in the literature thus far (CORE, 2003; Brackett 2007). This is to be anticipated since the resources at hand are rarely to be used for high-level research, but rather for the implementation of programs and reaching benchmark targets for interventions. However, according to Brackett (2007) research endeavors that uncover new information regarding the efficacy of particular nutrition interventions such as PD/Hearth are valuable and aid in the broader objective of funding agencies and non-governmental organizations to pinpoint malnutrition-fighting programs.

This can be the future of nutrition interventions in low-income countries. Community best practices can be put to use to alleviate malnutrition through mentor mothers or “Positive deviant mothers” (Le Roux et al., 2010). The PD/hearth strategy is one of many initiatives that the Zimbabwean government and its international collaborators have implemented to lower the nation's underweight rates. Based on the idea that every community has some individuals (referred to as "Positive Deviants") whose distinctive or unusual behaviors and habits make it possible for them to identify more efficient methods to steer clear of inadequate nutrition in comparison to their fellow neighbors who possess the exact same resources and encounter the exact same danger (Bisits Bullen, 2011). Positive Deviance (PD) is a more of a strength-based or asset-based approach (Sosanya et al., 2017). The goal of the positive deviance intervention is to help lower the high rates of malnutrition by helping families to continue the rehabilitation of their children who are malnourished at home independently, in a way that is both affordable and culturally appropriate.

Positive deviant mothers have been incorporated in the hearth model as crucial players for malnutrition recovery in Bangladesh, Vietnam, Kenya, Rwanda and Uganda (Anino, 2015; Bisits Bullen, 2011; Brackett, 2007; Mackintosh, 2002; Okochil, 2016). The community models structure of the PD Hearth intervention, offers a sustainable mechanism for alleviating malnutrition in low resource communities.

As a way of giving more insight to the study while World Vision was implementing the Positive Deviance Hearth Program in Mudzi from 2017 to 2020. A positive deviance inquiry was initially done which led to the development of the following key messages. These were adopted from World Vision's Training of Facilitators manual by Baik and Klaas (2021) as well as World Vision's Training of volunteers' manual for Positive Deviance Hearth.

i. Suggested diet items for children during hearth sessions

- Three dietary categories (protective, energy-giving, and body-building)
- colorful, diversified meals (include red/orange, green, and white);
- Give examples of foods from the community that fall into each category, stressing the value of consuming a variety of foods.
- Children should be introduced to all of these foods at the age of six months,
- Make use of locally available foods including sweet potatoes, pumpkin leaves, tomatoes, kapenta, baobab fruit, cow peas, small grains and more.

ii. Feeding practices:

- Three meals and two snacks (it's crucial to give snacks in between meals) should be given to children frequently at the appropriate times to ensure they don't go hungry.
- Bring snacks if you are taking the kids out into the field; if the kids stay home, leave them with a meal or snack;
- Start the kids off with solid meals at six months old, but breastfeed them often until they are two years old;
- It is crucial to watch over and encourage toddlers under the age of two while they eat (active feeding);
- Since older siblings tend to eat faster than younger children and don't finish their entire meal, each kid should have their own plate.

iii. Water and sanitation

- Before preparing and eating meals, after using the restroom, or after changing diapers, wash your hands with soap or ash;
- When washing your hands, pour water that is clean rather than making use of a single basin;

- Water in containers for storing, particularly drinking water, should be properly covered or closed;
- Bring drinking water to a boil and/or treat it with chlorine;
- Draw water from a protected well or borehole.

iv. Personal cleanliness and hygiene

- Give children a bath every day and do laundry frequently;
- To dry their dishes and bowls, every home needs a dish rack and should be properly assembled;
- Clean dishes and bowls right away after eating.
- Mother should also put on clean clothes and have a daily bath;
- Every house needs a latrine, which should be kept well-covered while not in use.
- It is appropriate to dispose of children's feces in the toilet.

v. Appropriate care of sick child

- Do not hesitate to take your child to the health center if they have a temperature, diarrhea, or coughing;

- Feed your child the Oral Rehydration Salt (ORS) packets if you have some and they are experiencing diarrhea, or try to obtain some from the Community Health workers.
- Breastfeed your child more often and give them extra food and fluids when they are unwell, also remain committed to feeding them;
- To prevent malaria, sleep under mosquito nets all year long.

2.9.2 Criticism of Positive Deviance Hearth Approach

Caregiving behaviors coupled with a household's capacity to access resources are inputs in child nutritional status outcomes (Bella, 2013; Sosanya et al., 2017). The positive deviance approach seeks caregiver behavior modification within the context of household resource constraints. Successful PD studies therefore aim to examine the whole spectrum of child caring practices, with the aim of identifying, mentoring and reinforcing behaviors that produce better outcomes (Sosanya et al., 2017). Noteworthy caregivers' self-sufficiency and management of resources are important factors that influence the quality of child care. This may account for the limited impact noted in earlier PD studies that focused on identifying PD foods and delivering these foods to children as compared with the later that identified PD behaviors and modified caregivers' behaviors accordingly (Shekar, 1990).

In some instances, the PD approach may not be feasible such as when the practice of good behaviors and opportunities to perform the behavior in question are low for example when there is limited relevant services/foods (Marsh et al., 2004; Marsh et al., 2007; Sosanya et

al., 2017). Moreover, some scholars view PD/ Hearth as a more expensive rehabilitative approach compared to preventive alternatives (such as growth monitoring and promotion), which identify problems while they are easier and less expensive to tackle before malnutrition sets in (Levinson et al., 2005; Sosanya et al., 2017). Meanwhile the researcher seeks to assess this by examining whether caregivers only apply learned behaviors during rehabilitation and implementation stage or rather sustain adopted behaviors and apply in child care of infants they might bear in future.

Another major limitation and critique of PD/Hearth is its possibility of failure in food insecure areas as participants may not have access to nutritious foods to contribute during long hungry seasons. Two of 11 PD studies evaluated corroborate that this is a limiting factor (Baik et al., 2022; Mulenga, 2014; STRIDES for Family Health Legacy series, 2015). Meanwhile, the case of PD Hearth successful implementation in Zimbabwean Mudzi district characterized by drought and high food insecurity levels obliviates this notion.

A study in Zambia substantiates that conducting the positive deviance/Hearth sessions during dry or hungry seasons can actually lead to the identification of menus of nutritious foods that can be recommended for such seasons (Mulenga, 2014). However, further studies may be required to confirm if Positive Deviance Hearth alone can be used in such settings, or if additional food assistance is needed and also to assess if caregivers can sustain the use of identified menus in future infants.

Previous studies by Mackintosh et al. (2002) showed that differences in feeding practices between the positive deviance and the comparison groups were statistically significant. For instance, from the study, 41% of the positive deviance mothers were breastfeeding

compared to 20% of the comparison group. The study noted that even after controlling possible factors (such as hours mother worked outside the home, age and sex of the beneficiaries), the PD intervention mothers still had significantly better feeding practices. Results from this study signified that the mothers in positive deviance interventions possessed higher ability to recall the recommended infant feeding practices 2 to 5 years after the implementation of the positive deviance practices.

2.10 Summary

This chapter provides comprehensive examination of relevant literature on the state of child malnutrition in Zimbabwe, other low-income African nations, and global trends in general. The theoretical framework and its relevance to the study is discussed. Infant and young child feeding practices in poor nations are explored as well. Findings from studies on Positive Deviant Hearth initiatives and related strategies in various contexts, as well as achievements, gains, and weaknesses in other nations are discussed as well as whether the Positive Deviance program's goals are feasible in less developed environments.

CHAPTER 3 METHODOLOGY

3.1 Introduction

The chapter describes the methods that the researcher shall employ in this study in detail, including the design, study settings and population, sampling strategy, data collection procedures and data management, ethical considerations and informed consent process, and approaches of statistical analysis.

3.2 Research Design

The study employed a Cross-Sectional Study design. The study participants were selected because of the household's exposure to Positive Deviance Intervention while under implementation in Mudzi district by World Vision during the period 2017 to 2020. The cross-sectional design provided a picture of then prevailing nutritional status of infants born to the households that were once exposed to Positive Deviance Hearth. The child nutritional status significantly reflected whether mothers or caregivers were still adopting the 2017-2020 Positive Deviance learned behaviors and sustaining them in child care of these future infants.

Variables under assessment were child anthropometry, infant and young child feeding practices (breastfeeding, minimum acceptable diet and dietary diversity) as well as appropriate sick care. Meanwhile, exposure to PD hearth was the independent variable whereas dependent variables were child health and nutritional status as well as appropriate sick care. The primary indicator for child nutritional status being weight for age. Sustenance of behaviors by caregivers was reflected through assessment of Minimum Dietary Diversity consumed by children 6 to 23 months old. It was also assessed based on ability of caregiver to recall at least three of the taught diarrheal prevention principles,

behavior regarding to infant and young child feeding and behaviors as well as behaviors displayed by caregivers when taking care of a sick child.

3.3 Study Site and Rational

The study was limited to 7 wards in Mudzi district where World Vision in partnership with MoHCC implemented the Positive Deviance Hearth program from 2017 to 2020.

3.4 Study Population

The study population comprised of Mudzi district residents in Mashonaland East Province of Zimbabwe. Primary focus was on households with mother child or caregiver child pairs enrolled in the World Vision Positive Deviance Hearth Program between the periods 2017 to 2020 with younger siblings that were never exposed to PD Hearth**.**

3.4.1 Inclusion and Exclusion Criteria

Criteria that was employed for inclusion in the study involved a pair of a mother or caregiver that were part of the 2017-2020 World Vision PD Hearth Program and then later had another child after 2020 PD Hearth sessions in a comparison ratio of 1:1 with mothers or caregivers that had never been exposed to Positive Deviance Hearth as explained below.

Positive Deviant participants: A household that has a mother or caregiver who previously participated in the PD Hearth during 2017 to 2020, and that mother or caregiver later bore a younger child, 6 to 23 months old, referred to as the "future infant" or "younger sibling." To be included in the study this child ought to have been born after period of PD Hearth intervention and did not get direct exposure to hearth sessions. The pair that is the mother and the later born younger sibling were chosen as study participants.

