ASSESSING THE NUTRITIONAL STATUS OF PRIMARY SCHOOL CHILDREN IN WAKISO DISTRICT UGANDA

by

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ABSTRACT

Malnutrition is a quiet pandemic affecting millions of people throughout the world. It has high Public Health significance because of the sheer number of people affected by malnutrition, the fact that vulnerable populations disproportionately suffer the effects of malnutrition, and because these effects are severe, long lasting, and cumulative. Also, malnutrition exacerbates the cycle of poverty inherent in most under-developed countries.

This essay designs a community health assessment, which focuses on school-aged children (ages 5-14) in Wakiso District Uganda. The proposed assessment focuses on the first four stages of the PRECEDE-PROCEED model to determine the community's views about childhood malnutrition, barriers preventing proper nutrition, and the potential modifiable factors related to malnutrition in Wakiso District Uganda. It recommends a social assessment of the target community utilizing surveys, an epidemiological assessment analyzing anthropomorphic measures of malnutrition indicators, and an ecological assessment incorporating Photo voice methodology. The assessment is designed to determine the issues present in the community related to access, availability and utilization of food because modifying these factors through an intervention has the potential to greatly influence the malnutrition of a specific population, according to the UNICEF Model of the Causes of Malnutrition.

To achieve these goals, this essay examines the current available literature on the topic of malnutrition, malnutrition assessment, and qualitative and quantitative measures of malnutrition. A gap exists in the literature with regards to the prevalence of malnutrition among school-age children. This essay's proposed community health assessment for the primary school children of Wakiso District Uganda (ages 5-14) can help to fill that gap.

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1.0 INTRODUCTION

Malnutrition studies use the assessment of the nutritional status of children 5 years old and younger as representative of the nutritional well being of an entire population because this age group suffers the effects of malnutrition more severely (19). While the prevalence of malnutrition in the under 5 age group is important, in 2002 the UN's Standing Committee on Nutrition (SCN) began to promote research and interventions into the malnutrition of school-age children, because of this age groups potential to experience "catch up" growth, for example, school-age children who were underweight early in life can grow to have a normal weight for age if their nutritional environment improves (50). The purpose of this essay is to design a community health assessment, which focuses on school-aged children (ages 5-14) in Wakiso District Uganda. An assessment of school-age children will both contribute to the knowledge base and influence nutrition interventions for this age group. The potential for children 5-14 years of age to "catch up" nutritionally is a driving factor of this assessment (50). Geography plays a significant role in the prevalence rates of malnutrition; Sub-Saharan Africa suffers disproportionately high levels of malnutrition and poverty, in fact according to the SCN the prevalence of stunting among school-age children is on the rise in East Africa (50,56). This study is geographically focused in Wakiso District Uganda for two reasons, first, Uganda has a high rate of malnutrition, which creates a public health concern; but also, I have experience in this region and a commitment to the health of Uganda's vulnerable children.

For comprehensive purposes, this essay is broken up into four separate sections: Introduction, Assessment Design, Data Analysis and Conclusions. The introductory portion of

this essay describes the severity, causes and consequences of malnutrition, which acclimates the reader to the current situation regarding malnutrition both in Uganda and globally. The second section outlines a proposed assessment study based on the Precede-Proceed model for community health assessments. The study design includes sampling information, data analysis suggestions and both qualitative and quantitative measures. Finally, the data analysis section explains and defends the chosen methods of assessment and the means of obtaining information from the study; the essay concludes with recommendations and possible limitations.

1.1 DEFINING MALNUTRITION

Malnutrition is a quiet pandemic affecting millions of people throughout the world. Vulnerable populations, such as children, women (especially expectant mothers), the elderly and people suffering with a disability disproportionately suffer the effects of malnutrition. In addition, malnutrition exacerbates the cycle of poverty inherent in most under-developed countries. Many scholars recognize the relationship between malnutrition and poverty, in fact, the World Bank states, "Reducing malnutrition is central to reducing poverty" (19,31,52). The complex nature of malnutrition makes defining the problem difficult. Throughout history, the definition of malnutrition has shifted focus from protein deficiencies (the Protein Gap) to a definition based on multiple micronutrient deficiencies (47). In the 1930's-1970's scholars defined malnutrition as, protein-caloric malnutrition (PCM) and protein-energy malnutrition (PEM) (9,11,13,43). The UN advocated the importance of protein deficiency in 1955 by forming the Protein Advisory Group to promote the consumption of "new protein foods" (9). Although protein deficiency remains significant, the most current definitions of malnutrition focus on the consumption of the

proper amount of multiple micronutrients, such as Zinc, Iron, Iodine, Vitamin A, Folic Acid, and Selenium (9,11,13,19, 39). While scholars agree that proteins as well as other micronutrients are important to overall nutrition, they disagree about the exact definition of malnutrition.

