

**FOOD INSECURITY: ASSOCIATED FACTORS,  
NUTRITIONAL AND HEALTH RELATED OUTCOMES IN A  
RURAL VILLAGE, NORTH-EAST TANZANIA.**

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## **Abstract:**

**Objective:** The main aim of this study was to determine the prevalence of food insecurity and its associated socio-demographic characteristics in Oria village North-East Tanzania.

It also aimed at exploring the relationship between food insecurity and nutritional and health outcomes in this population.

**Methods:** A cross sectional analysis using data from the 1997 Health Systems Research and Health Promotion in Relation to Reproductive Health survey in Tanzania was conducted. A total of 898 individuals aged between 15-36 years of age were included. The participation rate for the survey was 79%. A questionnaire was administered including a question adopted from the third National Health and Nutrition Examination Survey (NHANES III) to assess the food security status of the household. Information on socio-demographic characteristics, general health status, infant feeding practice and sexual behaviour was collected. HIV testing was done using saliva samples. Analysis was adjusted for age, education and occupation.

**Results:** Data analysis was done for 891/898 (99.2%) of the eligible respondents which included 402 men and 488 women. The overall prevalence of food insecurity was 25.2%. It was positively related to age, presence of children and having a health complaint among women and negatively associated with level of education among women and employment status among men. Food insecurity was not related to infant feeding practices. Food insecurity increased the odds of HIV infection among women by two though it did not remain statistically significant after adjusting for age, education and occupation. There was also an insignificant increase in the chance of food insecure households adopting risky sexual behaviour in both sexes.

**Conclusion:** Food insecurity is prevalent in Oria and should be considered of public health importance. The apparent relationship between food insecurity and age, education, presence of children and having health complaints among women as well as employment status among men shows that some households are more vulnerable to food insecurity than others. Food insecurity is also likely to be associated with an increased chance of engaging in risky sexual behaviours associated with increased risk of disease in this case HIV/AIDS.

**KEY WORDS:** Food insecurity, socio-demographic characteristics, infant feeding practices, risky sexual behaviours, HIV/AIDS, Tanzania.

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*asante mama!*

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## **List of abbreviations:**

FI – Food insecurity

FAO - United Nations Food and Agriculture Organization

GDP – Gross Domestic Product

HIV/AIDS - Human Immune-Deficiency Virus/Acquired Immune-Deficiency Syndrome

MTCT – Mother To Child Transmission

MUTAN – Mradi wa Ukimwi Tanzania na Norway (Tanzania and Norwegian AIDS project

SAP – Structural Adjustment Policies

STD – Sexually Transmitted Diseases

TDHS – Tanzania Demographic and Health Survey

UNAIDS – Joint United Nations Programme on HIV/AIDS

UNICEF – United Nations Children’s Fund

US – United States of America

USD - United States Dollar

WHO – World Health Organization

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**Definition of terms:**

*Food insecurity:* Food insecurity in this survey was defined using an adopted question from the third National Health and Nutrition Examination Survey whereby individuals were classified as ‘food insecure’ if a respondent reported that the household sometimes or often did not have enough food to eat.

*Infant feeding practices:* In this survey the main infant feeding practices that were explored were pre-lacteal feeding in early life of infants, current breastfeeding status, and the age of initiation of complimentary foods to the children.

*Pre-lacteal feeding:* was defined as giving an infant fluid other than breast-milk early in life.

*Risky sexual behaviour:* Risky sexual behaviours were characterized as behaviours whereby an individual had more than one sexual partner in the past 4 weeks or 12 months and/or did not use a condom during the last sexual intercourse.



# **1. INTRODUCTION**

## **1.0 Introduction:**

Global food supply is currently sufficient to meet the food needs of the world population; it is expected to continue to be sufficient well into the next century<sup>1</sup> except for Sub-Saharan Africa where it is expected to decrease over the next 20 years.<sup>2</sup> Despite such abundance of food, over 840 million people (20%) in the developing world today are estimated to suffer from chronic under-nourishment and many more suffer from micronutrient deficiency.<sup>3</sup>

While food availability is still a problem for some countries the root causes of food insecurity in developing countries is believed to be the inability of people to gain access to food due to poverty.<sup>4-8</sup> In recent years, food insecurity has also been noted to exist in food abundant countries among populations of lower economic status.<sup>9-12</sup>

The concept of “food security” has evolved and developed since the World Food Conference of 1974; with this various definitions of food security/insecurity have been presented.<sup>13</sup> The most frequently used definition of food security is a variation of the one adopted by the World Bank “Physical, social and economic access by all people at all times to sufficient, safe and nutritious food to meet the dietary needs and food preferences for an active and healthy life”.<sup>14, 15</sup> Food insecurity is thus a complex multidimensional phenomenon that results from financial resource constraints and leads to various behavioural paths in households revealing different coping strategies.<sup>16, 17</sup> Most of these strategies are possible precursors to nutritional, health and developmental problems.

In order to address food insecurity effectively, a thorough understanding of the prevalence and related factors of food insecurity at the household level is needed. This study aims at providing a crude overview of the magnitude and characteristics of food insecurity at a household level in rural Tanzania.

## **1.1 Literature review**

### **1.1.1 Magnitude and Socio-demographic factors:**

The United Nations Food and Agriculture Organization (FAO)<sup>18</sup> estimate that about 840 million people are undernourished globally; of these 798 million are in developing countries and around 200 million live in Sub-Saharan Africa.<sup>19</sup> The prevalence of food insecurity in developed countries is relatively low though, still of public health concern. In the

US 10% of the households were found to have food insecurity.<sup>20</sup> This finding is consistent with results from a study in Louisiana and New York where the prevalence of food insecurity was 8% and 11.8% respectively.<sup>21</sup> The prevalence of food insecurity in the US is however slightly higher than the 4% prevalence observed in Canada.<sup>22</sup> Food insecurity in some defined groups such as women, children or food stamp recipients has been shown to be higher than in the general population due to increased vulnerability in these groups. For instance the prevalence of food insecurity among women was found to be 22.4%<sup>23</sup> and 53%<sup>10</sup> in the US which is higher than the national estimates; while the prevalence rose even further to 66% among food stamp recipients.<sup>24</sup>

The few studies that have been conducted in developing countries reveal a much higher prevalence than observed in developed countries. The prevalence of food insecurity among subjects who participated in a study in Trinidad and Tobago was 25%.<sup>25</sup> This prevalence is lower than the observed 44% in South Africa<sup>26, 27</sup> 62.7% in Korea<sup>28</sup>; 82% in Malaysia<sup>29</sup> and 94.2% in Java-Indonesia.<sup>30</sup> The findings in Java were very high and attributed to the economical crisis that had struck Indonesia prior to the study.

Financial constraints are one of the major causes of food insecurity. It has been shown that households with low income are more likely to report experiencing food insecurity.<sup>12, 19, 21-23, 28-29, 31</sup> In Karachi, 83% and 51% of households who had very low and low income levels experienced food insecurity while only 6.3% and 1.8% of household with middle and high income levels had this experience.<sup>32</sup> Other factors related to financial limitations such as low level of education<sup>21, 23, 25, 28, 33, 34</sup> and unemployment<sup>22, 23</sup> have also been shown to have an association with food insecurity.

The household structure plays an important role in the food security status where the type of household influences the experience of food insecurity. Some studies have shown that there is an increased likelihood of experiencing food insecurity in single parent<sup>21</sup> households and particularly female headed households.<sup>26, 27, 33</sup> One researcher<sup>27</sup> suggested the reason for this finding is the unequal distribution of wealth in that community rendering the women more susceptible. The presence of children in the household is another household structural factor that influences food insecurity. Most studies have shown that there is an increasing odd of household food insecurity when there are children in the household<sup>26, 33, 34</sup> particularly when they are less than 6 years of age.<sup>23</sup> There is however, little evidence of increasing severity in household food insecurity with increase in number of children.<sup>25</sup>

A few studies have looked at perceived health as a factor that might be associated with food insecurity. Those that have, found that households with food insecurity have a greater chance of reporting poor health status.<sup>21-23</sup>

### **1.1.2 Food insecurity and infant feeding practices:**

The promotion of breastfeeding in the past decade has resulted in an almost universal practice of breastfeeding in the developing countries. These achievements have also reduced infant morbidity and mortality due to common childhood illnesses and promoted child spacing.<sup>35</sup> In the current HIV/AIDS pandemic there is a great concern that all these achievements will be lost.<sup>36</sup> Without preventive measures the risk of HIV/AIDS transmission in Sub Sahara Africa is 21-45%<sup>37</sup> with breastfeeding accounting for at least a 3<sup>rd</sup> of that risk.<sup>38</sup> Globally, 2.5 million children are living with HIV/AIDS<sup>39</sup> and more than 95% of these are in developing countries. UNICEF estimates that about 600,000-700,000 HIV infected infants are born annually; and roughly 200,000-300,000 infants are infected by HIV through breastfeeding each year.<sup>40</sup>