Non Positive Deviant participants: For the comparison group the criteria for inclusion was a household with a mother or caregiver who have never been exposed to PD/hearth intervention and had a child in the same age category (6 to 23 months) as a household that once was exposed to PD Hearth sessions.

Exclusion criteria:

Any household that had Positive Deviance participants that is mother or caregiver and older sibling but with no "younger sibling /future infant "was excluded from the study. Any household with Positive Deviance participants but the "younger sibling" having been already exposed to hearth sessions was also excluded. Thirdly, any household that failed to give consent to participate in the study was excluded from the study as well.

3.5 Sample size and sample size calculation

The total sample size for this study was 122 pairs of participants. The table was duplicated to show the involvement of caregivers on the screening of children as well as in providing information of caregiving they have been practicing in the upbringing of the particular child. Respectively that is for every child inspected the mother or caregiver for the child was also there implying that for Exposed group there was 122 participants (assuming Kelsey size) 61 care givers and 61 children (making a total of 244 participants for exposed group and unexposed). This study was applied as a cross-sectional on a cohort. The total population of the cohort that was exposed to Positive Deviance Hearth from 2017-2020 is 1940. The cohort and cross-sectional study function for Epi-info software was used to compute the sample size using a set of parameters and the desired confidence level. A two sided confidence level of 95% and 80% power to detect differences between groups was used. The proportion of exposed in relation to unexposed used was 1. Percentage outcome

in the unexposed group 50.1% was used to represent the incidence rate of underweight children in the unexposed group that is non Positive Deviant Hearth participant. Percentage outcome in the exposed group 25.4% was used to represent the incidence rate of underweight children in the exposed group that is Positive Deviant participant. Risk ratio and Odds ratio pops out from the software basing on information fed from 1 to 5 giving risk ratio = 0.5.

The output recommending sample size was as follows

	Care givers			**Infants (children)**		
	Kelsey	Fleiss	Fleiss /w cc	Kelsey	Fleiss	Fleiss / w cc
Exposed	61	60	68	61	60	68
Unexposed	61	60	68	61	60	68
Total	122	120	136	122	120	136

The first column provides estimates based on approach described by Kelsey et al, (1996).According to this approach the total sample size is 122. The second column provides estimates based on the approach described by Fleiss (1981). Two approaches were described one without continuity correction and another with continuity correction.

3.5.1 Sampling procedure

A census roster of the households with children born after the PD Hearth intervention in the 7 wards was developed and then cross-referenced with a roster of households with

children who would have previously participated in the 2017 -2020 PD hearth program. Households appearing on both lists made the target population. In the comparison group eligible households with no previous exposure to PD Hearth program activities were identified and had to include an older and younger sibling in the age range of the PD Hearth children. Stratified sampling technique was then used to accommodate variances across wards and avoid over representation

3.6 Data collection tools

The study made use of:

a. Anthropometry

Weight measurements: The researcher used SECA Digital scale for weight measurements as recommended by the Demographic Health Survey Biomarker Field manual, 2012. The same model of scale was used across all wards under study.

b. Caregiver survey questionnaire

The questionnaire examined caregivers' dietary practices with continued breast feeding beyond 1 year and Minimum Acceptable diet as the indicators of choice for IYCF practices. The questionnaire used in this study was adopted from the KPC tool developed by Johns Hopkins for the Child Survival and Health grants program and as then edited to suit parameters valid to this research study.

3.7 Pretest

The questionnaires used were programmed into tablets to facilitate and hasten data capturing process. Pretesting of questionnaires and anthropometric measurements was done by trained personnel, and the questionnaires were then modified based on the lessons

learnt from the pretesting. Pretesting was done in ward 10 Kotwa in Mudzi District which was a different ward from the wards that were under assessment.

3.8 Data collection procedure

Variables under assessment were child anthropometry, infant and young child feeding practices (breastfeeding, minimum acceptable diet and dietary diversity) as well as appropriate sick care. After a Positive Deviant household had been identified by the help of village health worker or community leader, researcher and two trained data collection aids proceeded to enter into the household and requested to speak to the head of the house. Introductions were done and permission to conduct the study was then requested. The purpose of the study was explained as well as the procedure for conducting the study to each household that was visited. If permission was granted and the household had a child who met the inclusion criteria the researcher proceeded to the next step, else the household was excluded from the study.

The researcher then went on to initiate a verbal discussion with the participants, stating clearly the objectives of the study, what is expected of them and voluntary and confidential nature of their participation. Participants were informed of their freedom to withdraw from the study at any given time. Caregivers were also told that they were allowed to ask any questions regarding the study. Once everything had been agreed upon, the participants were politely requested to complete and sign the informed consent as well as the parental assent form for the participation of their child in weight measurements. Sustenance of adopted positive deviant behaviors was then examined based on caregiver recall (or memory) of feeding practices, diet diversity, nutrition and health knowledge as well as Appropriate sick care practices and application of the behaviors in child care of infants

they bore later after World Vision ceased operations in their respective communities. The questionnaires were also used to assess knowledge and practices from comparison groups.

Anthropometry for children in age group 6 to 23 months among positive deviance hearth participants and the comparison group was done using methodology described in the MEASURE DHS Biomarker Manual, 2012.Weight-for-age is a composite index of height-for-age and weight-for-height. It takes into account both acute and chronic malnutrition. Children whose weight-for-age is below minus two standard deviations (-2 SD) from the reference median were classified as underweight. Children whose weight-for-age is below minus three standard deviations (-3 SD) from the reference median were considered severely underweight as per WHO definitions for threshold values on nutritional assessments.

3.8.1 Plan for Information Dissemination

Community sensitization about the research study was done through use of local leaders as well and village-based health cadres.

3.9 Plan for Data analysis

Data was collected and uploaded using KOBO collect software and then analyzed using EPI info 7. Moreover, to protect data integrity double entry system was employed. Data was then presented as frequencies and measure of association between variables such as Odds Ratio were done.

3.10 Ethical Considerations

Consent to conduct this study was sought from World Vision Management, Mudzi District Administrator and District Medical Officer as well as local leaders. Approval was granted

and letters are attached to appendices of this document. Ethical approval and clearance from Africa University Research Ethics Committee (AUREC) was obtained prior to proceeding to data collection. All study participants involved in the research had the research objectives explained to them and both informed consent and mother/caregiver assent sought since the research involved minors (children 6 to 23 months) prior to any data collection.

3.10.1 Informed consent

Informed written consent was sought from all participants. The researcher made sure that participants had as much information as possible in order for them to make informed decisions with regards to voluntary participation in the research. Since the research bears an aspect of assessing child anthropometry a special consent was sought from mothers or caregivers on behalf of the minors. Moreover, since the research was associated with Non-Governmental Organization work in the district, participants were clearly told that refuting to participate in the research did not affect their relations with World Vision or the researcher in any way.

3.10.2 Assurance of Confidentiality and anonymity

The participants were privately interviewed and no information disclosed to any other person.

3.11 Plan for Dissemination of results

The research findings will be presented in the Mudzi District DHE meeting. A copy will be shared with the DA's office. The student also plans to disseminate research findings as

journal articles and also in Positive Deviance Hearth and Nutrition Technical Working Groups.

3.12 Summary

Methods used in this study, covering design, population and study locations, sampling strategy, data collecting and management techniques, informed consent process, ethical issues, and statistical analysis techniques are discussed in detail in this chapter.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTEPRETATION

4.1 Introduction

This chapter provides research findings of the study. This includes anthropometric data as well as information gathered from the caregiver survey questionnaire. The study managed to collect data from 122 mother and child pairs making a total of 244 study participants.

4.2 Data presentation and analysis

This section provides results which include child nutritional status, complementary feeding patterns, caregiver practices employed when a child was sick and these are compared between the exposed and the unexposed group. T-tests and chi-square were done to bring out differences between groups.

4.2.1 Demographics of study participants

The study participants were characterized by a total of 59 males and 63 females. In the less than 12 months category there were 60 children. In the 12 to 23 months category there were 60 children. The study had two outliers who were above 23 months of age. These demographics are summarized in Table 3 below.

Table 3: Demographics of infants in both Positive Deviance participants and Non-Participants

Age group (years)	**Male**	**Female**	**Total**
< 12 months	30	30	60
12 -< 23 months	29	31	60
> 23 months		2	2
Total	59	63	122

4.2.2 Study findings with respect to Positive Deviance Hearth strategy

The study showed that the percentage of those who were on breastfeeding as of the date of screening since childbirth among the group of exposed were 57.4 % and on their counterparts 63.0%. Meanwhile 17.7% of the Positive Deviance Hearth group had a time period exceeding 12 months of breastfeeding which was higher than the non-participants group which had 8.3% of the mothers who continued breastfeeding beyond the 12month mark. The children of Positive Deviance Hearth group also had a lower incidence of diarrhea cases 17.7% as compared to the children of non-participants' group which had 35.0%. These findings are shown in Table 4 below which also shows the age components with respect to the two groups.

Table 4: Major characteristics with respect to Positive Deviance Hearth strategy

Characteristic	**Exposed (62)** N (%)	**Non exposed (60)** N (%)	**Total**
<12 months	24 (19.6)	36 (29.5)	60
12 -< 23 months	38 (31.1)	22 (18.9)	60
>23 months	-	2	2
% On breast feeding	35 (57.4)	38 (63.0)	73
% breastfeeding beyond 1 year	11 (17.7)	5 (8.3)	16
Under weight (waz06)	3 (5.0)	5 (8.0)	8
Ever had diarrhea in last 2 weeks			
Yes	11 (17.7)	21 (35)	32
No	50 (80.6)	39 (65)	89

The distribution of underweight in children of study participants using weight for age z scores from WHO formulas sited in 2006 is shown on the bar chart below in Figure 3. The distribution had 3 children from the exposed group who were underweight and 5 from the unexposed group who were underweight.