Some definitions focus on a lack of nutrient intake (25,43,47), for example, "Malnutrition is the cellular imbalance between the supply of nutrient energy and the body's demand to ensure growth maintenance and specific functions" (43). Still others focus on infections, such as helminthic infections, as the defining characteristic of malnutrition (27,38,49). Unfortunately, assessing the prevalence of infection and disease is beyond the scope of this design, which focuses primarily on nutrient consumption. This essay uses the following definition of malnutrition, "*Malnutrition is the syndrome of inadequate intake of protein, energy, and micronutrients, which result in poor growth and body size* (Schroeder pg 344)", because it represents the current state of malnutrition in Uganda, but also among the 5-14 year old age group (6,48,50).

1.2 SCOPE OF THE PROBLEM: SCHOOL-AGE CHILDREN

According to the WHO, in 2011 over 101 million children under the age of 5 were underweight (low weight for age), 165 million were stunted (low height for age), and approximately 52 million were wasted (low weight for height) (56). Consequently, estimates of the prevalence of malnutrition among school-aged children suggest that these indicators do not improve much with age. In 2010, according to the Growth and Assessment Surveillance Unit of the WHO, the global prevalence rate of malnutrition among school-age children (5-14 years old) as indicated by the prevalence of stunting, was approximately 28% (171 million children), with Eastern

Africa suffering a higher rate of 45% (22). A major study of school-age children from developing countries found the overall prevalence of stunting to range between 48-52% with an overall prevalence of underweight between 34-62%; the SCN notes that among school-age children stunting and underweight are more prevalent than wasting (50). In addition, among this age group, the most significant micronutrient deficiencies include Vitamin A and Iron deficiencies (50). Focusing on improving the nutritional well being of school-age children has the potential to reduce the severity of stunting, increase weight, and support cognitive function and possibly prevent the severe consequences discussed below (6, 50).

1.3 CONSEQUENCES OF MALNUTRITION

The consequences of malnutrition are severe and can have affects well into adulthood (47). A child suffering from malnutrition will undergo more frequent, long lasting, and severe illness than a child receiving proper nutrition (13,47). In addition researchers attribute higher mortality (13,43,47), and an increased prevalence of stunting and wasting to the existence of malnutrition during childhood (8,13,49,52). Without proper nutrition during a child's development, he or she can experience delayed motor skills (7,13) lower cognition and school performance (6,8,13,42,47) and detrimental effects on intelligence (42,49). An adult, who suffered from malnutrition as a child, will have reproductive difficulties (13,47), diminished work performance (13,47,49) and potentially unhealthy offspring (47). Also, being deficient in specific micronutrients or proteins can result in serious illness and disability, for example Kwashiorkor and Marasmus both protein deficiency diseases can result in edema, decreased muscle mass, changes in skin color, lactose-intolerance and severe wasting of both muscle and tissue (13).

Furthermore a Selenium deficiency compromises an individual's immune response exposing him or her to opportunistic diseases such as malaria, tuberculosis, and HIV/AIDS; while insufficient consumption of Iodine can result in impaired growth, development, and metabolic function (39).

In addition to the physical and cognitive consequences, malnutrition can have devastating effects on the economy. According to the World Bank, malnutrition affects the economy of a country in three ways: directly through a loss of productivity, indirectly through a loss of cognitive function, and losses caused by accrued health care costs (pg 1). The loss of productivity can cost an individual suffering from malnutrition 10% of his or her lifetime earnings, which can translate into a 2-3% loss in GDP (pg 2). On the other hand, decreasing the prevalence of malnutrition can have the reverse effect; a 1% decrease in stunting can increase wages by approximately 1.4% (57).

1.4 MALNUTRITION IN UGANDA

Disproportionately high levels of malnutrition and poverty throughout Sub-Saharan Africa result in a greater impact of the physical and financial consequences of malnutrition throughout the continent (56). The prevalence of stunting, which represents the long-term lack of proper nutrition, is a significant problem among the people of Africa. According to the WHO, the estimated prevalence of stunting among school-age children in Africa in 2015 will be 37% as compared to the next highest prevalence rate of 23% in Asia (22).

In Uganda, scholars have estimated the prevalence rate of stunting among children under the age of 5 years old to be between 30-39.9% (5,11,12,15,26,56) with some estimates over 45% (15,16) depending on the region. In 2006, USAID estimated the prevalence rate of wasting and

underweight (both indicators of malnutrition) in Uganda to be 6% and 16% respectively (26). In addition to stunting, wasting, and underweight indicators, Uganda also has a high prevalence of micronutrient deficits, specifically Vitamin A and Iron deficiencies (6,26,58). Vitamin A deficiencies alone will result in over 160,000 child deaths from 2006-2015, according to USAID (26). The prevalence of malnutrition throughout Uganda is a public health concern. In fact, scholars attribute 60% of all deaths of children less than 5 years of age in Uganda either directly or indirectly to malnutrition (5,26,32). Unfortunately, gaps exist throughout the literature with regards to measuring school-age children's' malnutrition levels. A recent study estimates that 10%, 9%, and 13% of the school-age children in Uganda are underweight, thin, and stunted, respectively (5). In Wakiso District, a study in 2012 found that 22% of school-age children were stunted, 5% were underweight, and approximately 19% suffered moderate acute malnutrition (27).

1.5 CAUSES OF MALNUTRITION

The UN states that malnutrition can be associated with both acute hunger, a short-term lack of food, and chronic hunger, a constant lack of food. Acute hunger caused by natural disasters, famine and/or conflict does not have the same detrimental effects as chronic hunger, in which people are continually not receiving the proper amounts of food to sustain their normal day-to-day activities (25). The UN refers to this "lack of food" as food insecurity, food security includes: access, availability, and utilization (11,25,42). An *availability of food* refers to the situation when a country either produces or purchases a large enough variety of food for its entire population; *access to food* expands on the idea of availability by stipulating that people have the

physical and financial means to obtain food; and finally the *utilization of food* furthers this same notion by including peoples knowledge and skills to properly use food (25). Low availability, disparities in access and the misuse of food within a community can result in malnutrition. The literature references two models, which explain how different factors affecting availability, access, and utilization can result in malnutrition: Biosocial Model of Health (13) and the UNICEF Conceptual Model of the Causes of Malnutrition (19).

The Bio Social Model of Health shows how biology, social factors and environmental conditions can affect the nutrition of an individual. Factors such as: cultural practices, for example preferential feeding of males a utilization issue; household income, an access issue; level of sanitation, which influences disease and can decrease the bodies ability to utilize the nutrients in food; and availability of resources such as land, greatly influence the level of malnutrition of a specific community (13).

While the Biosocial Model of Health suggests that each factor: biological, social and environmental, influences the individual's nutritional status equally, the UNICEF Conceptual Model of the Causes of Malnutrition takes a more linear hierarchical approach. Working backwards from the outcome of malnutrition, disability or death the model defines "inadequate dietary intake" and "disease" as the two immediate causes of these outcomes; access and utilization issues influence both dietary intake and disease (19). It is important to note that these factors not only relate to the outcome of malnutrition, but they influence each other as well. Diarrheal diseases result in mal-absorption of vital nutrients, thus even if an individual consumes the proper amount of food the body's nutritional intake remains insufficient (13). According to the model, access to food affects dietary intake, poor sanitation and a lack of health services influences disease, while maternal and child-care practices contribute to both diet and disease.

Further down on the hierarchy the model defines both the potential and actual resources of the individual's environment as basic causes at the societal level (19).

The UNICEF model builds on the Biosocial Model of Health to better define the pathways of causation, which in turn could guide an intervention in the future. The underlying causes of malnutrition, ie access to food, sanitation, and maternal and child-care practices, are significantly influenced by the access, availability and utilization of food. A study of eighty-five different countries credited interventions directed at these underlying causes for 65% of the change in nutritional status among the study population (42), an intervention into these underlying factors could garner the best results. Although much of the literature does not specifically follow one of these two models, biological, social, and environmental factors play a key role in most studies (5,8,13, 19,25,32,38,42,47,49,52).

2.0 ASSESSMENT DESIGN

The primary goal of the proposed community health assessment is to test the hypothesis that school-age children in Wakiso district Uganda suffer from a high prevalence of malnutrition, which is caused by a lack of access, unavailability, and insufficient utilization of food, all three underlying factors of malnutrition according to the UNICEF Conceptual Model of the Causes of Malnutrition (19). To test this hypothesis, this study utilizes an epidemiological assessment to determine the prevalence and severity of malnutrition and Photo voice and a stakeholder survey to determine where Wakiso District Ugandans get their food, how they prepare it, and the available quantities of food.

A secondary goal is to assess the capacity of the local community to incorporate agricultural interventions in the Wakiso district schools to decrease the prevalence of malnutrition among this age group. Photo voice and survey questions directed at determining the local communities availability of resources, knowledge of malnutrition, and current agriculture practices will help to achieve this goal. According to the UN, access, availability, and utilization determine food security, which influences the level of malnutrition in a specific population. Simply describing the nutritional status is not enough; a community health assessment must determine the extent of and reasons behind the lack of nutrition.

