Infant and Young Child Feeding Practices among children aged 0-23 months in Tanzania

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A thesis submitted for the degree of MPhil (Nutrition and Dietetics)

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Statement of Originality

This thesis contains no materials which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and. To the best of my knowledge and belief, contains no materials previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

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List of abbreviations

AIDS	Acquired Immunodeficiency Syndrome
AOR	Adjusted Odds Ratios
BF	Breastfeeding
BFHI	Baby- Friendly Hospital Initiative
BMI	Body Mass Index
CF	Complementary Feeding
CI	Confidence Interval
DHS	Demographic and Health Survey
EBF	Exclusive Breastfeeding
HIV	Human Immunodeficiency Virus
IYCF	Infant and Young Child Feeding
MDG	Millennium Development Goals
OECD	Organization for Economic Co-operation and Development
OR	Odds Ratios
ORS	Oral Rehydration Solution
TBA	Traditional Birth Attendant
TDHS	Tanzania Demographic and Health Survey
TRCHS	Tanzania Reproductive and Child Health Survey
UNICEF	United Nations Children's Fund
U.S	United States
UK	United Kingdom
WHO	World Health Organization

Abstract

Inappropriate infant and young child feeding (IYCF) practices are one of the major causes of undernutrition, morbidity and mortality among young children in Tanzania and the risk factors associated with inappropriate IYCF practices remain unclear. This information is therefore, vital to identify those at risk of poor feeding practices and who need to be targeted for interventions to improve IYCF practices in Tanzania. The main objective of this thesis was to describe the prevalence of the new World Health Organization IYCF indicators and identify factors associated with inappropriate breastfeeding and complementary feeding practices among children aged 0-23 months in Tanzania. The thesis also compared the trends of key breastfeeding indicators from 1999 to 2010 and complementary feeding indicators from 2004-05 to 2010. This thesis was a secondary analysis of cross-sectional data from the 1999 Tanzania Reproductive and Child Health Survey, the 2004-05 and 2010 Tanzania Demographic and Health Surveys. These surveys used a multi-stage cluster sample of 3,826 households in 1999, 10,312 in 2004-05 and 10,300 in 2010 from eight geographic zones in Tanzania. The sample consisted of 7,603 infants aged 0-23 months (Chapter 2).

Results from the analysis of breastfeeding data in Chapter 3 showed that breastfeeding is universal in Tanzania as almost all mothers (98%) breastfed their children as reported in the three surveys. However, breastfeeding was initiated within the first hour of birth in 59.0% of mothers in 2004-05 but reduced to 46.1% in 2010. In infants aged 0-5 months the prevalence of exclusive breastfeeding was 31.8% in 1999 and increased to 41.3% in 2004-05 and further improved to 49.9% in 2010. The proportion of infants aged 0-5 months who were “predominantly breastfed” declined from 59.8% in 1999 to 16.8% in 2010. Most mothers (>91.0%) breastfeed up to 1 year in all surveys, but the proportion decreased to 57.2% , 55.5% and 51.1% at 2 years of age in 1999, 2004-05 and 2010 respectively. The most consistent determinants of suboptimal breastfeeding (delayed initiation of breastfeeding within one hour of birth; non-exclusive breastfeeding and predominant breastfeeding) included young maternal age

(< 25 years), lower maternal education, maternal employment, home delivery, inadequate care during and after birth and poor economic status.

Chapter 4 presents the findings for the analysis of complementary feeding practices based on data from the 2004-05 and 2010 Tanzania Demographic and Health Surveys because information on complementary feeding practices (i.e. type of foods and frequency of feeding) was not collected in the 1999 survey. It was found that the majority of infants aged 6-8 months were reported to receive soft, semi-solid or solid foods, and the proportion increased from 79.6% in 2004-05 to 92.3% in 2010. However very few children aged 6-23 months met the minimum requirements for indicators for dietary diversity, meal frequency and acceptable diet. The prevalence of minimum dietary diversity showed slight decrease from 39.5% in 2004-05 to 38.0% in 2010, whereas minimum meal frequency and acceptable diet showed significant decline from 45.0% and 18.5% in 2004-05 to 34.7% and 13.4% in 2010 respectively. Lower parental education, poor household economic status, absence of postnatal check-ups after delivery, young child age and rural residence were significant and consistent risk factors associated with inappropriate complementary feeding practices in Tanzania.

Based on the above findings, this thesis concluded that levels of breastfeeding and complementary feeding indicators are below national targets of 80% placing millions of children at risk of childhood malnutrition associated with inappropriate feeding (Chapter 6). Tanzania has made significant improvement regarding feeding indicators such as exclusive breastfeeding under six months, continued breastfeeding up to 1 year and introduction of complementary foods at 6-8 months from 1999 to 2010. However, there was significant decline in the prevalence of the indicators for early initiation of breastfeeding within one hour after birth, continued breastfeeding up to two years, minimum dietary diversity, minimum meal frequency and minimum acceptable diet from 2004-05 to 2010. These findings highlight the need for effective national level nutrition programmes to enhance breastfeeding and complementary feeding practices and with a focus on the target groups with sub-optimal

practices- including young uneducated mothers and carers with young children who lacked postnatal contacts with health workers, those from poor families and residing in the rural areas.

Chapter 1 Introduction and Literature review

This Chapter provides background information and a review of the literature on prevalence and individual-, household-, and community-level factors influencing breastfeeding and complementary feeding practices among children aged 0-23 months. The Chapter begins with a rationale for infant feeding for optimal child health and survival starting with breastfeeding indicators and followed by complementary feeding indicators. The risk factors associated with suboptimal breastfeeding and complementary feeding practices are also described. The overview of literature is also provided which outlines the study rationale and aims. The thesis outline is provided at the end of this Chapter.

1.1 Infant and Young Child Feeding Practices

Infant and young child feeding (IYCF) practices, comprising of both breastfeeding and complementary feeding, rank among the most effective means to improve nutritional status and the survival of a child. About 35% of the under-five child mortality and 11% of the total global disease burden are due to undernutrition (1), with approximately 40% of these deaths occurring in developing countries including Sub Saharan Africa (2). Over 130, 000 estimated deaths that occur every year among children aged under five years in Tanzania (3) are due to poor feeding practices (4). Poor feeding practices in infancy and childhood result in undernutrition, contribute to impaired cognitive and social development, poor school performance and reduced productivity in later life (5).

The level of child undernutrition remains unacceptable throughout the world (6). It is estimated that, more than 195 million children under five years of age in developing countries are chronically undernourished (stunted), with 90 per cent of these children living in Africa and Asia (2). Although stunting is prevalent in these two regions, many children under five years are affected by stunting in Africa (40%) compared to Asia (36%) (2). The level of childhood undernutrition varies across Africa, with a regional average of 40% of children under five years of age being stunted and 13% are wasted (7). Recent estimates from the 2010 Tanzania

Demographic and Heath Survey (TDHS) shows that 41% of under- five children are stunted, 16% are underweight, and 59% are anaemic (8). Therefore promotion of appropriate infant feeding practices especially in the first 24 months is vital in Tanzania.

Infant and young child feeding practices are multidimensional and age specific. The period between birth and 2 years is widely recognized as a critical period because of the need for appropriate nutrition to support the rapid rate of physical growth and brain development (5). The nutritional needs of infants can be met through breastfeeding from birth up to six months of age and thereafter there is a need for other foods to provide additional energy and nutrients to support growth and development (6, 9). Apart from breast milk, other milk formulas are also used to provide nutritional needs for infants who are not breastfed (9).Thus, promotion of appropriate infant and young child feeding practices is fundamental to achieve a child's nutritional needs for optimal growth and development and consequently reducing child undernutrition and mortality (2).