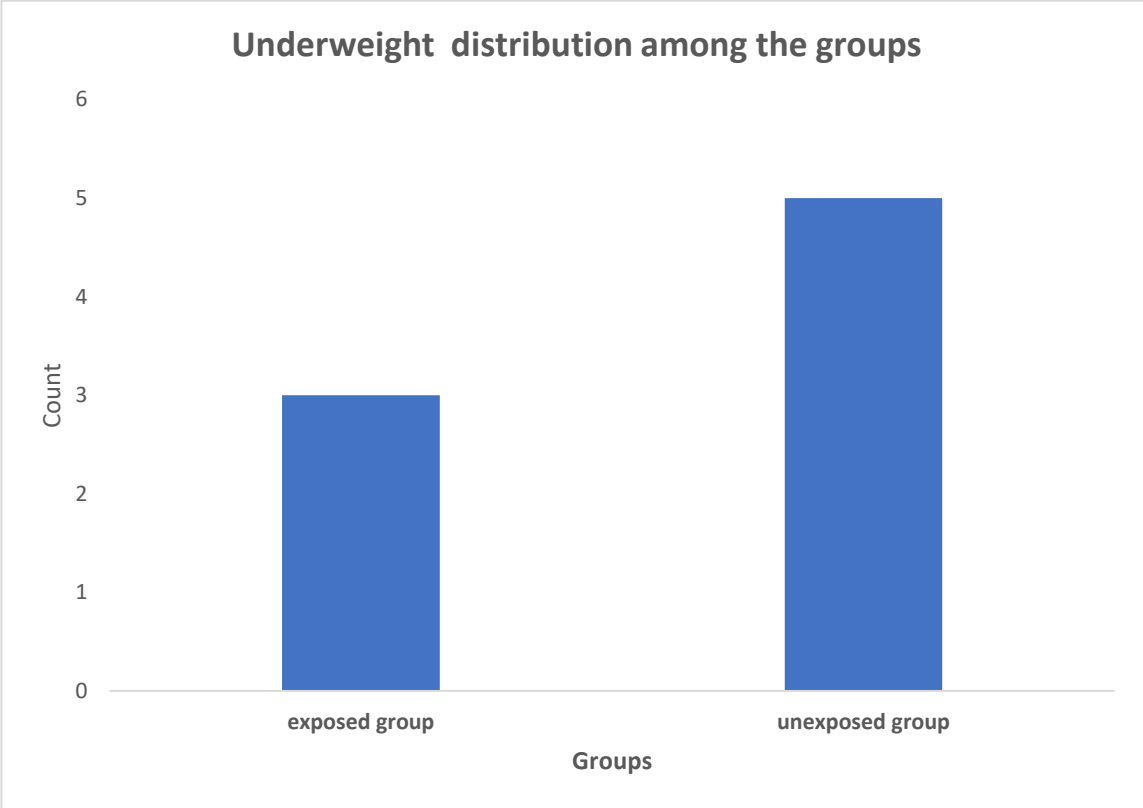

Figure 3: Prevalence of malnutrition among infants of Positive Deviance Hearth participants and Non-Participants

Table 5 : Mean weight for age (waz06) presented between the two groups

Index	**Exposed**			**Unexposed**			**P value**
	n	Sd	Mean	n	Sd	Mean	
0≤12 months mean weight for age	30	1.18	0.05	30	1.15	-0.12	0.660
12≤23 months mean weight for age	30	1.37	-0.98	27	0.54	3.62	0.095
All ages mean weight for age	60	2.15	-1.43	57	1.97	-0.14	0.454

** Extremely significant p< 0.01

* Significant p < 0.05 two paired t tests with unequal variances

The mean z score for the Positive Deviance Hearth mothers group on children under the age of 12 months was 0.05±1.18 and for the non-participants it was -0.12±1.15 . The t tests reviewed that the mean z scores of the unexposed group and exposed group were not statistically significant. The reason behind could be due to small sample size as well as probability of data contamination whereby, Positive Deviance Participants shared some behaviors they learnt with non-participants residing in the same community. The statistics for the exposed and unexposed groups were 0.98±1.37 and 3.62 ±0.54 respectively.

The p values were higher than the threshold implying a high chance that the difference in weight of the two groups may be experienced only by chance.

Table 6: Caregiver, household and subject characteristics

Household information		**Exposed**	**Unexposed**	**P value**
Mother's age		28±6.58	24±6.92	0.001**
Household members		5.34±1.41	4.97±1.82	0.205
Children in household		2.59±1.32	2±1.13	0.01*
Mother's education level				
	Primary	33(53.2)	28(46.7)	0.469
	Secondary	28(45.1)	32(53.3)	
Mother's job	Farmer	3(4.8)	4(6.7)	0.001**
	General worker	0	3(5)	
	Gold panner	13(20.9)	19(31.6)	
	House wife	34(54.8)	23(38.3)	
	Shopkeeper	0	1(1.7)	
	Vendor	12(19.3)	8(13.3)	
Time mother spent outside	2-4 hours	49(79)	43(71.6)	0.493
	5-6 hours	9(14.5)	14(23.3)	
	> 6 hours	3(1.5)	2(3.3)	
House hold toilet facility				
	Hanging(Temporary)	0	1(1.7)	0.006*
	Pit latrine (slabbed)	27(43.5)	17(28.3)	
	Pit latrine (ventilated)Blair	24(38.7)	21(35)	
	No toilet or bush	9(14.5)	19(31.6)	
Toilet means of disposal				
	Used disposable diapers	20(32.2)	16(26.7)	0.002**
	Used potty	23(37.1)	9(15)	
	Went in house yard	2(3.2)	3(5)	
	Went outside premises	6(9.6)	4(6.7)	
	Went in his /her clothes	9(14.5)	26(43.3)	
Rate of Toilet condition				
	Cleansing material	17(27.4)	8(13.3)	0.049*
	Flies present	9(14.5)	1(1.7)	
	Presence of a sit/cover	15(8.1)	15(25)	

	Strong odour	8(12.9)	1(1.7)	
Water source	Dug well	0	2(3.3)	0.002**
	Protected well	21(33.8)	6(10)	
	Public tap stands	34(54.8)	44(73.3)	
	Unprotected spring	1(1.6)	0	
	Unprotected well	3(4.8)	8(13.3)	
Alternate water source	Dug well	2(3.2)	1(1.7)	0.001**
	Piped to neighbour	2(3.2)	0	
	Protected well	22(35.4)	10(11.8)	
	Public tap stands	24(38.7)	26(43.33)	
	Unprotected spring	1(1.6)	1(1.7)	
	Unprotected well	4(6.5)	19(31.7)	

* Extremely significant $p < 0.01$

* Significant $p < 0.05$ Fisher's exact chi square for categorical variables and t tests for continuous variables

The results showed that for the continuous variable mother's age of the infants there was significant difference between the two groups with the exposed group having a mean age of 28 years and unexposed group 24 years (p value=0.001). Statistics for children in household had the exposed group with a mean of 3 children and unexposed group mean children per household was 2 (p value=0.01). The difference on the two statistics was significant and the difference explains a lot on the other associations which were significant. More years of age and number of children on the exposed group than their counterparts imply that the mothers of the exposed group have a better experience in child care. This is corroborated by results shown in table 7 for child feeding and hygienic practices. The exposed group had a mean of 3.1 ± 0.1 meals per day compared to from 2.7 ± 0.1 meals for the unexposed group (p value=0.015).

Furthermore, on complementary feeding patterns shown in table 8 the exposed group has more of mothers reporting more numbers in feeding children a complementary diet with

diversity. Statistically significant differences (p value=0.003) were noted between Positive Deviance Hearth trained mothers and untrained mothers particularly in feeding of protein rich and Vitamin A rich food, with Positive Deviance mothers feeding their children a diverse diet. These results show that Positive Deviance Hearth trained mothers observed the WHO guidelines in complementary feeding whereby they fed more than 3 different types of foods daily, including one animal food-fish, eggs, meat or liver to their children compared to their counterparts

Meanwhile, with respect to healthy snack a significant difference (p value=0.026) was noted in favor of untrained mothers having fed their children yoghurt the day before. This could be explained by the fact that majority of untrained mothers were gold panners whereas most of trained mothers were housewives and as such could not afford a snack such as yoghurt.

Table 7: Child feeding and hygiene practices pertaining to the future infants

Child feeding		**Exposed (62)**	**Unexposed (60)**	**P value**
Main meals per day		3. 1±0.1	2.7±0.1	0.015*
Currently breastfeeding	Yes	35 (56.5)	38 (63.3)	0.578
	No	26 (41.2)	22 (36.7)	
Treat water for drinking	Yes	12 (19.4)	6(10.0)	0.201
	No	49 (79.0)	54 (90.0)	
Methods for treating water	Does nothing	47 (75.8)	55(92.0)	0.002*
	Let it stand and settle	0	3 (3.3)	
	Add Chlorine	0	2 (3.3)	
	Boil Water	1 2 (19.4)	2 (3.3)	
Storage methods for drinking water				
	Containers	7 (11.3)	2(3.3)	0.036*
	Buckets	48 (77.4)	49(81.7)	
	Jerry can	1 (1.2)	7 (11.7)	
	Drum	5 (8.0)	2 (3.3)	
Container record of cover	All covered	58 (93.5)	39(65.0)	0.000**
	Some covered	3 (4.8)	21 (35.0)	
Location of hand washing facility				
	Inside or near toilet	54 (87.1)	34(56.7)	0.001**
	Inside near kitchen	1 (1.6)	3 (5.0)	
	Elsewhere in yard	1 (1.6)	6 (10.0)	
	No specific place	5 (8.0)	17 (28.3)	
Hand washing station	Cup	2 (3.2)	3(5.0)	0.000**
	Bucket	8 (12.9)	3 (5.0)	
	Basin	3 (4.8)	20 (33.3)	
	Tippy tap	48 (77.4)	33 (55)	
	Water jug	1 (1.6)	1 (1.7)	
Child waste disposal	Toilet Drop	48 (77.4)	36 (60)	0.051*
	Water discarded into sink	4 (6.4)	5 (8.3)	
	Discarded outside	0	4 (6.7)	
	Buried on sand	4 (6.4)	11 (18.3)	
	Rinsed washed away	5 (8)	4 (6.7)	

** extremely significant $p < 0.01$

* significant $p < 0.05$ Fisher's exact chi square for categorical variables and t tests for continuous variables

From table 7 it is also shown that 93.5 % of the exposed mothers covered their water containers compared to 65.0% rate from the unexposed group. Noteworthy for child waste disposal significant differences were noted with 77.7% for exposed whereas unexposed group had 60.0% of the mothers. This was in favor of mothers exposed to Positive Deviance program practicing proper disposal of the child's waste in the toilet. Positive Deviance mothers also reported a higher percentage of having a proper handwashing station situated near the toilet facility. These mothers had a 77.4% of homesteads with a tippy tap compared to the non-participant mothers whom only 55.0 % of these had a tippy tap in their homesteads. This significantly shows they still remembered diarrhea prevention practices and WASH behaviors taught during Positive Deviance Hearth sessions years back (p value=0.000).

