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Drivers of Increase in Stunting Prevalence among Children under Five Years of Age: Kayonza District, Rwanda

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Abstract

Childhood stunting remains a critical public health challenge in Rwanda, with notable disparities across districts. While national stunting prevalence declined to 35% by 2018, Kayonza District experienced a concerning increase from 33% in 2015 to 42% in 2018, surpassing the WHO critical threshold. This study investigates the multisectoral drivers of this increase in Kabare sector, Kayonza District. A qualitative case-study design, guided by an adapted UNICEF conceptual framework, was employed. Data were collected through 20 semi-structured household interviews with mothers of stunted children, 15 key informant interviews with district and national stakeholders, and one focus group discussion. Dietary diversity was assessed using the WHO Infant and Young Child Feeding (IYCF) guidelines. Thematic analysis was conducted to identify factors at the immediate, underlying, and basic levels. The average child dietary diversity score was 3.4, with only 5 of 20 children meeting the minimum dietary diversity of four or more food groups. Diets were predominantly carbohydrate-based, with minimal consumption of animal proteins, fruits, and vegetables. Recurrent droughts (affecting 20/20 respondents) and limited off-farm employment were primary vulnerability factors driving household food insecurity. Immediate causes included inadequate dietary intake and a high disease burden, with malaria (18/20) and diarrhea (16/20) being most prevalent. Underlying causes encompassed low household food production, poor maternal

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and child care practices linked to domestic conflicts and low nutritional knowledge, and unhealthy living environments characterized by poor WASH conditions. At the basic level, scarcity of agricultural land (reported by 20/20 respondents), limited income opportunities, and weak social support networks were critical. Systemic factors included the delayed implementation of nutrition interventions and the low prioritization of nutrition in district development planning and budgeting. The increase in stunting in Kayonza District is driven by a complex interplay of immediate, underlying, and basic determinants. Addressing this requires an integrated, multisectoral strategy that combines climate-resilient agriculture, improved WASH infrastructure, nutrition education, social protection, and strengthened district-level coordination to effectively prevent childhood stunting.

Subject Areas

Nutrition

Keywords

Childhood Stunting, Climate Change and Nutrition, Kayonza District, Food Insecurity, WASH, Rwanda

1. Introduction

The child and maternal undernutrition rates continue to be a great concern worldwide, with devastating consequences ranging from individuals to societies. Children in low-income countries face a range of interrelated problems, such as poor nutrition, inadequate water, sanitation, and hygiene (WASH), consequent infections, and growth and development impairments [1]. In Rwanda, despite the progress achieved in reducing under-5 mortality in the last decades, chronic malnutrition among children continues to be an important public health problem. According to the latest Rwanda demographic and health survey (RDHS), about 38% of under 5-year-old children were stunted in 2015 [2]. Undernutrition is a cause of deaths of over 3.5 million mothers and children under five every year, and millions more are permanently disabled by the physical and mental effects of inadequate food intake in the earliest months of life [3]. About 149 million children under five years were affected by stunting, equivalent to 21.9 percent of all children in 2018 globally. The authors state that over half of children under 5 afflicted by stunting lived in Asia, whereas more than one-third lived in Africa during the same period.

Childhood stunting is the best overall indicator of children's well-being and an indication of social inequalities [4]. Children are stunted when they are two standard deviations below the median height-for-age of the child growth standards [5]. Maternal undernutrition during pregnancy and child undernutrition within the first 2 years of life are highly seen as the drivers of the prevalence of stunting in preschool children [6]. According to [7], stunting is attributed to infections, poor

nutritional intake before and after a child's birth. Some research shows that once children reach their second year of life malnourished, they are more likely to suffer irreparable physical and cognitive impairments, thus hampering their future health, economic well-being, and welfare [3].

For the last twenty years, Rwanda has made remarkable economic growth, which has brought good progress in living conditions and poverty reduction. However, regardless of the economic performance, decreasing the level of stunting in smallholder rural children remains a great concern [8]. According to the World Bank Group, stunting tends to be an invisible problem in Rwanda, however, its effects jeopardize children's growth, and hinder them to prosper, and reach their full potential. In addition, the same source argued that the quality of human capital is deprived by stunting well-thought-out essential to attaining Rwanda's aspirations to become a middle-income country. Besides, significant costs are incurred by chronic malnutrition on society as well as to the country's economy. A study on the cost of hunger in Rwanda showed that undernutrition is directly or indirectly cause of 21.9 percent of child mortality, while Rwanda has lost approximately $820 million, in other words, 11.5 percent of the country's GDP in 2014 due to the social and economic impacts of child undernutrition.

The government of Rwanda and stakeholders have enacted different interventions to improve child nutrition, consequently, the stunting prevalence rates among children under five years of age decreased from approximately 51% in 2005 to approximately 38% in 2014-15 countrywide [9]. Among the policies to reduce childhood stunting in Rwanda include the National Multisectoral Strategy to Eliminate Malnutrition, the National Community Based Nutritional Protocol 2010, the District Action Plans to Eliminate Malnutrition, and the Joint Action Plan to Fight Malnutrition. In Rwanda, the burden of malnutrition may have increased due to the severe political and economic crisis surrounding the 1994 genocide [10].

Besides, the government has renewed its political commitment to eliminate stunting under the seven-year Government agenda whereby the aspirations are to reduce child stunting to 19 percent by 2024 through the newly created National Early Childhood Development Coordination Program to ensure high-level coordination. However, the prevalence of stunting for children 6 - 59 months is high within children found from the poorest wealth quintile as their stunting rates of 49 percent are far beyond those from the top wealth quintile with 21 percent [11]. The stunting rate within the poorest quantile is beyond the WHO threshold of greater than 40 percent, thus ranked among the highest in the world [6].

About 20 percent of Rwandan families are affected by inadequate household food security and complications from childhood infections which are drivers of the high rates of stunting in children and other nutrition problems [12]. [13] argued that only 18% of children aged 6 - 23 months in Rwanda are being fed ac-

cording to the recommendations for infant and young child feeding practices regardless of different interventions to improve child nutrition conditions.

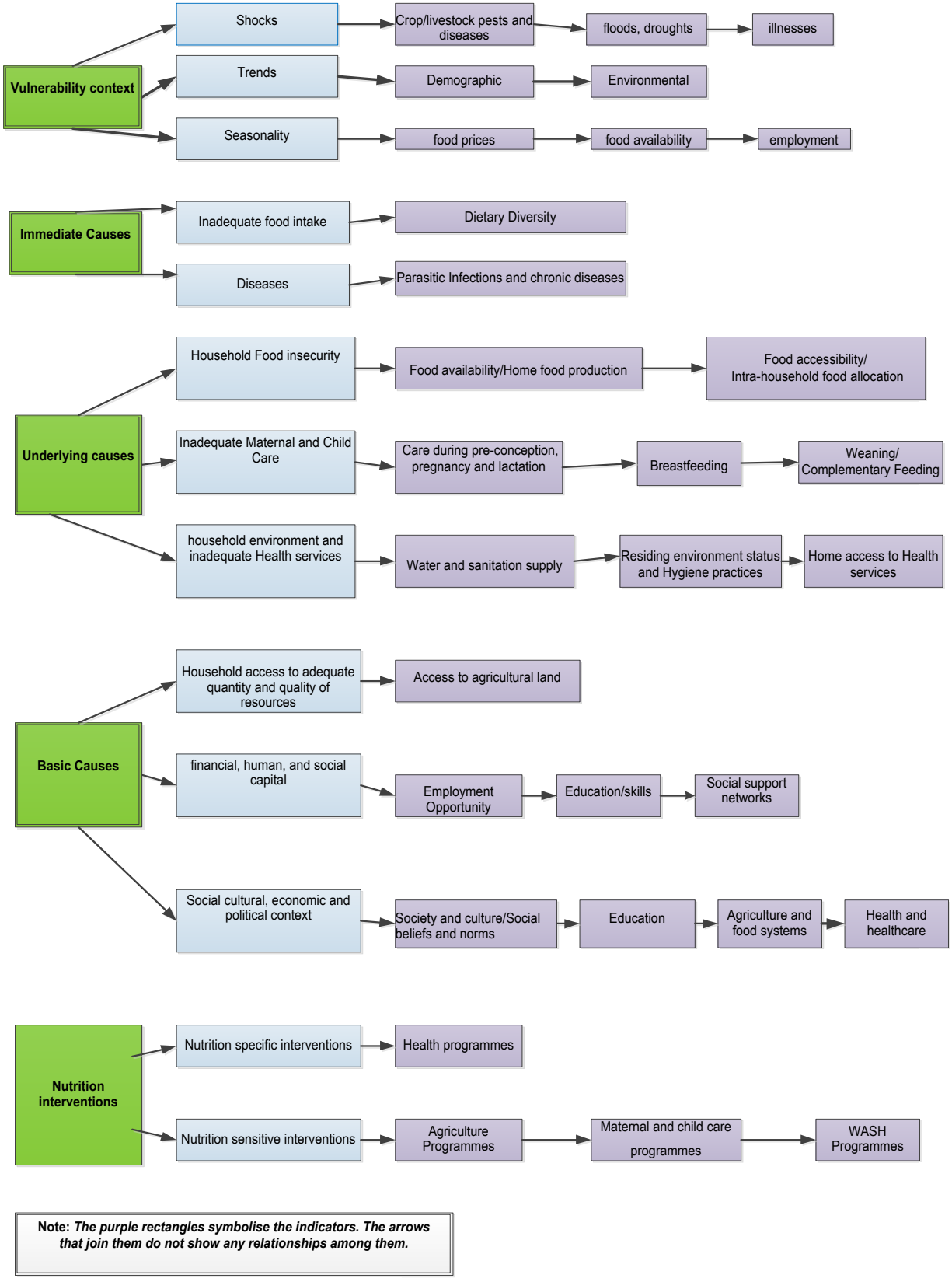
Statistics show that Rwanda has made improvements in nutrition and reducing childhood stunting at the national level from 37% in 2015 to 35% in 2018 at the national level [14]. However, the signals of curbing the child stunting prevalence are still alarming in some districts. It is a point for Kayonza District that saw an increase in stunting levels beyond the critical threshold of WHO from 33% in 2015 to 42% in 2018 [15].

2. Conceptual Framework

Food, health, and care are three important factors influencing nutritional status. The ideal nutritional status is attained when children have access to affordable, diverse, nutrient-rich food; appropriate maternal and child-care practices; adequate health services; and a healthy environment including safe water, sanitation, and good hygiene practices. The direct factors involve inadequate food intake and the incidence of infections [16]. Besides, the underlying causes are household food insecurity; inappropriate childcare and feeding practices; inappropriate health care, and unhealthy household and residing environments [17]. Moreover, the basic determinants cover the household access to acceptable quantity and quality of resources (land, education, employment, income) and socio-cultural, economic, and political context [18].

This study was guided by an adapted version of the UNICEF Conceptual Framework on the causes of undernutrition, as illustrated in **Figure 1**. The framework is covered from its three levels to understanding the factors that arise at all levels since stunting is caused by many factors. However, the adaptation of the framework is that we included the vulnerability context and interventions to understand the situation in which the households are living that exposes them to risks of stunting. Also, to see how the interventions put in place have contributed to addressing the issue of stunting in the researched area. The determining factors of increased prevalence in stunting were studied at three levels which are micro, meso, and macro-level since the stunting is caused by multiple factors. At the micro-level/individual level, immediate causes will be explored as factors that directly affect the child, these include food intake and prevalent diseases.

In addition, these direct causes are the impact of underlying causes that occur at meso level/household level, the focus will be on household food security, childcare and feeding practices, access to health services, and residing environment. Furthermore, macro-level/community level, the focus is on the basic causes reflecting the capitals and political context, which include household access to resources, financial (income, savings) human (skills, manpower), and social capital (social support networks); society and culture (social beliefs and norms), and economic and political context (education, agriculture, and food systems, health and health care).



Source: Adapted from UNICEF, 1990.

Figure 1. Adapted Conceptual framework of the determinants of child undernutrition.

3. Study Area and Participants

Study Area

Kabare sector is in the southern part of Kayonza district, inhabited by 41,181 people. The area's economy is mainly based on agriculture and the local livestock, mostly dominated by banana production, cassava, rice, coffee, and horticulture. In addition, the area has water resources for agribusiness aquaculture, fish growing, and attraction for tourism since there are two UNESCO world heritage sites nearby (Kayonza District, 2013).

Table 1. Profile of respondents for focus group discussion and key informant interviews.

Code1	FGD: Participant status	Gender	Code	KI interviews: Respondent's portfolio	Organization
MFGA-1	Mother with stunted child	Female	K.1	Director of Health	Kayonza district
MFGA-2	Mother with stunted child	Female	K.2	Executive secretary	Kabare sector
MFGA-3	Mother with stunted child	Female	K.3	Head of Health Centre	Kabeza health centre
MFGA-4	Mother with stunted child	Female	K.4	Antenatal care Nurse	Kabeza health centre
MFGA-5	Mother with stunted child	Female	K.5	District Director of agriculture	Kayonza district
MFGA-6	Mother with stunted child	Female	K.6	Director of Health	Gikuriro Project USAID
MFGA-7	Mother with stunted child	Female	K.7	Nutritionist	Rwanda Biomedical Centre
MFGA-8	Mother with stunted child	Female	K.8	WASH program manager	World vision
MFGA-9	Model mother in charge	Female	K.9	Household nutrition expert	National FNS Committee
FFGA-10	Model father in charge	Male	K.10	Food security specialist	National Early Child Development Program
HFGA-11	Health facilitator/councillor	Male	K.11	Programme Associate	World Food Program
CFGA-12	Community leader	Male	K.12	Nutritionist	Ministry of Health
			K.13	Community health centre	National FNS Committee
			K.14	Women's empowerment	National women's council
			K.15	Food security specialist	Ministry of Agriculture and Animal resources

Table 2. Profile of study respondents.

Respondent	Age	Education level	Wealth quintile	N. of children	Family size	Marital status	Main occupation
KyR1	29	Primary school	Category 1	4	6	Divorce	Sharecropping
KyR2	20	No school	Category 2	4	6	Married	Sharecropping
KyR3	36	P school	Category 2	5	7	Married	Sharecropping
KyR4	19	N° school	Category 2	4	6	Married	Mulching seller
KyR5	18	N° school	Category 2	3	5	Divorce	Sharecropping
KyR6	44	N° school	Category 2	5	7	Divorce	Sharecropping
KyR7	35	P school	Category 2	5	7	Married	No occupation
KyR8	30	N° school	Category 2	4	6	Married	Sharecropping
KyR9	22	P school	Category 1	4	6	Divorce	Barber

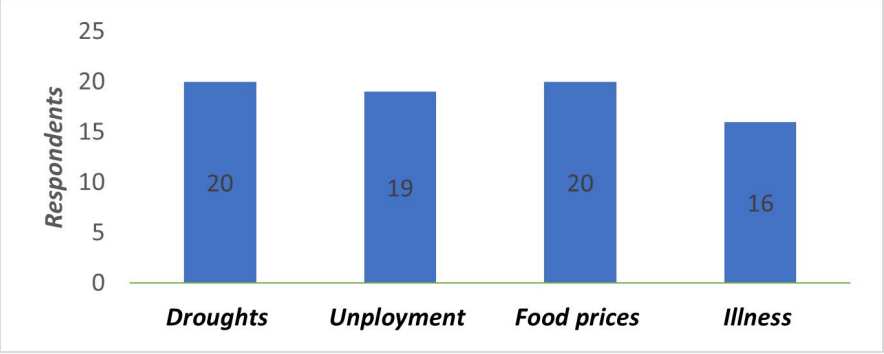
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KyR10	24	Sec school	Category 2	4	6	Divorce	Sharecropping
KyR11	28	N° school	Category 1	2	4	Married	Manpower
KyR12	28	P school	Category 2	3	5	Divorce	Sharecropping
KyR13	40	P school	Category 2	7	9	Divorce	Mason
KyR14	41	N° school	Category 1	6	8	Married	Sharecropping
KyR15	19	P school	Category 2	2	4	Married	No occupation
KyR16	45	P school	Category 2	7	9	Married	Sharecropping
KyR17	25	P school	Category 2	2	4	Married	Sharecropping
KyR18	20	N° school	Category 2	5	7	Divorce	Sharecropping
KyR19	44	P school	Category 2	3	5	Divorce	Sharecropping
KyR20	38	P school	Category 2	3	5	Divorce	Sharecropping

Source: Field work, 2020.

4. The Vulnerability Context of the Households in Kayonza

As described in Table 1, the vulnerability context was studied to understand the conditions experienced by the households which exacerbated the risk of childhood stunting. Data were collected through semi-structured interviews; child dietary diversity score, focus group discussions and Key informant interviews. Study participants stated droughts, food prices, illnesses and unemployment as major vulnerabilities in the district.



Source: Author, 2020.

Figure 2. Vulnerabilities occurrence at household level.

The findings from semi-structured interviews showed that Kayonza district was hit by severe droughts in 2016, 2017, and 2018 that had harmful impacts on people's lives as shown in Figure 2. 20 out of 20 respondents experienced crop failure, water shortage for humans and livestock, and particularly these conditions have driven to family's dislocation. This was also agreed by all key informants and during FGD since these are drought-prone areas. The respondents experienced a rise in food prices as an immediate consequence of the prolonged conditions of drought. It was also alleged during FDG that it has been a repeated situation whereby dur-

ing dry season people get a shortage of food, especially from June to September. One of the respondents stated:

> […] we have experienced recurrent droughts especially in the past 3 years (2016, 2017, 2018) to the extent that the government provided us with food assistance due to famine. During this period many families have relocated to neighbouring districts in our province as well as in Uganda […] (KyRp4, SSI1)

The results from semi-structured interviews also showed that employment opportunities are very limited and temporary, mainly based on doing farming on rented parcels during the rainy season and especially no off-farm opportunities. 17 out of 20 respondents stated that pregnant and lactating mothers do not have access to the few job opportunities available due to their status. This was confirmed by a mother during FGD-1, specifying that this popular farming system where at the harvest the landlords get 50 percent of the produce which continually leaves them in shortage of food. And when asked about paid agriculture labor, respondents revealed that the daily minimum wage on the farm is equivalent to 0.8 euro. According to one of the respondents:

> […] in this area we don't have enough job opportunities either on or off-farm and we depend much on agriculture, when it is a dry period, we suffer a lot. The available job opportunities are not given to mothers with young children. (KyRp1, SSI1)

The findings from semi-structured interviews, KII and FGD revealed that both communities are endemic to malaria, and it is especially frequent in the rainy season between September and February. People usually get sick in the most reliable agriculture period, preventing them from working on the farms and spend money for the hospital. According to key informants:

> […] This is a zone that is endemic to malaria and a lot of people are admitted to the health centers especially in rain seasons […] (K.3, K.8, KII).

5. Immediate Causes Associated with Child Stunting Increase in Kayonza

To measure the dietary diversity, the study collected information on food items a child consumed during the previous day. Foods were grouped into 8 major food groups based on the WHO's IYCF guidelines. i) Grains, roots and tubers ii) Vit A rich plant foods iii) Other fruits and vegetables; iv) Meat, poultry, fish, seafood v) eggs; vi) pulses/legumes/nuts; vii) milk and milk products; viii) foods cooked in oil/fat. The food group was assigned a value of one (1) for the child if he/she consumed at least one food item from a food group throughout the previous day, and zero (0) if not consumed. To obtain the dietary diversity score, the group scores were then summed up divided by the number of households. The findings showed that the average child dietary diversity score was low (3.4). Grains, roots, and tubers mainly cassava and banana were consumed by 20 out of 20 children. Gener-

ally, the food items of the remaining food groups including pulses/legumes/nuts mainly beans; meat, fish, seafood (small dry fish) and vegetables(dodo), food cooked in oil meat and fish, milk and dairy products were less consumed. It is obvious that from the diversity score children in Kayonza did not meet the recommended Minimum Dietary Diversity of more than 4 food groups the previous day. One respondent reiterated:

> […] Our menu is composed of cassava flour, banana, groundnuts, beans, and a very low intake of vegetables (Dodo). These food types are easily affordable in our community, we have a financial limitation, we don't have other choices. […] (KyRp2, SSI1)

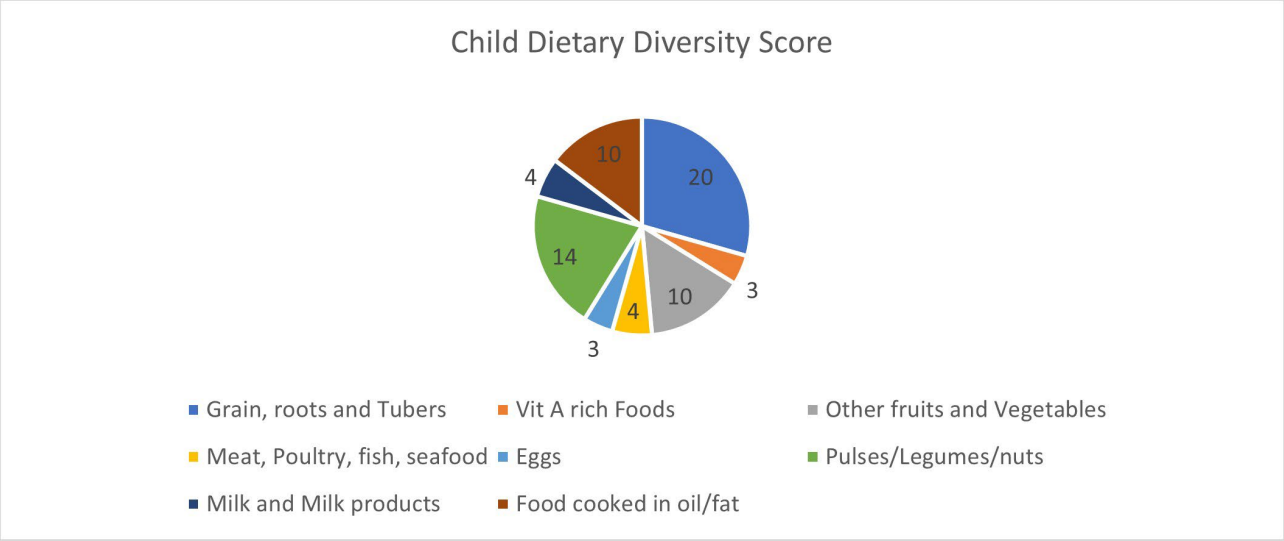


Figure 3. Child dietary diversity score.

Findings from semi-structured interviews showed that Kayonza is endemic to malaria which is a prominent disease affecting both mothers and children. 18 out of 20 respondents reported cases of malaria among children followed by diarrhea by 16 respondents. Apart from that, children in Kayonza are mostly affected by cough, pneumonia in the rainy season, and helminths, the latter mainly induced by lack of clean water and hygiene. One respondent stated:

> […] my child has been affected by malaria; he has been sick 10 times the last time was in April 2020. In addition, she got sick diarrhea 5 times, all these conditions make her always weak, and she loses appetite very often. (KyRp4, SSI1)

6. Underlying Causes Associated with Child Stunting Increase in Kayonza

6.1. Household Food Insecurity

As shown in **Figure 3**, findings from semi-structured interviews revealed that in Kayonza food production is low and mostly dominated by banana, cassava, maize,

beans, groundnuts, and vegetables. Most respondents 20 out of 20 respondents stated that low production is basically due to scarcity of agricultural land and recurrent droughts and irregular rains that cause crop failure. During FGD, a mother stated that they have very small plots around their homes through which they cultivate crops especially drought-tolerant like banana and cassava. Normally, the growing seasons are three throughout a year, but farmers produce in two seasons with a high risk of crop failure during the second season from June to September due to droughts, and hence, the market becomes the main source of food. The aforementioned declarations by respondents, it is the indication of deteriorated food security at household level where the availability and accessibility of food is problematic. Quotes from respondents' state:

> […] It is very difficult to grow food in our home due to lack of agricultural land and lack of watering options. We usually grow beans, sorghum, maize banana, and vegetables, but only drought-resistant crops are grown here mostly banana and cassava [….] (KyRp10, SSI1).
> […] It is very difficult to get food because we depend on the market, yet we don't have a stable source of income. We may pass the night without eating but when there is food, we reduce the quantity, so that we share it with all people in the house. […]. (KyRp3, SSI1).

6.2. Maternal and Childcare

The findings from semi-structured interviews showed that in both communities, most mothers 16 out of 20 have completed the four standard antenatal visits during pregnancy and delivered at the health centers. However, 16 out of 20 mothers in Kayonza experienced home conflicts with their husbands due to alcoholism. They pointed this behavior to be an important source of divorces and unplanned pregnancies, leading to a lack of support among mothers and inducing poor childcare. This was also confirmed by K.2 stating that, even in families with better socio-economic status, mothers have been confronted by home conflicts resulting in separations. During the FGD, a model mother also reported that the early child development centers are not yet established to help such children with less attention.

> […] In our community there is a local beer made in banana (Urwagwa) that people enjoy the most, I got impregnated with my drunkard mate after we have been drinking together for so long. The man is married and could not marry me, it has created a lot of problems between both families and the child being the most victimized at the end. […] (KyRp1, SSI1);
> […] We have a lot of cases of home conflicts in our communities and surprisingly some of the households with better living conditions still have stunted children due to lack of care from both parents. Parents spend a lot of their time in conflicts, many leading to divorces and other family distortions. […] (K.2, KII).

The findings also revealed that 7 out of 20 respondents in Kayonza had teenage pregnancies as a result of home conflicts following parents' abandonment. According to what they said, this pushes them to sleep with people in search of support. It was also supported by the local key informant K.3 who alleged that in most of the cases found in their health centers, these girls are abandoned and stigmatized by their own families. A respondent who experienced abandonment stated:

> […] Our parents left us in 2015 when we were still young, afterwards they decided to separate. Since then, I got someone to take care of my needs, we slept in exchange to support he used to give me, and accidentally I got pregnant, then he left me for good. I feel abandoned and this is what I also feed my child (KyRp2, SSI1);

The research has also revealed the parents' ignorance and lack of nutrition knowledge as leading factors whereby 10 out of 10 respondents in Kayonza acknowledged their lack of knowledge regarding the preparation of a child's diet and quality time with children. When asked about the recovered children through the village kitchen sessions, the point is only because their parents have changed the feeding practices including food preparation, adding vegetables to their meal, care practices mainly positive parenting, and compliance with the protocols of rehabilitation sessions.

> […] When I was admitted at the health center, I learn how to prepare a separate dish food for the child, change from cold to fresh warm food, and how to keep clean materials used in the kitchen […] (KrRp9, SS2)

The results from semi-structured interviews showed that in both districts the education level was low, whereby 12 out of 20 have primary school level of education while 8 out of 20 in Kayonza district. This was mainly to the lack of schools in the community where they stay and the dropout following the family problems including divorces and lack of financial resources.

> […] Initially, we had no schools in this community, many children were discouraged by long-distance travelled, many drops out of school were due to the lack of school fees and abandonment by their parents […] (KyRp9, SSI1)

6.3. Household Environment and Health Services

The findings from semi-structured interviews and observations showed that 20 out of 20 respondents in Kayonza live in unhealthy houses while the used kitchens are in very critical conditions to be used for food preparation. All respondents stated these environments increase the risk of diseases particularly diarrhea because they do not have financial resources to improve their dwelling environments.

> […] We live in a small, squeezed house made of mud materials, the hygiene in the house is so difficult, the floor has a lot of dust, the roof is made of trees which always make the home environment dirty […]

The results from semi-structured interviews and observations showed that in Kayonza, the community has one water tap where people pay 50 frw for 100L of water equivalent to 0.05 Euro to get water. Consequently, 17 out of 20 respondents get water from stagnant water in the marshland around the community because the money is not easily found, given the amount of water needed per day. In addition, they share toilets with their neighbors most of which are not covered and still practice open defection.

> […] Very often we use water from the stagnant source in the marshland down there, it is dirty, but it is the only option we have since we do not afford to buy water every day. In this whole community we depend on one water tap, even if we have money, it takes a lot of time to fetch water due to a queue around it. (KyRp4, SSI1)

The results from semi-structured interviews indicated that 8 out of 20 households in Kayonza still cannot access health services due to the inability to buy health insurance, especially households in category two of the wealth quintile. Both respondents in category one of the health quintiles stated that the government pays the health insurance for them.

> […] We don't have access to health services because we don't have insurance, it is very expensive to visit the health center, we sometimes use traditional medicine when the child is sick (KyRp5, SSI1)

7. Basic Causes Associated with Child Stunting Increase in Kayonza District

7.1. Household Access to Adequate Quantity and Quality of Resources

The findings from semi-structured interviews showed that among other factors, 20 out of 20 respondents stated scarcity of agricultural land as the main limitation to household food production. Especially, where respondents practice sharecropping farming on rented parcels, and then they pay 50 percent of the produce to the landowners. The findings also revealed that most of the agricultural land in the marshland around the Kayonza community was expropriated by the project PACCURI to grow crops used in making deodorants. This has left people with the option to cultivate on the hillside, which is hard due to the lack of irrigation options. Moreover, they do not have other productive assets and resources that could help them to sustain their livelihoods. According to a respondent:

> […] Before 2017, we had a piece of land located in the marshland where we used to grow more vegetables and other crops, the project PACCURI has expropriated us. Now we depend on hillside agriculture with difficulty to get water for irrigation during the dry season. We grow in "sharecropping", which is to rent a plot and grow crops after harvest we share with the landowner by 50% […] (KyRp5, SSI1).

7.2. Financial, Human and Social Capital

The findings from semi-structured interviews and FGD revealed that people in Kayonza 19 out of 20 respondents depend mainly on share cropping farming and selling labor as their main occupations. During the dry seasons, agricultural activities are less operational, fewer off-farm job opportunities available through VUP are only for people in the wealth category one and exclusively hard to secure for the mothers with young children, and yet among interviewed mothers 10 out of 20 are the household earners. The results from semi-structured interviews showed that apart from formal education, the interviewed mothers also do not have hands-on skills that can help them to get work elsewhere apart from farming skills. The results from semi-structured interviews revealed that 16 out of 20 respondents in Kayonza are members of small social support groups for funeral activities. Every member pays 1 euro per month which is used to buy the coffin. Besides, the community also and food assistance from the neighbour in case they do not have something to eat.

7.3. Society and Culture/Social Beliefs and Norms

The findings during semi-structured interviews and KII, revealed that all respondents did not state any special social beliefs or norms in both communities that could have been among accelerating or slowing factors to stunting. However, at a policy level, there was no measure put in place to mitigate the effects of climate change to the people who mainly depend on farming activities in Kayonza. In addition, politically the facilitation made to the entrepreneur to displace people's piece of land in marshland where they had options to grow during the dry season had impacts on household inability to produce food. This statement was corroborated by the member of national food and nutrition security during key informant interview:

> […] at the political view, no early warning systems against food insecurity following recurrent droughts, the ministry of agriculture could have done better to mitigation the impacts of climate change in Kayonza community to enable people having the alternative to access food. […] (K.11, KII).

The findings during semi-structured interviews found that 20 out of 20 respondents in Kayonza reported no impacts of the crop intensification program in their community because the program implementation has made the PACCURI entrepreneur expropriate their land to intensify his business farming. This was the marshland that provided them with a chance to grow crops during the dry season due to the availability of water, but now they are left with hillside agriculture which is not possible during the dry season.

7.4. Effectiveness of Nutrition Interventions Implemented

During the KI interview with K.1 and K.13, revealed that in previous national assessments of food and nutrition 2010 and 2012, western districts had the highest

levels of stunting compared to other districts, consequently most donors and NGOs with nutrition interventions focused on those districts. Eastern districts especially Kayonza, Nyagatare, and Gatsibo districts had more livestock especially cattle, which were considered as main sources of milk and meat in the country, thus were not among priority intervention's areas. It is when the droughts affected Kayonza back in 2015 that many interventions were introduced, much based on rehabilitation rather than prevention. These include milk distribution, fortified blended foods mostly used in recovery sessions.

> […] The interventions in Kayonza district have delayed, for example, the support from the World Bank under the Stunting Prevention and Reduction Program intended to speed up the fighting against stunting was initiated in 2018 following the increase in stunting levels […] (K.12, KII)

In addition, results from key informants (K.1, K.2, K.4, K.6) showed that in Kayonza, after the national household screening, there was no special nutrition assessment to address this issue based on root cause apart from the routine work done by hospitals. For instance, the detection of malnourished children was introduced, however, because children are monitored at home, the following upon progress of recoveries among treated children was difficult.

> […] we do not have a nutritional center, parents get milk and Fortified Blended Food(FBF) from the health center, the community health workers check whether the parents have given milk to the concerned children, but we cannot be sure of that, back home they sell milk and FBF reserved to malnourished children to their neighbors, and shared to both children in the house, thus leaving the affected child with risk of no recovery[…] (K.3, KII)

In terms of priority, the findings from (K.11, K.12, K.15) revealed that Kayonza district has not given much emphasis on nutrition in their development planning, and it was solely the responsibility of the health department, which also does not consider as the priority given other important components such as fighting against HIV, tuberculosis and other diseases.

> […] The district has not given priority to nutrition in the development plan, budgeting, and staffing, even with the additional government funds and other supplementary revenues released, you will never find nutrition among priorities like roads, schools, and fighting against diseases are, besides the nutrition is under health department which is considered as subsidiary component. (K.11, KII)

In terms of sustainability 20 out of 20 respondents revealed that some interventions in Kayonza like ready-to-use food (RUTF) for rehabilitation of malnourished children do not reach the beneficiaries while kitchen gardens are being completely abandoned. For instance, the Kitchen Garden program was supposed to increase the diversity of foods at the household level. But at the district level they report the number of kitchen garden constructed, which gives the impression of

success, yet they are abandoned, the reporting is biased because the issue is not the number of kitchen garden rather the number of available crops grown in those kitchen gardens to ensure the dietary diversity at the household level.

8. Discussion

This study attempts to an understanding of the drivers of increase in stunting prevalence among children under five years of age in Kayonza District.

8.1. Vulnerability Status of Households with Stunted Children

The findings report the droughts and irregular rains as main vulnerability conditions exacerbating household food insecurity. This situation has been recurrent and worsened the food availability of many households, thus undermining the nutrition status of mothers and children. These results are consistent with the findings of the MINAGRI reported that in 2016 Rwanda has faced the worst drought in 60 years particularly hitting Kayonza District and other districts in eastern province. Over 23,448 hectares of crops were destroyed, massive loss of lives of cattle, and 47,306 families were affected by famine [19]. This is also in agreement with the findings of the WFP that reported droughts as one of the factors that affected some areas in the country where stunting increased, a case in point is Kayonza which was the most affected among all districts in Rwanda with 77.7 percent of households affected [11]. A study of conflict and crop failure in Rwanda found that these events lead to continued crop failure, even after the event had stopped [20].

In addition, the repeated situation of droughts has driven the rise in food prices, especially the prices of staple crops risen consistently from 2015 onwards and had more effects on household food accessibility. Without surprise, the research also found the household demographics especially higher household members (6.2 on average) in Kayonza and lower wealth quintiles of the respondents as a hindrance to withstand these conditions. This is in line with the findings of [10] who argued that one contributing factor to stunting is a tendency of families in the lowest wealth quintile to have the highest household size of more than 5, thus be unable to cater to their necessary needs. Therefore, the droughts, food price fluctuations, and higher family size were the main vulnerability conditions found in Kayonza along with limited livelihoods alternatives, these events have changed the natural environment, have caused damage to people's living conditions especially food availability and access, and, hence aggravating the nutritional status.

8.2. Immediate Factors of Increase Specific to Kayonza District

The results from the Dietary Diversity Score (DDS) indicated that the food intake of children was less diverse in Kayonza with the score equivalent to 3.4 among researched children. This means that children in Kayonza did not meet the minimum dietary diversity (MDD) of 4 out of 8 groups of foods as it also reported in FANTA III that the minimum is reached when 4 out of 8 food groups are con-

sumed by the child [21]. These results are consistent with the findings of [11] reported that 9% of children 6 - 23 months in the Kayonza district reached the minimum acceptable diet which is less than the national rate for MAD of 17%. While the consumption of animal proteins is very limited with only 7% of children 6 - 23 months consuming dairy products and 1% consuming eggs. The results from the DDS portray the consumption of carbohydrates was predominant for all children in Kayonza while vegetables and fruits intake were low with animal protein foods almost inexistent, which reflects the poor nutrition given to children. This was confirmed by the findings of [6] in a study of stunting, food security, markets, and food policy in Rwanda, that the diet of poor rural people is characterized by high carbohydrates and low intake in animal-based proteins as well as fruit and vegetables.

Moreover, the findings showed that children in Kayonza suffer from illnesses such as malaria (the region being endemic to malaria), diarrhea, pneumonia, and helminths that make them unable to assimilate the nutrients they consume. This is in the same agreement with the findings of [22] who stated that many of these conditions are linked with lack of appetite and therefore make it difficult to make adequate nutrients substitutions, thus leading to a negative balance. [3] found that diarrhea is a mainly important hindrance of child growth due to its ability to extract a child's nutrients and cause a lack of appetite. Apart from being endemic to malaria, the water and sanitation situation in Kayonza is more likely to increase the risk of diseases to children if nothing is done to address it. In summary, immediate factors to stunting identified in Kayonza were child poor feeding reflected in a less diverse food consumed mainly food starchy along with persistent diseases conditions especially malaria and diarrhea.

8.3. Underlying Factors of Increase Specific to Kayonza District

The results indicated that household food insecurity was not only impaired by recurrent droughts but also the scarcity of agricultural land and low crop production at household level. Following the low food production, the market was found to be the main source of food consumed in Kayonza. Given that most respondents are classified into the two lowest wealth quintiles, their capacity to buy food is limited. The Comprehensive Food Security and Vulnerability Analysis revealed that, Kayonza was the third district with a larger proportion of food-insecure households Kayonza (32.8 percent) especially worsened between 2015 and 2018. The same source argued that 56% of food consumed by households in Kayonza came from the market and 40% from own production. At the household level, people in Kayonza suffered due to very limited financial access to food since the main source of food is the market which is abnormal situation in rural areas.

Besides, the research underlined the home conflicts among parents as a hindrance to childcare and growth mainly instigated by irregular marriages, household resources apportionment and alcoholism. As shown in **Table 2**, divorces were frequent amongst interviewed households which indicates that children did

not benefit from the care of both parents. A lack of parental stimulation can be a driver to abnormalities in social, emotional, and motoric activities in children since a proper stimulation can significantly improve child development of stunted babies. These home conflicts are shown to be the drivers of divorces, increased household poverty, and particularly inadequate psychosocial stimulation and parent-infant bonding.

Moreover, the findings found the nutritional knowledge, behavior and attitude among parents of stunted children as critical factors, particularly knowledge about preparation of balanced diet, stimulation, and following instructions during rehabilitation sessions for malnutrition monitoring, this adds to unsafe food administration due to poor hygiene in kitchens and unclean water. This was highly linked with the mother's education level, and nutrition knowledge. This finding is corroborated by [23] concluded that the childhood stunting rate was meaningfully less among families with mothers who attained higher levels of education than low-educated mothers. [24] stated education plays an important role in the successful care of children under five. For instance, the practice of exclusive breastfeeding is influenced by maternal knowledge and attitude as well as their educational levels.

In terms of complementary feeding, though it was timely initiated, it was constrained by the ability of the parents to access to appropriate food for children (quality and quantity) due to financial constraints. Children individual dietary diversity score highlighted low intake of vegetables and fruits, animal-based proteins, such as milk, meat fish which constitute the sources of proteins and micronutrients necessary for balanced nutrients. In addition, the complementary feeding was found to be not consistent in frequency since the majority could not have 3 meals per day. It was found that only 17% of children aged 6 - 23 months in Rwanda are fed according to the recommendations for infant and young child feeding practices. Malnourished children in Nigeria had problems during a transition period from breastfeeding to family food which is often associated with repeated infections and stress since they are given foods that are not appropriate to their needs.

The findings showed that at the household level people in Kayonza live in uncomfortable houses made of mud walls and floor, dirt cooking areas(kitchen), uncovered toilets, and practicing open defection. These are the conditions that induced diseases like diarrhea and helminths. In addition, the research found that water supply was a serious problem, only one water tap serves the whole community in Kayonza with 0.05 Euro per 100 litters of water which is expensive to many respondents following the amount of water needed per day, alternatively, most of the respondents use dirty water from the stagnant sources when available.

Open disposal of child stool is a detrimental practice that directly infects water bases and increases the prevalence of enteric infections for adults and young children. [25] agreed that unfortunate hygienic settings and unclean water induce infectious diseases leading to child stunting, particularly frequent in families with

lower socioeconomic status that frequently live in such unhealthy environments. Underlying factors of stunting in Kayonza were identified to have deteriorated food insecurity as reflected by the inability of households to produce their food along with low access to food due to lack of money. Home conflicts, parents' behaviors, and lack of nutrition knowledge, poor dwelling environments and lack of water and sanitation especially mud houses, unsafe kitchens, and lack of safe disposal of defecates were accelerating factors.

8.4. Basic Factors of Increase Specific to Kayonza District

The findings identified the access to agricultural land as a major constraint to crop production for all interviewed household members, who have small to no agricultural land as common characteristics of families classified into the lowest wealth quintiles category one and two. Under these conditions, these households do not dispose other productive resources that can help them to sustain their livelihoods. This is consistent with findings by [11] that stated that 35% of households in Kayonza have no access to land and 39% own less than 0.2 ha, this largely contributes to food insecurity. However, [26] argued that land ownership's role in child welfare, health, and nutrition cannot be comparable to parents' education and household wealth index even for rural agricultural dependant areas. Based on the above literature, the study considers the scarcity of agricultural land as a huge barrier to their living given the fact that to have market as the primary source of food in the rural area is an unusual situation.

In addition, in Kayonza the lack of stable on-farm and off-farm job opportunities is an important factor that has worsened their living conditions since people mainly depend on agricultural activities which are less available during the dry season, especially for mothers, thus lower income. This is in line with the findings of [27] who stated that children from the mothers who earn their living on landowners are more likely to be stunted compared to mothers who own their land. The authors argued that maternal working status may be a determinant for child growth, especially if they work in agriculture, due to limited time allocated to childcare and nutrition(ibid). Community mothers look for a job in the farms of landowners practicing sharecropping on rented parcels to get food, the harvest is equally shared afterwards.

On top of this, the research revealed that only small social support groups for funeral activities and food assistance are available in the community of Kayonza and lack important informal social saving groups that offer loan. These informal financial structures have been reported elsewhere to having a great impact on the livelihoods of people since they serve as basket money to buy health insurances, school materials for children and festivals celebrations at the end of the year**.** In the political context, people in Kayonza had no positive impacts of the crop intensification program in their community because the implementation of this policy program rather influenced the displacement of people's land by entrepreneur to intensify farming business. This was the marshland that provided them with the chance to grow crops

during the dry season due to the availability of water. Policymakers cite this policy to be vital in improving childhood stunting, however, [6] found it with no significant effect on the prevalence of stunting in the rural areas. The basic factors identified in Kayonza are the scarcity of agricultural land, lack of stable and decent job opportunities leading to low income, weak social networks, and negative impacts of agricultural policy implementation that displaced their land.

8.5. Effectiveness of Nutrition Interventions Implemented

The findings showed that in terms of ownership and approach in implementing nutrition interventions, the district development plan and budgeting has given less priority to nutrition. Despite the additional funds from central government and other supplementary revenues released, nutrition was not considered as priorities as it for other components like fighting against diseases, infrastructures among others. Kayonza district has been inefficient in coordination and monitoring of nutrition intervention via DPEM (though it was difficult to get a clear picture through key informants at the district level, confirmed by KII representing partners in the district). This is contrary to other districts in the country which significantly curb the levels of stunting during the same time span, for instance Kirehe District is reputed for its bottom-up approach in planning and monitoring of activities, strong lines of accountability at all levels, effective use of the performance contracts with a high level of authority accountability, and performance-based incentives for health facilities called "Race to the Top competition", a performance-based program incentivized health centres to improve child and maternal nutrition health indicators. This constant process of planning, coordinating, and monitoring results through the DPEM can be regarded as an example of good practice by other districts.

In terms of community health engagement, detection, and follow-up of malnourished children, Kayonza follow up is done by hospital and community health workers while children are at home, leading to a high chance of no improvement of child's conditions. This process elsewhere is initiated by the hospital providing close follow-up, with emphasis on both identifying cases and addressing potential causes through the hospital admission of both child and mothers for rehabilitation until the end of recovery. This admission has positive effect because, firstly the parents are supervised and easily comply with rehabilitation instructions, secondly, it serves as a lesson to other parents since it is seen as humiliation and waste of time spent in hospital while leaving out other activities. Moreover, the lack of clear continuity and sustainability of available interventions in Kayonza district as highlighted by the abandonment of kitchen gardens among people regardless of their importance to increase dietary diversity; lack of consistent mass communication through its community radio to influence behavior change.

9. Conclusions and Recommendation

The failure to mitigate the effects of climate change was an important factor that

has led to household food insecurity in Kayonza district, disrupting households' ability to produce their own food, thus undermining the nutrition of mothers and children. Additionally, these circumstances have driven the increase of food prices in the communities, making access to food so hard. Besides, the higher household size with the socio-economic status of the families in the lowest wealth quintiles are hindering factors to their livelihood strategies. In addition, the child's inappropriate food intake coupled with diseases were identified as continuous threats to their growth. The child's diet is less diverse mainly dominated by roots and tubers where children are fed as the same as what adults eat and mostly not consistent in meal frequency—less than 3 meals per day, due to lack of financial resources to access diverse foods. Children are victims of diseases like malaria, waterborne diseases especially diarrhea while households are still unable to purchase health insurance due to financial constraints.

Besides, household food insecurity deteriorated by droughts and land scarcity which led to low crop production and hence, poor food intake for both mothers and children. The home conflict was identified as a pertinent issue that has deprived mothers and child's appropriate care mainly caused by parents' delinquencies alcoholism and divorces leading to a lack of parenting support and proper mother and childcare during pregnancy and after birth. Parents' ignorance and lack of nutrition knowledge were found to be critical to stunting especially knowledge to prepare a balanced diet along with complying with hospital instructions during malnutrition rehabilitation sessions. Poor hygiene and unsafe living environment including shared toilets, open defecation, use of unclean water, and inappropriate kitchen conditions were identified as accelerating factors to diseases and other health problems affecting children. Moreover, limited agricultural land as rural people who depend more on natural resources to win their living, is a serious hindrance to their livelihood strategy, contributing to the inability of a household to diversify food. The lack of income due to unstable on-off-farm jobs mainly available in the rainy season adds on the burden and unfortunately, very difficult for pregnant and lactating mothers to secure these temporary opportunities even when they are available due to their status.

Furthermore, at the district level, there was a delay in the implementation of nutrition interventions since Kayonza District was not considered as an urgent intervention area as compared to many other districts which also contributed to the severity of the stunting issue. And more so, nutrition has not been given much emphasis in district development plans and budgeting as it is solely seen as an issue to the health department. In addition, from the district to the community level, the coordination is inefficient in Kayonza, especially the monitoring of stunted children at home after detection. Besides, there is no sustainability of support programs being operational because some are not implemented as foreseen to reach the beneficiaries, while others are abandoned. As part of recommendations, the following can be conveyed to:

Policy makers

As revealed that many interventions initiated to address childhood stunting are part of social protection package include but not limited to fortified blended food, milk distribution, and cash transfers done through VUP among others, however, these kinds of initiatives are not sustainable in the long run given the economic status of households who receive them. The alternative should be to improve the livelihoods and coping strategies of the households who are in the lowest level of poverty to enable them to acquire their economic structures able to reduce poverty and hence, generate income that sustain their households. This should be addressed at a policy level and strengthened at the district level as an implementing body.

Kayonza District administration

The effects of climate change namely prolonged droughts and irregular rains were identified as major constraints to household food security. To introduce irrigation projects and water harvesting systems for storage that is affordable to rural people such as dams and small-scale irrigation, as well as the introduction of drought-resistant varieties to enable people to grow diverse crops, especially during severe droughts. In addition, facilitate diversification and increase the production of nutrient-dense crops and small-scale livestock. For example, horticultural products, legumes, livestock at a small scale, and biofortified such as yellow potato. Diversified production systems are important to enable vulnerable producers to be resilient to climate and price shocks.

Besides, in regard to parents' lack of knowledge on nutrition education seen as critical to stunting, the district should therefore strengthen the positive deviance hearth practices in the community and social and behavior change communication using mass media to enable parents improve nutrition knowledge, the emphasis must be on food preparation, compliance of health instructions during the rehabilitation's sessions of malnourished children, and prioritise the hospital admission of malnourished children as a lesson learned from other districts that performed better.

Moreover, the implementation of the nutrition intervention is multi-sectoraal, combining agriculture, health, social protection, and water, sanitation, and hygiene not as the sole responsibility of the health sector as identified in Kayonza. Collaborate and coordinate with other sectors and programs, through its District plan to Eliminate Malnutrition (DPEM) as joint strategies to address simultaneously the multiple fundamental causes of malnutrition. Additionally, incorporate explicit nutrition objectives and indicators into their design of the district development plan whereby the district development plan and budgeting systems should have a special emphasis on malnutrition by intensifying the nutrition support programs and overall avoiding the label reserved on malnutrition as a subsidiary issue. Furthermore, the access to clean water and sanitation is critically hampering the hygiene in the households, thus leveraging on available waterbodies in Kayonza to supply water and sanitation package to reduce the risk of exposure to dangerous pathogens and diseases among children including cheap op-

tions of water filters, and improved toilet facilities and handwashing practices at the household level. Based on the results of the research, the study recommends exploring more about the effectiveness of nutrition interventions implemented at district level as future research.

Author Contributions

Alexis MUTEBUTSI (First Author): Data collection, Data curation, Writing original draft, Formal analysis, Resources, Methodology and validation. Suzanne NEDERLOF (Second Author): Conceptualization, Supervision and validation. Yves NDIZEYE (Corresponding Author): Data curation, writing review & editing, Writing original draft, formal analysis and Conceptualization. Aimable ABAYISENGA (Third Author): Data collection, formal analysis and Validation. Delfania MATASIK (Third Autor): Writing Review & Editing, formal analysis and Methodology.

Conflicts of Interest

The authors declare no conflicts of interest.

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