WHO, UNICEF and UNAIDS have prepared guidelines on breastfeeding and HIV to promote full informed choices of infant feeding methods for HIV positive mothers in order to reduce the risk of Mother to Child Transmission (MTCT) of the virus. Unfortunately, these choices are limited in economically disadvantaged groups in all developing countries. While the guidelines outline exclusive breastfeeding for 6 months followed by abrupt weaning; most demographic and health surveys in developing countries have shown that mixed breastfeeding is the norm where in addition an infant is given water, herbal teas, cereal etc early in life. Furthermore, most African communities also practice prolonged breastfeeding, during this time breast milk acts as an invaluable and often irreplaceable dietary supplement. One of the biggest constraints in following these guidelines and in exclusive breastfeeding in general among the population in developing countries is the availability of food.<sup>41</sup> Food security in the household is an essential criterion for breastfeeding to be properly followed. It is known that maternal diet<sup>42</sup> is one of the factors that significantly influences the mothers breast milk production hence, determining whether exclusive breast feeding will be practiced or not and the duration of breast feeding for the child. It is estimated that around 21 million infants in Africa are breast fed for about 20 months in rural areas.<sup>43</sup> In Tanzania, a study has shown that most of the population has favourable attitudes towards breast feeding and that more than 97% of Tanzanian infants are breast fed for at least some time.<sup>44</sup>

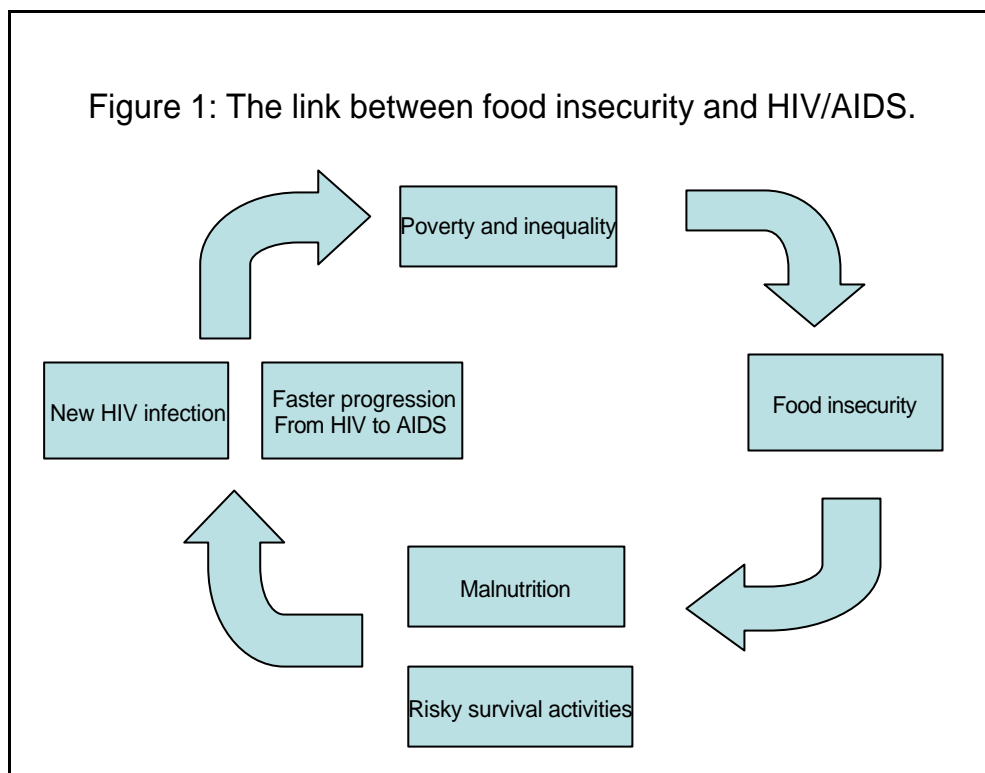
Despite the fact that the WHO guidelines were primarily meant for HIV positive mothers; there is a possibility of cultural diffusion that may lead to loss of confidence in breastfeeding to spread to all women.<sup>36</sup> Coupled with the regions chronic food insecurity situation a risk of change in breastfeeding patterns in the community exist that will have a direct impact on infant health and child well being in the country and region as a whole.

### **1.1.3 Food insecurity and HIV/AIDS.**

The Human Immune deficiency virus (HIV) infection has become one of the worst epidemics the world has ever seen. It has affected 42 million people worldwide and 26.6 million of these people live in Sub-Sahara Africa alone.<sup>34</sup> Tanzania, one of countries' that has been severely affected by HIV/AIDS in Sub-Sahara Africa has about 2.4 million people who are estimated to be infected by the virus.<sup>45</sup> The current prevalence of the epidemic among the adult population in Tanzania is around 8-12%.<sup>46</sup> Kilimanjaro (the region where Oria is located) is ranked as the fifth hardest hit region in the country with a HIV/AIDS rate of 185.6 per 100,000 people.<sup>47</sup>

The majority of studies that have examined nutritional and health consequences of food insecurity have not considered the undeniable intertwined relationship which exists between food insecurity and HIV/AIDS, particularly in Southern Africa. Several FAO publications have addressed these specific relationships between food insecurity and HIV/AIDS.<sup>18, 48-51</sup> A clear and critical two-way relationship between HIV/AIDS and food insecurity is suggested. One of these relationships is the influence food insecurity has on the HIV/AIDS epidemic. Food insecurity is thus considered a major cause of vulnerability to HIV infection at the social level. Food insecurity experiences increase the likelihood of HIV infection, as people are driven to adopt risky coping strategies in order to survive. There are many activities individuals can opt to involve themselves in such as migration in search of additional income sources, risky sexual behaviours including exchanging sex for money or food which put the individual at high risk of infection resulting in adverse nutritional and health effects that reduce the livelihood and food security situation even further thus creating a vicious cycle.

A conceptual model on the above link has been formed to show the relationship between food insecurity and HIV/AIDS in Southern Africa which is of great importance to researchers and policy makers.



Source: Save the children UK, Oxfam International<sup>52</sup>

Poverty and inequality in the community have been described as among the major factors predisposing households and individuals alike to food insecurity. Ultimately, they are forced to adopt risky survival activities predominantly in times where coping strategies such as eating less food, limiting portion size, borrowing, maternal buffering and skipping meals are not sufficient to deal with the situation. Survival activities that are adopted during these periods in economically challenged communities that are of great health importance include risky sexual behaviours. Risky sexual behaviours are adopted as a means to provide for food and/or money for oneself and dependents in the society. These behaviours mainly multiple sexual partners, unprotected sex and transactional sex among females are HIV/AIDS risk factors and have been described as the corner stone for HIV transmission. Changes in these behaviours has been shown by a number of studies to reduce the incidence of HIV/AIDS in some African countries.<sup>53-58</sup> In Tanzania, Kapiga et al<sup>53</sup> found that out of 8,120 men and 2256 women interviewed 21.3% men and 5.2% women had non regular partners and that 44.7% of men and 75.3% of women had exchanged money for sex in their last sexual encounter. In total, 28.8% of men and 7.7% of women were engaged in multiple sexual encounters; this shows the high rate of sexual networking in the country plays a major role in the spread of HIV/AIDS. In areas where women in particular find themselves in circumstances where they

are subject to sexual violence or forced to trade sex for food, the possibility for sexual negotiation is limited<sup>59</sup> resulting in low condom use. Tanzania is one of the countries with a low condom use. The 1996 Tanzania Demographics and Health Survey (TDHS)<sup>53</sup> revealed that despite more than 97% of its respondents being aware of AIDS only 57% and 42% of men and women respectively mentioned condom use as an AIDS prevention measure. Furthermore, only 4% of women and 15% of men reported to have used a condom during their last encounter. These findings are consistent with results observed in northwest Tanzania whereby of the 50% men and 15% women who reported having casual sex during the previous year; only 20% and 3% men and women respectively ever used a condom.<sup>57</sup>

The model also depicts the relationship between food insecurity and HIV/AIDS among those already infected by the virus; whereby food insecurity leads to poor dietary quantity and quality much needed by those already infected and exposing them to the risk of malnutrition which in turn exhausts the immune system further. These individuals thus become more susceptible to malaria, tuberculosis and other opportunistic infections and ultimately have a faster progression from HIV to full blown AIDS. This link will not be pursued in this study.

Other health risky behaviours that have been associated with food insecurity include current smoking and binge drinking.<sup>23</sup>

## **1.2 Project background:**

Kahe has been the site of many surveys related to HIV/AIDS since the early 90's that have been funded by the Norwegian Government. Initial surveys took place between 1990-1995 under MUTAN (Mradi wa Ukimwi Tanzania na Norway/Tanzania & Norwegian AIDS Project). Later on the project evolved into "Health Systems Research and Health Promotion in Relation to Reproductive Health in Tanzania" with funding from the Norwegian Universities' Committee for Development Research and Education (NUFU).

Oria, a village in Kahe ward was selected for surveys in intervention in 1991, 1993 and 1997 whereby STD/HIV surveys were conducted. Qualitative studies addressing breastfeeding and voluntary testing for HIV/AIDS have also been carried out.