Table 8: Complementary feeding patterns of exposed and unexposed groups

Complementary	**Exposed n=62**	**Unexposed n = 60**	**P value**
Sadza	55 (88.7)	44(73.3)	1
Soup	55 (88.7)	44(73.3)	1
Porridge	55 (88.7)	44(73.3)	1.0
Rice	55 (88.7)	44(73.3)	1.0
Pumpkin	46 (74.2)	29(48.3)	0.003**
Potatoes	46(74.2)	29(48.3)	0.003**
Vegetables	46(74.2)	29(48.3)	0.003**
White yams	9(14.5)	13(21.7)	0.235
Cassava	9(14.5)	13(21.7)	0.235
Meat organs	4(6.4)	1(1.7)	0.365
Beef	10(16.2)	8(13.3)	0.365
Pork	10(16.2)	8(13.3)	0.365
Eggs	22(35.5)	11(18.3)	0.021*
Cheese	1(1.7)	0	1
Beans	45(72.5)	25(41.7)	0.001**
Peas	45(72.5)	25(41.7)	0.001**
Lentils	45(72.5)	25(41.7)	0.001**
Fish	10(16.2)	4(6.7)	0.155
Plain water	55(88.7)	46(76.7)	0.096
Sugar glucose	42(67.7)	19(31.7)	0.000**
Maheu	26(41.2)	32(53.3)	0.205
Vitamins	1(1.7)	2(3.3)	0.616
Yogurt	0	5(8.3)	0.026*
Cereals	2(3.2)	5(8.3)	0.269
Infant formula	0	1(1.7)	0.412
Juice or juice drinks	12(20.9)	19(31.7)	0.120
ORS	3(4.8)	4(6.7)	0.715

Extremely statistically significant differences were noted in dietary composition between groups (p value=0.003 and p value=0.001) as shown in table 8. These differences were notably so in protein rich plant based as well as vitamin rich foods in favour of more of Positive Deviance Hearth trained mothers reporting to have fed their children nutrient dense and diverse foods compared to untrained mothers.

Table 9: Appropriate sick child care and health care seeking management

Factors	**Exposed (62)**	**Unexposed (60)**	**Unexposed (60)**	**P value**
hand washing products	Mild sand	1 (1.7)	3(5)	0.000**
	Soap	11 (17.7)	3 (5)	
	Detergent	33 (53.2)	9 (15)	
	Water	16 (25.8)	45 (75)	
Ever had diarrhea in last 2 weeks	Yes	11 (17.7%)	21 (35%)	0.041*
	No	50 (80.6%)	39 (65%)	
Ever seek advice for diarrhea treatment	Yes	11(17.7)	18 (30)	0.534
	No	0	3 (5)	
Was the child given ORS	Yes	11 (17.7)	13 (21.7)	0.029*
	No	0	8 (13.3)	
Was the child given zinc	Yes	8 (12.9)	10 (16.7)	0.266
	No	3 (4.8)	11 (18.3)	
What was given to treat	Antibiotic	4 (6.7)	0	0.001**
	Injection	3 (6.7)	0	
	Syrup	4 (6.7)	14 (23.3)	
When the child was sick was he given less than usual to eat	Yes	2 (3.3)	38 (63.3)	0.000**
	No	53 (85.5)	18 (30)	
When the child was sick was he given less than usual to drink	Yes	2 (3.3)	28 (46.7)	0.000**
	No	53 (3.3)	28 (46.7)	

** Extremely significant p< 0.01, * Significant p < 0.05 Fisher's exact chi square for categorical variables and t tests for continuous variables

The Positive Deviance Hearth trained mothers also showed extremely significant difference from untrained mothers with regards to appropriate care when a child fell sick. Most trained mothers sought medical attention when their child fell ill and also offered their child Oral Rehydration Solution in cases of diarrhea. In addition, when their children had diarrhea Positive Deviance trained mothers did not reduce quantity of food or drink which they offered to their children as compared to their counterparts (p value=0.000).

Table 10: Risk assessment

Risk factor		**Underweight**	
		Yes	No
	Exposed to PD	3	59
	Un exposed	5	55
P value 0.3477 OR = 0.6 (0.2 ;1.9)			

Odds ratio of 0.6 times more likely to be underweight are being noticed on the group exposed to Positive Deviance program as compared to the group that was not exposed to Positive Deviance program. Mothers who once had been part of the Positive Deviance program are experiencing 44.4% less chance of having underweight children than those who were not on the program. This also conclude that attending a Positive Deviance program is protective of being underweight.

4.3 Discussion and interpretation

This section provides a detailed critique of the research findings in relation to other similar sources of literature on other Positive Deviance Hearth strategy studies that were

conducted in other countries. The study's unusual or most notable outcome is that children that were born in future who are younger siblings who had never experienced the intervention firsthand benefited nutritionally the most.

4.3.1 Child nutritional status

Supporting the aforementioned unique finding is the proportion of children with malnutrition that is low weight for age which was significantly more among children of caregivers who had never been exposed to Positive Deviance Hearth (8.0%) compared to (5.0%) among those who had previously been exposed to Positive Deviance Hearth Strategy. This is corroborated by studies done in Bangladesh, Vietnam, Kenya, Rwanda and Uganda (Anino, 2015; Bisits Bullen, 2011; Brackett, 2007; Mackintosh et al., 2002; Okochil, 2016). In the study by Mackintosh et al. (2002) the populations that had been exposed to the nutrition program three to four years prior had superior child nutritional status, as per hypothesis.

The above mentioned studies also greatly relate with the results of this study where in comparison to the group that was not exposed to the Positive Deviance program, the group exposed to the program had odds of being underweight that were 0.6 times lower. Paralleled to mothers who did not participate in the program, mothers who had previously participated in the Positive Deviance program had a 44.4% lower risk of having underweight children. This leads to the further deduction that participation in Positive Deviance programs protects against underweight and improves nutritional status of children born in future to trained mothers.

A similar study in Guatemala further supports these findings as it showed that subsequent generations after a nutrition intervention benefited from the caregiving practices learnt

(Martorell, 1995). Another Positive Deviance Hearth study in rural Rwanda also showcased full rehabilitation from malnutrition in 67.8% of children program participants between 2004 and 2006, although program's overall rehabilitation goal of 80% was not met. This suggests that Positive Deviance Hearth is an effective strategy for addressing malnutrition in rural Rwanda as well as other similar developing countries (Brackett, 2007).

Worth mentioning, there was no statistically significant difference between prevalence of underweight between children of Positive Deviance Hearth trained mothers and untrained mothers (p value=0.454). The study conducted in rural Rwanda substantiates this as similar results were noted. According to the Rwandan study findings Positive Deviance Hearth failed to influence prevention of malnutrition as the child nutritional status of the younger siblings of Positive Deviance participants was not significantly different from that of younger siblings of non-participants (Brackett, 2007).

The underlying assumption could be that majority of Positive Deviance Hearth participants were households where poverty and incidence of malnutrition had been previously witnessed whereas for the comparison groups, one could not tell as they were randomly selected. The assumption of poverty causing a lack of significant difference in malnutrition between groups is corroborated by a midterm evaluation carried in Rwanda in 2004 in which respondents alluded that poverty and child illness were key reasons that led to infants persisting to be malnourished despite partaking in training sessions for PD Hearth (Brackett, 2007).

However, study findings in Kenya by Macharia et al., (2005) thwarts the assumption above as stunting prevailed among children despite poverty eradication support which was

offered by World Vision Kenya (Macharia et al., 2005; Okochil, 2016). Even when socioeconomic situation was taken into account, the results showed that there was no discernible difference between the control group and the children covered by the World Vision program in terms of nutritional status. So, it is possible to hypothesize that data showing a connection between child malnutrition and poverty has been manipulated (Appoh & Krekling, 2005; Okochil, 2016). For example, food shortages are inevitable in areas like Mudzi District that experience persistent drought, which over time leads to insufficient nutritional intake. However, despite their poverty, some households in the district are known as "Positive Deviants" because they have well-nourished children. Imperatively finding out how much information caregivers have about infant and young child feeding and how that information affects their behavior when it comes to child care, and ultimately child nutritional status is of paramount importance with regards to addressing malnutrition (Okochil, 2016).

Additionally, children who had diarrhea within the previous two weeks were more among untrained mothers (35.0%) as compared to (17. 7%) among trained Positive Deviant mothers. This diarrheal illness might have affected study measures by causing weight loss and thus the nutritional status of the child (weight for age). However, it is also unclear which way the association between malnutrition and diarrheal illness ran that is, whether illness caused malnutrition or malnutrition caused illness.

Some of the variables of child nutritional status in this study were continued breast feeding for more than a year, frequency of meals, diversity of diet and the health of the infant couple of days prior to data collection day, that is whether the child had suffered from diarrhea or not. These are also discussed below.

4.3.2 Infant and young child feeding practices

A double proportion of positive deviant mothers (17.7%) reported continuing feeding of breastmilk to their infants beyond one year compared to (8.3%) of the non-participants. Majority of untrained mothers quickly weaned their children from breastmilk at the one-year mark. For example, in a study by Mackintosh et al., (2002) it was found that compared to 20.0% of the comparison group, 41.0% of the women who were positive deviance mothers were breastfeeding. The study established that the Positive Deviance intervention mothers had noticeably better feeding practices even after adjusting for potential variables (such as the mother's hours worked outside the home, the beneficiaries' ages, and their sexes). According to the study's findings, women who participated in positive deviance trainings were better able to remember the suggested feeding behaviours for infants two to five years after the practices were put into place.