The World Health Organization (WHO) (10, 11) recommends that all infants should be initiated with breastfeeding within one hour of birth and exclusively breastfed from birth until 6 months of life. Thereafter, infants should be introduced to nutritionally adequate and safe complementary foods with continued breastfeeding up to two years or beyond. These recommendations comply with the global strategy to improve infant and young feeding practices. The Global strategy for infant and young child feeding emphasized the need for comprehensive national policies on IYCF, ensuring that all health services protect, promote and support appropriate breastfeeding and complementary feeding practices (6). Some of the policies recommended include implementation of the International Code of Marketing of Breast milk substitutes, the Baby Friendly Hospital Initiative (BFHI), and the Maternity protection. The International Code of Marketing of Breast milk substitutes provide guidelines for the marketing of breast milk substitutes and use of bottles (12). The BFHI is a worldwide programme that supports optimal breastfeeding practices. The programme was launched by the World Health Organization and UNICEF in 1991 (13, 14), following the adoption of the

Innocent Declaration on breastfeeding promotion in 1990 (15) .The BFHI is a global effort to ensure that all maternity became centres for protecting, promoting and supporting breastfeeding, in accordance with the International Code of Marketing of Breast milk Substitutes (12). The BFHI also aims to increase the numbers of infants who are exclusively breastfed worldwide, as a goal that could contribute to reduction of millions of child deaths every year (16).

In response to global recommendation, Tanzania has implemented a number of different initiatives to improve IYCF practices, such as the National Strategy and Implementation Plan on Infant and Young Child Nutrition, the Baby Friendly Hospital Initiatives (BFHI), and training programmes for health workers on infant and young child feeding counselling skills (17). For example, the BFHI was introduced in 1992 with the aim of improving the quality of health care that are provided and reducing morbidity and mortality among women and children. A number of activities have been conducted to ensure the aim of BFHI is met in the country. These include training of trainers and counsellors in lactation management and infant feeding in the context of HIV; creation of BFHI assessors both at national/regional and district levels; development of training manuals and counsellors job aids; establishing the National Regulation of Breast-milk substitutes and maternity protection act (4, 17). Despite these efforts, rates of breastfeeding (BF) and complementary feeding (CF) indicators remain suboptimal in Tanzania as in many other low and middle-income countries (18) highlighting a need to identify and explore factors that can aid in recognizing the individuals or the population groups at risk of having suboptimal IYCF practices.

1.2 Breastfeeding practices

1.2.1 Definitions of breastfeeding practices and indicators

Breastfeeding (BF) is the feeding of an infant or young child with breast milk direct from the breast or expressed (19) and breastfeeding practices refer to the practices to be followed in breastfeeding a baby (20). The World Health Organization (WHO) (21) and the American Academy of Pediatrics (AAP) (22), recommend breastfeeding as the preferred method of feeding a baby because of its health benefits to both the child and mother. For the baby 0-5

months of age, breast milk provides almost all the necessary nutrients to meet growth needs (23) and several immunological factors to protect against infections and reduce mortality (23-25). Optimal breastfeeding is effective in protecting infants from common childhood illnesses such as diarrhoea, pneumonia and other respiratory infections (26-28), the primary causes of child mortality worldwide (29).

The health benefits for breastfeeding mothers include lactation amenorrhea, early involution of the uterus, and enhanced bonding between mother and infant (23). Breastfeeding is less expensive than breast milk substitutes (23) from an economic perspective. In addition, breast milk is readily available at any hour of the day or night (22), and remains an important food until the children are two years (30). In light of these benefits, the new WHO infant feeding guidelines (6) recommend that infants should be initiated early on breastfeeding within one hour after birth; be exclusively breastfed from birth until 6 months of life; and to continue with breastfeeding for up to 2 years or beyond to achieve optimal growth and development of infants.

The WHO has developed two guidelines of indicators for assessing infant and young child feeding practices. The main purpose of developing these indicators was to have a common set of measures to assess IYCF practices, which can be used to collect data to evaluate the progress of promotional programmes. The first guideline was published in 1991 and it provided a set of indicators for assessing breastfeeding practices (see Table1:1 below) and only one indicator for complementary feeding i.e. the timely complementary feeding rate. This indicator provided information about whether complementary foods were consumed, but not about the quality or quantity of those foods. In response to concerns about lack of adequate indicators of complementary feeding, in 2002 WHO began a process to review and develop indicators of complementary feeding practices, which were validated in 2004 to reflect dietary quality and quantity, using existing data sets from 10 different sites in developing countries. The development of these indicators were finalised and in 2008, WHO published the new guideline with fifteen indicators (eight core and seven optional) which are currently being used to assess infant and young child feeding practices (10).

The core list includes new indicators for dietary diversity, feeding frequency and minimum acceptable diet among children aged 6-23 months. The new guidelines also provide additional information such as the acceptance of Oral Rehydration Solution (ORS) in the exclusive breastfeeding category. There was also some updated information on the criteria for inclusion in infants age e.g. exclusive breastfeeding is currently recommended for 6 months which was changed from 4 months. Similarly, introduction to complementary foods is now recommended to start at 6-8 months instead of 4-6 months. The changes in age group were also made on other indicators like early initiation of breastfeeding within one hour of birth; ever breastfed rate and bottle feeding (Table1:1). Some optional indicators in the 1991 guidelines (e.g. early initiation of breastfeeding within one hour of birth) are currently recommended as key indicators due to its protective effects against gastrointestinal infections (31) and reduction in the risk of neonatal deaths (1). More information regarding the guideline for assessing infant and young child feeding are outlined in the WHO documents (10, 11, 21).

Table1:1 Definition of infant and young child feeding indicators according to World Health Organization in 1991 and 2008

Indicator	1991 guideline	2008 guideline
Early initiation of breastfeeding**	Proportion of infants <12 months who first suckled within one hour of birth.	Proportion of children born in the last 24 months who were put to the breast within one hour of birth.
Ever breastfed rate	Proportion of infants <12 months who were ever breastfed.	Proportion of children born in the last 24 months who were ever breastfed.
Exclusive breastfeeding **	Proportion of infants <4 months who are fed exclusively on breast milk	Proportion of infants 0-5 months of age who are fed exclusively with breast milk.
Predominant breastfeeding*	Proportion of infants <4 months whose main source of nourishment is breast milk but receive other fluids.	Proportion of infants 0-5 months of age who receive breast milk as the predominant source of nourishment but also receive other fluids except non-human milk and food-based fluids.
Introduction of complementary foods**	Proportion of infants 6-9 months who are receiving complementary foods in addition to breast milk.	Proportion of infants 6-8 months of age who receive soft, semi-solid or solid foods.
Minimum dietary diversity**		Proportion of children 6-23 months of age who receive foods from 4 or more food groups
Minimum meal frequency**		Proportion of breastfed and non-breastfed children 6-23 months of age who receive soft, semi-solid or solid foods but including milk feeds for non-breastfed children) the minimum number of times or more.

Minimum acceptable diet**		Proportion of children 6-23 months of age who receive a minimum acceptable diet apart from breast milk.
Continued breastfeeding at 1 year**	Proportion of children 12-15 months who are breastfed.	Proportion of children 12-15 months of age who are fed breast milk.
Continued breastfeeding at 2 years*	Proportion of children 20-23 months who are breastfed.	Proportion of children 20-23 months of age who are fed breast milk.
Bottle feeding*	Proportion of infants <12 months who are receiving any food or drink from a bottle.	Proportion of children 0-23 months of age who are fed with bottle.
Consumption of iron-rich or iron-fortified foods**		Proportion of children 6-23 months of age who receive an iron-rich food or iron-fortified food that is designed for infants and young children, or that is fortified in the home.
Age-appropriate breastfeeding		Proportion of children 0-23 months of age who are appropriately breastfed.
Exclusive breastfeeding rate by mothers	Proportion of infants up to 4 months who are exclusively breastfed by their natural mother	

Note: ***** *refers to core indicator in 1991 guideline and* ***** *refers to core indicator in 2008 guideline*

1.2.2 Early initiation of breastfeeding

"*Early initiation of breastfeeding within one hour of birth*" refers to the process of putting a newborn baby on breast immediately after birth. Early initiation of breastfeeding within one hour of birth is vital as it facilitates emotional bonding of the mother and the baby (5) , determines the successful establishment of breastfeeding (5), and has a positive impact on duration of exclusive breastfeeding (32).