Though the HIV infection rate has remained relatively low in this area; prevalence rate of 3.0%, 4.8% and 3.7% in 1991, 1993 and 1997 respectively, women of reproductive age have remained at higher risk of the disease with prevalence of 4.3%, 6.1% and 5.1% for 1991, 1993 and 1997 respectively. During this period high rates of tobacco, alcohol and cannabis use have also been observed.

The project has thus been able to collect and analyze a large amount of data that address the various objectives developed during each pre- study phase. The project has also been able to disseminate its findings to the village, district authorities and policy makers through conferences, seminars and publication. Coupled with these surveys has been research capacity building, one of the major components of the project objectives.

### **1.3 Problem statement and rationale.**

Tanzania is considered one of the poorest countries in the world <sup>60</sup> having an annual Gross Domestic Product (GDP) of 427 million USD of which only 5.9% is used for health expenditure.<sup>61</sup> As many other countries in Sub Sahara Africa, agriculture has been the dominant sector in the country in terms of output, employment and export earnings. In 2002, the agriculture sector accounted for 47.5% of the countries annual GDP.<sup>61</sup>

The topography, climatic condition of the country and poor farming technology limit crop cultivation to only a small fraction of the total land area, also the sector is highly dependent on seasonal rainfall. As a result food production in Tanzania has not always been able to meet the demands of its population; the deficit has necessitated the country to import food and receive aid to meet these demands. The main cause of this fluctuation in production is believed to be climatic instabilities i.e. heavy rains and flooding alternated with periods of draught.

The current trends in international trade policies have also had an effect on food security in the region. With these trends developing countries are expected to turn from net agricultural exporters to net importers. Moreover, economic liberalization and privatization which are major features of structural adjustment policies (SAPs) focus on reduction and elimination of agricultural and food subsidies among others. For countries such as Tanzania that depend on agricultural exports to finance food and other imports these measures are likely to have a negative impact on small and poor farmers which make up 80% of the rural population of Tanzania and are thus the most vulnerable to food insecurity in the country.

In terms of food insecurity, Tanzania is one of the most severely affected countries with an estimated 47% of the population being undernourished.<sup>62</sup> On top of that Tanzania has been ranked by FAO<sup>43</sup> as the 9th hardest hit African country (by HIV/AIDS) and is expected to loose 13% of its labour force by the year 2015. This is a major threat to agriculture production and food insecurity in the country.

Unfortunately there is no/little data that exists on the magnitude of food insecurity at a household level in the country or information on the household socio-demographic characteristics that are associated with it. Search in Pub med revealed no study that has looked at the influence food insecurity has on the HIV/AIDS epidemic in the country; and how they might both influence current breastfeeding practices in rural areas. This study seeks at providing a detail description of the magnitude and socio-demographic characteristics of households affected by food insecurity and associated factors. It also aims at exploring the relationship between food insecurity and breastfeeding practices and identifying risky health related behaviours that may be associated with food insecurity; and the influence food insecurity has on HIV/AIDS in rural Tanzania. This knowledge is essential for policy makers, local government authorities, international organization and intervention groups that deal with food crises in the country to allow for proper food distribution during times of crises; but also to allow nutrition programmes to plan practical prevention programmes to those households most at risk of experiencing food insecurity as well as incorporating HIV/AIDS in their prevention strategies.

#### **1.4 Objectives:**

##### **1.4.1 Main Objective**

The main objective of this study is to determine the prevalence of household food insecurity and its associated socio-demographic characteristics in Oria. An additional objective is to explore the relationship between food insecurity and nutritional and health outcomes in this population.

##### **1.4.2 Specific objectives**

1. To estimate the prevalence of food insecurity in Oria-Kahe.
2. To identify socio-demographic characteristics and perceived health status of households with food insecurity.
3. To explore the relationship between food insecurity and infant feeding practices.
4. To ascertain the association between food insecurity and cigarette smoking and alcohol consumption.
5. To explore the association between food insecurity and risky sexual behaviours.
6. To explore the relationship between food insecurity and HIV infection.



## **2. METHODS:**

**2.1 Study design:** A community based cross sectional study.

**2.2 Study area/population:** Oria is a village in Kahe ward, Moshi Rural district in Kilimanjaro region North-East Tanzania. This district is one of six others which make up Kilimanjaro region namely; Moshi Urban, Rombo, Mwanga, Same and Hai. Oria village is located 30 km. south of Moshi town (the administrative capital of the region).

According to the 1988 National Census the village had an estimated population of 3873. The population in Oria originates from all over Tanzania as well as neighbouring countries. There are a total of 36 ethnic tribes in the village, the majority belonging to the Pare and Chagga ethnic groups. The village has a 50% Muslim population the rest belonging to different Christian denominations. A large majority of the population is engaged in farming activities while a small proportion are involved in petty business. The village has a market once a week where a wide variety of commodities are sold ranging from fruits and vegetables to clothes and shoes. The market is used by people from the village and neighbouring villages and also by businessmen from Moshi town.

### **2.3 Data collection:**

This study is built on data collected in 1997 where 898 individuals between 15-36 years were surveyed. In this survey a narrow age eligibility criterion was established (compare to previous surveys which included age between 6 months and 44 years) due to the above age group being highly affected by HIV-1 infection in previous project surveys in 1991 and 1993. All eligible subjects for the study were registered through house to house registration and interviews took place in their households. Verbal informed consent for participation in the study was sought from each eligible subject. For confidentiality purposes, the field team collected saliva samples for HIV-1 testing from each consenting participant in a private room or place. All eligible participants absent after 2 consecutive follow up visits were excluded from the study and registered as in-eligible.

### **2.4 Data collection tools:**

Face to face structured interviews were conducted by a team of trained research assistants in the national language of “Swahili”. Information on socio-demographic characteristics, food insecurity, risky health related behaviours particularly smoking, alcohol use and sexual

history as well as reproductive health history was sought. All participants were given an opportunity to ask questions regarding HIV/AIDS to clear any misconceptions that they might have. Posters on HIV/AIDS and condoms were distributed and anyone who was found with a health condition was offered treatment while those found to have complicated health conditions were referred to Kilimanjaro Christian Medical Centre (KCMC).

## **2.5 Variables:**

### **Dependent variable:**

***Food insecurity:*** There has been a lot of effort to understand and measure food insecurity in terms of its nature and extent in the past decades. Introduction of direct measures to address this phenomenon have been successful and utilised successfully in the developed world. Research to understand food insecurity at the household level in developing countries has also begun. In this survey food insecurity was measured using a single question adopted from the third National Health and Nutrition Examination Survey (NHANES III) “which of the following statements best describes the amount of food eaten in your household, 1) have enough food to eat; 2) sometimes have enough food to eat; or 3) often do not have enough food to eat and 4) I don’t know.” This operational definition of food insecurity is similar to that used in other research<sup>11, 22, 31, 63-65</sup> and national nutritional and health surveys in the U.S and Canada. This measure has been found to be valid<sup>63, 64, 66, 67</sup> and reliable.<sup>64</sup> Other food insecurity related items were included in the questionnaire to validate the main food insecurity measure and also assess its reliability. The questions, namely ‘in the last year (12 months), did you ever not eat for a whole day because there wasn’t enough food?’; ‘how often did this happen?’ and ‘sometimes people lose weight because they don’t have enough to eat. In the last year (12 months), did you lose weight because there wasn’t enough food?’ were adopted from various nutritional surveys in developed countries. All food insecurity items were dichotomized during analysis.

### **Other dependent variables:**

***Infant feeding practices:*** Infant feeding practices namely current breast feeding status, history of pre-lacteal feeding and age of onset of complimentary foods were assessed among the female population in the study area. Current breast feeding status was assessed by respondents replying ‘yes’ or ‘no’ to a question on whether they were still breastfeeding. The questions ‘what did you feed your child during the first few days after birth?’ assessed pre-

lacteal feeding habits while ‘at what age did you start giving your child complementary food?’ was used to estimate the age of onset of complimentary feeding.

***Risky sexual behaviours:*** Risky sexual behaviours were measured by asking the respondents on the number of different persons they had had sex with in the last 4 weeks and 12 months and whether they used a condom during their last sexual intercourse.

### **Independent variables:**

***Socio-demographic variables:*** Socio-demographic variables collected included age, sex, marital status, religion, occupation, level of education and number of children in the household. Age was condensed into four categories; 15-19 years, 20-24 years, 25-29 years and 30 years and above. The variable of marital status was grouped into 3; single, married and/or cohabiting and previously married (including separated, divorced, widowed or widower). The occupation variable was a condensation of 8 occupational categories into 5 namely; peasant, employee, petty business, student and housewife. No ‘other’ category was necessary as all respondents fitted into the above categories. Categorization of the variable for education was done by combining primary education between 1-4 years into no formal education, lower and higher secondary education were condensed into higher education (which also included college and university) while those with primary education between 5-7 years had their own category.