This concurs with the findings of this study as well whereby with regards to complementary feeding practices Positive Deviance mothers' responses to what they had fed their children the previous day clearly showed they still recalled lessons taught on meal frequency and dietary diversity using locally available resources. Positive Deviance mothers showed statistically significant differences in meal frequencies they offered their children 3.1 ± 0.1 and 2.7 ± 0.1 for non-participants (p value=0.015). The results are almost similar to those observed in a study conducted in 1998 in Vietnam where trained mothers fed the younger siblings more meals per day on average than did their counterparts, 2.9 ± 0.4 versus 2.2 ± 0.4, respectively ($p < 0.001$) (Mackintosh et al., 2002).

In addition, Positive Deviance Hearth trained mothers observed recommendations from World Health Organization on complementary feeding as shown in table 1. The Positive

Deviance mothers managed to feed more than 3 different types of foods daily, including one animal food-fish, eggs, meat or liver as per WHO recommendation. Moreover, extremely statistically significant differences were noted in dietary composition between groups (p value=0.003 and p value=0.001). These differences were notably so in protein rich plant based as well as vitamin rich foods such as pumpkin, vegetables, eggs, beans, peas, lentils in favour of more of Positive Deviance Hearth trained mothers reporting to have fed their children these nutrient dense and diverse foods compared to untrained mothers.

4.3.3 Caregiver recall of Positive Deviance Hearth Behaviors in diarrhea prevention and appropriate sick child care

Findings in table 7 revealed that 93.5% of mothers who were exposed covered their water containers, but only 65% of mothers in the unexposed group did the same. There were also notable disparities in the proportion of mothers who practiced proper child waste disposal that is 77.7% of mothers trained in positive deviance hearth and 60% in the untrained mothers group.

Mothers trained in Positive Deviance also reported having a larger percentage of a proper handwashing station located close to the restroom compared to their counterparts. Compared to women who did not previously participate in Positive Deviance Hearth, just 55.0% of them had a tippy tap in their homesteads were as 77.4% of Positive Deviance mothers had a tippy tap in their homesteads. This clearly demonstrates that they could still recall principles of diarrhea prevention and were also practicing the WASH behaviors they had been taught years back during Positive Deviance Hearth sessions.

This research also makes the connection that the significant differences in hygienic practices mentioned above clearly contributed to the differences in incidence of diarrheal illness of children between the two comparison groups. Where forth, statistically significant results, 17.7% of Positive Deviance trained mothers and almost double 35% of untrained mothers had children who had suffered from diarrhea in the preceding two weeks (p value=0.041). Moreover, 31. 6% of non-participants compared to 14.5% of the trained mothers (p value=0.006) had no toilet facility and were practicing open defecation and subsequently also fetching water from unprotected sources and not treating the water prior to drinking it. There was also a statistically significant difference among groups in use of soap and detergent during handwashing with 70.9% of positive deviant mothers preferring use of either soap or detergent combined compared to 20% of untrained others (p value=0.000). This clearly shows trained behaviors during Positive Deviance Hearth sessions were sustained in care of younger siblings.

A study conducted in Ecuador indicated that mothers whose children had improved after Positive Deviance Hearth sessions were the only ones to mention handwashing, child cleanliness, and illness treatment when ability to recall Water and Sanitation and Hygiene behaviors was assessed (Roche, 2011). Saha (2019) postulates that there is a clear connection between human health and sanitation. A number of diseases have been linked to poor personal and food hygiene, incorrect disposal of human waste, and consumption of tainted drinking water.

4.4 Summary

The results showed that majority of caregivers from the positive deviance hearth exposed group still utilized most of the behaviors they had been taught in child care compared to their counterparts who had never been trained. The chances of having children who were underweight were lower in the positive deviance hearth exposed group. In addition the caregivers from the positive deviance hearth managed to offer their children a diverse diet as witnessed by the significant differences in the food groups. Positive Deviance mothers also demonstrated appropriate care of sick child compared to their counterparts.

CHAPTER 5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter focuses on discussing major findings of the study in line with the research objectives. The implications of the whole study to public health are denoted and the researcher carefully highlights limitations experienced while undertaking the study. Conclusion to whether to accept or reject the hypothesis is finally given. Suggestions for further research are specified.

5.2 Discussion

There has been a noticeable decline in child mortality in developing nations; this development can be attributed in part to effective nutritional intervention initiatives. It is still unclear, though, how much these initiatives are sustained among communities in the long run when support and facilitation is withdrawn by Non-Governmental Organizations as post project studies are rarely done. Accordingly, the goal of this research was to ascertain how the Positive Deviance Hearth intervention behavioral strategies imparted to caregivers during the period 2017-2020 affected nutritional status of children under five born 3 years later in Mudzi District.

5.2.1 Child nutritional status

The long-term impacts of a nutrition education and rehabilitation program run in Mudzi District by World Vision Zimbabwe in partnership with Ministry of Health and Child Care were investigated in this study. Noteworthy, beneficiaries of the program maintained their improved nutritional awareness for up to two years following the withdrawal of the

implementing agency. The study results showed that children of caregivers who had been previously exposed to PD Hearth had better nutritional status than their counterparts. However, the difference between groups were not statistically significant (p value= 0.454). An assumption could be made that perhaps data contamination could have occurred over the years whereby diffusion of caregiving practices learnt during Positive Deviance Hearth sessions to neighbors who had never been exposed to PD Hearth transpired

5.2.2 Infant and Young child feeding practices

The most crucial step in order to prevent malnutrition in the future, is to ascertain the level of nutritional information that caregivers possess about infant and young child feeding and to comprehend how this knowledge affects their behaviors regarding child care and, in turn, their nutritional status (Okochil, 2016).

The obtained results were a clear indication that caregivers remembered the Positive Deviance Hearth menu meals and were applying the acquired nutrition education in feeding of future children they bore. This is substantiated by Sethi et al. (2003) that the level of nutritional awareness of a caregiver has influence on dietary quality. Nutrition education and knowledge, empowers caregivers to provide proper care even with limited resources. Research done implicate that feeding patterns are not solely because of household food availability but relatively also the knowhow of the caregiver with respect to nutrition (Sethi et al., 2003).

However, there is an interesting avenue which was not researched. Due to their vulnerability status, there is possibility that majority of Positive Deviance trained mothers were part of the World Food Program Social and Humanitarian Food Assistance program

in which beneficiaries were being given cereals, pulses and vegetable oil. Hence explaining the significant difference in mothers who fed their children pulses.

Notably, one socio-economic factor that is mother's occupation between the comparison groups was statistically extremely significant (p value=0.001). Positive Deviance trained mothers had 54.8% of them who were housewives compared to 38.3% of their counterparts. This greatly also influenced proportion of time spent out by mothers in both groups whence, Positive Deviance mothers had 79.0% spending only two to four hours outside. Nevertheless, time spend outside the home was not statistically significant between the two comparison groups. Perhaps this could be because majority of activities in rural areas may involve spending more time outside home such as fetching water or firewood, taking livestock for grazing as well as farming.

Meanwhile mother's occupation might have contributed to meal frequency and dietary composition offered to infants by the two groups**.** A significant difference was noticed in the two groups on a healthy snack (p value=0.026) in favor of untrained mothers having fed their children yoghurt the day before. This could be explained by the fact that majority of untrained mothers were gold panners whereas most of trained mothers were housewives and as such could not afford a snack such as yoghurt. This could be true based on an observation of a midterm evaluation carried out in 2004 in Rwanda alluding that many mothers knew correct nutritional behavior but were basically too impoverished to carry out that behavior. Contrary to this fact though, the other assumption could be that Positive Deviance mothers mastered the art of utilizing what was locally available to them in preparing their children's meals as taught in PD Hearth sessions.

5.2.3 Caregiver recall of Positive Deviance Hearth Behaviors in diarrhea prevention and appropriate sick child care

This research makes the assumption that the poor hygienic practices observed among study groups may have contributed to diarrheal illness in their children and subsequently the poor nutritional status of their children. This is supported in a study conducted in Rwanda where illness was mention by positive deviance trained mothers as one of the reasons why children remained underweight in spite of participating in Positive Deviance sessions. This clearly shows that there is need to aggressively advocate for proper hygiene and also complement Positive Deviance Hearth programs with WASH programs such as borehole drilling and building of ventilated Blair toilets.

Furthermore, the study also denoted that 5.0% of untrained mothers who had reported their children of having diarrhea in the previous week did not seek treatment. Whilst for the trained mothers group all of them sought treatment for their children and moreover, they did not reduce amount of feeding or fluids offered to their children when they were sick. Neither did the untrained mothers offer Oral Rehydration Solution to their children. This clearly showed a lack of nutrition education and knowledge of appropriate sick child care among mothers who had never attended Positive Deviance Hearth sessions.

The aforementioned results perhaps can be explained by conclusions drawn from a study in India (Alimonte, Deshmukh, Jayaraman & Humphries, 2016). The study reported that positive deviant mothers mentioned that their community health worker was a great resource for advice on raising children, which could point to a good rapport between the two groups. On the other hand, non-positive deviant moms frequently claimed that they were unsure of whom to consult for guidance regarding the health and diet of their

children. Notably, they failed to see the health worker as a valuable resource (Alimonte et al., 2016). This could explain the poor dietary choices as well as poor hygienic and sick child handling practices observed in this study.

5.3 Study conclusions

Unanimously this study stands out because it shows that younger siblings who were not directly exposed to the Positive Deviance Hearth program in 2017-2020 intervention had improved growth and nutritional status compared to their counterparts. Thus the conclusion drawn is that improved infant feeding practices with diverse diet, appropriate child care and healthcare are, at least somewhat, responsible for Positive Deviance mothers' children's higher nutritional status as compared to their age-equivalent peers. The teachings of "good foods, good childcare, and good health care" during Positive Deviance Hearth sessions and growth monitoring and promotion sessions seem to have had a lasting impact on mothers' caregiving practices in the 7 wards in Mudzi District, which in turn improved the nutritional outcomes for future infants they bore after World Vision ceased its operations.