Furthermore, early initiation of breastfeeding within one hour protects the newborn from acquiring infection and reduces mortality in the newborn (33). A large cohort study undertaken in rural Ghana concluded that 22% of neonatal deaths could be prevented if all infants could be put to the breast within the first hour of birth (34). Similarly, a reduction of child deaths from 13 million globally in 1990 to 8.8 million in 2008 have been noted as partly due to the adoption of basic health interventions such as early initiation of breastfeeding (35).

In spite of these benefits, in many developing countries early initiation of breastfeeding rates were still unsatisfactory as compared to developed countries. The rates of early initiation of breastfeeding within one hour of birth in developed countries are high and range from 75% in United States (36) to 92% in Australia (37). In contrast only one third of mothers initiated breastfeeding within the recommended first hour of birth in developing countries (38). According to Dibley et al (39) rates of timely initiation of breastfeeding among infants in some developing countries varied from 32% in Indonesia to 46% in Timor-Leste. Data from Pakistan revealed that early initiation of breastfeeding rate was only 27.2% for all newborns in 2007 (40). In most Sub-Saharan African countries levels of early initiation of breastfeeding within one hour of birth were below 60 per cent (11).

Early initiation of breastfeeding within one after birth is one of strategy being promoted in Tanzania (4) for reducing under-five mortality rate in order to achieve the fourth Millennium Development Goal (MDG) by 2015 (41). Recent data shows that breastfeeding was universal in Tanzania (8). However, only 46.1% of infants were breastfed within one hour of birth (8),

which is below the national target of 80% for reducing infant mortality rate. Improved health care delivery systems and adequate health support such as breastfeeding counselling services to mothers could be the possible reason for higher early initiation of breastfeeding rates in many developed countries compared to inadequate health services in many developing countries.

1.2.3 Exclusive breastfeeding (EBF)

"*Exclusive breastfeeding*" means feeding infants only breast milk from the mother (either directly or expressed) and no other liquids or solids with the exception of Oral Rehydration Solution (ORS), drops of syrup consisting of vitamins, mineral supplements or medicine prescribed by a medical doctor (10). WHO (6) made a global recommendation that all infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health (6). Thereafter, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to 24 months or beyond. The current recommendation to continue exclusive breastfeeding from birth up to 6 months as opposed to the previous recommendation for exclusive breastfeeding (EBF) up to 4 months was based on scientific evidence showing that, exclusive breastfeeding up to 6 months has the largest potential impact on reducing mortality from the two biggest contributors of infant deaths:- diarrhoea and pneumonia (1).

Benefits of exclusive EBF for 6 months compared to partial or non-exclusive breastfeeding have been extensively documented worldwide (1, 31, 42). Exclusive breastfeeding during the first 6 months of life reduces morbidity and mortality among infants and young children (1, 31, 42). Furthermore, it has been established that the deaths of 10% to 15% of children under 5 years of age in resource-poor countries could be prevented through EBF alone (1).

A recent analysis of maternal and child undernutrition in developing countries by Black et al (1) established that non-exclusive breastfeeding in the first 6 months of life results in 1.4 million deaths and 10% of disease burden in children younger than 5 years of age. Furthermore, Black et al (1) found that the relative risks of all-cause mortality and pneumonia incidence were

significantly higher for non-exclusively breastfed infants. In addition, the study conducted by Kulwa et al (43) in Dar es Salaam region concluded that, most stunted children (88%) were not exclusively breastfed for the first 6 months. A pooled analysis by the WHO Collaborative Study Team (44) found that the risk of death from diarrhoea among partially breastfed infants aged 0–6 months was 8.6 times higher compared to the risk for exclusively breastfed children. For those who received milk formulas, the risk of death was 25 times higher than those who were exclusively breastfed (45).

Despite the benefits conferred by breastfeeding, "exclusive breastfeeding for 6 months" as recommended by WHO (6) is still not widely practiced. The rates of EBF at 6 months are low in both developed and developing countries. The global rate of exclusive breastfeeding infants under 6 months of age is estimated to be less than 40% (29) and only 39% of infants in the developing world were exclusively breastfed (2). Despite high rates of initiation of BF, EBF rates at 6 months in many developed countries were also very low. For example, only 12%, 7% and 14% of all infants aged 0-5 months were exclusively breastfed in United States (36), United Kingdom (46) and Australia (37) respectively.

According to UNICEF (2), the percentage of infants aged 0-5 months who were exclusively breastfed in Sub-Saharan Africa was only 30% which falls below the 90% target which is associated with reduction of 10% of under-five mortality rate in developing countries (31). In Tanzania, EBF among infants under 6 months was 50% (8). Although this rate seems to be better than the rates for other countries given above, this rate is still below the national target of 90% (4). Further, data also indicated that younger infants (<2 months) are more likely to be exclusively breastfed than those aged 4 to 5 months in Tanzania (70% vs. 13%) (8).

The practice of exclusive breastfeeding has been documented to vary across geographical regions of Tanzania. Poggensee et al (47) found EBF was inadequate in South Western Tanzania, as only 19% of all infants aged 0-5 months were exclusively breastfed. In a cross-sectional study of children under 3 years Kulwa et al (43) found that, the rate of EBF was very

low (9%) in urban Dar es Salaam region. Other studies in Igunga and Mbulu districts revealed that EBF was only practiced for the first two to four months respectively (48, 49). Similarly, Shirima et al (50) reported that EBF was not widely practiced in either the rural or urban areas of Morogoro region, suggesting that many infants were introduced to solid foods early before 6 months of age because mothers reported to have insufficient milk and they perceived that the nutritional needs of infants would not be met by breast milk alone.

1.2.4 Predominantly breastfeeding

"*Predominantly breastfeeding*" as defined by WHO (10) refers to practice of feeding infants with breast milk as their predominant source of nourishment and also the giving of other fluids such as plain water, glucose water, fruit juice, tea, Oral Rehydration Solutions (ORS) and drops or syrup of vitamin and/or mineral supplements (10). Giovannini et al (51) recently reported that breastfeeding with supplementation of glucose water before 6 months of age was associated with short duration of breastfeeding in Italy. Further predominant breastfeeding is not the best breastfeeding practice for children 0-5 months compared to exclusive breastfeeding as it is less effective in protection against infections which contribute to infant's mortality. According to Black et al (1) the relative risk of diarrhoea and pneumonia mortality among infants in developing countries were 2.3 to 3.1 higher for predominantly breastfed infants than those being exclusively breastfed during the first 6 months. The practice of predominant breastfeeding has been also found to be associated with increased risk of diarrhoeal infections in Peru and Zimbabwe (52, 53), which could be due to poor preparation of fluids like fruit juice and milk formula under unhygienic conditions.

Despite these limitations, predominant breastfeeding is widely practiced in many countries. For example, in Italy about 43% of infants under 6 months were predominantly breastfed (51).The proportion of children aged 0-23 months who were introduced to breast milk substitute before 6 months in New South Wales Australia during 2007-2008 was 54.4% (54). Estimate showed that, most of the infants in developing countries were predominantly breastfed and the highest prevalence (above 70%) were observed in Chad, Niger, Nigeria, Burkina Faso, Cameroon,

Congo Brazzaville, Kenya and Viet Nam (11). The rate of predominantly breastfeeding in Tanzania was approximately 23% in 2005 (55) but reduced to 16% in 2010 (8). However, these rates are still above the national target of 10% that is aimed to of reduce infant mortality rates.

1.2.5 Factors affecting breastfeeding practices

Breastfeeding has been found to be influenced by many factors such as individual, household, community, socio-cultural attributes, perceptions, attitudes and behaviours. The aim of thesis was to determine the individual, household and community-level factors affecting breastfeeding and complementary feeding practices. Therefore, the present chapter focused on the literature for individual-, household- and community-level factors affecting breastfeeding practices. Table 1:2 shows the summary of individual-, household-, and community-level factors that has been reported to affect early initiation and exclusive breastfeeding practices.

Table 1:2: Summary of factors that affect breastfeeding practices

Individual-level factors	Household-level factors	Community-level factors
Maternal young and old age	Household wealth index	Area of residence
Marital status		Regional differences
Level of education		
Maternal work		
Lack of antenatal services		
Parity		
Infant's gender		
Place of delivery		
Caesarean delivery		
Unprofessional delivery assistance		

1.2.5.1 Individual-level factors influencing breastfeeding practices

The individual-level factors that influence breastfeeding practices ("Early initiation of breastfeeding" and "Exclusive breastfeeding") are well established and include maternal age, maternal level of education, marital status, maternal work status, antenatal visits, place of delivery, mode of birth delivery, maternal nutritional status (as measured by Body Mass Index (BMI), infants gender and parity.

Maternal age

Maternal age has been well documented as a strong individual factor that influences early initiation of breastfeeding and exclusive breastfeeding (56-61). A prospective study of determinants of breastfeeding in Athens Greece found that young mothers (<25 years) were less likely to initiate breastfeeding within one hour of birth (62). Similarly, researchers found that the odds of exclusive breastfeeding increased with maternal age (56, 58, 63), but the rate of exclusive breastfeeding (EBF) in these studies were for infants aged less than 4 months only in Canada, Norway and Italy. Researchers in Bangladesh and Philippines found that increasing maternal age of 30 years or above was a risk factor for non-exclusive breastfeeding in the first 6 months of an infant life (59, 60).

However, the opposite association was reported in Ghana by Solomon (64) in that mothers aged between 30 and 35 years were more likely to exclusive breastfeed their infants during the first 6 months than younger mothers. In addition, both younger (<25 years) and older (>36 years) maternal age were found to be negatively associated with exclusive breastfeeding in Nigeria (65). Literature suggests that older mothers are more likely to breastfeed their infants in the same way that they fed other siblings (66). Lack of experience and inadequate knowledge to breastfeed might be the possible reason for young mothers not to manage to comply with EBF during the first 6 months (67) This suggests that maternal age is a strong predictor of breastfeeding practices and it is important to understand which group of mothers in Tanzania (young or older) do have poor breastfeeding practices since the findings from studies in other countries are not consistency in terms of direction of the impact of maternal age on BF practices.

Maternal education

The influence of maternal level of education on initiation of breastfeeding and exclusive breastfeeding has been well established in both developing and developed countries. In a prospective study of determinants of breastfeeding in Athens Greece and Netherlands,

Theofilogiannakou et al (62) and Rossem et al (68) found that mothers with collage/university education level had higher probability to initiate breastfeeding within one hour of birth than those with primary school education . Findings from a cross-sectional study of 2383 mothers with infants aged 0-5 months carried out in Norway showed that exclusive breastfeeding was more frequent among mothers who completed tertiary or collage education compared to those with primary school education only (56% vs. 27%) (56).

Venancio and Monteiro (69) also found a positive correlation between exclusive breastfeeding rate and higher level of maternal education (secondary and tertiary levels) in their study on individual and contextual determinants of exclusive breastfeeding in Brazil. They found that the odds of exclusive breastfeeding under 6 months were 2 times higher for infants of mothers with complete secondary and tertiary education than infants of mothers with incomplete primary education.

Studies in developing countries have however, shown contradictory results regarding influence of maternal education on exclusive breastfeeding. Higher level of maternal education was observed to be positively associated with exclusive breastfeeding in some Asian and African countries like Bangladesh, Timor-Leste, Vietnam, Cambodia, Botswana, Ghana and Nigeria (59, 64, 65, 70-73). Conversely, Tan K (74), Alemayehu et al (75) and Chudasama et al (76) found negative association between higher level of education and exclusive breastfeeding practices in Malaysia, India and Ethiopia. These studies reported that mothers with lower level of education have higher rates of exclusive breastfeeding than mothers with higher level of education. The reason thought was when women are better educated, the opportunity for employment is eminent and thus the opportunity to stay home and practice EBF is compromised (75). Interestingly, maternal education did not show any significant association on exclusive breastfeeding in other cross-sectional studies despite the fact that this variable was adjusted with other confounders such as maternal age, place of delivery and employment status (77-79).

Marital status

Marital status is another individual-level variable found to influence breastfeeding. This factor revealed inconsistent findings from both developed and developing countries. According to Collen and Pinelli (80), married women across Canada, the United States, Europe and Australia had a higher incidence of breastfeeding initiation immediately after delivery. A qualitative study of 2383 Norwegian infants aged 6 months (56) indicated that cohabitants/ non-married women were less likely to exclusive breastfeed their infants in the first 4 months than married mothers. In contrast mothers who were not married in Ethiopia were 2 times more likely to exclusively breastfeed their infants for the period of 6 months than married women (75). Despite being adjusted with other potential confounders, marital status did not indicate a significant influence on exclusive breastfeeding in other studies conducted in Botswana and Nigeria (65, 77). However, it has been suggested that women who are not married have inadequate support from families or communities, which causes poor infant feeding practices (74, 81). Thus provision of infant feeding support to all mothers remains critical (6, 82).

Maternal working status

For many working women, employment is essential for the economic survival of their families while they also fulfil their role of providing nutrition to their babies through breastfeeding. However, maternal working status is a critical variable with strong influence on breastfeeding practices. Worldwide, investigations reveal that maternal work outside the home is a strong predictor of breastfeeding success. Data from Organization for Economic Co-operation and Development (OECD) countries indicate that return to work is a main reason why some mothers never start breastfeeding or only breastfeed for short duration (83). Many mothers in United States (U.S) stop breastfeeding as soon as they return to paid work (84). Further, Dibley et al (39) determined that working mothers in East and Southeast Asia were less likely to fully exclusive breastfeed up to 6 months because of the demand to return back to work after maternity leave.

Researchers in Africa have also demonstrated a similar association where the prevalence of EBF at 6 months was significantly higher among infants of unemployed than those of employed mothers (64, 85). In a cross-sectional study among 444 working mothers in Nairobi Kenya, Lakati et al (85) found that the rate of EBF was only 13% at 3 months because that was the period when working mothers had maternity leave. Women in the African culture including Tanzania are thought to be the primary child-care providers in the home while men will participate in various activities outside home to ensure they provide adequate income to meet their family needs such as food, clothing and medical services for all family members (67, 85, 86). The situation is slightly changing nowadays due to economic hardship and many mothers work outside their home engaging in different economic activities to improve their family income. This change has made women's work limiting the time available for childcare including breastfeeding (85). The main question for Tanzania today is whether women's work may have a negative or positive impact on infant feeding practice.

Antenatal visits

Antenatal contact with health professionals has been recognized as an important factor that helps to build confidence of women to establish and sustain breastfeeding. In a cross-sectional study conducted in Brazil (87) mothers who got guidance on breastfeeding during pre and post natal visits presented higher rates of early initiation of breastfeeding than mothers who did not get any counselling. Dibley et al (88) completed a cross-country comparison of selected infant feeding indicators and associated factors in four South Asian countries. They consistently found higher rates of timely initiation of breastfeeding among mothers who had made some antenatal care visits or were seen by a health care provider at home during pregnancy. Few studies have established a positive influence of antenatal visits on initiation of breastfeeding in Africa (89, 90). It appears that antenatal clinic visits are helpful in promoting initiation of BF.

Similarly, the association between antenatal visits and exclusive breastfeeding has been reported worldwide. However, results seem to vary among studies. For example, some studies found higher number of antenatal visits made by mothers during pregnancy was significantly

associated with non-exclusive breastfeeding in Brazil and Nepal (72, 79, 91), and the opposite was true in other countries such as Bangladesh, India, Philippines and Sri Lanka (60). One possible reason regarding noncompliance with EBF among mothers who made some antenatal clinic visits is that that these women were more educated and might have returned to their jobs after maternity leave (79). Data on influence of antenatal visits on exclusive breastfeeding practices is lacking in many parts of Africa including Tanzania.

Place of delivery

Place of delivery refers to where a mother delivered her children and it ranges from giving birth in own home, home of traditional birth attendant, and health facilities of different levels. The association between place of delivery and breastfeeding practices has been documented in most studies conducted in developing countries (39, 71, 72, 78, 92). For example, a recent study in Southeast Asia reported that mothers who delivered their babies at health facilities had higher odds of early initiation of BF than those mothers who delivered their babies at home (88).

Furthermore, results from a number of cross-sectional studies in India, Ghana and Malawi (71, 72, 78, 92) do suggest that hospital delivery favours exclusive breastfeeding and this could be due to the fact that mothers who gave birth at health facilities made some antenatal clinic visits during pregnancy and got some appropriate breastfeeding information from antenatal care staff (77). The association of place of delivery and initiation and exclusive breastfeeding from birth up to 6 months of infant's life has not been established in Tanzania. However, this factor is critical to consider as most of deliveries (53%) take place at home in Tanzania (8, 55).

Caesarean delivery

Mother's who deliver by caesarean section might encounter difficulties to initiate breastfeeding during the first hour of delivery if they do not get adequate support from health workers (93). The negative association between caesarean delivery and poor breastfeeding practices has been well documented in both developed and developing countries. In a cross-sectional survey of

2669 mothers in Western Australia, Hauck et al (94) revealed that caesarean birth was independent predictor of non-exclusive breastfeeding at 9 weeks after hospital discharge.

Furthermore, findings from a multilevel analysis of factors influencing breastfeeding practices in Asia showed that caesarean delivery was a consistent factor negatively associated with early initiation of breastfeeding in India, Nepal and Sri Lanka (88). Also in 2008, Nakao et al (95) showed that full breastfeeding infants to four months of age was affected by caesarean section in Japan. Few studies have confirmed negative influence of caesarean delivery on exclusive breastfeeding practices during the first 6 months of infant's life (60). However, Agho et al (77) found no correlation between mode of delivery and breastfeeding in Nigeria, and knowledge about the influence of mode of delivery and breastfeeding is lacking in Tanzania.

Some authors who found negative association between mode of delivery and breastfeeding believe that, even with hospital practices with favouring breastfeeding practices, birth by caesarean section is a significant barrier that inhibits breastfeeding within one hour of life (96, 97). However, evidence shows that breastfeeding can be initiated immediately even after a caesarean delivery as long as the mother is supported to start breastfeeding as early as possible (98). This factor could be challenging especially in health facilities with a shortage of health workers and those with inadequate skills to support mothers including post caesarean mothers to establish timely initiation of breastfeeding immediately after birth. Currently more than 7% of Tanzania women (8) deliver by caesarean, necessitating the need for studies to determine the relationships between mode of delivery and breastfeeding outcomes.

Type of delivery assistant

The assistance that mothers get during labour depends on place of delivery and can influence breastfeeding practices (59, 77-79). For example, if delivery takes place in hospital/health facility, mothers are assisted by trained health professionals, unlike home delivery where most mothers are supported by either Traditional Birth Attendants (TBA) or untrained persons (friend or relative) in most developing countries in Asia and Africa. This aspect is of concern especially

in resource-poor countries like Tanzania where most births are attended by TBAs and relatives or friends.

In exploring the determinants of infant and young child feeding practices in Bangladesh, Mihrshahi et al (59) reported that mothers who were assisted by TBA or untrained person (friend/relative) were more likely not to exclusive breastfeed their infants in the first 4 months. Moreover, mothers who were assisted by health professional had significantly higher rates of timely initiation of breastfeeding and exclusive breastfeeding than those assisted by TBAs or untrained person in India, Nepal and Nigeria (77-79). Inadequate information on breastfeeding management such as proper positioning and attachment of infant on breast to establish breastfeeding could probably be the possible reasons for poor breastfeeding practices among mothers who give birth at home and assisted by their relatives and TBAs. For example, Agnarsson and other authors (49) conducted an assessment of infant feeding practices in infants aged 0-6 months in rural areas of Igunga district in Tanzania. They reported that none of the mothers who reported to be assisted by either their grandmothers or TBAs during delivery received any instructions or support regarding positioning of the baby on the breast to initiation breastfeeding soon after birth.

Parity

Parity means number of birth woman has given. Women who gave birth once are referred to as primiparous mother while multiparous mother refers to woman having given birth two or more times. The influence of parity on initiation and exclusive breastfeeding practices is not widely cited and the results seem to be inconsistent across countries. In the Third National Health and Nutrition Examination Survey, Li et al (99) concluded that multiparous women in US were less likely to initiate breastfeeding. Studies from Australia showed that primiparous is a risk factor for exclusive breastfeeding (94, 100, 101). In these studies, they found that infants of primiparous mothers were more likely to be given infant formula (100, 101) and less likely to be exclusively breastfed at hospital and in nine weeks postpartum (94). Although primiparous mothers have been observed to have poor breastfeeding practices, it would be important to

consider that these are mothers of first child and they may have difficulties in establishing and sustaining breastfeeding if they lack support (101). Other research studies which have adjusted this variable in the model for initiation and exclusive breastfeeding have failed to show significant association in South eastern Asia, Nigeria and Ghana (71, 72, 77, 88).

Maternal nutritional status

Maternal nutritional status as measured by Body Mass Index (BMI) has been a public health concern in many countries due to its impact on women's decision and ability to breastfeed successfully (6, 99). Body Mass Index is a simple index of weight-for-height that is commonly used to assess nutritional status of individuals. BMI is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2) (102). The World Health Organization has classified BMI for adults into 4 categories: underweight (BMI< 18.50 kg/m^2), normal weight (BMI 18.50-24.99 kg/m^2), overweight (BMI ≥25.00 -29.99 kg/m^2) and obesity (BMI ≥30.00 kg/m^2) (102).

There is now substantial evidence linking maternal BMI and poor breastfeeding outcomes. A systematic review by Amir and Donath (103) found that obese women were less likely to initiate breastfeeding. In 2010 Liu et al (99), compared breastfeeding practices between normal-weight and obese women in United States. They also found that, obese women were less likely to initiate BF (AOR= 0.63, 95% CI 0.52 to 0.94) compared to normal weight women. It has been suggested that the negative association between obesity and delay initiation of breastfeeding could be due to fact that some obese mothers have complicated labour which resulted to caesarean section (104). Belief that breastfeeding could increase postpartum weight was found also to be the reason for poor breastfeeding among overweight and obese women (105). In contrast, high maternal BMI appears to have no relationship with infant feeding in some cultures. For example, indigenous women in Canada with high levels of overweight and obesity were observed to have high levels of breastfeeding (80).

There is limited research on the association between maternal underweight and breastfeeding practices worldwide. Giovannini et al (106) investigated the relationship between low pre-pregnant BMI and breastfeeding practices among 1272 women in Italy. They found no relation between low maternal BMI and initiation of breastfeeding within one hour of birth. Pandey et al (79) found that infants of underweight mothers (BMI <18.50 kg/m^2) in Nepal had low rates of exclusive breastfeeding in the first 6 months of life compared to those infants of normal weight mothers. These results were not significant in multivariate analysis an adjusted for other potential confounders like maternal age, employment status, household wealth status, and area of residence. However, the results predict the link between low maternal BMI and breastfeeding practices which need to be further investigated in different populations considering the fact that undernutrition is a public health problem in many developing countries.

For instance, in Tanzania malnutrition among mothers, especially in rural areas, is a common phenomenon. The commonest types are underweight and anaemia due to malaria and nutritional deficiencies; and iodine deficiency disorders. According to TDHS in 2005, 19 percent of women of reproductive age are underweight in Tanzania, and the prevalence of anaemia among pregnant and lactating women is 48% (55, 107).

Infant's gender

It has been established that, infants gender is associated with breastfeeding practices especially EBF. Being a girl infant seems to be favoured by exclusive breastfeeding than being a boy (56, 59, 69, 77). In the Norwegian Infant Nutrition Survey, Lande et al (56) found that girls infants had significantly higher odds of being exclusively breastfed that boys (p=0.03). Similarly, results from a study on determinants of exclusive breastfeeding in Nigeria, Agho et al (77) found that female infants were more likely to be exclusively breastfed than male infants (AOR=2.13, 95%CI=1.03-4.39). There is no literature on the influence of infant's gender on breastfeeding practices in Tanzania.

Some authors (69) discussed the possibility of there being a belief among mothers that boy infants have greater nutritional needs, and thus required complementary feeding an earlier age. It is therefore necessary to educate mothers that during the first 6 months of life breast milk alone is sufficient to provide adequate nutrients to meet optimal growth and development of infants regardless of their gender. However, it is important to consider this factor in the African culture since some families tend to value a boy child and when women give birth to the desired gender they are supported for optimal breastfeeding practices.

1.2.5.2 Household-level factors associated with breastfeeding practices

Household wealth index-poor

It is generally believed that wealth contributes to improved quality of lifestyle in terms of both feeding and attainment of better social services such as education and health care. Similarly, the household with higher wealth would be likely to provide adequate care and support for lactating mothers to have optimal breastfeeding practices. For example, a lactating mother from a household with higher wealth is likely to be provided with adequate nutritious foods which in turn enable her to produce sufficient breast milk for her infant. However, this might not guarantee good breastfeeding among mothers from households with higher wealth index since studies have indicated inconsistent association between household wealth and breastfeeding practices.

Mihrshahi et al (59) found that mothers from wealthier households in Bangladesh had higher rates of timely initiation of breastfeeding than those from poor households. It has also been reported that infants of mothers from wealthier households were less likely to be exclusively breastfed than those from poorest families in Timor-Leste and India (70, 88). Conversely, infants from poorest households in Nigeria were less likely to EBF compared to infants from middle-level (AOR=2.45, 95% CI=1.06-5.68) and wealthiest households (AOR=1.15, 95% CI-0.28-6.69) (77).The association between household wealth and breastfeeding practices has not been documented in Tanzania.

1.2.5.3 Community-level factors associated with breastfeeding practices

Community level factors that have been found to be associated with breastfeeding (BF) practices include area of residence and geographical/ecological zones (88, 108).

Area of residence

Available literature indicates inconsistent results regarding the association between area of residence and breastfeeding practices. In a cross-country comparison of selected factors associated with feeding practices, researchers (88) found that living in urban areas was a risk factor for lower rates of timely initiation of breastfeeding in Bangladesh and lower exclusive breastfeeding in India. In contrast, other investigators (70) revealed that mothers who lived in the rural west region of Sri Lanka were significantly less likely to exclusive breastfeed than those from urban areas in Timor-Leste (OR=3.2; 95%CI: 1.70-5.86; $p < 0.001$). Furthermore, Shirima et al (109) found that urban residence was positively associated with duration of exclusive but not predominant breastfeeding in Morogoro Tanzania.

Regional differences/Ecological zones

Breastfeeding practices have been established to vary across regions/ ecological zones in many countries (77, 88, 110), which might be due to cultural differences. For example, an Australian study by Dahlen and Homer (110) found that Chinese mothers in Perth initiated breastfeeding early and exclusive breastfed their infant's more than Australian mothers, despite living in the same geographical region. Researchers from Bangladesh, India and Nepal have indicated correlation between geographical differences /ecological zones and exclusive breastfeeding practices (59, 78, 79). They found that, living in Sylhet, Khulna or Raishahi in Bangladesh, living in Midwestern in Nepal and living in Northeastern, Southern or Western regions of India influenced higher rates of timely initiation of breastfeeding and exclusive breastfeeding. Poor coverage of child health services such as immunization and traditional beliefs were reasons sought to account for these geographical differences in infant feeding practices (49, 78).

In addition, a study done in Nigeria by Agho et al (77) showed that mothers who lived in the North Central geopolitical region were more likely to exclusively breastfeed their babies than those mothers lived in other North East, North West, South East and South West regions. Some researchers (59, 78) have argued that, the discrepancies on breastfeeding practices across geographical regions could be due to different cultural practices existing across different regions in many countries. The association between geographical regions and breastfeeding practices may exist in Tanzania as the country is big with diverse social and cultural settings.

1.3 Complementary feeding practices

Complementary feeding (CF) refers to the process of introducing foods and liquids into a child's diet when breast milk is no longer sufficient to meet the nutritional requirements for optimal growth and development (111). An infant's need for energy and nutrients starts to exceed what is provided by breast milk alone from the age of 6 months, and complementary feeding becomes necessary to fill the energy and nutrient gap (11, 112). The complementary feeding indicators "Introduction to soft, semi-solid or solid foods", "Minimum dietary diversity", "Minimum meal frequency" and Minimum acceptable diet" described in this literature are based on 2008 WHO guidelines (10) as outlined earlier in Table1:1.

1.3.1 Introduction to complementary foods

The timely introduction of appropriate complementary foods promote growth and good nutritional status in infants and young children (113). Introduction to complementary foods refers to the time when infants start to receive soft, semi-solid or solid food after 6 months of life while continuing breastfeeding up to 2 years or beyond. In the 1991 guideline for assessing IYCF indicators (114) , there was only one indicator reflecting complementary feeding-"*timely complementary feeding*" which measured the proportion of children aged 6-9 months who received breast milk and complementary foods. This indicator provided information about whether complementary foods were consumed during the past 24 hours in the 6-9 months age group and covered only breastfed children.

The lack of information on other important aspects of feeding such as the quality of the diet as dietary diversity made application of this indicator quite limited. It is on this basis that this indicator was revised to reflect the age range of 6-8 months and to include both breastfed and non-breastfed in the current guideline (10). In addition, three new globally agreed indicators for complementary feeding were introduced. These indicators better reflect the quality and quantity of food given to children aged 6-23 months, which include: *minimum dietary diversity, minimum meal frequency and minimum acceptable diet*.

A country profile report for data on infants and young child feeding indicators by WHO, 2010 indicates that, the prevalence of timely introduction of complementary foods varies in many developing countries (11). The rate of introduction of complementary foods in South Asian countries is estimated to range from 56.7% in India to 93.4% in Sri-Lanka (88). In African countries the rates of introduction to complementary foods are estimated to be 80.6% in Kenya, Uganda (75%), Zambia (90.3%) and Malawi (82.9%) (11). In Pakistan the rate of introduction to complementary foods was low (36.3%) compared to other African countries (40). For Tanzania about 79% of infants are introduced to complementary foods at 6 months (11).

Poor complementary feeding practices such as too early and too late introduction to complementary foods do exist. Too early introduction of complementary foods before 6 months pre-dispose infants to reduced protective benefits of breast milk and more often the complementary feeds if contaminated with pathogens contribute to high levels of infant and childhood undernutrition, morbidity and mortality (115). Furthermore, introducing infants early with complementary foods is discouraged, as it is believed to be associated with excessive weight gain, which may results to childhood obesity in developing countries (116).

Despite these risks, early introduction of complementary foods is widely practiced both in developed and developing countries for various reasons such as insufficient breast milk (117), demand to return to work among employed mothers (59) and misconception that breast milk alone is not enough to fulfil infant's hunger (118). The European literature on complementary

feeding showed that high rates of infants are introduced to complementary foods and infant formulas before the age of 4 months (56, 119, 120). For example, in United Kingdom 55% of infants were introduced to solid foods by 3 months of age (121). The rate for early introduction of complementary foods in Australia was estimated to be 48.3% for children aged 0-23 months (54). In other industrialized countries rates of early introduction of complementary foods ranged from 16.4% in Germany (119) to 21% in Norway (56).

Hotz and Gibson (118, 122) found that complementary feeding began early in Malawi and most of the complementary foods was mainly made from maize starch. Similarly, Mamabolo et al (123) found that supplementary feeds were being introduced at an early age in South Africa, with 56% of the infants receiving thin maize porridge by the end of the first month. According to TDHS 2004-05, complementary feeding starts at an early age in Tanzania and was recorded in 7% of infants under the age of 2 months, 32% of infants aged 2 to 3 months and 58% of infants aged 4 to 5 months (55). It has been further documented that the most commonly complementary foods introduced early in Tanzania include thin maize porridge, soft rice, cow milk and mashed potatoes/ bananas (117, 124-128). It is important to note that these foods may not fulfil the nutritional requirements for optimal health of the growing child.

The delayed introduction of complementary foods is also a poor complementary feeding practice as and it is equally detrimental to the growth of infants and children. The practice of delayed introduction of complementary foods may put children at risk of undernutrition due to inadequate energy and other nutrients to support rapid growth, physiological maturation and development after 6 months of life. Delayed introduction of complementary feeding after the age of 6-8 months in children has been noted in Sub-Saharan Africa (129) and Tanzania in particular (55, 130). For example, in a community-based study on infant and young child feeing practices among pastoralists in Mbulu district Tanzania, Sellen (48) found that majority of infants (70%) experienced delayed introduction to some complementary foods until after 9 to 21 months. This author explained that mothers in that community have good access with cow's

milk thus they breastfeed their babies and also gave them cow's milk but no other solids foods which resulted in inadequate nutrients intake.

Nutritional quality of Complementary Foods

Complementary foods given to infants after six months of life need to be adequate in both quality and quantity in order to provide sufficient energy and nutrients to meet a child's growing needs (6). The guideline for complementary feeding for children aged 6-23 months states that complementary feeding should start at six months of age with the introduction of small amounts of food and food given should increase in quantity as the child gets older, while maintaining frequent breastfeeding (18, 111). The amount of complementary food offered to infants should also be based on the principles of responsive feeding and ensure that the quality of food and meal frequency are adequate to meet child's needs (131).

The WHO guidelines (2008) recommend that complementary foods for infants after six months of age be made from seven food groups namely grains, roots and tuber; legumes and nuts; dairy products (milk, yogurt, cheese); flesh foods (meat, fish, poultry and liver/organ meats); eggs; vitamin-A rich fruits and vegetables and other fruits and vegetables (10, 11). Meals made from each food group provide adequate nutrients to meet daily nutritional needs for proper growth and development.

1.3.2 Minimum dietary diversity

"Minimum dietary diversity" is an indicator recommended by WHO/UNICEF (10) for assessing the nutritional quality of complementary foods consumed by infants and young children. It covers the proportion of children aged 6-23 months old who receive foods from 4 or more of the food groups (10, 11). A child would be considered to have minimum dietary diversity if she/he consumed any amount of complementary food made from four or more food groups mentioned above daily. Data from pooled analysis of studies done in developing countries by the WHO infant feeding team (132) showed that consumption of complementary foods made from at least 4 food groups was associated with better quality diets for both breastfed and non-breastfed

children. They further reported that if a child consumed foods from at least 4 food groups daily, they would be most likely to have eaten protein and vitamin rich foods in addition to carbohydrate made from staple foods (grain, root or tuber).

Finding from studies done in China, Vietnam and Zambia indicate that dietary diversity of food consumed by infants is generally poor in terms of quality (133-135). Most complementary foods given to infants after six months are less diverse and are mainly made from starch staples which may not meet nutritional requirements (134). Dang et al (135) found that less than 30% of Tibetan children under 2 years consumed eggs, meat and fresh vegetables on daily basis because these foods are expensive and only few can afford to purchase. Further, data from developing countries including Africa, Vietnam, Prague, South Africa, Malawi and Kenya indicate that the most common complementary food given to children after 6 months is porridge made by maize meal or sorghum (133, 136-139).

Hotz et al (118), Macharia-Mutie et al (139) and Hope et al (133) further observed that children were less likely to consume animal proteins foods in their daily diet in Malawi, Kenya and Vietnam. For example, only 4% and 5.7% of children aged 6-23 months consumed eggs, meat and fish in rural Malawi and Vietnam; however the prevalence of protein's food consumption in Kenya was not reported by Macharia-Mutie. Studies carried out in Rukwa, Kilosa, Simanjiro and Morogoro Districts of Tanzania have also reported that majority of children consume porridge made from local staples like maize, sorghum, finger millet, rice, cassava, potatoes, yam and plantains (86, 117, 125, 126). Inaccessibility to varieties of foods due to economic constraints was the main reason stated by researchers (135, 140).

Data on the indicator for minimum dietary diversity is very limited in most of resource poor countries like Tanzania. The recent published data from South Asian countries indicate that prevalence of minimum dietary diversity among children aged 6-23 months varies across those countries. For example in Sri Lanka (141) and Indonesia (142) the prevalence of minimum dietary diversity were high 71.1% and 68.4% respectively. In contrast, rate of minimum dietary

diversity among children aged 6-23 months were low in Bangladesh (42%) (143), Nepal (34.2%) (144) and very low in India (15.2%) (145). A few studies conducted in Tanzania have reported this indicator by mentioning the types of complementary foods given to infants such as porridge, rice (117, 125, 126, 130) rather than minimum number of food groups consumed by infants per day which would provide better understanding of quality of diets. In addition, data on 2004-05 TDHS and other studies in Tanzania (117, 125) did not report this indicator for the following age groups; 6-11 months, 12-17 months and 18-23 months.

1.3.3 Frequency of feeding Complementary Foods

Infants need to be fed frequently as they cannot consume large quantities of food in one meal sitting. The WHO (10) recommends that breastfed infants aged 6-8 months should consume complementary foods a minimum of 2 times per day while those aged 9-23 months need complementary foods at least 3 times per day. For non-breastfed children aged 6-23 months, should be fed complementary foods a minimum of 4 times per day.

The difference regarding the minimum number of meals among breastfed and non-breastfed children 0-23 months is due to different energy needs to meet the nutritional requirements. For example, in order to ensure that energy needs are met, a healthy breastfed child requires approximately 615kcal, 686kcal and 894 kilocalories per day at 6-8 months, 9-11 months and 12-23 months respectively. A non-breastfed child needs 634 (at 6-8 months), 701(at 9-11 months) and 900 kilocalories daily (at 12-23 months) to meet his/her energy requirements for proper growth (131). It should be noted that children who are breastfed gets extra energy from breast milk thus require low calorific values compared to non-breastfed children of the same age.