***Self reported health status:*** Perceived health status was assessed through a self rated health scale. Self reported health status provides a global and simple direct way of capturing perceptions of health criteria that are broad and inclusive as the respondent chooses to make them.<sup>68,69</sup> The validity of perceived health status has been shown by several studies.<sup>69-71</sup> In this survey the following question was asked “In general, how healthy would you say that you are compared to other people your own age?” For analysis the response was coded into three categories, i.e. 1) very healthy, 2) quite healthy and 3) not very healthy. Also the presence of any health complaint was assessed as either ‘yes’ or ‘no’ from the question ‘do you have any health complaints?’

### **2.6 Testing strategy:**

***HIV-1 testing:*** During the survey, saliva samples were used for HIV-1 testing. Saliva was collected from each consenting participant using Omni-SAL saliva collection devices. All saliva samples were tested for HIV-1 antibodies using Bionor HIV 1&2 (NORWAY) and

Virono stika HIV Uniform II enzyme linked-immune Assays (EIA) (Akso, The Netherlands) while confirmation was made using Orosure Western Blots.

HIV-1 testing was strictly confidential and code numbers used according to the Tanzanian Ministry of Health guidelines.

### **2.7 Assurance of data quality:**

Frequent reviewing of collected questionnaires was done to detect any incorrect, illogical or missing data while in the field, this also involved discussion on problems emerging during data collection. All saliva samples were taken by trained personnel in the field team. The samples were stored and transported in ideal conditions for testing at the Northern Zone Reference Laboratory for Parasitic and Infectious Diseases at Kilimanjaro Christian Medical Centre in Moshi Tanzania.

### **2.8 Statistical analysis**

All analysis was performed using SPSS version 11.0. Cross tabulations were performed to describe associations and further analysis by binomial regression was done to identify the relative importance of each variable.

### **2.9 Research and Ethical Clearance:**

The survey was reviewed and cleared by the Tanzanian Ethical Committee of the Ministry of Health and Muhimbili University College of Health Sciences in Dar Es Salaam; also by the Norwegian Committee for Medical Research Ethics.

Introduction of the project at various levels in Moshi Rural district and Oria village was made through meetings. All eligible subjects provided an informed consent prior to participating to the study and received both pre and post test counselling for HIV-1 testing.

### 3. Results:

A total of 898 subjects participated in the survey. During analysis only 891 subjects were included whom their age was between 15-36 years and had responded to the question on food insecurity. In total eight subjects were excluded from the analysis of which four had their age recorded outside the age range 15-36 years and two responded 'I don't know' to the question on food insecurity.

**Table 1: Distribution of sample characteristics by sex**

	Total	Male n (%)	Female n (%)	P-value
<b>Age-group</b>				
15-19yrs	352	186(52.8)	166(47.2)	
20-24yrs	155	67(43.2)	88(56.8)	
25-29yrs	147	63(42.9)	84(57.1)	
30+yrs	236	86(36.4)	150(63.6)	0.001
<b>Marital status</b>				
Single	389	212(54.5)	177(45.5)	
Married/cohabiting	363	126(34.7)	237(65.3)	
Previously married	43	5(11.6)	38(88.4)	0.000
<b>Religion</b>				
Catholic	258	125(48.4)	133(51.6)	
Protestants	177	82(46.3)	95(53.7)	
Moslems	412	169(41.0)	243(59.0)	
Others	18	11(61.1)	7(38.9)	0.118
<b>Education</b>				
No formal education	170	69(40.6)	101(59.4)	
Primary education	646	290(44.9)	356(55.1)	
Higher education	57	34(59.6)	23(40.4)	0.04
<b>Occupation</b>				
Peasant	509	218(42.8)	291(57.2)	
Employee	64	40(62.5)	24(37.5)	
Petty business	43	14(32.6)	29(67.4)	
Student	226	118(52.2)	108(47.8)	
Housewife	30		31(100)	0.000
<b>Number of children</b>				
0	180	71(39.4)	109(60.6)	
1-2	215	77(35.8)	138(64.2)	
3-4	145	42(29.0)	103(71.0)	
5+	70	5(7.1)	65(92.9)	0.000

*Table 1:* The population sample had a total of 488(54.8%) female participants with the remaining proportion attributed to males. The mean age for females in the sample population was 24.24 years while that of males was 22.52 years. Males were significantly younger than their female counter parts. Majority of the men 212(54.1%) were single, had higher levels of

education and also had fewer number of children. Women were more likely to be married or previously married, have no formal education and more number of children when compared to their male counterparts. Women were more involved in petty business and farming as their major income generating activity while men were employees. The distribution of religion among both males and females was more or less the same.

**Table 2: Frequency distribution of food security status**

	Frequency	percentage (%)
<b>Food secure</b>		
Sufficient food to eat	666	74.6
<b>Food insecure</b>		
Sometimes have enough to eat	145	16.2
Often do not have enough to eat	80	9.0
<b>I don't know</b>	2	0.2*

\* excluded from further analysis.

*Table 2:* The overall prevalence of food insecurity in the sample population was 25.2%. Twenty-seven percent of women reported food insecurity compared to 22.9% men, but the difference did not reach statistical significance [crude OR =1.26, 95% CI (0.93-1.72); adjusted OR=1.14, 95% CI (0.82-1.57)]

**Table 3: Distribution of food security status by other food security related measures**

Food security measure	N	Percentage (%)
<b>In last 12 months, not eaten for whole day due to no enough food:</b>		
Food secure	838	94.8
Food insecure	46	5.2
<b>How often did not eat for a whole day in last 12 months :</b>		
Food secure	11	23.9
Food insecure	35	76.1
<b>In last 12 months, lost weight due to no enough food:</b>		
Food secure	836	96.1
Food insecure	34	3.9

*Table 3:* The proportion of respondents who had not eaten for a whole day due to no enough food was 5.2%. Of these 73.2% did not eat for a whole day almost every month or for at least

some months (but not two months or less). Only 3.9% of the respondents had lost weight in the last 12 months due to lack of enough food.

**Table 4: Crude and adjusted odds ratio of food insecurity for males by socio-demographic characteristics**

	FI/Total (%)	OR <sup>1</sup> (95%CI)	OR <sup>2</sup> (95%CI)
<b>Age-group</b>			
15-19yrs	39/186 (21.0)	1.0	1.0
20-24yrs	14/67 (20.9)	1.0 (0.5-2.0)	1.0 (0.4-2.2)
25-29yrs	15/63 (23.8)	1.18 (0.6-2.3)	1.24 (0.5-2.9)
30+yrs	24/86 (27.9)	1.46 (0.8-2.6)	1.22 (0.6-2.6)
<b>Marital status</b>			
Single	45/212 (21.2)	1.0	1.0
Married/cohabiting	30/126 (23.8)	1.16 (0.69-2.0)	0.85 (0.40-1.8)
Previously married	3/5 (60.0)	5.57 (0.9-34.3)	8.13 (0.8-85.7)
<b>Religion</b>			
Catholic	27/125 (21.6)	1.0	1.0
Protestant	14/82 (17.1)	0.75 (0.4-1.5)	0.7 (0.33-1.47)
Moslem	44/169 (26.0)	1.28 (0.7-2.2)	1.20 (0.68-2.11)
Others	5/11 (45.5)	3.03 (0.86-10.67)	3.05 (0.73-12.64)
<b>Education</b>			
No formal education	13/69(18.8)	1.0	1.0
Primary education	71/290(24.5)	1.4(0.72-2.7)	1.25(0.62-2.52)
Higher education	6/34(17.6)	0.92(0.32-2.69)	0.71(0.22-2.23)
<b>Occupation</b>			
Peasant	57/218(26.1)	1.0	1.0
Employee	3/40(7.5)	0.23(0.07-0.77)	0.24(0.07-0.8)*
Petty business	5/14(35.7)	1.57(0.51-4.88)	2.03(0.6-6.88)
Student	24/118(20.3)	0.72(0.42-1.24)	0.86(0.42-1.73)
<b>Number of children</b>			
0	14/71(19.7)	1.0	1.0
1-2	19/77(24.7)	1.33(0.61-2.91)	1.35(0.34-5.35)
3-4	14/42(33.3)	2.04(0.86-4.85)	2.44(0.5-12.02)
5+	2/5(40.0)	2.71(0.41-17.83)	3.65(0.33-40.22)
<b>Health perception</b>			
Very healthy	6/40(15.0)	1.0	1.0
Quite healthy	82/350(23.4)	1.73(0.7-4.27)	1.83(0.74-4.55)
Not very healthy	3/11(27.3)	2.12(0.44-10.37)	2.48(0.5-12.46)
<b>Health complaints</b>			
No	70/321(21.8)	1.0	1.0
Yes	9/33(27.3)	1.35(0.6-3.02)	1.2(0.5-2.86)

<sup>1</sup> crude odds ratio, <sup>2</sup> OR adjusted for age, education and occupation; \*significant after adjusting for age, education and occupation.

Table 4: Food insecurity among men had no relationship to most of the socio-demographic factors measured except for occupation. Employees had lesser odds (about 77% less) of

experiencing food insecurity than peasants. This reduction of odds remained significant when controlled for age, education and occupation.