5.4 Implications

The better nutritional status of children whose mothers had once been exposed to the Positive Deviance Hearth is a clear indication that behavior can be sustained over time. Thus the Positive Deviance Hearth Strategy can be adopted in other provinces of the country which have similar challenges of malnutrition. National policies and strategies can also adopt this strategy as an aiding tool to achieve Global Nutrition targets.

Meanwhile the food insecurity status due to El-nino induced drought in Mudzi District can limit access to diverse diets. However, the fact that caregivers who had once been

exposed to Positive Deviance Hearth were able to feed their children diverse diets is an indication that behavior and knowledge as well as aspects of care may have more impact on outcome of child nutritional status.

Finally, in spite of poor access to health care if communities are aware of locally available health service avenues such as Community Health Workers and the role they play in child nutritional status the chances of practicing appropriate care when children are ill are raised.

5.5 Recommendations

In light of the study findings inference can be made that growth-promoting child-care methods that are simple and inexpensive to implement can be found using the positive deviance approach. When these qualities are present, caregiver practices can persist for many years even after an outside implementation group such as World Vision has ceased operations. Therefore, recommendation is for researchers and programmers to investigate the potential of the Positive Deviance approach for identifying key behaviors related not only to child health but also to other domains in public health.

In addition, since self-sufficiency is the definitive objective of all international health and development efforts recommendation is made for health policy makers in Zimbabwe to incorporate Positive Deviance in the Ministry of Health and Child Care Programs and policies in order to hasten its scale up even to other provinces that are burdened with malnutrition. Moreover, not only limit it to nutrition and child care but rather broaden it to other health care programs.

The researcher suggests implementing Positive Deviance Hearth sessions concurrently with social protection initiatives like Cash Based Transfers or Food Assistance. Although the PD/Hearth approach aims to find and disseminate solutions to malnutrition that community members with well-nourished children in a resource-poor area are already using, research indicates that the continuation of adopted behaviors stops when families encounter obstacles related to poverty or disasters like drought. This is not because they do not want to receive guidance or adopt healthy habits. The sustainability of taught behaviors could be significantly increased by combining income-generating activities at the individual or family level with the implementation of social protection and resilience building programs, as well as Positive Deviance Hearth. More research might focus on a more detailed examination of socioeconomic status and how it affects positive behavior sustenance.

5.5 Dissemination of results and action taken in response to the findings

Study results were presented and defended to the Africa University college of Health Science board as well as to World Vision health and Nutrition department. Findings were also shared with the Mudzi District Health Executive and households with malnourished children were noted and referred to the district hospital for enrollment in a nutrition program. A copy of the study was shared with the District Administrator's office. The student also plans to disseminate research findings as journal article.

5.6 Suggestions for further research

The researcher recommends that an observational research be done over time in order to address the issue of bias of over reporting from caregivers. In addition, the food insecurity aspect as a barrier or motivator to successful implementation and sustenance of the

Positive Deviance Hearth Strategy needs to be explored as a stand-alone research. This will also provide literature on feasibility of Positive Deviance Hearth during times of severe food shortages and drought.

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Appendix 1: Budget

Item	**Estimate cost (USD)**
Data and airtime costs	$50
Procurement of tablet for data capturing	$300
2 Research assistants	$220
Travelling for data collection	$200
Stationery and printing	$50
Contingency	$50
Total	$870

Appendix 2: Timeframe

Sustainance of PD behaviors among caregivers

Timeline

Project Start: Thursday, March 10, 2022

Display Week: 1

TASK	ASSIGNED TO	PROGRESS	START	END
Development of research topic				
Background note		100%	3/10/22	3/15/22
Formulating Research proposal		100%	3/15/22	4/14/22
Proposal presentation and defense		100%	4/19/22	4/29/22
Submission to AUREC		pending	5/4/22	5/25/22
Chapter 1				
Introduction		100%	5/25/22	5/30/22
Chapter 2				
Review of related literature		90%	5/25/22	9/22/22
chapter 3				
Data collection		pending	10/1/22	10/15/22
Data cleaning		pending	10/15/22	10/20/22
Chapter 4				
Data analysis and presentation		pending	10/21/22	10/24/22
Chapter 5				
Disscussion, Conclusion and recommendation		pending	10/25/22	11/4/22
Insert new rows ABOVE this one				

Appendix 3: Informed Consent

My name is Taonga Trish Magomo l am a final year Masters in Public Health student from Africa University but currently working with World Vision in Mudzi District. I am carrying out a study on "Sustenance of the positive deviant behaviours by caregivers or mothers with at least one child 6 to 23 months old. I am kindly asking you to participate in this study by responding to the questions that l shall ask.

The information collected will help World Vision and other stakeholders design better nutrition programs and policies to address malnutrition in children under 5. You were selected for the study because you were once part of a cohort that was trained on Positive Deviance Hearth two years ago.

If you decide to participate you will be asked questions which would normally take 30 to 45 minutes. I may also ask to see around your homestead. The study also involves taking the weight of your child.

There are no risks or direct benefits to you from participating in the survey but your participation will contribute to improving development of sustainable nutrition interventions. All of the answers you give will be confidential and will not be shared with anyone other than members of the study team. You don't have to be in the study, but l hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time. If you decide not to participate in this study, it will not affect your future relationship with World Vision or any other donor funded programs. Do you have any questions or areas that you may need me to clarify? May I begin the interview now?

If you have decided to participate in this study, please sign this form in the space provide below as an indication that you have read and understood the information provided above and have agreed to participate.

---------- ----------

Name of Research Participant (please print) Date

Signature of Research Participant or legally authorised representative

If you have any questions concerning this study or consent form beyond those answered by the researcher including questions about the research, your rights as a research participant, or if you feel that you have been treated unfairly and would like to talk to someone other than the researcher, please feel free to contact the Africa University Research Ethics Committee on telephone (020) 60075 or 60026 extension 1156 email aurec@africau.edu

Name of Researcher ----------

Appendix 4: Mother/ Caregiver Assent for child to Participate in a Research Study

Title of Study: **Sustenance of the positive deviance hearth strategy behaviours by caregivers in Mudzi district, Mashonaland east, Zimbabwe**

Principal Investigator: Taonga Trish Magomo 0777585563 Africa University MPH student

Parent/Guardian Name:

Introduction

We are requesting permission for your child to participate in anthropometry measurements to examine sustenance of the positive deviant behaviours by caregivers or mothers with at least one child 6 to 23 months' old. S/he has been selected because you were once exposed to trainings to the World Vision Positive Deviance program implemented during 2017 to 2020 before s/he was born. Hence we would now like to assess (name of current child) nutritional status by measuring her weight and height. This will give a reflection if you are still applying the behaviors you learnt in Positive Deviance Hearth sessions in child care. Some of your neighbors who might have previously participated in the Positive Deviance Hearth program in 2017-2020 but did not bore another child afterwards have been excluded from the study. I implore you to feel free to ask any questions that you may have before allowing your child to participate in this study.

Purpose of Study

The purpose of the study is to assess whether Positive Deviance Hearth Intervention behaviors adopted by mothers and/or caregivers are sustained in child care of future infants 6 to 23 months and the effect on child nutritional status. The information collected will help World Vision and other stakeholders design better nutrition programs and policies to address malnutrition in children under 5. Ultimately, this research will be submitted to Africa University in partial fulfillment of the requirements of my Masters' in Public Health studies. The research may also be published as a research article.

Description of the Study Procedures

In the circumstance that you decide to allow your child to participate in this study, s/he will be asked to do the following things: you will be asked to help hang your child on a SECA scale so that we can measure his or her weight. The child will be required to remove all clothing.

Risks/Discomforts of Being in this Study

There are no reasonable foreseeable risks to the child or to you.

Benefits of Being in the Study

There are no direct benefits to you from participating in the survey but your participation will contribute to improving development of sustainable nutrition interventions in Mudzi District and other malnutrition prone areas. However, in the case that it turns out your child is malnourished s/he will be referred to a nutrition program.

Confidentiality

The records of this study will be kept strictly confidential. Research records will be kept in a locked file, and all electronic information will be coded and secured using a password protected file. We will not include any information in any report we may publish that would make it possible to identify your child.

Payments

No payments will be given at any stage of this research study to you or to the child

Right to Refuse or Withdraw

The decision to participate in this study is entirely up to you since your child is still a minor. Noteworthy the interview is focused on you but we only require at a point to measure your child's weight. Any cues from your child indicating being uncomfortable at any stage will be taken to consideration without affecting your relationship with the investigators of this study or your future relationship with World Vision or any other donor funded programs. You also have the right to withdraw your child completely from the interview at any point during the process; additionally, you have the right to request that the interviewer not use any of the interview material.

Right to Ask Questions and Report Concerns

You have the right to ask questions about this research study and to have those questions answered by me before, during or after the research. If you have any further questions about the study, at any time feel free to contact me Taonga Trish Magomo (07775855630. If you like, a summary of the results of the study will be sent to you. Alternatively,

concerns can be reported by making use of the suggestion box that will be availed at village assembly points

Consent

Your signature below indicates that you have decided to allow your child participate as a research subject for this study, and that you have read and understood the information provided above. You will be given a signed and dated copy of this form to keep, along with any other printed materials deemed necessary by the study investigators.

Parent/Guardian Name:	_____		
Parent/Guardian Signature:	_____	Date:	_____
Investigator's Signature:	_____	Date:	_____

Appendix 5: Caregiver survey questionnaire to assess sustenance of PD behaviors

IDENTIFICATION	
CLUSTER NUMBER	
HOUSEHOLD NUMBER	
RECORD NUMBER	
DATE OF INTERVIEW (DD/MM/YYYY)	
INTERVIEWER'S NAME	
SUPERVISOR'S NAME	
COMMUNITY	

INFORMED CONSENT

Hello. My name is Taonga Trish Magomo. I am studying for a Master's in Public Health with Africa University but currently working with (World Vision) in Mudzi District. I am conducting a survey about "Sustenance of adopted positive deviant behaviors in future infants among women with at least one child 6 to 23 months old." The information collected will help World Vision and other stakeholders design better nutrition programs and policies to address malnutrition in children under 5. You were selected for the survey. There are no risks or direct benefits to you for participating in the study. The questions usually take about 30 to 45 minutes. All of the answers you give will be confidential and will not be shared with anyone other than members of the study team. You don't have to be in the study, but l hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time.

