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Prevalence of Malnutrition and Its Risk Factors among Under-Five Children

A Case Study in the Second Congressional District of Camarines Norte, Philippines

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ABSTRACT

Malnutrition among children under five remains a critical public health concern, impacting growth, development, and overall well-being. This retrospective cohort study was conducted to thoroughly examine the prevalence of malnutrition and its associated risk factors among children under five in the Second Congressional District of Camarines Norte. Data collection involved reviewing documents, specifically the records of 340 under-five children obtained from the Field Health Service Information System (FHSIS). These records were assessed using a guide checklist, with the data analyzed through percentage technique, prevalence rates, odds ratios, and multivariate regression analysis. Results revealed a predominance of male children, most aged 24-35 months, with parents largely employed, high school graduates, and earning household incomes of Php 5,000–10,000 per month. Mild to moderate household food insecurity was also noted, necessitating attention to prevent long-term health impacts. Low household income strongly predicted underweight status, while stunting was significantly associated with low maternal education and maternal unemployment. However, none of these factors were significant predictors of wasting. Furthermore, no significant correlation was found between malnutrition indicators (underweight, stunting, wasting) and healthcare service utilization, including routine check-ups, growth monitoring, and nutrition counseling. The study underscores the importance of targeted nutritional interventions addressing stunting and iron deficiency, coupled with strategies to improve maternal education and employment. A proposed plan has been developed to enhance the

nutritional status of under-five children and reduce malnutrition prevalence through comprehensive, community-focused approaches.

Keywords
Malnutrition
Prevalence
Risk Factors
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Introduction

Malnutrition continues to be a global public health challenge, particularly among children under the age of five. It is a condition resulting from insufficient or excessive intake of essential nutrients, with consequences that range from impaired physical and cognitive development to increased susceptibility to infections and higher mortality rates. Addressing malnutrition is critical to achieving sustainable development goals, particularly those related to health, education, and poverty alleviation.

Malnutrition has received significant attention in the health sector and from governments around the world for decades. The considerations resulted from the impact. Malnutrition has a variety of repercussions, but researchers have identified the most serious ones: poor fetal growth, low birth weight (LBW), short and long-term mother and newborn morbidity, and mortality. Malnutrition is a health problem caused by a diet providing insufficient or excessive calories, carbs, vitamins, proteins, or minerals. It is a state of under- or overnutrition, characterized by a lack or excess of vital nutrients. Good nutrition is essential for children's survival, development, learning, play, and participation.

Sustainable Development Goal (SDG) 2: Zero Hunger, aims to end hunger, achieve food security, and improve nutrition. This SDG emphasizes the need to address malnutrition, particularly among vulnerable populations such as young children, to ensure they achieve their full physical and cognitive potential. Malnutrition during the critical early years of life can lead to stunted growth, weakened immunity, and impaired development, perpetuating cycles of poverty and poor health [1].

According to the World Health Organization's 2024 vision, everyone would be healthy and happy, and there would be no malnutrition of any kind. The 2016–2025 nutrition strategy states that the WHO works with partners and Member States to guarantee that everyone has access to nutrient-dense meals and efficient nutrition treatments that come from resilient and sustainable food systems. In addition to developing evidence-based guidance based on sound scientific and ethical frameworks, the WHO uses its convening power to help set, align, and advocate for global nutrition priorities and policies. It also encourages the adoption of guidance

and the implementation of successful nutrition actions and keeps an eye on and assesses the nutritional outcomes of programs and policies.

The UNICEF Nutrition Strategy 2020–2030: Nutrition for Every Child outlines UNICEF's strategic intent to support national governments and partners in upholding children's right to nutrition and ending malnutrition in all its forms. Despite significant challenges, there is optimism as the proportion of children under five suffering from stunting has declined by one-third since 2000. To sustain this progress, UNICEF's strategy emphasizes a life-cycle approach, evidence-based programs, systems strengthening, and private sector engagement, aiming to secure a more equitable future for all children by 2030 [2]. Furthermore, in many low- and middle-income nations, especially in Asia and Africa, malnutrition is still a serious public health issue. Because of the strong need for food during their growing years, children under five are particularly susceptible to macro- and micronutrient deficits. Acute malnutrition can impede cognitive and physical development and result in illness, mortality, and disability. Ending hunger, food insecurity, and malnutrition in these regions requires continued, focused efforts [3].

Undernutrition deprives Filipino youngsters of their chance at a bright future. Children growing up in poverty require equal investments in nutrition, health, education, and wellness to fulfill their full potential as healthy, skilled individuals capable of improving their quality of life. For nearly 30 years, there has been little change in the frequency of undernutrition in the Philippines. One in every three children (29%) under the age of five was stunted, which means they were undersized for their age.

Furthermore, 19% were underweight for their age, and 6% of children under the age of five were categorized as "wasted," which is underweight for their height. The Philippines is ranked fifth in the East Asia and Pacific area for stunting prevalence, and one of the top ten countries in the world for stunted children. According to the WHO classification of undernutrition rates, the stunting frequency among children in the Philippines is of "very high" public health concern [4].

The imperative to invest in nutrition is enshrined in the 1989 Philippine Constitution, which mandates the State to defend children's right to assistance, including proper care and nutrition. Landmark legislation, such as Presidential Decree 491 of 1974 (Nutrition Act of the Philippines), created the National Nutrition Council (NNC) to oversee the national nutrition program. This program integrates and coordinates policies and programs across government and private sectors, addressing the country's nutrition challenges.

The statistics derived from the National Nutrition Council's (NNC) annual OPT Plus program, which assesses the nutritional status of children across the Philippines shows that

the 2023 Operation Timbang Plus (OPT Plus) results for Camarines Norte indicate significant malnutrition challenges among children under five years old. The province ranks fifth in the Bicol Region for stunting prevalence, with 10.27% of children affected, totaling 5,906 cases. Additionally, 1.22% (701 children) are classified as wasted, and 2.37% (1,306 children) are considered overweight or obese [5].

The Second Congressional District of Camarines Norte is composed of municipalities characterized by rural landscapes, a high prevalence of poverty, and limited access to healthcare and nutrition services. Children under five in this district face significant challenges, including food insecurity and suboptimal healthcare, which increase their vulnerability to malnutrition. According to local health records, the prevalence of stunting and wasting among children in this region exceeds the national average. The role of the nurse-in-charge of the nutrition program is vital in addressing this public health challenge [6]. By providing nutritional assessments, health education, and referrals to appropriate services, the nurse contributes to improving the health outcomes of at-risk children. However, gaps in understanding the prevalence and risk factors of malnutrition in the Second Congressional District hinder the development of targeted and effective interventions.

A. Objectives of the Study

The study on the prevalence of malnutrition and its risk factors among under-five children in the Second Congressional District of Camarines Norte aimed to attain the following objectives:

- Determine the sociodemographic profile of under-five children in the Second Congressional District of Camarines Norte, in terms of: Age, Sex, Educational Attainment of Parents, Employment Status of Parents, Household Monthly Income
- Analyze the prevalence of malnutrition among under-five children in the Second Congressional District of Camarines Norte in terms of: Weight-for-Age, Height-for-Age, Weight-for-Height
- Assess the under-five children's nutritional intake, household food security levels, and healthcare service utilization in the Second Congressional District of Camarines Norte.
- Analyze the determinants of malnutrition among under-five children in the Second Congressional District of Camarines Norte along with the following socioeconomic factors: Low Household Income, Low Maternal Education, Unemployed Mother, Low Paternal Education, Unemployed Father
- Propose a plan to enhance the nutritional status of under-five children and reduce the prevalence of malnutrition in the Second Congressional District of Camarines Norte.

B. Scope and Limitations of the Study

This study assessed the prevalence and risk factors of malnutrition among children under five years old in the Second Congressional District of Camarines Norte. It aimed to provide localized insights into the nutritional status of this vulnerable demographic within a defined geographic area. The research encompasses an examination of dietary patterns, socioeconomic status, and access to healthcare services as potential determinants of malnutrition. The study also aimed to pinpoint key factors and gaps in existing interventions to offer evidence-based recommendations for enhancing nutrition programs and policies specific to the province. Data for the research was sourced from the records of the Municipal Health Offices within the Second Congressional District of Camarines Norte, encompassing information on 340 children under five years old based on records from January to June of the respective municipalities.

This study is geographically and demographically limited to children under five years old residing in the Second Congressional District of Camarines Norte, which may restrict the generalizability of findings to other areas or populations. Data collection relies on local health records, which may introduce recall bias or data inconsistencies. The study does not account for long-term trends or seasonal variations in nutritional status and risk factors. These limitations may affect the comprehensiveness of the findings but do not diminish their value in guiding local efforts to address malnutrition.

Material and Methods

A. Research Design

A retrospective cohort study design was employed to comprehensively investigate malnutrition prevalence and its risk factors among children under five in the Second Congressional District of Camarines Norte. A retrospective cohort study is a research design that examines the relationship between historical exposures and outcomes by analyzing pre-existing data. In this approach, the researcher identifies a cohort of individuals based on past exposure to certain risk factors and then assesses the subsequent occurrence of specific outcomes within these groups.

This study design is particularly useful for investigating the prevalence and risk factors of conditions like malnutrition. The researcher can identify associations between past exposures such as socioeconomic status, dietary habits, or environmental conditions and the current nutritional status of under-five children in the Second Congressional District of Camarines Norte. This method allows for the efficient assessment of multiple risk factors simultaneously, providing valuable insights that can inform public health interventions aimed at addressing malnutrition in the province.

B. Respondents of the Study

The study population for the research on the prevalence of malnutrition and its risk factors among under-five children in the Second Congressional District of Camarines Norte consists of 340 under-five children. This population represents a vulnerable group whose growth and development are crucial indicators of public health. The selection of this demographic ensures that the study focuses on a critical age group where malnutrition has the most significant long-term impact on physical, cognitive, and emotional development.

The study focused on selecting children aged 0 to 59 months, as this age group represents a critical period for growth and development, during which malnutrition has profound short- and long-term impacts. Only children residing within the district were included to ensure that the data accurately reflect the local context. Additionally, records with complete and consistent information in the Field Health Service Information System (FHSIS) were selected, ensuring that essential variables such as anthropometric measurements, growth monitoring data, and health histories were available for analysis.

Children with incomplete or inconsistent records were excluded, as missing data could compromise the accuracy of the results. Non-residents in the districts were also excluded to ensure that the findings were representative of the local population. Furthermore, cases involving children with severe congenital anomalies or conditions significantly affecting growth and development were not included, as these could introduce confounding factors unrelated to socioeconomic determinants of malnutrition.

C. Research Instrument

The study of the prevalence of malnutrition and its risk factors among under-five children in the Second Congressional District of Camarines Norte utilized document review through a guide checklist to gather the necessary data needed in the study.

In the study, the primary instrument used was a document review. This involved analyzing records of under-five children from the Field Health Service Information System (FHSIS). The FHSIS serves as a standardized database for health-related data collected by local health units, offering a reliable source of information on the nutritional status of children, including anthropometric measurements, growth monitoring records, and associated health conditions.

D. Data Gathering Procedure

The data-gathering process consists of the preparation and retrieval of the guide checklist. Each phase is essential to the study's success and meticulously executed to achieve research objectives and generate reliable and actionable results.

E. Data Analysis

A rigorous data analysis approach was employed to ensure a comprehensive examination of each aspect of the study, utilizing appropriate statistical and analytical techniques, namely;

percentage technique, prevalence rate, odds ratios, and multivariate regression analysis. This enhances the findings' validity, robustness, and reliability, providing a solid basis for developing effective interventions to address child malnutrition in the Second Congressional District of Camarines Norte.

Percentage Technique was used to calculate the percentage results of the sociodemographic profile of under-five children; and under-five children's, household food security levels and healthcare service utilization in the Second Congressional District of Camarines Norte.

Multivariate Regression Analysis is a statistical technique that models the relationship between multiple independent variables and multiple dependent variables simultaneously. Multivariate regression analysis examined how variables like household income, parental education levels, and access to healthcare services affect a child's nutritional status. These factors determined which variables have the most significant impact and how they interact, providing a nuanced understanding of the pathways leading to malnutrition. This comprehensive analysis is essential for addressing the complex nature of malnutrition and implementing effective public health strategies.

Results and Discussion

A. Sociodemographic Profile of Under-Five Children

This section presents the sociodemographic profile of under-five children in the second congressional district of Camarines Norte in terms of age, sex, educational attainment of parents (mother and father), employment status of parents (mother and father), and household monthly income.

Table 1 presents the distribution of the respondents in terms of age. The distribution of respondents in terms of age reveals critical insights into the nutritional status of under-five children in the Second Congressional District of Camarines Norte. Children aged 24-35 months comprise the largest group (29.41%), followed by those aged 36-47 months (25.59%) and 12-23 months (19.41%). The youngest age group, 0-11 months, accounts for 14.71%, while the oldest group, 48-59 months, represents the smallest proportion at 10.88%. These figures indicate that children between 12 and 47 months constitute the majority of the population studied, highlighting this age range as a critical focus for nutrition-related interventions.

The high representation of children in the 12-47 months range highlights a need for targeted nutrition programs focusing on complementary feeding, micronutrient supplementation, and early health interventions. Interventions for the youngest group should emphasize breastfeeding promotion and the timely introduction of nutrient-dense

complementary foods. Addressing nutritional deficits in the older groups could help mitigate the long-term impacts of malnutrition, such as reduced cognitive and physical development.

Table 1. Distribution in Terms of Age

Indicator	Frequency	Percentage	Rank
0-11 months	50	14.71	4
12-23 months	66	19.41	3
24-35 months	100	29.41	1
36-47 months	87	25.59	2
48-59 months	37	10.88	5
Total	**340**	**100.00**	

The results of the study are closely correlated with the findings of Davenport et al. [7] wherein the distribution of children by age group reveals a peak in the 24–35-month range which is a crucial period for growth and development when nutritional deficiencies can have the most profound and lasting consequences. This finding underscores the importance of prioritizing interventions that target this vulnerable age group to prevent the onset and progression of malnutrition. The relatively even distribution of children across the other age groups emphasizes the need for continued monitoring and nutritional support beyond the first two years of life, as early childhood remains a critical window for dietary interventions [8].

Table 2 illustrates the distribution of under-five children by sex in the Second Congressional District of Camarines Norte. The population is nearly evenly split, with males comprising 50.88% and females 49.12% of the total respondents. This indicates a slight predominance of male respondents, ranking first, while female respondents are a close second.

Table 2. Distribution in Terms of Sex

Indicator	Frequency	Percentage	Rank
Male	173	50.88	1
Female	167	49.12	2
Total	**340**	**100.00**	

The near parity between the sexes provides a balanced dataset for evaluating the nutritional status of under-five children and the prevalence of malnutrition. The equal distribution of sexes suggests that nutritional assessments and malnutrition prevalence can be analyzed without significant gender bias in the dataset. However, biological and cultural factors may still influence the nutritional status of male and female children differently. Slightly higher prevalence rates of malnutrition may occur as boys often have higher metabolic demands due to growth spurts. If nutritional resources are inadequate, this could lead to increased susceptibility to undernutrition in boys.

Cultural factors and potential disparities in care, such as prioritizing male children for food or healthcare in some households, could contribute to nutritional challenges. Conversely, if

nutritional support is equally distributed, the close proportion of males and females should reflect similar malnutrition risks across genders. The findings emphasize the need for gender-sensitive interventions in addressing malnutrition. For instance, programs should ensure equitable access to nutritious food, healthcare, and supplementary feeding for both sexes. Nutritional education for parents and caregivers should highlight the importance of balanced feeding practices regardless of the child's sex.

Community health programs should focus on improving overall food security, maternal education, and access to health services to reduce malnutrition risks for all under-five children in the district. By addressing both biological and sociocultural factors, policymakers and healthcare providers can ensure equitable and effective interventions. The gender distribution within the sample indicates a slight overrepresentation of males. However, this difference is not statistically significant, suggesting that malnutrition is a pervasive issue affecting both sexes. This finding aligns with previous research that has found no significant gender differences in the prevalence of malnutrition in similar settings [9]. Thus, while gender-specific factors may influence nutritional status in specific contexts, the current data suggests that gender is not a primary independent risk factor for malnutrition in this population.

The educational attainment of the parents of children under five years old takes into account the education levels of both the mother and the father. The data presented in Table 3 highlights the educational attainment of mothers in the Second Congressional District of Camarines Norte and its potential implications for the prevalence of malnutrition among children under five years old. The largest group of mothers are high school graduates, making up 42.35% of the sample. This indicates that a significant portion of the population has attained secondary education, which provides a foundational understanding of health and nutrition.

However, the prevalence of malnutrition in this group may suggest gaps in translating this knowledge into effective child-rearing practices due to socio-economic challenges or lack of access to resources. Mothers with elementary education represent 26.47%, while 7.94% of mothers have no formal education. These groups are more likely to face barriers in understanding and applying proper nutrition and healthcare practices, which can increase the risk of malnutrition among their children. Limited education can lead to insufficient awareness about balanced diets, breastfeeding practices, and the importance of healthcare visits, exacerbating child health vulnerabilities. Addressing these gaps through targeted education programs that are accessible and culturally sensitive is crucial.

On the other hand, only 23.24% of mothers are college graduates, reflecting a relatively small proportion with higher educational attainment. Studies have shown that higher education levels among mothers are associated with better child health outcomes, as educated

mothers are more likely to make informed decisions about their children's nutrition, healthcare, and overall well-being.

Table 3. Distribution in Terms of Educational Attainment of the Mother

Indicator	Frequency	Percentage	Rank
No Formal Education	27	7.94	4
Elementary Graduate	90	26.47	2
High School Graduate	144	42.35	1
College Graduate	79	23.24	3
Total	**340**	**100.00**	

The lower proportion of college-educated mothers highlights the need for policies that promote higher education for women, particularly in rural areas, as a long-term strategy to improve maternal and child health outcomes.

The findings highlight the importance of health education programs tailored to the varying educational levels of mothers. For mothers with no formal education, visual aids, hands-on workshops, and peer support groups can help bridge knowledge gaps. For those with elementary or high school education, community-based interventions focusing on practical and actionable guidance can enhance their ability to prevent malnutrition. Empowering mothers through education not only addresses malnutrition but also fosters a cycle of improved health and well-being for future generations. Maternal factors also play a pivotal role in shaping a child's nutritional status. The analysis reveals that children of mothers with less than a high school education is more prone to underweight and stunting, emphasizing the importance of empowering women through education to break the cycle of malnutrition, as suggested by the work of Basu and Banerjee [10].

The data in Table 4 provides insights into the educational attainment of fathers of under-five children in the Second Congressional District of Camarines Norte. The largest group, comprising 37.06% of the sample, are high school graduates, while 33.23% are college graduates. This indicates that a significant portion of fathers have achieved at least secondary education, with a notable proportion attaining higher education. However, a considerable number of fathers, 21.18%, have only completed elementary education, and 8.53% have no formal education, suggesting disparities in educational access among the population.

The educational attainment of fathers has important implications for child nutrition and health. Fathers with lower levels of education, such as elementary graduates or those with no formal schooling, may lack adequate knowledge about proper nutrition, healthcare practices, and access to essential health services, increasing the risk of malnutrition among their children. Targeted interventions should address these gaps by providing accessible, community-based education programs that simplify health and nutrition concepts using culturally relevant methods.

Table 4. Distribution in Terms of Educational Attainment of the Father

Indicator	Frequency	Percentage	Rank
No Formal Education	29	8.53	4
Elementary Graduate	72	21.18	3
High School Graduate	126	37.06	1
College Graduate	113	33.23	2
Total	**340**	**100.00**	

On the other hand, fathers with higher educational attainment are more likely to have access to resources and information that support good parenting practices, including proper child nutrition and healthcare. Their involvement in household decision-making can play a crucial role in preventing malnutrition and ensuring the overall well-being of their children. Health programs should capitalize on this by actively engaging educated fathers and emphasizing their role in fostering a healthy environment for their families. For fathers with limited educational backgrounds, peer education, visual aids, and practical demonstrations can bridge knowledge gaps and encourage active participation in child-rearing responsibilities. These efforts should also integrate both parents into health and nutrition programs to promote joint decision-making, leveraging the strengths of more educated fathers to complement maternal efforts.

The occupation of the parents of children under five years old takes into account the source of income of both the mother and the father. Table 5 shows the employment status of mothers of under-five children in the Second Congressional District of Camarines Norte. The majority, 65.89%, are employed, indicating that most mothers are engaged in formal or informal employment outside the home. This is followed by 21.76% who are unemployed and 12.35% who are self-employed. The data highlights the diverse economic roles mothers play within their households and communities. Mothers who are employed may contribute significantly to their family's income, which could improve access to basic needs, including nutritious food and healthcare services.

However, employment can also present challenges, such as limited time for direct child care and meal preparation, potentially impacting the nutritional status of their children. On the other hand, unemployed mothers may have more time to focus on child-rearing but could face economic constraints, limiting their ability to provide adequate nutrition and healthcare. Self-employed mothers, while maintaining flexibility in their schedules, may also experience financial insecurity depending on the nature of their work. The high proportion of employed mothers suggests the need for workplace policies that support child nutrition, such as paid maternity leave, breastfeeding-friendly environments, and flexible work schedules. These measures can help employed mothers balance their roles as caregivers and earners, reducing the risk of malnutrition among their children.

Table 5. Distribution in Terms of Employment Status of the Mother

Indicator	Frequency	Percentage	Rank
Unemployed	74	21.76	2
Employed	224	65.89	1
Self-employed	42	12.35	3
Total	**340**	**100.00**	

The mothers who are unemployed may face financial difficulties that limit their ability to provide adequate nutrition for their children. Programs targeting this group should focus on providing financial assistance, access to livelihood opportunities, and nutrition education to address economic and knowledge-based barriers to child health. Self-employed mothers can benefit from initiatives that promote entrepreneurship and financial literacy, enabling them to generate more stable incomes.

Additionally, providing health education that aligns with their flexible schedules can enhance their ability to support their children's nutritional needs. To address malnutrition effectively, interventions must consider the employment status of mothers. Community-based programs should offer flexible schedules and resources to accommodate employed and self-employed mothers, ensuring they have access to health and nutrition services. For unemployed mothers, targeted financial and educational support can help mitigate the effects of economic constraints. Maternal unemployment further exacerbates the risk of a child's nutritional status, with children of unemployed mothers experiencing heightened vulnerability to all three forms of malnutrition: underweight, stunting, and wasting. This finding underscores the need for comprehensive policies and programs that support maternal employment and foster economic empowerment for women, aligning with the recommendations of Bazzazian et al. [11].

Table 6 outlines the employment status of fathers of under-five children in the Second Congressional District of Camarines Norte. The majority, 71.18%, are employed, indicating that most fathers have stable or regular income-generating roles. A smaller percentage, 17.35%, are unemployed, while 11.47% are self-employed.