Community Health Assessments (CHAs) are systematic investigations into the health status of particular groups/communities. The literature cites several different models/frameworks

that Public Health practitioners use to conduct CHAs, the four most prominent include MAPPS (1,24,28,44,46), MAP-IT (3,28), PRECEDE-PROCEED (28,36,45), and PATCH (28). This proposed study utilizes a multi-methods approach following the PRECEDE-PROCEED model for community health assessments to determine the prevalence of malnutrition among school-age children in Wakiso District Uganda, the factors contributing to malnutrition of the target population (access, utilization, availability), but also to assess the local communities capacity for school based agricultural interventions. This essay is restricted to the first four phases of the Precede-Proceed model, however the information gathered from this study will guide and support the intervention process and phases seven through nine of the Precede-Proceed model.

The Precede-Proceed model is the best choice for the proposed assessment design, for several reasons: First, it has demonstrated efficacy in many different health settings; secondly, this model has proven to have a positive effect on intervention development at the local level (45); and finally, the Precede-Proceed model can be modified to be problem based and follows a systematic comprehensive process. Malnutrition is a complex issue that relates to many different facets of a community; social norms, personal behaviors, environmental factors, biology, ecology, geography and several other factors contribute to malnutrition. The Precede-Proceed model accounts for these different factors by laying out a phase-by-phase framework that assesses the social, epidemiological, environmental, political, and behavioral elements of a community, which is necessary for a complete assessment of the nutritional status of the target population.

2.1 SAMPLE GEOGRAPHIC REGION

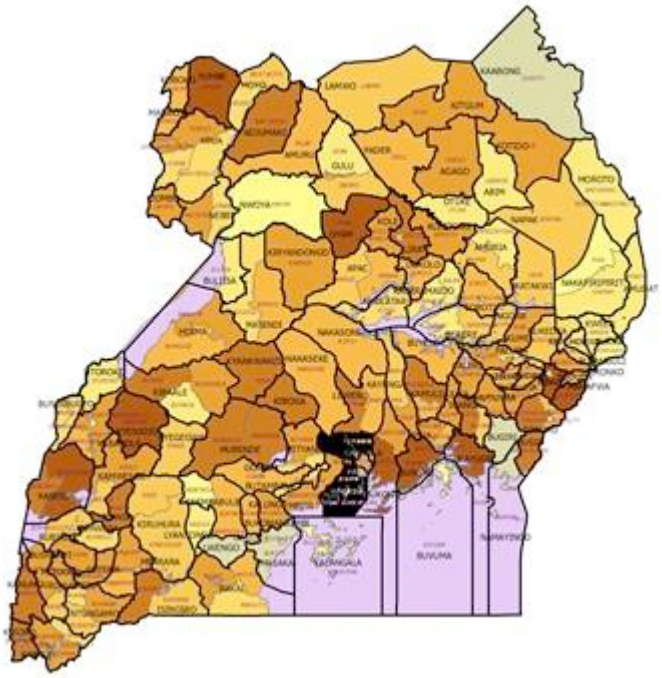

Figure 1. Wakiso District Uganda

Wakiso District Uganda taken from "Wakiso District Schools." *School Guide Uganda*. N.p., 2012. Web. 25 Mar. 2013. http://www.schoolguideuganda.com/find-a-school/district/Wakiso-District.aspx

Wakiso District is a large semi-urban district in the southern central portion of the Central Region of Uganda (2). Wakiso district is made up of two administratively separate districts: Kyandondo and Busiro and 15 sub counties (27). It has over 900,000 inhabitants, more than 200,000 registered pupils (49.6% male, 50.4% female) and approximately 1,000 registered primary schools (4,27,37,51,53). The choice of Wakiso District Uganda is significant because Uganda has extremely fertile soil and an economy largely based on agriculture, both of which are important to the success of a future agricultural intervention.

2.2 SAMPLE POPULATION

For the purpose of this study, the target population includes children ages 5-14 years old who attend primary school in Waksio District Uganda. Limiting the study to children ages 5-14 is important because there exists a gap in the literature about the nutritional status of this age group, in addition, recent studies have begun to focus on school-age children, because girls and boys of this age group have the potential to experience catch-up growth, ie growth that will bring them to a normal range for weight for age, height for age, and weight for height (50). School-age children also yield the greatest potential for malnutrition interventions because children attending school rely less on the care of their family and have more available health services; family care practices and health care services are important underlying contributors to malnutrition, according to the UNICEF Conceptual Model of the causes of malnutrition (19).

2.3 PHASE 1: SOCIAL ASSESSMENT

To conduct a social assessment, this study will utilize a hand delivered survey, which will be distributed to local stakeholders. Survey questions will focus on demographic information and information about the availability, utilization and access to food, to achieve the primary goal of this assessment: to test the hypothesis that school-age children in Wakiso district Uganda suffer from a high prevalence of malnutrition, because of a lack of access, unavailability, and insufficient utilization of food. In addition, to assess the capacity of the local community to incorporate agriculture interventions, the second goal of this assessment, several survey

questions will probe for information about the local knowledge of malnutrition, the availability of resources, and current agriculture practices.

2.3.1 Sampling Methodology and Procedures

For the purposes of this study, the Social Assessment survey will be administered face-to-face to a targeted sample of 45 key stakeholders. Since this is a qualitative study a large sample size is not necessary to obtain the information required, Action Against Hunger utilized a similar sampling methodology in a 2012 study (23). To determine the stakeholders within the target community, the first step is to conduct a *Stakeholder Analysis* (10). First, the researchers should identify possible stakeholders in the community beginning with the specific target populations then disseminate the list to local leaders for advice about other concerned parties. Possible stakeholders in this community include the target population (ie. school-age children), parents, headmasters, local tribal leaders, local health practitioners, and governmental representatives (10). Since this study is focused on community and school level malnutrition and capacity, the key stakeholders will include children, teachers, headmasters, tribal leaders and parents.

After determining the sample population for the survey, the researchers should cluster each category (ie children with children, teachers with teachers) then randomly select 9 individuals from each cluster for a total of 45 individuals (28). Face-to-face surveys can be difficult to conduct because gaining access to individuals is often a problem (28). To prevent issues with gaining entre, the assessment team should include 3 to 5 local health practitioners, who have been trained, as the enumerators of the survey.

The actual survey should be culturally sensitive and if possible in the local language of Luganda. It should be designed, coded and pilot-tested before being administered to the selected

population of stakeholders. The survey should include both open and close-ended questions to determine the community's knowledge and concerns about nutrition, issues surrounding access, availability and utilization of food, resource availability, agriculture practices, and important demographic data about the individuals. For the purposes of this study, the results of the survey will help define malnutrition according to the local populations, determine the availably resources and agriculture practices which is important determine the local community's capacity to absorb and maintain an intervention. Also, specific questions will target the issues of access, availability, and utilization of food, which will help establish the underlying causes of malnutrition, whether that is issues with access, availability or utilization of food.

Table 1. Example Survey Questions: Action Against Hunger (23)

Example Questions Open Ended:
1. Can you describe the situation of food? Is it always available? Is it affordable? Is it fresh and healthy?
2. How do most people get their food/where do they shop (if purchase)?
3. Is there any agriculture in the area?

Example Questions Close Ended:
1. In the last 30 days I have been worried my household would not have enough food?
Strongly Agree, Agree, Disagree, Strongly Disagree

2.4 PHASE 2: EPIDEMIOLOGICAL ASSESSMENT

The goal of the epidemiological assessment is to collect primary data to determine the overall health status of the target population. It is important to note that the literature focuses on measuring the physical manifestation of malnutrition (5,8,19,13,15,18,32,34,40-43, 47,49,50,52). Researchers collect three types of measures to determine an individual's nutritional status, anthropomorphic measures (3,5,15,18,19,27,34,40,41,42,47,50,52) biochemical markers (14,49,58), and clinical indicators (14,49).

Anthropomorphic measures, which are cheap and easy to conduct, represent both growth and body composition (49); as a result they are the most frequently utilized measure. The most common anthropomorphic measures are weight, height, age, and gender (5,8,19,13,34,43,47,52). Researchers combine these four measures into the following malnutrition indicators: stunting (low height for age), wasting (low weight for height), and underweight (low weight for age) (5,8,15,34,40,42,47, 50,52). In addition to gender, height, weight, and age, some scholars incorporate mid-upper arm circumference (MUAC) as an additional indicator of malnutrition (47,57).

The indicators and measures of malnutrition as compared to a reference population will determine the severity of malnutrition within a population; the most commonly indicated reference for anthropomorphic measures is the NCHS/WHO reference population (19,47,49,58). Less popular and more complicated measures of malnutrition include: biochemical markers, which indicate the level of nutrition by examining a person's blood and/or urine and clinical indicators that examine the physical representation of malnutrition, such as skin discoloration (14,49). Because of their simplicity and accuracy, this study utilizes anthropomorphic measures to determine the prevalence of malnutrition among the target population. Table 2 is an example

equation and table to calculate, compare, and classify the anthropomorphic measure of weight; this equation can also be used for height according to the CDC Manual for Measuring and Interpreting Malnutrition and Mortality (19).

Table 2. Anthropomorphic Measure Classification

Classification	Weight for Age %	Height for Age %	Weight for Height %
Adequate	90-120	95-110	
Mildly Malnourished	80-89	90-94	
Moderately Malnourished	70-79	85-89	60-80
Severely Malnourished	<70	<85	<60

$$\% \text{ of the median} = \frac{\text{measured weight of the child}}{\text{median weight of the reference population}} \times 100$$

2.4.1 Sampling Methodology and Procedures

To determine the sample size needed to obtain valid results from the measures of malnutrition this study will utilize the following equation with a 95% confidence interval.

Table 3. Statistical Equation to Determine Sample Size

n = Sample Size

e = Level of Error

N= Total Population

n = 200,000/ 1- 200,000 (.0025) = 400.8

$$n = \frac{N}{1 - N(e^2)}$$

For the purposes of this study researchers will obtain a representative sample of 401 children ages 5-14 who attend primary school in Wakiso District Uganda. A sample size of 401 allows for greater internal and external validity of the study results. The most appropriate method to obtain this sample is to use the cluster sampling method (6,7,15). First, the researcher will randomly select 50 primary schools, limiting the selection pool to those schools having 200+ students, Action Against Hunger used a similar method while studying nutrition in IDPC camps in Northern Uganda. Next, a random sample of 401 students will be taken from these 50 schools. Staff doctors and local health personnel working within the selected primary schools' health clinics will use measuring tapes and scales to obtain each individual child's anthropomorphic measures. These measures will be calculated and classified according to the classification system illustrated in Table 2. The results of this analysis are important to determine the actual health of the target population. The quantitative analysis of this study will determine the prevalence of stunting, wasting, and underweight among the primary school children of Wakiso District and directly test the hypothesis that the this population suffers a high prevalence of malnutrition. The epidemiological assessment shows the actual levels of malnutrition in the target population, while the other assessments should focus on determining "why" these levels exist.

2.5 PHASE 3: BEHAVIORAL, ENVIRONMENTAL, ECOLOGICAL AND EDUCATIONAL ASSESSMENTS

Phases 3 and 4 of this study build on the information gathered in the quantitative assessment, by focusing on more qualitative data. Knowing the prevalence of malnutrition in a target population is insufficient, this portion of the assessment examines the factors that contribute to malnutrition to answer the question "why?".

The goal of the third and fourth phases of the precede-proceed model is to assess the behavioral, environmental, ecological, and educational components to malnutrition, ie to determine the target populations access, availability and utilization of food. For the purposes of this study, Photo voice will be used to ascertain why the target population and relevant stakeholders believe they are malnourished, what barriers they perceive to be preventing them from accessing proper nutrition, and what resources they have available for an intervention; focusing on the community's resources, behaviors and ability to change.

2.5.1 Sampling Methodology and Procedures: Photo voice

Photo voice is a creative technique designed to engage participants by providing them with a camera and asking them to photograph specific elements in their environments. These photographs spur discussions in small groups, where the participants can explain what they chose to photograph and why (54). Photo voice has precedence for use when discussing malnutrition, a recent study utilized Photo voice to ascertain the food-security issues among the Inuit (35). Photos allow participants to identify issues in the community, while ensuring reluctant or shy participants have their voices heard; it is an important method for this assessment because, visual methods of representation can generate different ideas and responses than written methods and

children may respond better to visual techniques (21). Since malnutrition is a complex issue that relies on the political atmosphere, the photos and discussion gained from photo voice can be used to catalyze policy action.

In this study Photo voice focuses on the participants' consumption patterns, food preparation practices, and food intake, to determine if problems exist with participants' access to food, availability of food, or ability to utilize the food properly. In addition, the facilitator will request images of the participants' agricultural practices and availability of resources to determine the community's capacity to sustain agriculture interventions. Photo voice takes place over a series of three meetings. First, the researchers will recruit a selection of 24 participants (8 children attending primary school, 8 parents, 8 school officials); a 7-10 participant group is consistent with the recommended number of participants for Photo voice (35,54,55). The Photo voice exercise in this study does not mix these three groups.

Meeting 1: The facilitator should describe the methodology of Photo voice to participants. In addition, he or she should discuss the ethics associated with taking pictures of people without consent, the possible risks associated with taking pictures in Uganda, and any other culturally appropriate information. Finally, this meeting should conclude with each participant signing a consent form (55).

Meeting 2: During the second meeting, the participants receive disposable cameras after the facilitator explains the desired themes of the photographs (55).

Table 4. Photo voice guiding questions

Children's group questions:
Identify what you eat?
Where you eat?
Where does your food come from? (access/availability/agriculture)

Parent's group questions:
Where do you get the food for your family? (access/availability/agriculture)
How do you prepare the food? (utilization)

School Official's group:
Where does the school obtain food for its students? (access/availability/agriculture)
How is the food prepared? (utilization)

Meeting 3: Before the third meeting, the facilitator should have each disposable camera's film developed and give each photo a number. The third meeting should occur one week after the second meeting and have duration of one to two hours. During the third meeting each participant will have a chance to discuss his or her photos. The facilitator should project the photo, by printing a larger image onto a poster board, for each participant to see. An additional staff member should transcribe the entire discussion noting the photographs number and the dynamics of the conversation (55).

For the purposes of this study Photo voice will be used to obtain information about the underlying, social, behavioral, and environmental causes of malnutrition, which relates directly to the goals of the assessment: to determine the factors contributing to malnutrition (access, availability, utilization) of the target populations and its capacity to incorporate interventions.

3.0 DATA ANALYSIS

The quantitative and qualitative data collected during the four assessments will be analyzed in several different ways. First, researchers can utilize software such as excel to help code and analyze the survey data. This study utilizes excel because it is an inexpensive and common software. All survey questions should be entered into an excel spreadsheet. The answers to the close-ended questions should be coded; Table 5 shows an example of coding for a close-ended question from this study.

Table 5. Coding Survey Questions (Close-ended)

Coding Close Ended Question:

2. In the last 30 days I have been worried my household would not have enough food?

Strongly Agree, Agree, Disagree, Strongly Disagree

Response	Code
Strongly Agree	4
Agree	3
Disagree	2
Strongly Disagree	1

After coding, the researchers can create graphs and charts to illustrate the results. In addition, researchers can use these graphs to determine patterns and themes. Also, by numerically coding each individual response, the data has for all intents and purposes become quantitative data, and can be analyzed as such. For the purposes of the proposed study, descriptive statistics (ie. mean, mode, range and frequency) for each question will be sufficient (28).

Analysis of the open-ended questions from the survey will be more complex. The researchers should still code the open-ended responses, but rather than with numbers these questions should be coded with themes; Table 5 illustrates possible ways to code an open-ended question from this study.

Table 6. Coding Survey Questions (Open-ended)

Coding Open Ended Questions:

1. How do most people get their food/where do they shop (if purchase)?

Possible answers:	Thematic code:
My mom buys food from the market	"market" "available" "access"
My whole family works in the field because we can't afford the food in the market	"Agriculture" "access"

Like the close-ended question response, the open-ended responses can be illustrated in both graph and chart form. Further coding may be necessary to obtain the desired results; for the purposes of this study, the following themes will be important to determine the causes of

malnutrition among the primary school children of Wakiso District: issues with access to food, availability of food, knowledge of nutrients, associations with weight, school related food issues, agricultural practices. In addition to the coded analysis of the survey data, the researchers should also pull out specific quotes from the participants to illustrate the issue of malnutrition described by the community.

The data gained from the analysis of the survey results is important for several reasons, first, the issues, themes and trend identified will help guide the Photo voice exercise. Second, these data will help future researchers focus their interventions into the malnutrition of this specific target population. In addition, by including questions about school feeding programs, availability of land for farming, and children's knowledge of agriculture practices; the data will help determine if an agricultural intervention is viable.

After analyzing the data from the survey, the researchers will analyze the data gathered from Photo voice. Throughout the duration of Photo voice discussions will be transcribed word for word, making sure to reference the number assigned to the photo being discusses and the dynamic of the group. The data from Photo voice can be treated like data gathered from a focus group. It should be coded based on theme, for example if the children were looking at a photograph taken of their dinner plate, and the discussion included references to "not having enough to eat" and "still being hungry", these would be coded as "quantity of food". Ideally the facilitator would have probed this discussion to discover, why there wasn't enough food, ie an access, availability, or utilization issue. Like the analysis of the survey, the Photo voice themes can be numerically coded based on importance or frequency of use and these codes can be analyzed using descriptive statistical analysis.

In addition to qualitative data analysis, this study will also require statistical analysis of the primary data gathered from the epidemiological assessment of the primary school children of Wakiso District Uganda. A Statistician will compare the anthropomorphic measures from the target population to the NCHS/WHO reference population (19). In addition, the statistician will use statistical software like SPSS to analyze the epidemiological data to determine the prevalence of malnutrition indicators such as wasting, stunting and underweight, the correlation or association of malnutrition to other factors such as age, gender, and SES, and tests of statistical significance (7,32,52). In many cases statistics (actual numbers) can be very persuasive. The quantitative analysis will be used to understand exactly how prevalent malnutrition is among the primary school children of Wakiso district. However, prevalence rates are not the only goal, knowing the factors related to malnutrition (ie SES, age, gender) will inform the intervention process: for example, if age proves to be a driving factor of malnutrition an agricultural intervention specific to the most affected age group will be necessary.

The data analysis portion of this proposed assessment is extremely important to determine the prevalence of malnutrition among the primary school children of Wakiso District Uganda, but also to uncover the underlying social, environmental, behavioral, and political factors contributing to this malnutrition. The analysis of the survey, Photo voice, and Epidemiological Assessment results should relate back to the original two goals of this proposed assessment to determine if there is indeed a high prevalence of malnutrition among the target population, if issues exist with the target populations' access, availability, and utilization of food, and whether the community possesses the capacity to sustain an agriculture intervention. Potential questions that could be answered by the analysis of the qualitative data include: Do barriers to proper nutrition exist?, Is there a lack of food consumption and/or inadequate hygiene

during preparation?, Is access to food an issue?, Do people rely on homegrown crops or markets? Is land availability an issue? Do people distribute food evenly? Do children have agriculture knowledge and skills? Do schools have adequate resources?