Do you have any questions? May I begin the interview now?

SIGNATURE OF INTERVIEWER: DATE:

RESPONDENT AGREES TO BE INTERVIEWED. . . 1 RESPONDENT DOES NOT AGREE TO BE INTERVIEWED… 2 → END

NAME OF MOTHER
AGE OF MOTHER (YEARS
NAME OF MOST RECENT CHILD
AGE OF MOST RECENT CHILD (MONTHS)
CHILD'S DATE OF BIRTH (DD/MM/YYYY)
SEX OF CHILD (1 = MALE, 2 = FEMALE)

SECTION A: Child Anthropometry (CA)

CA101	RECORD THE NAME, AGE, DATE OF BIRTH, AND SEX OF THE MOST RECENT CHILD FROM THE COVER PAGE	NAME AGE (MONTHS) . . . . DATE OF BIRTH (DD/MM/YYYY) . . . . . . SEX (1 = MALE, 2 = FEMALE) . . . . .
CA102	As part of this survey, we are measuring the weight of children age years in order to measure their growth. Do you have any questions? You can say yes or no. It is up to you to decide. Will you allow (NAME OF CHILD FROM CA101) to participate in the weight measurements?	YES . . . . . .1 NO 2 (MNUT101)
CA103 (1)	WEIGHT IN KILOGRAMS	KG . . . . . . NOT PRESENT . . . . . 9994 REFUSED . . . . . 9995 OTHER 9996

(1) In countries where the weighing scale shows the weight to only one decimal place, retain only one box after the decimal point and delete the first '9' from the other three codes.

SECTION B: **Infant and Young Child Feeding (IYCF) practices**

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
IYCF 101	RECORD THE NAME, AGE, DATE OF BIRTH, AND SEX OF THE MOST RECENT CHILD FROM THE COVER PAGE.	NAME AGE IN MONTHS DATE OF BIRTH DD/MM/YYYY SEX (1=MALE, 2=FEMALE)	
IYCF 102	Are you still breastfeeding (NAME OF CHILD FROM IYCF101)?	YES 1 NO . 2	
IYCF 103 (1)	Now I would like to ask you about liquids or foods that (NAME OF CHILD FROM IYCF101) had yesterday during the day or at night. I am interested in whether your child had the item I mention	YES NO DK	
	b) Juice or juice drinks?	b) . . 1 2 8	
	c) Sugar or glucose water?	c) . . 1 2 8	
	d) Maheu?	d) . . 1 2 8	
(2)	e) Sugar-salt-water solution or a solution made from ORS?	e) . . 1 2 8	
	f) Vitamins, minerals, or medicines given as drops or syrup?	f) . . 1 2 8	
	h) Milk such as tinned, powdered, or fresh animal milk? IF YES: How many times did (NAME) drink milk?	h) . . 1 2 8 NUMBER OFTIMES DRANK MILK ☐	
	i) Infant formula? IF YES: How many times did (NAME) drink infant formula?	i) . . 1 2 8 NUMBER OFTIMES DRANK FORMULA ☐	
	j) Any other liquids?	j) . . 1 2 8	
	k) Yogurt? IF YES: How many times did (NAME) eat yogurt?	k) . . 1 2 8 NUMBER OF TIMES ATE YOGURT ☐	
	l) Any [BRAND NAME OF COMMERCIALLY	l) . . 1 2 8	
(3)	m) Sadza, Samp, Bread, rice, porridge, or other foods made from grains (maize,	m) . . 1 2 8	
(4)	n) Pumpkin, carrots, squash, sweet potatoes, or other vegetables that are yellow or	n) . . 1 2 8	

(5)	o) White potatoes, white yams, manioc, cassava, or any other foods made from roots?	o) . .	1	2	8	
(6)	p) Any dark green, leafy vegetables?	p) . .	1	2	8	
	q) Ripe mangoes, papayas, or [INSERT ANY OTHER LOCALLY AVAILABLE VITAMIN A-RICH FRUITS]?	q) . .	1	2	8	
	r) Any other fruits or vegetables?	r) . .	1	2	8	
	s) Liver, kidney, heart, or other organ meats?	s) . .	1	2	8	
	t) Any meat, such as beef, pork, lamb, goat, chicken, or duck?	t) . .	1	2	8	
	u) Eggs?	u) . .	1	2	8	
	v) Fresh or dried fish or shellfish?	v) . .	1	2	8	
	w) Any foods made from beans, peas, lentils, groundnuts, or other legumes?	w) . .	1	2	8	
	x) Cheese or other food made from milk?	x) . .	1	2	8	
	y) Any other solid, semi-solid, or soft food?	y) . .	1	2	8	
IYCF 104	CHECK IYCF103 (CATEGORIES 'k' THROUGH 'y'): NOT A SINGLE 'YES' / AT LEAST ONE 'YES'					
IYCF 105	Did (NAME OF CHILD FROM IYCF101) eat any solid, semi-solid, or soft foods yesterday during the day or at night? IF 'YES' PROBE: What kind of solid, semi-solid or soft foods	YES 1 (GO BACK TO IYCF103 TO RECORD FOOD EATEN) (THEN CONTINUE TO IYCF106)				CA 10
IYCF 106	How many times did (NAME OF CHILD FROM IYCF101) eat solid, semi-solid, or soft foods yesterday during the day or at night? IF 7 OR MORE TIMES, RECORD '7'.	NUMBER OF TIMES . . DON'T KNOW 8				

(1) A separate category: "Foods made with red palm oil, palm nut, or palm nut pulp sauce" must be added in countries where these items are consumed. A separate category: "Grubs, snails, insects, or other small protein food" must be added in countries where these items are eaten. Items in each food group should be modified to include only those foods that are locally available and/or consumed in the country. Local terms should be used.

(2) Include in the question the common names / brands for ORS.

DIARRHOEA PREVENTION PRINCIPLES: WASH

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
WASH101	What is the main source of drinking water for members of this household?	**PIPED WATER** PIPED INTO DWELLING 11 PIPED TO YARD / PLOT. 12 PIPED TO NEIGHBOR 13 PUBLIC TAP / STANDPIPE. 14 TUBE WELL OR BOREHOLE 21 **DUG WELL** PROTECTED WELL 31 UNPROTECTED WELL 32 **WATER FROM SPRING** PROTECTED SPRING 41 UNPROTECTED SPRING 42 RAINWATER 51 TANKER TRUCK 61 CART WITH SMALL TANK 71 SURFACE WATER (RIVER / DAM /	WASH 105
WASH106	In the past two weeks, has the water from this source been unavailable for at least one full day?	YES 1 NO 2 DON'T KNOW 8	
WASH107	If the water from this source is not available at any time, what other source of drinking water do members of this household usually use?	**PIPED WATER** PIPED INTO DWELLING 11 PIPED TO YARD / PLOT. 12 PIPED TO NEIGHBOR 13 PUBLIC TAP / STANDPIPE. 14 TUBE WELL OR BOREHOLE 21 **DUG WELL** PROTECTED WELL 31 UNPROTECTED WELL 32 **WATER FROM SPRING** PROTECTED SPRING 41 UNPROTECTED SPRING 42 RAINWATER 51 TANKER TRUCK 61 CART WITH SMALL TANK 71 SURFACE WATER (RIVER / DAM / LAKE / POND / STREAM / CANAL /	
WASH108	Do you treat your water in any way to make it safer for drinking?	YES 1 NO 2	WASH112
WASH109	What do you usually do to the water to make it safer for drinking? Anything else? RECORD ALL MENTIONED.	LET IT STAND AND SETTLE/SEDIMENT A STRAIN IT THROUGH CLOTH B BOIL C ADD BLEACH / CHLORINE D WATER FILTER (CERAMIC, SAND, COMPOSITE) E SOLAR DISINFECTION F	WASH112
WASH110	May I see the supplies you use for making water safe?	YES. 1 NO . 2	WASH112

WASH111 A B C D	OBSERVATION ONLY: IF BOILED WATER WAS MENTIONED: IS THERE A PLACE TO BOIL WATER AND A CONTAINER (KETTLE)? IF BLEACH IS ADDED: IS THERE BLEACH? IF WATER IS FILTERED (CERAMIC, SAND, COMPOSITE): IS THE FILTER PRESENTLY USED? IF SOLAR DISINFECTION IS MENTIONED: IS	YES 1 NO 2 DON'T KNOW 8 YES 1 NO 2 DON'T KNOW 8 YES 1 NO 2 DON'T KNOW 8 YES 1 NO 2 DON'T KNOW 8	
WASH112	How do you store drinking water?	IN CONTAINERS (BUCKET, JERRY CAN, JERKIN, BOTTLE, DRUM, ETC.) ..... 1 ROOF TANK OR CISTERN 2 NO WATER STORED 3	WASH 116
WASH113	May I see the containers please?	YES 1 NO 2	WASH116
WASH114	OBSERVE THE CONTAINERS AND CHECK ALL THAT APPLY. *Narrow-mouthed: opening is 3 cm or less (interviewers use template)*	NARROW-MOUTHED A WIDE-MOUTHED B BOTH TYPES C	WASH116
WASH115	OBSERVE THE NARROW-MOUTHED CONTAINER(S) AND RECORD IF COVERED.	ALL ARE COVERED 1 SOME ARE COVERED 2 NONE ARE COVERED 3	
WASH116	Does your household have a handwashing station such as a tap, basin, bucket, sink, or tippy tap?	YES. 1 NO 2	
WASH117	Can you show me where you usually wash your hands and what you use to wash hands? ASK TO SEE AND OBSERVE.	INSIDE / NEAR TOILET FACILITY 1 INSIDE / NEAR KITCHEN/COOKING PLACE 2 ELSEWHERE IN THE HOME 3 ELSEWHERE IN THE YARD 4 OUTSIDE YARD 5 NO SPECIFIC PLACE 6 NO PERMISSION TO SEE 8	WASH 121
WASH121	What type of handwashing products do you prefer to use when washing your hands? ASK: Anything else? RECORD ALL MENTIONED.	SOAP A DETERGENT B ASH C MUD / SAND D NONE E WATER F OTHER X	
WASH122	What type of handwashing station do you see people using in your community to wash their hands? ASK: Anything else? RECORD ALL MENTIONED.	BUCKET A CUP B BASIN C WATER JUG D TOWEL..... E SINK..... F TIPPY TAP G OTHER X	
WASH123	In your opinion, what is the main reason that people in your community wash their hands?	TOLD BY NGOs 11 TO BE HEALTHY 12 TO CLEAN THEIR HANDS 13 TO PREVENT DIARRHEA..... 14 THEY SEE OTHERS DOING IT..... 16 OTHER 97 (SPECIFY) DON'T KNOW 98	