**Table 5: Crude and adjusted odds ratio of food insecurity for females by socio-demographic characteristics.**

	FI/Total (%)	OR <sup>1</sup> (95%CI)	OR <sup>2</sup> (95%CI)
<b>Age-group</b>			
15-19yrs	30/166(18.1)	1.0	1.0
20-24yrs	24/88(27.3)	1.7(0.92-3.14)	1.65(0.83-3.31)
25-29yrs	21/84(25.0)	1.51(0.8-2.84)	1.49(0.73-3.04)
30+yrs	58/150(38.7)	2.86(1.71-4.78)	2.15(1.16-3.98)*
<b>Marital status</b>			
Single	36/177(20.3)	1.0	1.0
Married/cohabiting	76/237(32.1)	1.85(1.17-2.92)	1.19(0.66-2.16)
Previously married	12/38(31.6)	1.81(0.83-3.93)	0.87(0.35-2.16)
<b>Religion</b>			
Catholic	28/133(21.1)	1.0	1.0
Protestant	27/95(28.4)	1.49(0.81-2.74)	1.49(0.78-2.83)
Moslem	73/243(30.0)	1.61(0.98-2.65)	1.63(0.97-2.75)
Others	3/7(42.9)	2.81(0.6-13.30)	5.12(0.93-28.17)
<b>Education</b>			
No formal education	43/101(42.6)	1.0	1.0
Primary education	85/356(23.9)	0.42(0.27-0.67)	0.46(0.28-0.74)*
Higher education	3/23(13.0)	0.20(0.06-0.73)	0.24(0.06-0.86)*
<b>Occupation</b>			
Peasant	93/291(32.0)	1.0	1.0
Employee	2/24(8.3)	0.19(0.05-0.84)	0.25(0.06-1.09)
Petty business	13/29(44.8)	1.73(0.8-3.74)	1.93(0.86-4.33)
Student	17/108(15.7)	0.4(0.22-0.71)	0.45(0.23-1.07)
Housewife	6/31(19.4)	0.51(0.2-1.29)	0.6(0.23-1.53)
<b>Number of children</b>			
0	15/109(13.8)	1.0	1.0
1-2	47/138(34.1)	3.23(1.69-6.19)	2.61(1.03-6.61)*
3-4	31/103(30.1)	2.7(1.35-5.37)	1.49(0.46-4.79)
5+	40/138(29.0)	3.91(1.87-8.2)	1.72(0.48-6.23)
<b>Health perception</b>			
Very healthy	11/33(33.3)	1.0	1.0
Quite healthy	108/433(24.9)	0.67(0.31-1.42)	0.72(0.33-1.57)
Not very healthy	14 /22(63.6)	3.5(1.13-10.84)	3.16(0.98-10.19)
<b>Health complaints</b>			
No	95 /398(23.9)	1.0	1.0
Yes	22/54(40.7)	2.19(1.22-3.96)	2.12(1.15-3.93)*

<sup>1</sup> crude odds ratio, <sup>2</sup> OR adjusted for age, education and occupation; \* OR significant after adjusting for age, education and occupation.



*Table 5:* Several socio-demographic factors had an association to food insecurity among the female strata. A positive association between age, number of children and presence of health complaint during the survey period was found and could not be explained by other factors adjusted for it namely age, education and occupation. Women who were 30 years and above, had children and presented with health complaint(s) had twice the odds of experiencing food insecurity when compared to other women aged between 15-19 years, with no children and no health complaint(s). Education among women had an inverse relationship to food insecurity and remained significant after adjusting for age and occupation. Having primary education reduced the chances of women experiencing food insecurity by 54% while having higher education (secondary education, college and university) reduced the chance by 76% when compared to women with no formal education.

**Table 6: Tabulation of cigarette smoking and alcohol use for men and women by food security status**

	Total (n)	% <sup>y</sup>	OR <sup>1</sup> (95%CI)	OR <sup>2</sup> (95%CI)
<b>Cigarette smoking</b>				
<u>Males</u>				
No	298	23.5	1.0	1.0
Yes	90	20.0	0.81(0.46-1.46)	0.68(0.36-1.31)
<u>Females</u>				
No	463	27.9	1.0	1.0
Yes	5	20.0	0.65(0.07-5.85)	0.49(0.05-4.68)
<b>Alcohol use</b>				
<u>Males</u>				
Never user	236	24.2	1.0	1.0
Alcohol user	150	20.0	0.79(0.48-1.29)	0.61(0.35-1.05)
<u>Females</u>				
Never	309	22.7	1.0	1.0
Alcohol user	158	31.6	1.58(1.03-2.43)	1.16(0.73-1.84)

<sup>1</sup> crude odds ratio, <sup>2</sup> adjusted for age, education and occupation; <sup>y</sup> proportion of individuals who positively responded to each outcome variable.

*Table 6:* Ninety (23.2%) and 147(38.9%) of the male population smoked cigarettes and drank alcohol respectively while only 5(1.1%) of the female population smoked cigarettes and 157(33.8%) used alcohol. Smoking cigarettes and alcohol use reduced the chances of experiencing food insecurity among the men though the finding was not significant. Cigarette smoking among women reduced the odds of food insecurity while alcohol use increased the

chances of food insecurity among women but not among men; both differences were not statistically significant.

**Table 7: Infant feeding practices among women by food security status**

	Total (n)	% <sup>y</sup>	OR <sup>1</sup> (95%CI)	OR <sup>2</sup> (95%CI)
<b>Currently breastfeeding</b>				
Food secure	189	(49.7)	1.0	1.0
Food insecure	97	(50.5)	1.03(0.63-1.68)	1.25(0.73-2.12)
<b>History of pre-lacteal feeding</b>				
Food secure	185	(16.8)	1.0	1.0
Food insecure	90	(11.1)	0.62(0.29-1.33)	0.62(0.27-1.4)
<b>Age of onset of complimentary foods &gt; 4 months</b>				
Food secure	173	(65.3)	1.0	1.0
Food insecure	82	(74.4)	1.54 (0.86-2.77)	1.59 (0.86-2.95)

<sup>1</sup> crude odds ratio, <sup>2</sup> adjusted for age, education and occupation; <sup>y</sup> proportion of individuals who positively responded to each outcome variable E.g. 'Yes' to currently breastfeeding.

*Table 7:* Analysis for the above variables was done using data from the female participants. Only 286(58.6%) of the women who participated responded to questions about infant feeding practices i.e. current breastfeeding practice, history of pre-lacteal feeding and age at which complimentary feeds were started. During the survey period 143(50.0%) of the women were currently breastfeeding their children. Food insecurity had no relationship to current breastfeeding status.

Pre-lacteal feeding was defined as giving an infant feeds other than breast-milk early in life. It was practised by only 41(14.9%) of the women in the study population. The commonest feeds given to these infants during this early period were water and glucose. Food insecurity reduced the likelihood of giving pre-lacteal feeds to infants though not significantly.

Out of the 299 women who responded to the question on age of onset of complimentary feeds, 174(68.2%) initiated complimentary feeding when the infant was four months or older. (Table not shown). The main type of complementary food given to infants was porridge 237(90.5%) and cow milk 25(9.5%). Food insecurity increased the chances of an infant being initiated complimentary foods at an age of 4 months or older; however this increase was not significant.

**Table 8: Distribution of risky sexual behaviours for men and women by food security status**

	Total (n)	% <sup>y</sup>	OR <sup>1</sup> (95%CI)	OR <sup>2</sup> (95%CI)
<b>More than 1 sexual partner in past 4 weeks</b>				
<u>Males</u>				
Food secure	158	(17.7)	1.0	1.0
Food insecure	52	(19.2)	1.11(0.5-2.46)	1.14(0.5-2.59)
<u>Females</u>				
Food secure	157	(3.2)	1.0	1.0
Food insecure	67	(4.5)	1.43(0.33-6.14)	1.86(0.4-8.6)
<b>More than 1 sexual partner in past 12 months</b>				
<u>Males</u>				
Food secure	183	(29.0)	1.0	1.0
Food insecure	57	(33.3)	1.23(0.65-2.32)	1.32(0.68-2.58)
<u>Females</u>				
Food secure	187	(5.9)	1.0	1.0
Food insecure	73	(8.2)	1.43(0.51-4.03)	1.52(0.5-4.56)
<b>Condom use</b>				
<u>Males</u>				
Food secure	168	(27.4)	1.0	1.0
Food insecure	52	(26.9)	0.98(0.49-1.97)	1.26(0.6-2.63)
<u>Females</u>				
Food secure	167	(13.2)	1.0	1.0
Food insecure	69	(13.0)	1.0(0.43-2.27)	1.14(0.49-2.68)

<sup>1</sup> crude odds ratio, <sup>2</sup> adjusted for age, education and occupation; <sup>y</sup> proportion of individuals who positively responded to each outcome variable.

*Table 8:* Approximately 80% of the population were sexually active with 50% having their first sexual debut by the age of 16 years. Males started having sexual intercourse at an earlier age (mean age 15.6 years) compare to females (mean age 17.4 years). (Table not shown). Thirty-eight (18.1%) and 8(3.6%) of men and women respectively had more than one sexual partner in the past 4 weeks. Food insecurity increased the odds of having more than one sexual partner for both men and women though the finding was not significant. In the past 12 months, 72(30%) of men and 17(6.5%) of women had more than one sexual partner. Food insecurity increased the likelihood of having more than one sexual partner in the past 12 months but, this increase was not significant. Only 60(27.3%) of men and 31(13.1%) of women had used a condom during their last sexual intercourse. Food insecurity had no influence on the use of condoms for both men and women.

**Table 9: Distribution of HIV status for men and women by food security status**

	Total (n)	HIV positive (%)	OR <sup>1</sup> (95%CI)	OR <sup>2</sup> (95%CI)
<b>Males</b>				
Food secure	293	3.1	1.0	1.0
Food insecure	85	3.5	1.15(0.31-4.36)	1.06(0.27-4.14)
<b>Females</b>				
Food secure	326	3.7	1.0	1.0
Food insecure	119	9.2	2.67(1.14-6.22)	2.13(0.88-5.16)

<sup>1</sup> crude odds ratio, <sup>2</sup> adjusted for age, education and occupation

*Table 9:* The prevalence of HIV in the study population was found to be 3.2% for males and 5.2% for women. (Table not shown). Food insecurity significantly increased the chances of being HIV positive by two for women, upon adjusting for age, education and occupation this increase was not significant. Food insecurity also increased the odds of being HIV positive for men though there was no statistical significance.

## **4. Discussion:**

### **4.1 Methodological considerations.**

This survey used a single question to measure the perceived quantitative aspect of food insecurity. Food insecurity was based on describing the amount of food eaten in the household as “often do not have enough food to eat” or “sometimes have enough food to eat”. This question has been used by several other national surveys such as the 1998-99 National Population Health Survey (NPHS) of Canada and the Continuing Survey of Food Intakes by Individuals (CSFII) of 1994 through 1996 as well as the Third National Health and Nutrition Examination Survey (NHANES III) of the U.S. Although this measure has been tested and found valid and reliable in developed countries, it has not been used in developing countries.

In our study we found that this single question measure of food insecurity in a rural area was associated with financial indicators that were assessed by socio-demographic characteristics. This finding is consistent with other studies that have used a similar measure to study food insecurity in their settings.<sup>11, 22, 63-65</sup>

In addition to this single question measure; a set of follow up questions were also applied to compliment the assessment of food insecurity using a single question. Results showed that a smaller proportion of individuals had gone a whole day without food in the past 12 months and an even smaller proportion had lost weight due to lack of food when compared to those who did not have or sometimes had enough food. A positive response to both of these supplementary questions was considered as food insecurity and can be viewed as the severity of food insecurity in that population. The above observed trend was expected and conforms to existing knowledge. Further more the follow up questions showed associations with assessed socio-demographic characters particularly among women as in the single question measure. (Table not shown).

The observed trend of the follow up questions with the single question measure coupled with significant associations with socio-demographic characters indicates good internal validity even though we were not able to do external validity tests.

### **4.2 Prevalence and socio-demographic characteristics.**

The prevalence of food insecurity based on our survey was 25.2% (Table 2); a rather low estimate when compared to the 'proxy' used by FAO<sup>62</sup> and also lower than the observed in other developing countries<sup>25, 28-30, 32, 34</sup> including Africa.<sup>26, 27</sup> No significant difference was noted between men and women in terms of reporting food insecurity contradicting what many

studies have shown whereby women<sup>21,27,31,32</sup> and particularly those single<sup>22</sup> are more vulnerable. However, the prevalence observed is higher than experienced in developed countries<sup>11,20-22</sup> though lower than what has been found among groups of low income and/or food stamp recipients.<sup>10,23,24</sup>

Comparing our results with other studies must be done with caution particularly since food insecurity is defined variably by other authors. This may be one of the reasons for our prevalence being lower than that observed by other studies. Most recent studies use a broader definition of food insecurity where not only food insufficiency but also psycho-social dimensions of food insecurity are included and other quantitative and qualitative aspects of food supply and food intake.<sup>10,20,23-25,28-30,32-24</sup> Our study defined food insecurity rather narrowly mainly concentrating on food insufficiency which has been perceived to be the same as food insecurity and has been used interchangeably.<sup>31</sup> While food insecurity is defined as 'limited or uncertain availability of nutritionally adequate and safe foods or ability to acquire acceptable foods in socially acceptable ways'<sup>9,10,25</sup>; food insufficiency is defined as 'inadequacy in the amount of food intake because of a lack of money or resources that provide access to enough food'.<sup>11,22,31</sup> Although the definitions are similar the former describes a much broader condition than the latter. This study used only one question to determine food insecurity (insufficiency).

The sample size in this survey is small compared to what has been used by other studies and may be a reason for the low prevalence observed. This has resulted in underestimation of the magnitude of food insecurity in the community as a smaller proportion of individuals with the desired outcome were captured. Studies using a bigger sample size are needed to study further this phenomenon.

Our finding may also be attributed to the seasonal variation that exists with food insecurity. The study was conducted during the second half of the year which is considered the harvest season for this rural area. It was thus expected that most of the population were not experiencing food shortage at the time and could not report the previous months food situation. Although the prevalence we found is considered low in relation to the geographic distribution of food insecurity<sup>8</sup> it should still be considered of public health importance for this area.

Households which reported food insecurity were clearly different in socio-demographic characteristics from those that did not report food insecurity and particularly women. Our finding that there was a positive association between food insecurity and age, presence of children and having health complaints is similar to findings from other studies.<sup>11,</sup>

<sup>22, 28-29, 33-34</sup> Women who were 30-36 years had twice the likelihood of experiencing food insecurity than women aged 15-19 years. (**Table 3**) The age category though lower than in other studies <sup>11, 28</sup> still shows that increase in age may carry a more odds of food insecurity. In Africa women of this age category may be responsible for food production and supply at the household level as it is estimated that 80% of Africa's food is produced by women and hence may experience the burden of food insecurity more in comparison to other age groups.

The presence of children in the household increases the odds of food insecurity (**Table 3**) this is consistent to findings from other studies. <sup>33, 34</sup> Pre-school children and particularly those less than 6 years <sup>23</sup> have been suggested to be most affected by food insecurity despite the mother and community efforts to shield them from the experience. Unfortunately, the data used had no record of the age of children whose parents participated in the survey. No trend was found towards increasing food insecurity with increasing number of children in the household as in Trinidad and Tobago. <sup>25</sup>

Another demographic factor that showed associations with food insecurity among the women was education. Increase in education attainment decreased the likelihood of reporting food insecurity as found in many other studies in both developed <sup>11, 21</sup> and developing countries. <sup>25, 28, 34</sup> The protective effect was stronger among those with secondary education and higher.

Men in this population survey showed an inverse relationship between employment and food insecurity. The likelihood of reporting food insecurity among men was less if they were employed which is consistent with some previously conducted studies. <sup>22, 25</sup>

The general health perception among women had an inverse association with food insecurity whereby poorer health perception increased the odd of food insecurity. Other studies have also found similar results. <sup>22, 69</sup> However this association did not remain after adjusting for age, education and occupation. On the contrary, the presence of a health complaint among women had a positive association with food insecurity and could not be explained after further adjustment for age, education and occupation.

#### **4.3 Infant feeding practices.**

Breastfeeding is the most nutritious infant feeding practice needed to provide adequate nutrition and enhance mental and physical development of children. It is widely practised in most developing countries and even more in Africa. <sup>43</sup> One of the survey objectives was to study the influence of food insecurity on infant feeding practices such as breastfeeding.

During the study period approximately 50% of the women were breastfeeding; the median duration of breastfeeding in this community was 18 months (SD 11.05), a relatively low duration then the reported 22 months from the Tanzania Health and Demographic surveys<sup>72, 73</sup> as well as among studies conducted in other communities.<sup>74,75</sup> Seventy-five percent of the children were reportedly breastfed until 24 months of age consistent with breastfeeding practices in the northern zone and rural areas.<sup>76</sup>

Pre-lacteal feeding, another infant feeding practice common in most African countries including, Tanzania was also looked at. The proportion of women who gave pre-lacteal fluids to their infants early in life in this rural area was relatively smaller than the 25-30% observed by another study<sup>74</sup> although the type of fluids given did not differ.

Our findings show that food insecurity in rural areas may not play a major role in decision making regarding breastfeeding practices but may influence the practice of giving pre-lacteal fluids (**Table 7**) albeit the relationship was not statistically significant.

The total number of women who responded to these questions was very small (286) and could have contributed to the non-significant finding particularly about history of pre-lacteal feeding. Other explanations could be that breastfeeding is culturally controlled as some studies have suggested and thus women breastfeed irrespective of the food security status the household is in because she is expected to do so by the community.

Change in breastfeeding patterns have been noted in urban dwellers where they have shifted to a more 'western' form of breastfeeding with shorter durations.<sup>74</sup> This has been attributed to improved socio-economic status among other factors. Women in rural communities have limited resources rendering them with no other options than to breastfeed. The perception of lactation insufficiency has also been given as a major reason for women to give pre-lacteal fluids to their infants.<sup>74</sup> It is possible that when there is no other food alternative women may be forced to rely only on their breast-milk for the child's nutrition.

The recommended age of onset of complimentary feeding has changed since the HIV epidemic. Initially emphasis was on exclusive breastfeeding for four-six months before introduction of complimentary foods, now it is recommended for the first six months of life.<sup>77</sup> About 68.2% of the women in the study initiated complimentary foods to their children when they were four months or older, this figure although high does not necessarily mean that these children were exclusively breastfed for the initial three months. Although there was an increase in food insecurity among mothers who began complimentary foods at age of 4 months or older, it was not statistically significant. The main types of food given as



complimentary foods to children were animal (cow) milk and porridge similar to other studies in Tanzania.<sup>74</sup>

The age at which a child is put on complimentary foods may not depend on the food situation in the household; rather it is dictated by the social cultural forces that surround the women and common practices within that area. However, economical limitations may also play a role as different infant feeding patterns have been observed between rural and urban areas.

#### **4.4. Risky sexual behaviours.**

The overall prevalence of HIV in Oria was 4.2% which is in line with studies conducted in other rural areas of Tanzania although lower than that observed in urban areas and also lower than the national estimate.<sup>45, 46, 78, 79</sup> The so called ‘feminization’ of the epidemic in Sub-Sahara Africa is evident in our findings where 5.2% of the women were affected compare to 3.2% of men. Food insecurity increased twice the chance of testing positive for HIV among women but not among men (**Table 9**); this relationship did not remain significant after adjusting for age, education and occupation. One of the reasons our study failed to show this relationship was possibly due to the study area/population not being typical of the setting described for such an association to exist. Oria is an area of low HIV transmission as indicated by the prevalence, hence underestimates the relationship and can not show an association after adjusting for other potential risk factors.

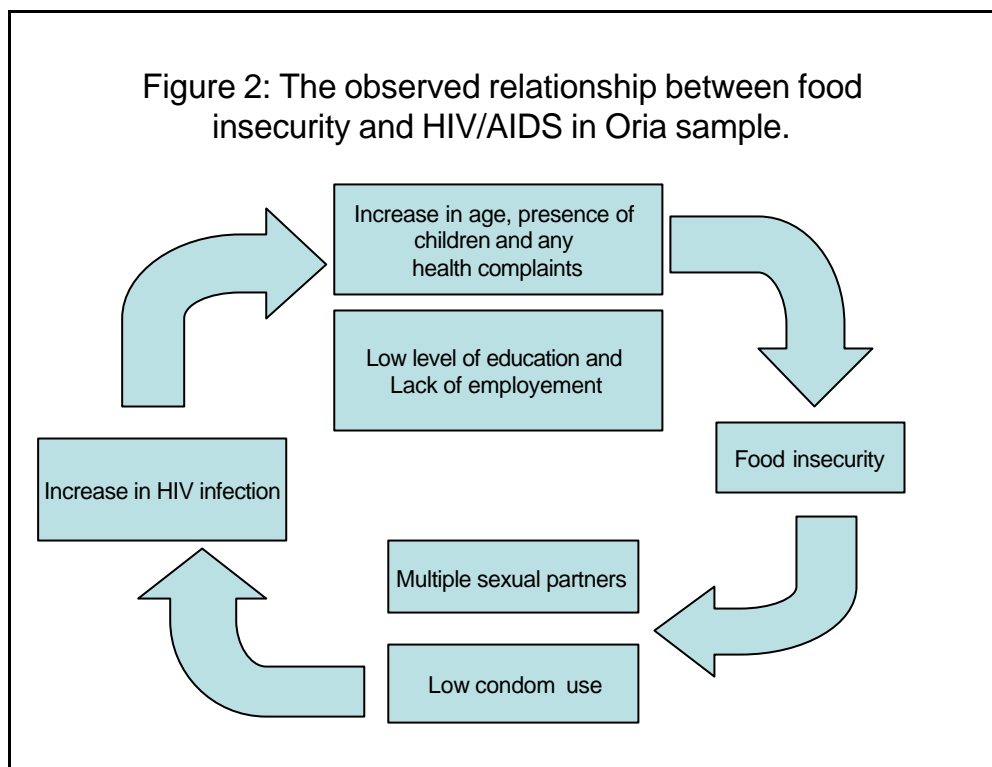
Approximately 18.1% and 3.6% of men and women respectively in the study population had more than one sexual partner in the past four weeks; this increased to 30% for men and 6.5% for women in the past 12 months. The proportions were lower than that observed by Kapiga et al<sup>53</sup> but had a similar trend whereby a higher proportion of men had more than one sexual partner at both time recalls. Our study shows that food insecurity increases the risk of having more than one sexual partner for both men and women at both past four weeks and past 12 months; though this association was not significant. (**Table 8**).

These findings depict that sexual networking in this rural area is relatively low when compared to other areas; it is also likely to be the major reason for the low HIV/AIDS prevalence observed. The low trend in HIV infection may be attributed to repeated surveys that have sensitized the population on risks of HIV infection and hence modified survival activities individuals’ use. However, the low prevalence of food insecurity found during this time may also contribute to the low estimates of risky sexual behaviours whereby local coping strategies adopted during times of food shortage are sufficient to ensure food supply for

affected households. The small number of respondents who participated in these questions could also have underestimated the above associations, a study with larger sample size is needed to explore further this relationship.

Condom use in the study area was relatively high with 27.3% and 13.1% of men and women respectively reporting to use a condom during their last sexual intercourse; this finding is higher than the estimated in other studies conducted in Tanzania.<sup>53</sup> Food insecurity had no association with condom use for both men and women. The increase in condom use observed may be as a result of interventions in past surveys where health education and free condoms were provided.

Results from our study can be summed up in a modified model of the one presented earlier (pg 14). In this model (below), socio-demographic characteristics that were investigated in the study act as 'proxy' to indicators of poverty. Our findings show that the link between food insecurity and HIV/AIDS is likely to exist for both men and women though different socio-economic and demographic factors drive the cycle for the two sexes. Women, who were older, with children and had a health complaint, were more likely to have reported food insecurity and thus had more chances of having multiple sexual partners and not using a condom during their last sexual intercourse. This put them at a higher risk of infection and made them more likely to test positive for HIV infection. On-the-other hand, educated women had decreased odds of food insecurity and a decreased odd of adopting risky sexual behaviours i.e. multiple sexual partners and no condom use thus putting them at a lesser risk of HIV infection. Men who were employed were protected from the experience of food insecurity; allowing them not to participate in risky sexual behaviours and hence lower risk of HIV infection.



Other health related behaviours that were studied included cigarette smoking and alcohol use; only a small proportion of men 23.2% and women 1.1% smoked cigarettes and 38.4% of men and 33.7% of women drank alcohol. Though smoking reduced the chance of reporting food insecurity for both sex it was not significant. A possible explanation could be that those able to afford cigarettes have also the resources to afford food. Men older than 20 years, with higher education and who were employed were more likely to drink alcohol as were women older than 30 years with no formal education and who participated in petty business as a source of income. Alcohol consumption increased the likelihood of food insecurity among women meaning women who drank alcohol probably used money meant for food to buy alcohol and hence render their households vulnerable to food insecurity.<sup>22</sup> Conversely, alcohol use decreased food insecurity experience among men indicating that they are able to afford alcohol without interfering with money for buying food.

## **5.0 Limitations, conclusion and recommendations:**

**Limitations:** One of the major limitations of cross sectional analysis is in its inherent inability to discern a temporal relationship between exposure and outcome. The author can thus not conclude with utmost certainty that the observed findings are due to socio-demographic factors or as a result of food insecurity; also it can not be concluded that the

increased odd of HIV infection among women is due to food insecurity or as a result of food insecurity. In order to overcome this barrier more studies should be conducted using longitudinal design to provide more insight into the socio-demographic characteristics associated with food insecurity and its health outcomes.

Another limitation of the study is it relies on secondary data; hence analysis of other desired factors is limited. Other factors that could have been analysed for include gender of the head of household in which studies have shown an increased reporting of food insecurity among female headed households<sup>26, 27, 33</sup> and age of children in the household.

The use of an unevaluated question to measure food insecurity also limits the study. The validity of the measure is questionable despite it being related to socio-demographic factors similar to other studies. There is a possibility of the responses either overestimating or underestimating food insecurity. In this case the latter option is more possible. Also much development has occurred in instruments used to measure food insecurity in the past years, use of this measure makes it difficult to compare to other studies which use the newly developed instruments in assessing food insecurity. More studies should be conducted to validate old and new measures as well as develop culture sensitive measures to assess food insecurity in developing countries.

**Conclusions:** In Oria, food insecurity was common and more so among older women, with children and who had health complaint(s) during the survey period. It was less common among employed men and educated women. Food insecurity showed no association with infant feeding practices in particular breastfeeding, giving pre-lacteal fluids and age of initiation of complimentary foods though an insignificant decrease in pre-lacteal feeding was observed among food insecure women. There was no evidence of a relationship between risky sexual behaviour and food insecurity in this rural area despite the fact that an association between food insecurity and HIV status among women existed although the association did not remain significant after adjusting for age, education and occupation.