4.0 CONCLUSION

Malnutrition is a significant problem throughout the world, but specifically in under-developed African countries like Uganda. The literature abounds with research studies and assessments of the nutritional status of children less than 5 years of age, however a gap exists in the literature with regards to the prevalence of malnutrition among school-age children. This essay proposes a community health assessment for the primary school children of Wakiso District Uganda (ages 5-14) to fill that gap. It is important to examine the nutritional status of this age group because children ages 5-14 have the potential to "catch up" physically and mentally if their nutritional situation improves.

The focus of this essay is the assessment design. The proposed community health assessment has two main goals: to test the hypothesis that school-age children in Wakiso district Uganda suffer from a high prevalence of malnutrition and to assess the capacity of the local community to incorporate agricultural interventions in the Wakiso district schools to decrease the prevalence of malnutrition among this age group. The proposed assessment focuses on the first four stages of the PRECEDE-PROCEED model to determine the community's views about childhood malnutrition, barriers preventing proper nutrition, and the potential modifiable factors related to malnutrition in Wakiso District Uganda to achieve these goals. The assessment focuses on determining the issues present in the community related to access, availability and utilization of food because modifying these factors through an intervention has the potential to

greatly influence the malnutrition of a specific population, according to the UNICEF Model of the Causes of Malnutrition (42). This assessment takes into account all aspects of the social, behavioral, environmental, and epidemiological implications of malnutrition, where previous studies have focused too intensely on the quantitative analysis of the factors contributing to malnutrition (32). Ultimately, after completing this proposed assessment a researcher will know:

- The prevalence rate of malnutrition among the primary school children in Wakiso District Uganda and how this rate compares to other countries around the world;

- The local communities perceptions about malnutrition, including causes, consequences, and self efficacy issues;

- The underlying causes of malnutrition of the target population (access, availability, utilization, disease, behavior just to name a few)

- The viability of certain malnutrition interventions, which is important to determine how to intervene (knowledge of agriculture).

5.0 LIMITATIONS

The proposed assessment design has several potential limitations that a public health practitioner implementing the assessment will have to consider. First, this is a large-scale assessment; funding will most likely be an issue. In addition, the potential exists for inconsistencies in the data, which will influence the chosen interventions; if the epidemiological data shows the problem to be nutrient consumption, but the qualitative data suggests that sanitation is the real issue, an intervention into food consumption would not be sustainable. A practitioner designing

an intervention will have to determine if education or conscious rising is necessary to change attitudes before implementing an intervention. Also, a public health practitioner working in Uganda must be aware of the potential for political disagreement. Poverty, hunger and malnutrition are very important targets for the MDGs; the government of Uganda may be dissatisfied if my assessment disagrees with their stated progress toward MDG 1. Finally, the issue of malnutrition is an extremely complex issue, this assessment focuses on nutrient consumption with out a consideration of disease and infections that could limit nutrient absorption. Researchers conducting this assessment may chose to add additional measures to ascertain the prevalence of infection that could influence the levels of malnutrition.

6.0 RECOMMENDATIONS

The final five stages of the PRECEDE-PROCEED model focus on planning, implementing, and evaluating of an intervention, which will be based on the results of the assessments conducted in the first four phases, the assessment proposed above. The malnutrition literature cites three main types of interventions: supplementation, fortification, and agricultural programs (9, 25, 38). Uganda has great potential for agricultural interventions due to its overwhelmingly fertile soil and year round growing season; its rich environment has over 160 different species of plant throughout the whole of the country.

The government of Uganda has implemented several nutrition and health policies to curb malnutrition including: protocols for managing malnutrition consequences in the hospital setting (11), and interventions focusing on infection reduction (27). However, school food programs seem to have the greatest effect. By incorporating food into schools, the children show an

increase in cognitive ability and the schools experience greater attendance (5,6,48). If the proposed assessment finds malnutrition to be a significant issue among the primary school children in Waksio District Uganda; an agricultural intervention in schools may prove successful. Similar school based interventions have proven efficacious, in the 1960's Uganda had a rural youth farming initiative called Young Farmers Uganda (YFU). YFU focused on increasing livestock and crop production, creating opportunities for youth in rural areas, and improving health. YFU failed due to political unrest in the 1970's, but it represents a goo model for malnutrition interventions in Uganda. The local community's perceptions about agriculture, the schools available resources for a school garden, and the children's agricultural skill level will have an affect on the sustainability of an agricultural intervention. Also, the underlying factors uncovered in the proposed assessment will determine the efficacy and appropriateness of an agricultural intervention.

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