WASH124	In your opinion, what is the main reason people in your community do NOT wash their hands?	THEY DON'T THINK IT HELPS 1 THEY FORGET 2 THEY RUN OUT OF SOAP 3 DON'T HAVE ENOUGH WATER 4 OTHER 7 (SPECIFY)	
WASH125	What kind of toilet facility do members of this household usually use? IF NOT POSSIBLE TO DETERMINE, ASK PERMISSION TO OBSERVE THE FACILITY.	**FLUSH OR POUR FLUSH TOILET** FLUSH TO PIPED SEWER SYSTEM ..... 11 FLUSH TO SEPTIC TANK ... 12 FLUSH TO PIT LATRINE ... 13 FLUSH TO SOMEWHERE ELSE ..... 14 FLUSH, DON'T KNOW WHERE ..... 15 **PIT LATRINE** VENTILATED IMPROVED PIT LATRINE ..... 21 PIT LATRINE WITH SLAB ... 22 PIT LATRINE WITHOUT SLAB / OPEN PIT ..... 23 COMPOSTING TOILET ... 31 BUCKET TOILET ... . 41 HANGING TOILET / HANGING LATRINE ..... 51 NO FACILITY / BUSH / FIELD ... 61 OTHER 96 (SPECIFY)	WASH 127 WASH 127
WASH130	May I see the toilet facility?	YES 1 NO 2	WASH 132
WASH131 A B C D E	OBSERVATION OF SANITATION FACILITY: ARE THERE VISIBLE FECES ON THE FLOOR? ARE THERE VISIBLE FECES ON THE TOILET SEAT OR LATRINE COVER? IS THERE A STRONG ODOR INSIDE THE FACILITY? ARE THERE FLIES PRESENT INSIDE THE TOILET FACILITY? ARE THERE CLEANSING MATERIALS VISIBLE?	YES 1 NO 2 YES 1 NO 2 YES 1 NO 2 YES 1 NO	
WASH132	The last time [NAME OF CHILD] passed stool, where did he/she defecate?	USED SANITATION FACILITY 11 USED POTTY 12 USED WASHABLE DIAPERS 13 USED DISPOSABLE DIAPERS 14 WENT IN HOUSE / YARD 15 WENT OUTSIDE THE PREMISES 16 WENT IN HIS / HER CLOTHES 17 OTHER 96 (SPECIFY) DON'T KNOW 98	
WASH133	The last time [NAME OF CHILD] passed stools, where were the feces disposed of? (IF "WASHED OR RINSED AWAY", PROBE WHERE THE WASTE WAS DISPOSED OF. IF "DISPOSED", PROBE WHERE IT WAS DISPOSED OF SPECIFICALLY.)	DROPPED INTO TOILET FACILITY 11 RINSED / WASHED AWAY ~ WATER DISCARDED INTO TOILET FACILITY ..... 21 ~ WATER DISCARDED INTO SINK OR TUB CONNECTED TO DRAINAGE SYSTEM 22 ~ WATER DISCARDED OUTSIDE 23 DISPOSED ~ INTO SOLID WASTE / TRASH 31 ~ SOMEWHERE IN YARD 32 ~ OUTSIDE PREMISES 33 BURIED 41 DID NOTHING / LEFT IT THERE 51 OTHER 96 (SPECIFY) DON'T KNOW 98	

APPROPIATE SICK CHILD CARE BEHAVIOR: **Caregiver Knowledge**

NO.	QUESTIONS AND	CODING CATEGORIES	SKIP
SC501	Sometimes children get sick and need to receive care or treatment for illnesses. What are the signs of illness that would indicate your child needs treatment? DO NOT READ OPTIONS. RECORD ALL RESPONSES.	HIGH FEVER. A DIARRHEA WITH BLOOD IN STOOL. B DIARRHEA WITH DEHYDRATION (SUNKEN EYES, NO TEARS WHEN CRYING, SKIN PINCH GOES BACK SLOWLY) . C FAST / DIFFICULT BREATHING OR CHEST IN-DRAWING . D NOT ABLE TO DRINK OR FEED OR BREASTFEED. E VOMITING EVERYTHING. . F CONVULSIONS. G LOSS OF CONSCIOUSNESS. H LETHARGIC / TIRED / SLOW TO RESPOND / DOESN'T WANT TO PLAY I DOES NOT LOOK WELL . . STIFF NECK. K DON'T KNOW. X	
SC502	Are there any CCM-trained community health workers in your community? **(1)**	YES . 1 NO . 2 DON'T KNOW . 8	↓ END
SC503	What kind of work do the CCM-trained community health workers do in your community? **(1)** DO NOT READ OPTIONS. RECORD ALL RESPONSES.	**PREVENTATIVE** MOBILIZE THE COMMUNITY. A DISTRIBUTE LLINS . B ORGANIZE HEALTH CAMPAIGNS C SPREAD HEALTH MESSAGES. . D HELP HANG NETS IN HOUSEHOLDS. E PROVIDE HEALTH INFORMATION IN HOUSEHOLD. F PROVIDE HEALTH INFORMATION AT COMMUNITY EVENTS. G PROVIDE WATER TREATMENT TABLETS . H COLLECT HEALTH INFORMATION I OTHER . J **CURATIVE** REFER TO HEALTH FACILITY. K TEST FOR MALARIA. L TEST FOR PNEUMONIA . M PROVIDE MALARIA TREATMENT. N PROVIDE TREATMENT FOR FEVER. O PROVIDE TREATMENT FOR FAST / DIFFICULT BREATHING (PNEUMONIA). P PROVIDE ORS FOR DIARRHEA. Q PROVIDE ZINC FOR DIARRHEA. R ASSESS FOR MALNUTRITION. S FOLLOW UP SICK CHILDREN. T OTHER . U DON'T KNOW. Z	

(1) Include this question only if the behavior / intervention is practiced in the program area.

Appendix 6: Approval letter from study site authorities

MINISTRY OF LOCAL GOVERNMENT AND PUBLIC WORKS

All correspondences should be directed to the District Development Coordinator

Telephone: 065(2) 2230/2818/2687

Email: damudzikotwa@gmail.com

MINISTRY OF LOCAL GOVERNMENT, PUBLIC WORKS AND NATIONAL HOUSING
Office of the District Administrator
Office 215 Second Floor
MUDZI GOVERNMENT COMPLEX
Kotwa Growth Point
P O BOX 100
MUDZI

February 7, 2023

The MPH Coordinator
The Africa University College of Health, Agriculture, and Natural Sciences
P.O. Box 1320
Mutare
ZIMBABWE

SUPPORT AND PERMISION TO UNDERTAKE FIELD STUDIES FOR AN AFRICA UNIVERSITY MASTERS IN PUBLIC HEALTH STUDENT – TAONGA TRISH MAGOMO REG. NUMBER 191092 IN MUDZI DISTRICT

The above subject matter is pertinent.

TAONGA TRISH MAGOMO REG. No. 191092 a registered Masters in Public Health Student with Africa University who wishes to undertake academic research entitled **"Sustenance of Positive Deviance Hearth Strategy behaviours by caregivers in Mudzi District"** has been allowed to conduct field research in Mudzi District.

Taonga Trish Magomo is urged to observe local cultural norms and Covid 19 Regulations and Ministry of Health and Child Care Protocols during interviews and interactions with the traditional, religious leaders and general community. She will also share her findings with District Stakeholders upon completion of the research. During the course of her research, Taonga will utilize the appropriate sub district structures during the research under this office's overarching direction.

Yours Faithfully

DISTRICT DEVELOPMENT COORDINATOR MUDZI
09 FEB 2023
P.O. BOX 100, MUDZI

R. MZEZEWA
DISTRICT DEVELOPMENT COORDINATOR
MUDZI

Cc **Taonga Trish Magomo – Africa University College of Health, Agriculture and Natural Sciences : Old Mutare Road, Box 1320, MUTARE**

Appendix 7: Approval letter from AUREC submission from academic supervisor

AFRICA UNIVERSITY
(A United Methodist-Related Institution)

"Investing in Africa's Future"

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL RESOURCES

1 February 2023

To AUREC Administrator

Dear Sir/Madam

Re: Permission to Submit to AUREC for Taonga Trish Magomo (191092)

Programme: MPH

This letter serves to confirm that the above-mentioned student has satisfied all the requirements of the faculty in developing the dissertation proposal and is ready for assessment.

Your facilitation for review of the proposal is greatly appreciated.

Thank you

Dr E. Mugomeri

Appendix 8: Approval letter from AUREC

Investing in Africa's future

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 website: www.africau.edu

Ref: AU2869/23 17 May, 2023

Taonga Trish Magomo
C/O Africa University
Box 1320
MUTARE

RE: **SUSTENANCE OF THE POSITIVE DEVIANCE HEARTH STRATEGY BEHAVIOURS BY CAREGIVERS IN MUDZI DISTRICT, MASHONALAND EAST, ZIMBABWE**

Thank you for the above-titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

a) Research proposal

- **APPROVAL NUMBER** AUREC 2869/23
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** May 17, 2023
- **EXPIRATION DATE** May 17, 2024
- **TYPE OF MEETING** Expedited
  After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be submitted a month before the expiration date for renewal purposes.
- **SERIOUS ADVERSE EVENTS** All serious problems having to do with subject safety must be reported to AUREC within 3 working days on standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)
APPROVED
P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU
ASSISTANT RESEARCH OFFICER: FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE