

Research Proposal:

Statistical Models for Food Security and Nutritional Status of Mothers and Under-five Child Pairs in Tanzania.

Background of the Study

For the past four decades, malnutrition has gained remarkable consideration in the health sector and governments in the world. The considerations have stemmed from the side effect of it. Although malnutrition has several consequences, researchers have pointed out the most severe outcomes which include poor fetal growth, low birth weight (LBW) and short and long-term maternal and infant morbidity and mortality (Black *et al.*, 2013; Jones *et al.*, 2003). Around 45 percent of deaths among under five years old children are linked to undernutrition.

According to UNICEF, WHO and World Bank Joint Child Malnutrition estimates in 2017; globally, around 155 million under-five children suffer from stunting, 66 percent of the children live in low-middle-income countries. These children start their lives at a marked disadvantage: they face learning difficulties in school, earn less as adults, and face barriers to participate in their communities. Nearly 52 and 17 million under-five children were wasted and severely wasted respectively. Wasting is a life-threatening disease, which weakens the immune system, delays the growth of a child and increases risks of diseases and death. The global report also indicates that there are 41 million overweight under-five children in the world.

Many countries have managed to reduce the level of malnutrition to children under five, in Africa the situation is still worse. Recent statistics indicate that more than 59 million children under five years are stunted, 10 million are fighting to reduce their overweight and 69 million suffer from wasting (WHO, 2017). Despite the decrease in the prevalence of stunting in the world, the number of stunted children in Africa has increased due to population growth (Fanzo *et al.*, 2018).

Availability of data on nutritional status of under-five year old children and women of reproductive age provides an opportunity to use statistical techniques to jointly examine forms of malnutrition among mother-child pairs. Also, identify clusters with the highest prevalence of mother-child malnutrition and examine its association with food insecurity. The approach will help to address the coexistence of forms of malnutrition among mother and child pairs and the associated factors.

Statement of the Research Problem

The transformation vision for 2030 agenda of sustainable development emphasizes countries and stakeholders to work together towards ending hunger and all forms of malnutrition. Every country and every individual in the world is at risk of one or more forms of the malnutrition. Studies have been done on the prevalence and factors related to nutritional status around the world. Food security is one of the factors associated with malnutrition, but the relationship between malnutrition and household food security is not conclusive in the existing literature. For example, the results of Brazil (Kac *et al.*, 2012), Mexico (Kaiser *et al.*, 2002) and Nepal (Osei *et al.*, 2010) show no significant relationship between food security and nutritional status. Contrary to that, the results of Ethiopia (Betebo *et al.*, 2017) and Mexico (Casey *et al.*, 2006) show significant relationship between food security and nutritional status. This study intends to examine forms of malnutrition among mother and under-five child pairs and its association with household food security in Tanzania.

Objectives of the Study

Main objective

The main objective of this study is to assess linkages between food security and nutritional status of mothers and under-five child pairs to better nutrition intervention programs and policies aimed at eradicating all forms of malnutrition.

Specific objectives

The specific objectives of this study are to:

1. Determine the prevalence of malnutrition among mother-child pairs.
2. Develop a geostatistical model to predict the nutritional status of mother-child pairs in Tanzania.
3. Examine the linkages between household food security and nutritional status of mother-child pairs in clusters with the highest prevalence of mother-child malnutrition.

Research questions

This study will answer the following research questions:

1. What is the prevalence of malnutrition among mother-child pairs?
2. What is the best geostatistical model to predict the nutritional status of mother-child pairs in Tanzania?
3. What are the linkages between household food security and the nutritional status of mother-child pairs in clusters with the highest prevalence of mother-child malnutrition?

Significance of the study

The study will add knowledge in the literature on the prevalence of double burden of malnutrition at the household level by studying the coexistence of malnutrition forms among mother-child pairs.

Literature Review

Malnutrition is a global health problem, it has short and long-term effects. The short-term effects include morbidity and mortality while long-term effects include the poor growth of a child, which later affects a country's productivity (Bryce *et al.*, 2005). Every individual is at the risk of one or more forms of malnutrition. Coexistence of undernutrition and overweight/obesity or diet-related non-communicable diseases is referred to as the double burden of malnutrition. It can occur at individual, household, community, national or regional level. Developing countries now face the double burden of malnutrition hence, it is important to address the double burden of malnutrition in the efforts of eradicating all forms of malnutrition and attain sustainable development goal 2.2 (WHO, 2018).

Studies in Tanzania have been done on malnutrition and determined the associated factors; sex of a child, mother's education, economic status, immunization status, place of residence and number of under five years old children in a household, child feeding practices, sanitation, illness episodes, birth weight (Girma & Genebo, 2002; Mbago & Namfua, 1992; Mgongo *et al.*, 2017; Safari *et al.*, 2015; Setswe, 1994).

Children from households with food insecurity are more likely to be malnourished compared to children from households with food security (Casey *et al.*, 2006). FAO report on the state of food security and nutrition in 2018 indicates that the number of hungry people in the world is increasing. There has been an increase in the number of undernourished people from 804 million people in 2016 to about 827 million people in 2017. Unreliable access to food is linked to undernutrition, overweight and micronutrient related malnutrition (FAO *et al.*, 2018). Contrary to that, some studies suggest that there is no relationship between food insecurity and malnutrition since the world can produce sufficient food for the global population, about one third of the produced food, is certainly not consumed, therefore there is more to malnutrition than food insecurity (Ben-Davies *et al.*, 2014; Gray *et al.*, 2006; Osei *et al.*, 2010).

Research Methodology

Research Design

This study will use a cross-sectional research design using TDHS-MIS 2015-16 data and primary data. Firstly, secondary data will be used to assess nutritional status of mothers and under-five children using multivariate techniques and identify clusters with the highest prevalence of malnutrition using geostatistical techniques. Secondly, primary data will be collected from the identified clusters to assess current coexistence of forms of malnutrition among mothers-under-five child pairs. Also, assess linkages between household food security and nutritional status of mothers and their under-five years children.

Targeted Population

The targeted population for this study will be under five years old children and their mothers. Under-five children have been chosen because children with poor nutritional status are at the highest risk of dying from diseases. Mothers of under-five children are involved because they are the ones who mostly take care of the children and have an influence on the household nutritional and food security status. Mothers link a child to its environment, the relationship between a mother and a child starts from the gestation period until a child becomes independent.

Study Variables

Dependent Variable

The dependent variable will be the nutritional status of mother-under-five child pairs. The nutritional status of mother-under-five child pair will be categorized into four categories:

A normal pair if both mother and child are normal ; undernourished pair if at least one is undernourished and none is overweight; overweight pair if at least one is overweight and none is underweight and double burden pair if there is coexistence of undernourishment and overweight.

$$Y_i = \begin{cases} 0 \\ 1 \\ 2 \\ 3 \end{cases} = \begin{cases} \text{Normal Pair} \\ \text{Undernourished Pair} \\ \text{Overweight Pair} \\ \text{Doubleburdened Pair} \end{cases}$$

A mother and child will be referred to undernourished if stunted, wasted or underweight.

Independent Variables

The independent variables for this study are:

Child characteristics; sex, age, birth weight, illness episodes, breastfeeding duration, immunization status

Mothers Characteristics; Age, marital status, highest education level, employment status, alcohol consumption habit, knowledge, attitude, and feeding practices.

Household Characteristics; Number of under-five children, family size, sex of the head of the household, place of residence, source of drinking water, type of the toilet facility, food availability, accessibility, utilization and stability, household wealth, place of residence.

Data

The study will use both primary and secondary data; secondary data will be used to examine the nutritional status of mother-child pairs in Tanzania and forms of malnutrition among mother-under-five child pairs. Primary data will be used to assess the current prevalence of malnutrition among mother-child pairs, household food security and general nutrition-related knowledge, attitude, and feeding practices.

Data Analysis Plan

The study will utilize quantitative techniques. Multivariate Linear Regression, Generalized Linear Spatial Models and Multinomial Logistic Regression will be used to analyse the data. R statistical software, ArcGIS and SaTScan™ will be used to analyse the data.

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