**Recommendations:**

- a) **Recommendations for further research:** There is a deficit in published studies on food insecurity at the household and individual level in developing countries and Africa in particular. More studies should be conducted on food insecurity at the household level in these settings where food insecurity at the national level is estimated to still exist. These studies should be both descriptive and analytical to assist

in confirming the magnitude of food insecurity as well as suggested associations between food insecurity, socio-demographic characteristics and other nutritional and health related outcomes in developing countries. The link between food insecurity and HIV/AIDS should be assessed more thoroughly as it may provide an explanation for failure of much of the interventions introduced including behavioural interventions.

- b) Other recommendations:* 1) Promotion of better agricultural techniques to increase food production and better infrastructure to facilitate transportation of food products to other areas is a necessary step in reducing national food deficits. 2) Improve food accessibility to all populations by increasing their purchasing power in terms of education and employment. 3) Promote education programmes that target nutrition and health to improve better understanding of their cause, symptoms and prevention. 4) Initiate nutrition programmes and policies that can identify households more at risk of food shortage and ways to assist them during times of food crises. 5) Develop nutrition programmes that can integrate healthy life skills including risky sexual behaviours avoidance skills and HIV prevention strategies.

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**Appendix II: Questionnaire (in English)**

**NUFU PROJECT: KAHE COHORT STUDY 1997.**

1. ID No. \_\_\_\_\_
2. Date (dd/mm/yy): \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_
3. Participation ID No. \_\_\_\_\_
4. Sex of respondent (*Circle appropriate answer*)
  1. Male
  2. Female
5. How old are you? (*Probe for best estimate*) \_\_\_\_\_ Years
6. What is your religion?
  1. Catholic-Christian.
  2. Protestant-Christian.
  3. Muslim.
  4. Other(Specify):\_\_\_\_\_
7. What is your present major occupation?
  1. Peasant
  2. Government employee
  3. Private business owner
  4. Private business employee
  5. Housewife
  6. Student (primary/secondary)
  7. Unemployed
  8. Petty (small) business
  9. Others (Specify):\_\_\_\_\_
8. What additional activities do you do to supplement your income?
  1. None
  2. Specify: \_\_\_\_\_
9. What is the highest level of formal education you have completed?
  1. No formal education
  2. Standard 1-4
  3. Standard 5-7
  4. Form 1-4
  5. Form 5-6
  6. Higher secondary school
  7. Others (Specify): \_\_\_\_\_
10. What is your current marital status?
  1. Single
  2. Married
  3. Cohabiting
  4. Divorced/separated
  5. Widow/widower
11. Are you in a polygamous marriage?
  1. Yes
  2. No
12. If married, do you live with your spouse(s)
  1. Yes, all the time
  2. Yes, one to four times a year
  3. Yes, every month or after one month
  4. Yes, so many times per month

13. How old were you when you first married?  
(or started cohabiting)? \_\_\_\_\_ Years old

14. (If divorced, separated or widowed), how many  
years ago did this happen? \_\_\_\_\_ years ago.  
(Write 0 if less than 1 year)

**We are now going to ask you some questions about your health behaviours and beliefs.**

15. Do you use any tobacco related products? 1. Yes  
2. No ? **Skip to Q22**

If YES, which of the following tobacco products do you use?

	Yes	No	At what age did you start
16. Cigarettes	1	2	_____ years ? <b>Skip to Q21</b>
17. Oral snuff	1	2	_____ years
18. Nasal snuff	1	2	_____ years
19. Pipe	1	2	_____ years

20 Others (Specify) \_\_\_\_\_

21. If you smoke cigarettes, how many do you smoke per day?  
Number of cigarettes per day \_\_\_\_\_

22. Do you ever drink alcohol? 1. Yes  
2. No

23. If YES, how often do you drink alcohol?  
(Name local types of alcohol) 1. Everyday  
2. Several times a week  
3. Once a week  
4. Once or twice a month  
5. Less than once a month

**The next questions are about food eaten in your household.**

24. Which of the following statements best  
describes the amount of food eaten in your  
household: 1. We have enough food to eat  
2. Sometimes we have enough food to eat  
3. We often do not have enough food to  
eat  
4. Don't know

25. In the last year (12 months), did you  
ever NOT eat for a whole day because  
there wasn't enough food? 1. Yes  
2. No ? **Skip to Q27**  
3. Don't know? **Skip to Q48**

26. How often did this happen? 1. Almost every month  
2. Some months, but not every month  
3. Only 1 or 2 months  
4. Don't know

27. Sometimes people lose weight because they don't have enough to eat. In the last year (12 months), did you lose weight because there wasn't enough food?
1. Yes
  2. No
  3. Don't know

**The next questions are about AIDS. Please answer yes, no, or whether you don't know to the a questions.**

28. Have you yourself ever known anyone who had AIDS in this community or country?
1. Yes
  2. No
  3. Don't know

29. Can a person be infected and have the virus that causes AIDS but not have any symptoms?
1. Yes
  2. No
  3. Don't know

30. Can someone who looks healthy but who has the AIDS virus pass it on to other people?
1. Yes
  2. No
  3. Don't know

31. Can one get AIDS by touching the body of a person who has AIDS or AIDS virus?
1. Yes
  2. No
  3. Don't know

32. Can one get AIDS by kissing a person who has AIDS or AIDS virus?
1. Yes
  2. No
  3. Don't know

33. Can one get AIDS by sharing food or cups with a person who has AIDS or AIDS virus?
1. Yes
  2. No
  3. Don't know

34. Can one get AIDS by wearing clothes used by a person who has AIDS or AIDS virus?
1. Yes
  2. No
  3. Don't know

**Now I will ask you some questions about your own opinions. Let me know which one of the answers fits best for you. (Read all response categories).**

35. How much of a threat do you think HIV/AIDS is to the health of your local community?
1. No threat at all
  2. Some threat
  3. Serious threat
  4. Don't know

36. Are you personally at risk of getting HIV/AIDS?
1. No, not at all
  2. Yes, at slight risk
  3. Yes, at serious risk
  4. Don't know



37. Can you protect yourself against getting HIV/AIDS?
1. No, not at all
  2. Yes, with difficult
  3. Yes, I can easily protect myself
  4. Don't know
38. In general, how healthy would you say you are compared to other people your own age?
1. Very healthy (above average)
  2. Fair health (average)
  3. Not healthy (below average)

**I will now ask you some personal questions regarding sexual behaviour. Remember that your answers will be treated strictly confidential.**

39. Have you ever had sexual intercourse (in your your lifetime)?
1. Yes
  2. No ? **Skip to Q128**
40. How old were you when you had your first intercourse? \_\_\_\_\_ years
41. How many different persons have you had sex within the last 4 weeks, including your spouse/regular partner? \_\_\_\_\_ Total no. of persons
42. Altogether, how many different persons, including your spouse/regular partner, have you had sex with in the last 12 months, that is since (\_\_\_\_\_)
- \_\_\_\_\_ number
43. How many different persons have you had sex within the last 5 years, including your spouse/regular partner?
- \_\_\_\_\_ number
44. Have you (or your partner) ever used condom during sex?
1. Yes
  2. No ? **Skip to Q134**
45. Do you (or your partner) use condom with your spouse/regular partner?
1. Yes, always
  2. Yes most of the time
  3. Yes, sometimes
  4. No, never
46. Do you (or your partner) use condoms with other partner/regular partner?
1. Yes, always
  2. Yes most of the time
  3. Yes, sometimes
  4. No, never
47. Did you ( or your partner) use condom at the last sexual intercourse?
1. Yes
  2. No

**Women, Gynaecological and Obstetric history ( For men go to Q)**

48. How old were you when you reached your Menarche:
- \_\_\_\_\_ years.

49. Have you ever been pregnant? 1. Yes  
2. No ? **Skip to Q**
50. How many times have you been pregnant? \_\_\_\_\_ Total (lifetime)  
\_\_\_\_\_ After 1991
51. For your last born child still alive, for how many months did you breastfeed him/her? \_\_\_\_\_ months of breastfeeding
52. Are you still breastfeeding the last child? 1. Yes, Age of child \_\_\_\_\_ months  
2. No
53. If NOT, why did you stop breastfeeding? 1. Pregnancy  
2. Illness of the child; specify \_\_\_\_\_  
3. Not enough milk  
4. Work situation; specify \_\_\_\_\_  
5. Death of the child  
6. child was old enough  
7. Other \_\_\_\_\_
54. At what age did you start giving your child complimentary food? \_\_\_\_\_ months
55. What kinds of food was this? \_\_\_\_\_
56. What did you feed the child during the first few days after birth? \_\_\_\_\_

**We have reached the end of our interview. Thank you very much for participating in this interview!**

(Please proceed with filling in the following information after completion of the interview).

59. Was health education ( for issues that were not understood or had misconception) provided at the end of the interview? 1. Yes  
2. No

#### **RESULT CODES**

60. HIV screening test with BIONOR 1. Negative  
2. Positive
61. HIV screening with ELISA 1. Negative  
2. Positive
62. HIV confirmatory test with Western Blots 1. Negative  
2. Positive