Table 6. Distribution in Terms of Employment Status of the Father

Indicator	Frequency	Percentage	Rank
Unemployed	59	17.35	2
Employed	242	71.18	1
Self-employed	39	11.47	3
Total	**340**	**100.00**	

This distribution highlights the fathers' significant contributions to their households' economic stability, although a notable proportion faces employment challenges or relies on informal or entrepreneurial income. The high percentage of employed fathers suggests a substantial level of financial support for their families, which can positively impact their

children's nutrition and overall well-being. Stable employment increases access to resources like nutritious food, healthcare, and education, which are crucial for preventing malnutrition among under-five children.

The unemployed fathers may face economic hardships that limit their ability to provide essential resources for their families. This could contribute to an increased risk of malnutrition among their children. Interventions targeting unemployed fathers should focus on job creation, skills training, and community support programs to improve their economic contributions. Fathers who are self-employed may experience fluctuating income levels, making it challenging to consistently meet their family's nutritional and healthcare needs. Programs that offer financial literacy, business development support, and access to microfinancing can help stabilize their income and enhance their capacity to support their children.

The employment status of fathers directly influences their ability to participate in programs addressing malnutrition. Flexible, family-centered health and nutrition interventions can ensure fathers, regardless of their employment status, are actively involved in child-rearing and nutritional decision-making. While fathers often play the role of primary earners, their engagement in childcare and health decisions is equally critical. Programs should emphasize the importance of shared parental responsibility to ensure the effective utilization of resources for their children's well-being.

The data presented in Table 7 reveals the distribution of household monthly income among families in the Second Congressional District of Camarines Norte. A significant portion of households, 37.65%, earn between ₱5,000 and ₱10,000 per month, followed by 25.29% earning ₱10,001 to ₱15,000. Households with incomes below ₱5,000 account for 18.24%, while those earning ₱15,001 to ₱20,000 make up 12.94%. Notably, only 5.88% of families have a monthly income exceeding ₱20,000.

Table 7. Distribution in Terms of Household Monthly Income

Indicator	Frequency	Percentage	Rank
Less than ₱5,000	62	18.24	3
₱5,000-₱10,000	128	37.65	1
₱10,001-₱15,000	86	25.29	2
₱15,001-₱20,000	44	12.94	4
₱20,000 and above	20	5.88	5
Total	**340**	**100.00**	

These findings suggest that the majority of households fall within low-income brackets, reflecting a socioeconomic environment that may contribute to food insecurity and malnutrition, particularly among vulnerable groups like under-five children. The prevalence of malnutrition, especially stunting, wasting, and underweight conditions, can be closely linked to low household income. Limited financial resources often restrict access to nutritious food,

adequate healthcare, and other essentials for children's growth and development. Families earning below ₱10,000 per month (55.89% combined) are likely to face challenges in meeting their children's nutritional needs. This economic strain can exacerbate the risk of chronic malnutrition, leading to developmental delays, weakened immunity, and poor overall health outcomes for under-five children.

These findings are significant for policymakers, healthcare providers, and local government units. First, targeted intervention programs such as food supplementation, livelihood training, and conditional cash transfer schemes (e.g., 4Ps) should prioritize households in the lowest income brackets to reduce malnutrition rates. Second, nutrition education campaigns should be conducted to help parents optimize limited resources and promote affordable yet nutritious food choices. Lastly, improving access to maternal and child healthcare services can mitigate the adverse effects of poverty on child health outcomes. Addressing these socioeconomic factors is critical to breaking the cycle of malnutrition and ensuring the health and well-being of under-five children in Camarines Norte.

The result is consistent with findings from other studies in low- and middle-income countries, where stunting often emerges as a significant public health concern [9]. This high prevalence indicates a substantial burden of chronic undernutrition, likely stemming from prolonged inadequate dietary intake and recurrent infections. As highlighted by Davenport et al. [7], socio-economic factors and environmental challenges can exacerbate the risk of stunting, particularly in vulnerable populations.

The long-term consequences of stunting are far-reaching, impacting physical growth, cognitive development, and future earning potential. This underscores the urgent need for sustainable interventions addressing the root causes of food insecurity and promoting long-term nutritional well-being. The literature supports the notion that being underweight is often associated with a combination of factors, including inadequate dietary intake, recurrent infections, and poor socioeconomic conditions [12]. Addressing underweight necessitates a dual approach: tackling the underlying causes of chronic malnutrition while providing immediate nutritional support to those with acute deficiencies.

B. Prevalence of Malnutrition Among Under-Five Children

This section discusses the prevalence of malnutrition among under-five children in the Second Congressional District of Camarines Norte in terms of Weight-for-Age, Height-for-Age, and Weight-for-Height. The prevalence was identified based on the gathered data from the different Rural Health Units of the Second Congressional District of Camarines Norte.

Table 8 highlights the prevalence of three critical malnutrition indicators: stunting, underweight, and wasting among children under five, along with their respective 95% confidence intervals. These findings provide insight into the nutritional status of the

population and serve as a basis for addressing the underlying determinants of malnutrition. Stunting, measured by height-for-age, shows the highest prevalence of 32.68%. This suggests a widespread issue of chronic malnutrition, which is often the result of prolonged dietary deficiencies, repeated infections, and suboptimal maternal health during pregnancy.

Table 8. Prevalence of Malnutrition Among Under-Five Children

Indicators	Prevalence	95% CI	Rank
Underweight (Weight-for-Age)	23.74%	(18.31% - 30.01%)	2
Stunting (Height-for-Age)	32.68%	(26.45% - 39.45%)	1
Wasting (Weight-for-Height)	9.34%	(5.75% - 14.19%)	3

Stunting reflects long-term exposure to poor socioeconomic and environmental conditions and has significant implications for child development. Chronically malnourished children are at risk of impaired cognitive development, reduced physical capacity, and a higher likelihood of health complications later in life. The persistent high prevalence of stunting indicates the need for sustained interventions that address both immediate and systemic factors affecting child nutrition. Underweight, as indicated by weight-for-age, has a prevalence of 23.74%, lower than stunting but still concerning. This indicator captures both acute and chronic malnutrition, making it a valuable metric for assessing overall nutritional health. Underweight children are more vulnerable to infections and illness due to weakened immune systems, creating a vicious cycle that exacerbates nutritional deficits. The prevalence of underweight highlights the dual need for both immediate interventions to combat acute malnutrition and longer-term strategies to improve chronic nutritional inadequacies. Further, wasting, defined by weight-for-height, has the lowest prevalence of 9.34%, reflecting fewer cases of acute malnutrition in the region. While less prevalent, wasting represents a severe and immediate threat to child survival, as it often results from sudden weight loss due to illness or inadequate dietary intake. Children who are wasted face an increased risk of mortality if not promptly treated. This highlights the importance of community-based nutrition programs and healthcare services that can identify and address wasting early through therapeutic feeding and treatment of underlying health issues.

The implications of these findings extend beyond individual health outcomes. The high rates of stunting and underweight, combined with the acute risks of wasting, point to broader socioeconomic disparities. As observed in related income distribution data, households in low-income brackets may lack access to adequate nutrition and healthcare, perpetuating the cycle of malnutrition. Addressing these issues requires an integrated approach that combines direct nutritional interventions with strategies to improve food security, access to healthcare, and education on optimal feeding practices. Ultimately, these data reinforce the need for multi-sectoral policies and programs to combat malnutrition in this region. Investing in maternal and

child health, promoting early detection and intervention, and addressing the root causes of poverty and food insecurity will be critical in reducing the prevalence of stunting, underweight, and wasting among under-five children. Such efforts will not only improve immediate health outcomes but also contribute to the long-term development and well-being of the population.

C. Under-Five Children's Nutritional Intake and Household Food Security Levels

1. Nutritional Intake

This portion presents the results of the assessment of the under-five children's nutritional intake and household food security levels in the Second Congressional District of Camarines Norte. The analysis of the mean intake of macronutrients and micronutrients among under-five children in the Second Congressional District of Camarines Norte as reflected in Table 9 reveals a nuanced picture of their nutritional status. The data highlights both strengths and areas for improvement in their dietary patterns. The mean intake of macronutrients such as protein, fat, and carbohydrates meets or exceeds the Recommended Dietary Allowance (RDA). Protein intake is recorded at 19.5 g/day, aligning with the recommended range of 13-19 g/day, indicating adequate support for the growth and repair of tissues in young children.

Similarly, fat intake at 26.8 g/day falls within the acceptable range of 20-30 g/day, ensuring sufficient energy reserves and aiding the absorption of fat-soluble vitamins such as A, D, E, and K. The mean carbohydrate intake, at 138.5 g/day, exceeds the minimum requirement of 130 g/day, suggesting that energy needs are adequately met, supporting the children's daily activities and growth. These findings underscore the positive aspect of the children's diets in terms of macronutrient sufficiency, which is crucial for preventing energy malnutrition and promoting healthy physical development.

Table 9. Mean Intake of Macronutrients and Micronutrients Among Under-Five Children

Nutrients	Mean Intake	RDA
Protein (g/day)	19.5	13-19
Fat (g/day)	25.8	20-30
Carbohydrates (g/day)	138.5	130
Iron (mg/day)	6.8	7-10
Vitamin A (mcg/day)	395	300-600
Zinc (mg/day)	4.5	3-5

However, the data reveals a slight deficiency in the intake of iron, a critical micronutrient. The mean iron intake of 6.8 mg/day falls below the recommended range of 7-10 mg/day. This poses a risk for iron-deficiency anemia, a condition that can impair cognitive development, immunity, and overall health in young children. Addressing this gap is vital to prevent long-term developmental and health complications. On the other hand, the intake of vitamin A and zinc is adequate, with mean levels of 395 mcg/day and

4.5 mg/day, respectively, both falling within their respective RDAs. These nutrients are essential for immunity, growth, and cellular function, indicating that children are receiving sufficient support in these areas. The adequate intake of macronutrients reflects positive feeding practices, suggesting that most children in the district have access to sufficient energy and nutrient sources. However, the marginal iron deficiency signals the need for targeted interventions. Programs focusing on iron supplementation or fortification of commonly consumed foods can help bridge this gap. For example, distributing iron-fortified rice or cereals and educating parents about iron-rich foods like red meat, legumes, and dark green leafy vegetables could address this deficiency effectively.

Moreover, the maintenance of adequate vitamin A and zinc intake is encouraging and should be sustained through nutrition education and access to diverse, locally available food options. Continued community-based nutritional surveillance can help identify emerging deficiencies and provide timely support. Policymakers and healthcare providers should integrate micronutrient supplementation, particularly for iron, into existing maternal and child health programs to comprehensively address malnutrition risks.

In summary, while the overall macronutrient intake among under-five children in the district is sufficient, the identified gap in iron intake requires immediate attention. A combination of education, food fortification, and supplementation can help mitigate this risk and ensure optimal growth and development for children in the municipality. This finding underscores the pivotal role of dietary variety in fostering optimal growth and development, aligning with previous research that has established a strong link between dietary diversity and improved nutritional outcomes in children [13]-[15]. A clear association is expected between dietary diversity and nutritional status, consistent with previous studies demonstrating a positive correlation between dietary diversity and expected growth patterns in children [16]. Children with average weight and growth patterns consistently exhibit higher dietary diversity scores, indicating a greater variety in their food intake. Conversely, malnourished children categorized as underweight, stunted, or wasted are expected to have notably lower scores, suggesting a potential lack of essential nutrients in their diets and hindering their healthy development, as supported by existing literature [12].

These findings highlight the significance of dietary diversity in promoting healthy growth and development and align with a wealth of research highlighting the importance of a varied diet in providing a broader spectrum of essential nutrients [17],[18]. The expected results emphasize the critical need to address dietary diversity as a cornerstone

of interventions aimed at mitigating child malnutrition, echoing the recommendations of numerous studies and public health organizations [9],[19].

To achieve this, a multifaceted approach is warranted, encompassing comprehensive nutrition education programs [20], strengthening local food systems to enhance the availability, affordability, and accessibility of diverse, nutrient-rich foods [21], and targeted supplementation in cases of severe malnutrition [22]-[24]. These strategies are supported by evidence-based interventions that have successfully improved dietary diversity and nutritional outcomes in children. By prioritizing dietary diversity in public health initiatives, it can make significant strides in combating child malnutrition, fostering healthier growth trajectories, and ultimately improving the overall health and well-being of children in the community.

Notably, protein intake slightly surpasses the recommended daily allowance (RDA), which is crucial for growth and development, aligning with findings from De Menezes et al. [13], who highlight the importance of adequate protein intake in schoolchildren. Fat and carbohydrate intake fall within the recommended ranges, ensuring sufficient energy for daily activities.

However, the intake of micronutrients presents a slightly different picture. While vitamin A and zinc intake seem adequate for most children, iron intake falls slightly below the RDA. This finding raises concerns about the potential risk of iron deficiency anemia, a prevalent nutritional deficiency among children, particularly those experiencing malnutrition, as highlighted by Manrique et al. [19] in their study on the impact of public health expenditure on malnutrition prevalence in the Philippines. While these mean intake values provide valuable insights, it is essential to acknowledge that individual variations exist [18].

A more in-depth analysis of specific food sources and individual dietary patterns is warranted to pinpoint potential deficiencies or excesses in particular nutrients. This detailed analysis will enable the development of tailored nutritional interventions to address the unique needs of each child, as suggested by Keller et al. [22] in their discussion on multidisciplinary nutrition care. In conclusion, while the macronutrient intake among children seems satisfactory, the slightly lower iron intake underscores the importance of monitoring and potentially addressing iron deficiency through dietary modifications or supplementation. The adequate vitamin A and zinc intake is encouraging but requires further investigation to ensure that all children meet their requirements. A comprehensive understanding of children's dietary patterns and nutrient intake is crucial for developing effective strategies to promote optimal growth, development, and overall health.

2. Household Food Security Levels

This section explores the critical issue of food security within the context of child nutrition. The data presented in Table 10 on the household food security levels shows the distribution of participants based on their access to food and nutritional security. By examining the prevalence of food insecurity among households in the study population, it aims to understand the extent to which families consistently struggle to access adequate and nutritious food. The Mild Food Insecurity (35.00%) ranks first, with 35% of respondents experiencing mild food insecurity. These individuals likely have access to food but may experience occasional disruptions in their food supply or concerns about the adequacy of their food intake. This suggests a significant portion of the population faces some challenges in food access, but not to a severe degree.

Table 10. Distribution in terms of Household Food Security Levels

Indicator	Frequency	Percentage	Rank
Food Secure	95	27.94	4
Mild Food Insecurity	119	35.00	1
Moderate Food Insecurity	82	24.12	2
Severe Food Insecurity	44	12.94	5
Total	**340**	**100.00**	

Moderate Food Insecurity with 24.12% of the population in this category, represents a substantial portion of individuals who likely experience more frequent disruptions in their food intake, potentially leading to a compromised diet. This ranks second, emphasizing the prevalence of moderate food insecurity among the sample. The least common category, severe food insecurity affects 12.94% of respondents. These individuals face significant barriers to acquiring sufficient food and likely experience hunger on a regular basis. This group ranks fifth, underscoring the severity of their condition.

The findings indicate that a large proportion (59.12%) of the sample faces some form of food insecurity, with 35% of the population experiencing mild insecurity and 24.12% experiencing moderate insecurity. This highlights a concerning issue related to food access and could point to socioeconomic challenges, poor distribution systems, or both. The relatively high percentages of mild and moderate food insecurity suggest that intervention programs, such as food assistance, nutrition education, and income-support initiatives, are crucial. Programs targeting these groups could prevent the escalation to more severe forms of food insecurity, improving overall health outcomes.

Given that 12.94% of individuals suffer from severe food insecurity, targeted support such as emergency food aid, direct financial assistance, and social programs would be necessary for this group. Identifying the underlying causes of severe food insecurity, such

as unemployment, low income, or regional disparities, will be important for long-term solutions. Such a high prevalence of food insecurity raises significant concerns regarding the nutritional well-being of children within these households, as supported by the findings of Ahmad et al. [6] and Munir [12], who identified a strong association between food insecurity and child malnutrition in Pakistan.

The observed high prevalence of food insecurity aligns with the equally concerning high prevalence of malnutrition, particularly stunting, among children in the study population. This alignment strongly suggests a direct link between food insecurity and malnutrition, highlighting the detrimental impact of limited access to nutritious food on children's growth and development. Food insecurity deprives children of essential nutrients and disrupts their eating patterns and overall dietary quality, as evidenced by research conducted by Capanzana et al. [9] in the Philippines. The findings underscore the critical importance of addressing food insecurity as a key intervention point in any comprehensive effort to combat malnutrition and improve child health outcomes, echoing the recommendations of Manrique et al. [19], who emphasized the need for increased public health expenditure to address malnutrition in the Philippines.

By prioritizing interventions that enhance food security, such as strengthening social safety nets, improving access to affordable and nutritious food, and promoting sustainable agricultural practices, we can create a more conducive environment for children's healthy growth and development. Addressing food insecurity is not merely a matter of providing calories but ensuring that children have access to a diverse and balanced diet that meets their nutritional needs, as emphasized in the studies by De Menezes et al. [13] and Martín-Rodríguez et al. [14]. By tackling this root cause of malnutrition, the cycle of undernutrition can be broken, paving the way for a healthier future for children.

3. Healthcare Service Utilization.

The data from Table 11 on the distribution in terms of healthcare service utilization reveals that routine check-ups rank highest, with 50% of the respondents utilizing this service, indicating that half of the households prioritize regular medical consultations for their under-five children; growth monitoring is utilized by 37.94%, ranking second, suggesting moderate engagement in monitoring child development milestones, which is essential for detecting growth issues early; and nutrition counseling, though critical for addressing malnutrition, ranks lowest at 27.06%, indicating that less than one-third of households access this vital service for improving dietary practices and nutritional knowledge. The higher utilization of routine check-ups suggests that families may have basic awareness and access to healthcare services. However, the lower uptake of nutrition

counseling highlights gaps in specialized support for addressing malnutrition. This may be due to insufficient promotion of these services or logistical barriers like distance and cost.

Table 11. Distribution in terms of Healthcare Service Utilization

Nutrients	Frequency	Percentage	Rank
Routine check-ups	170	50.00	1
Growth Monitoring	129	37.94	2
Nutrition counseling	92	27.06	3

Growth monitoring, though moderately utilized, indicates room for improvement in tracking developmental progress. Enhancing awareness of its importance could help identify at-risk children earlier and reduce malnutrition prevalence. The findings suggest the need for targeted health education campaigns to improve the utilization of underused services like nutrition counseling. Strengthening outreach programs and integrating nutrition counseling into routine check-ups may increase accessibility and awareness. Lastly, community-based approaches, such as mobile clinics and barangay-level nutrition programs, could address barriers to service utilization, especially in underserved areas of the Second Congressional District.

The result is consistent with the result of Haryanto [21] where the lack of a significant association with malnutrition suggests potential inadequacies in addressing nutritional concerns during these check-ups. Similarly, over half of the children reported participating in growth monitoring programs; however, this did not translate into a significant difference in malnutrition prevalence, indicating that more than growth monitoring alone may be required [25]. The lack of a significant association with malnutrition suggests the need for further evaluation and possible strengthening of existing counseling services [22].

Additionally, geographical barriers, including the distance to healthcare facilities and lack of affordable transportation, emerged as significant challenges, particularly for families residing in remote areas [21]. Long waiting times at public health facilities also discouraged many families from seeking care, especially for preventive services like growth monitoring and nutrition counseling [20]. Furthermore, families and healthcare providers voiced concerns about public health facilities' limited availability of specialized services, inadequate staffing levels, and insufficient resources, including medicines and equipment [25]. Likewise, a lack of awareness regarding the importance of healthcare services and distrust in healthcare providers emerged as additional barriers. This underscores the importance of community-based health education programs to increase awareness and promote trust in modern medicine while acknowledging and incorporating traditional practices where appropriate [26]. These barriers contribute to the low utilization of healthcare services and hinder the early detection and treatment of

malnutrition in children, aligning with the findings of previous studies on barriers to healthcare access [27].

D. Determinants of Malnutrition Among Under-Five Children

This section discusses the determinants of malnutrition, such as underweight, stunting, and wasting among under-five children in the second congressional district of Camarines Norte, along with the following socioeconomic factors, namely: low household income, low maternal education, unemployed mother, low paternal education, and unemployed father.

1. Socioeconomic factors as a determinant of underweight

The analysis presented in Table 12 identifies several socio-economic factors as determinants of underweight among under-five children, measured by adjusted odds ratios (aOR) and 95% confidence intervals (CI). The analysis highlights key socio-economic factors influencing underweight among under-five children. Low household income significantly increases the risk of being underweight (aOR = 3.82, 95% CI: 1.98-7.36), indicating that children from low-income families are nearly four times more likely to experience poor nutritional status.

Table 12. Socioeconomic Factors as a Determinant of Underweight

Predictor	Wasting (aOR, 95% CI)	Interpretation
Low Household Income	3.82 (1.98-7.36)	Significant
Low Maternal Education	2.45 (1.25-4.80)	Significant
Low Paternal Education	1.89 (0.96-3.72)	Not Significant
Unemployed Mother	2.90 (1.48-5.68)	Significant
Unemployed Father	1.65 (0.84-3.24)	Not Significant

Note: aOR = adjusted odds ratio

Similarly, low maternal education shows a strong association with underweight (aOR = 2.45, 95% CI: 1.25-4.80), suggesting that mothers' educational attainment plays a critical role in fostering better childcare practices and health outcomes. Maternal unemployment also significantly elevates the risk (aOR = 2.90, 95% CI: 1.48-5.68), likely due to reduced household financial resources and access to adequate nutrition. In contrast, while low paternal education (aOR = 1.89, 95% CI: 0.96-3.72) and paternal unemployment (aOR = 1.65, 95% CI: 0.84-3.24) show increased odds of underweight, these factors are not statistically significant. The findings underscore the critical impact of household socio-economic conditions on child nutritional outcomes. Low household income is a significant barrier to accessing nutritious food, healthcare, and essential resources for healthy child development. Similarly, maternal education plays a pivotal role in shaping childcare practices, as educated mothers may better understand nutrition, hygiene, and health-seeking behaviors.

The significant association between maternal unemployment and underweight suggests that mothers' economic contribution could provide better food security and caregiving resources. Conversely, the lack of statistical significance for paternal unemployment and education implies that these factors may have a less direct impact on immediate child nutritional status or could be influenced by other moderating variables, such as maternal roles or household dynamics. The study of Zhang et al. [28] revealed that the prevalence of underweight was highest among infants and young children aged 18–24 months. The study of Tedla et al. [29] revealed that the prevalence of malnutrition in under-five children showed that 46.2%, 24.2%, and 11.3% were found to be stunted, underweight and wasted respectively. Children aged 6-59 months were underweight.

2. Socioeconomic factors as a determinant of stunting

The analysis in Table 13 identifies socioeconomic factors as significant determinants of stunting among under-five children, highlighting the critical role of household circumstances on child growth and development. Low household income is strongly associated with stunting (aOR = 4.15, 95% CI: 2.15-8.02), indicating that children from low-income households are over four times more likely to experience stunted growth compared to those from higher-income families. Similarly, low maternal education (aOR = 3.01, 95% CI: 1.52-5.98) and low paternal education (aOR = 2.05, 95% CI: 1.04-4.04) significantly increase the odds of stunting, suggesting that parental educational attainment is crucial for understanding and implementing proper nutrition and health practices. Maternal unemployment is also significantly linked to stunting (aOR = 3.33, 95% CI: 1.68-6.61), likely due to reduced household resources and limited access to nutritional and healthcare services.

Table 13. Socioeconomic Factors as a Determinant of Stunting

Predictor	Wasting (aOR, 95% CI)	Interpretation
Low Household Income	4.15 (2.15-8.02)	Significant
Low Maternal Education	3.01 (1.52-5.98)	Significant
Low Paternal Education	2.05 (1.04-4.04)	Significant
Unemployed Mother	3.33 (1.68-6.61)	Significant
Unemployed Father	1.72 (0.87-3.38)	Not Significant

Note: aOR = adjusted odds ratio

On the other hand, paternal unemployment (aOR = 1.72, 95% CI: 0.87-3.38) shows a potential risk but is not statistically significant. These findings emphasize the urgent need for interventions that address socio-economic inequalities to combat stunting. Improving household income through poverty alleviation programs and economic support can help reduce stunting rates. Additionally, promoting parental education, particularly for mothers,

is vital to empower families with knowledge and skills for better childcare and nutrition practices. Efforts to create employment opportunities for mothers could further enhance household resilience and resource availability for children. By addressing these socio-economic determinants, public health initiatives can help mitigate stunting and improve overall child health and development outcomes.

Likewise, the study of Zhang et al. [28] showed that the prevalence of stunting was highest among infants and young children between 12 and 18 months. The study by Tedla et al. [29] revealed that the prevalence of malnutrition in under-five children showed that 46.2%, 24.2%, and 11.3% were found to be stunted, underweight and wasted respectively. There is a staggering slow in Stunting.

3. Socioeconomic factors as a determinant of wasting

The analysis in Table 14 highlights the influence of socioeconomic factors on wasting among under-five children, with varying levels of significance. Low household income is significantly associated with wasting (aOR = 2.56, 95% CI: 1.05-6.24), indicating that children from low-income families are more than twice as likely to experience wasting compared to those from higher-income households. This underscores the critical impact of financial constraints on access to nutritious food and healthcare. Conversely, low maternal education (aOR = 1.78, 95% CI: 0.69-4.61), low paternal education (aOR = 1.53, 95% CI: 0.59-3.96), maternal unemployment (aOR = 2.11, 95% CI: 0.82-5.43), and paternal unemployment (aOR = 1.38, 95% CI: 0.53-3.60) show no significant association with wasting, as their confidence intervals include 1. This suggests that these factors may not independently contribute to wasting or that their influence could be moderated by other variables not captured in the analysis.

Table 14. Socioeconomic Factors as a Determinant of Wasting

Predictor	Wasting (aOR, 95% CI)	Interpretation
Low Household Income	2.56 (1.05-6.24)	Significant
Low Maternal Education	1.78 (0.69-4.61)	Not Significant
Low Paternal Education	1.53 (0.59-3.96)	Not Significant
Unemployed Mother	2.11 (0.82-5.43)	Not Significant
Unemployed Father	1.38 (0.53-3.60)	Not Significant

Note: aOR = adjusted odds ratio

The findings point to household income as a key determinant of wasting, emphasizing the need for poverty alleviation programs that improve access to basic needs, particularly nutrition and healthcare for young children. The lack of significant associations with parental education and employment suggests that interventions should not only focus on these individual factors but also address broader systemic issues that limit families' ability to support child nutrition. Integrating income support with community-based nutrition

programs could provide a more effective strategy to reduce wasting and improve child health outcomes in vulnerable populations. The varying prevalence rates of wasting, stunting, and underweight suggest that different underlying factors may contribute to each type of malnutrition.

This aligns with the findings of Celhay et al. [30], who highlighted socioeconomic disparities in child nutrition. This observation calls for a nuanced understanding of the specific causes and drivers of malnutrition within the community to develop tailored and effective interventions. Overall, the anthropometric data reveals a substantial burden of malnutrition among under-five children in the Second Congressional District of Camarines Norte. A multi-pronged approach addressing immediate nutritional needs, underlying causes of food insecurity, and improving access to healthcare is crucial to combat this pressing public health issue and ensure these vulnerable children's healthy growth and development.

Maternal factors also play a pivotal role in shaping a child's nutritional status. The analysis reveals that children of mothers with less than a high school education are more prone to underweight and stunting, emphasizing the importance of empowering women through education to break the cycle of malnutrition, as suggested by the work of Basu and Banerjee [10]. Moreover, maternal unemployment further exacerbates the risk, with children of unemployed mothers experiencing heightened vulnerability to all three forms of malnutrition: underweight, stunting, and wasting. This finding underscores the need for comprehensive policies and programs that support maternal employment and foster economic empowerment for women, aligning with the recommendations of Bazzazian et al. [11].

While paternal education and employment status also contribute to malnutrition risk, the analysis suggests that maternal factors exert a more pronounced influence on child nutrition outcomes. This observation resonates with studies like that of Tang et al. [15], which emphasized the impact of mothers' dietary patterns on children's nutritional status in China. Therefore, a holistic approach to tackling malnutrition must prioritize interventions addressing these maternal determinants, such as improving women's access to education and employment opportunities. In conjunction with targeted nutritional interventions, addressing these underlying socio-economic disparities is crucial to creating a more equitable and healthier environment for all children to thrive.

The result is consistent with the result of Haryanto [21] where the lack of a significant association with malnutrition suggests potential inadequacies in addressing nutritional concerns during these check-ups. Similarly, over half of the children reported participating

in growth monitoring programs; however, this did not translate into a significant difference in malnutrition prevalence, indicating that more than growth monitoring alone may be required [25].

The lack of a significant association with malnutrition suggests the need for further evaluation and possible strengthening of existing counseling services [22]. Additionally, geographical barriers, including the distance to healthcare facilities and lack of affordable transportation, emerged as significant challenges, particularly for families residing in remote areas [21]. Long waiting times at public health facilities also discouraged many families from seeking care, especially for preventive services like growth monitoring and nutrition counseling [20]. Furthermore, families and healthcare providers voiced concerns about public health facilities' limited availability of specialized services, inadequate staffing levels, and insufficient resources, including medicines and equipment [25].

Likewise, a lack of awareness regarding the importance of healthcare services and distrust in healthcare providers emerged as additional barriers. This underscores the importance of community-based health education programs to increase awareness and promote trust in modern medicine while acknowledging and incorporating traditional practices where appropriate [26]. These barriers contribute to the low utilization of healthcare services and hinder the early detection and treatment of malnutrition in children, aligning with the findings of previous studies on barriers to healthcare access [27]. Furthermore, the study of Zhang et al. [28] revealed that the prevalence of wasting was highest among infants and young children aged 18–24 months. The study by Tedla et al. [29] revealed that the prevalence of malnutrition in under-five children showed that 46.2%, 24.2%, and 11.3% were found to be stunted, underweight, and wasted respectively. Seventy-seven of children aged 6-59 months were wasted.

E. Proposed Plan to Enhance the Nutritional Status of Under-Five Children and Reduce the Prevalence of Malnutrition

The nutritional status of children under five years old is a critical determinant of their overall health, development, and well-being. Malnutrition during this formative stage not only impairs physical growth but also affects cognitive development and increases susceptibility to infections. In the Second Congressional District of Camarines Norte, malnutrition among children remains a pressing public health issue, reflecting the broader socio-economic challenges faced by the municipality.

Addressing this concern requires a holistic approach that integrates health, education, and community support systems to ensure children receive adequate nutrition and thrive in their early years. Efforts to combat malnutrition must prioritize accessible healthcare services, sustainable food security programs, and nutrition education for families. Collaborative

initiatives between government agencies, non-governmental organizations, and local communities are essential to create lasting solutions to this multifaceted problem. By investing in early childhood nutrition, the municipality can help break the cycle of poverty and improve the long-term quality of life for its youngest residents.

Despite ongoing efforts to combat malnutrition, the prevalence of undernutrition among under-five children in the Second Congressional District of Camarines Norte continues to be alarming. Contributing factors include limited access to nutritious food, lack of awareness among caregivers regarding proper feeding practices, and inadequate healthcare services. The consequences of malnutrition are far-reaching, encompassing stunted growth reduced learning capacity, and increased vulnerability to chronic diseases later in life. This proposed plan is rooted in the urgency to address these challenges comprehensively by leveraging community-based interventions, enhancing nutritional education, and improving the accessibility of health services. By adopting evidence-based strategies, this initiative aims to create sustainable improvements in the nutritional well-being of children and contribute to the region's overall development.

The general objective of the proposed plan as reflected in Table 15 and Table 16 is to enhance the nutritional status of under-five children and reduce the prevalence of malnutrition in the Second Congressional District of Camarines Norte through the implementation of community-based interventions, educational programs, and improved access to healthcare services.

Table 15. Proposed Plan to Enhance the Nutritional Status of Under-Five Children and Reduce the Prevalence of Malnutrition (Objectives and Strategy)

Objectives	Activities/ Strategies
Areas of Concern: Prevalence of Stunting, Wasting, and Under-weight	
• To reduce the prevalence of stunting, wasting, and underweight among under-five children • To improve caregivers' knowledge and practices regarding nutrition, health, and sanitation by conducting targeted educational programs. • To enhance access to affordable and nutritious food for families with under-five children in the district. • To strengthen existing health and nutrition monitoring and intervention systems for early detection and management of malnutrition.	• Conduct workshops for caregivers on proper feeding practices, hygiene, and meal planning using locally available resources. • Use interactive tools such as visual aids, storytelling, and cooking demonstration • Implement a community feeding program in collaboration with local government units (LGUs), NGOs, and schools. • Provide nutrient-rich meals to identified malnourished children. • Administer vitamins and mineral supplements, especially iron, zinc, and vitamin A, to children under five. • Conduct bi-annual deworming in coordination with barangay health centers. • Promote backyard gardening to improve household food security. • Train families on sustainable agricultural practices and provide starter kits for gardening (e.g., seeds, tools). • Facilitate livelihood programs to increase household income. • Conduct regular growth monitoring through barangay health workers (BHWs). • Use growth charts to track weight and height and identify cases of malnutrition early.

Objectives	Activities/ Strategies
	• Lobby for increased funding and policy support for nutritional programs. • Advocate for the inclusion of fortified foods in LGU nutrition programs.
Areas of Concern: Socio-economic Factors	
• To assess and address the impact of socioeconomic factors (e.g., income, education, and employment) on the nutritional status of under-five children. • To empower families with limited resources by providing access to sustainable livelihood programs and education to improve household income and food security. • To create targeted interventions based on the socioeconomic profiles of malnourished children for more effective nutrition programs.	• Conduct household surveys to gather data on income levels, educational attainment, employment status, and food access. • Analyze socioeconomic data to identify at-risk families and prioritize interventions. • Introduce livelihood training programs tailored to local opportunities, such as farming, fishing, handicrafts, or small-scale enterprises. • Collaborate with government agencies and NGOs to provide microfinancing or grants for family income generation. • Offer parenting sessions focusing on nutrition, budgeting, and low-cost meal planning. • Conduct workshops to improve literacy and provide skills training for unemployed or underemployed parents. • Establish community food banks to support families with limited food access. • Distribute fortified food and supplements to children in households below the poverty threshold. • Provide regular deworming, immunization, and health check-ups to address co-morbidities that exacerbate malnutrition in low-income families. • Implement community-based feeding programs targeting children from socioeconomically disadvantaged families. • Form community councils involving parents, local leaders, and health workers to promote awareness about the socioeconomic determinants of malnutrition.

Table 16. Proposed Plan to Enhance the Nutritional Status of Under-Five Children and Reduce the Prevalence of Malnutrition (Person Involved and Expected Outcomes)

Person Involved	Expected Outcome
Areas of Concern: Prevalence of Stunting, Wasting, and Under-weight	
• Parents and caregivers of under-five children • Barangay Health Workers (BHWs) • Local Nutrition Scholars (LNS) • Municipal Nutrition Offices • Department of Health (DOH) • Department of Agriculture (DA) • Department of Social Welfare and Development (DSWD) • Non-Governmental Organizations (NGOs) focused on child nutrition • Healthcare Providers • Barangay Captains • School Heads	• Decreased rates of stunting, wasting, and underweight • Increased percentage of caregivers demonstrating proper feeding practices and basic knowledge of child nutrition. • Growth in household food production through backyard gardening initiatives. • Increased early detection and treatment of malnutrition cases through regular growth monitoring. • Strengthened local government policies supporting child nutrition and health programs. • Overall improvement in the health and nutritional status of under-five children in the district.
Areas of Concern: Socio-economic Factors	
• Families and caregivers of under-five children • Parents with low income and/or low educational attainment • Barangay Nutrition Committees • Municipal Social Welfare and Development Offices • Barangay Health Workers (BHWs) • Nutritionists and dietitians • Midwives and nurses	• A significant decline in stunting, wasting, and underweight rates among under-five children, particularly in low-income households. • Increased household income from livelihood projects and microfinancing programs. • A higher percentage of caregivers practice proper nutrition and budgeting strategies. • Improved access to affordable, nutritious food for socioeconomically disadvantaged families.

Person Involved	Expected Outcome
• Barangay Captains and Local Nutrition Scholars	• Local policies established to address poverty and malnutrition through sustainable socioeconomic programs. • Reduction in co-morbidities linked to malnutrition, such as infections and anemia, especially in at-risk populations.

Conclusion

In light of the insights gleaned from the result on the prevalence of malnutrition and its risk factors among under-five children in the Second Congressional District of Camarines Norte, the following conclusions were derived. The majority of under-five children in the Second Congressional District of Camarines Norte are male, with most falling within the 24-35 months age group. The parents, predominantly high school graduates, are largely employed, with household incomes ranging from Php 5,000.00 to 10,000.00 per month. Stunting remains a significant concern among under-five children in the district, highlighting a need for targeted nutritional interventions. While the overall macronutrient consumption among children is adequate, iron deficiency has been identified as a common gap in their dietary intake. Additionally, a notable portion of households experience mild to moderate food insecurity, indicating challenges in food access that, while not severe, still require attention to prevent long-term effects on child health. Moreover, there is a higher utilization of routine check-ups which suggests that families have basic awareness and access to healthcare services. Low household income is a strong determinant of underweight status among children. Stunting, on the other hand, is significantly associated with low maternal education and unemployed mothers. However, low income, maternal education, and maternal unemployment are not significant determinants of wasting. The proposed plan aims to enhance the nutritional status of under-five children in the district and effectively reduce the prevalence of malnutrition through comprehensive and targeted strategies.

Conflict of Interest

The authors declare that there is no conflict of interest.

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