There is limited information on the prevalence of meal frequency for both breastfed and non-breastfed children aged 6-23 months in many countries including Tanzania. However, the prevalence of meal frequency for breastfed children aged 6-23 months as documented in WHO report (11) in developing countries varies. For example, in some countries like Bangladesh,

Cambodia, Sri Lanka, Nepal, Peru, and Philippines the prevalence of meal frequency for breastfed children aged 6-23 months were above 60% (11), while in others the prevalence was low e.g. India (41.5%) (11, 145).The reason for variation could be due to the different infant feeding practices across those countries.

Findings from a cross-sectional study by Li et al (146) showed that, the median meal frequencies of complementary feeding among infants aged 6-8 months, 9-11 months and 12 months in Beijing were 2, 3 and 3 times per day. Although, investigators in this study did not provide rates/ prevalence of meal frequency; this study however is among the few found to report data on meal frequency based on age categories of children despite the fact that they only target infants below 1 year. The recent publications from South Asian countries did not provide the information about the minimum number of times children consumed soft, semi-solid or solid foods according to age and breastfeeding criterion i.e. 2 times for breastfed infants aged 6-8 months, 3 times for breastfed children aged 9-23 months and 4 times for non-breastfed children aged 6-23 months.

In the Sub-Saharan African countries, rates of meal frequency among children aged 6-23 months are lower than 50 per cent as reported in Uganda (40.1%), Rwanda (44.3%), and Mozambique (37.8%) (11). Further, in a cross-sectional study of rural children in Malawi Hotz and Gibson (122) estimated that children aged 6-23 months consumed approximately 3-4 meals and 1 snack per day. However, the percentage of meal frequency was not reported.

In Tanzania the prevalence of meal frequency of complementary foods was estimated to be 48% in 2005 (11). This data does not specify if it is for breastfed, non-breastfed or all children aged 6-23 months. In addition, the TDHS report of 2004-05 showed that breastfed children aged 6-9 months consume complementary foods on average of 2 times per day. However, this data was only for consumption of foods made from grains, thus inadequate to provide detailed information about the indicator for meal frequency among children aged 6-23 months in Tanzania. In addition, investigators in some parts of Tanzania have reported that most of infants

more than 6 months consume family foods 1-3 times per day as the way other family members eat regardless of high nutritional needs to support rapid growth and development (117, 125, 147).

The main limitation in reporting on this indicator in the previous studies (including those done in Tanzania) with the exception of the Malawi study (122) is that, the other studies (55, 117, 146, 148) did not report this indicator based on breastfeeding status of studied infants. The analysis and reporting of the prevalence of meal frequency considering breastfeeding status and age categories is important since the energy requirements differs among breastfed and non-breastfed infants and also among children at different ages.

1.3.4 Minimum acceptable diet

"Minimum acceptable diet" is another indicator recommended by WHO/UNICEF (10) for assessing both nutritional quality and frequency of feeding complementary foods for both breastfed and non-breastfed children. This is a composite indicator that covers the proportion of breastfed children 6-23 months old who had at least the minimum dietary diversity and the minimum meal frequency; and the proportion of non-breastfed children 6-23 months of age who received at least two milk feeds and had minimum dietary diversity and the minimum meal frequency during the previous day.

There is limited data on prevalence and risk factors associated with minimum acceptable diet in developed and developing countries. The new recently published data from South Asia indicate that the proportion of children 6-23 months who meet recommendation for minimum acceptable diet varied across South Asian countries (149). For example, the rate of minimum acceptable diet for breastfed children aged 6-23 months was very low in India (9%) (145), Nepal (32%) (144), average in Bangladesh (40%) (143) and Indonesia (45%) (142) and slightly high in Sri Lanka (68%) (141). Different feeding practices across countries was thought to have contributed to the difference in the rates of minimum acceptable diet (150). In addition, poor maternal education, fewer or lack of antenatal and postnatal care visits, limited exposure to media and

lower household wealth were among the factors associated with poor acceptable diet. These factors are discussed in detail in the next section.

1.3.5 Factors that may influence complementary feeding practices

Individual-, household-, and community-level factors that have been reported to influence complementary feeding practices are outlined in Table 1:3 below.

Table 1:3 Summary of factors that may affect complementary feeding practices

Individual-level factors	Household-level factors	Community-level factors
Young maternal age (< 25 years)	Socio-economic status	Area of residence
Maternal level of education		Regional differences
Maternal work		
Lack of antenatal care visit		
Caesarean delivery		
Lack of post-natal check up		
Parity		
Young infant's age (<12 months)		
Infant gender		
Limited exposure to media		

1.3.5.1 Individual level factors affecting complementary feeding practices

Maternal age

The influence of maternal age was not found on breastfeeding practices only, but extends also to complementary feeding. The fact that older mothers (>30 years) would have better child feeding practices due to their prior experiences has been demonstrated by some studies. For example, Landel et al (56) found that the odds of introduction of complementary foods increased with increasing maternal age in Norway. Furthermore, older mothers were observed to practice timely introduction of complementary foods than young mothers in Ireland, Timor-Leste and Nepal (70, 79, 151). Conversely, young maternal age (<25 years) were found to be associated with early introduction of complementary foods before 4 months (119, 152).

In a cross-sectional study of socio-cultural factors influencing infant feeding practices, Solomon (64) found that younger mothers were more likely to introduce other foods before 6 months than older mothers in Cape Cost Ghana. In most of these studies investigators have concluded that, younger maternal age less than 25 years was the negative factor for appropriate complementary feeding practices (64, 70, 144). Less experience and inadequate knowledge regarding appropriate young child feeding practices among young mothers are the reasons claimed (60) to influence poor feeding practices.

Maternal education

Inadequate knowledge and lower levels of education on feeding practices among mothers are greater determinant of child nutrition than lack of food. A mother's education may play a vital role in increased receptivity to knowledge and awareness related to nutritional requirements of their infants (153). Association between higher level of maternal education and complementary feeding practices have shown inconsistent findings across studies in both developed and developing countries (56, 79, 119, 135, 146, 153). In a cross-sectional study in Pakistan, Liagar et al (153) and Hazir et al (154) found that educated mothers introduced soft, semi-solid or solid foods to their infants at appropriate age and were giving complementary foods more frequently to their children compared to uneducated mothers. Hazir et al (154) reported that lower maternal education was a significant determinant of delayed introduction of soft, semi-solid or solid food among infants in Pakistan. Dang et al (135) and Li et al (146) found that in both urban and rural areas of China, high maternal education was a risk factor for early introduction of complementary foods and employed educated mothers had demands to return to work a few months after birth delivery resulting in the early introduction of complementary foods.

Rheban (119) found that low level of maternal education in Germany was a risk factor for early introduction of complementary foods to infants before the age of 4 months. In addition, uneducated mothers and those with lower education (primary education) delayed introduction of complementary foods after 6 months compared to educated mothers in Bangladesh (143), India (153) and Nepal (144). Furthermore, lower maternal education was found as a strong predictor

and a consistent factor associated with inadequate dietary diversity, meal frequency and acceptable diet in some Asian countries such as Bangladesh (143), India (145), Indonesia (155), Nepal (144) and Sri Lanka (141). However, lower paternal education was also found to be a predictor of inappropriate complementary feeding in Bangladesh (143) indicating that parental education is important regarding dietary knowledge, dietary diversity, quality of food and feeding frequency (143, 153).

Very few studies have established the relationship between maternal education and complementary feeding among children aged 6- 23 months in Africa (64). In a cross-sectional survey of socio-cultural factors that influence the infant feeding practices of 147 mothers attending a welfare clinic at the Central Regional Hospital in Cape Coast Ghana, Solomon (64) found that mothers who reported having tertiary education were more likely to introduce solid foods to infants before the age of 6 months compared to mothers with primary school education.

Maternal employment status

Maternal work/employment status is the factor which can positively or negatively affect child feeding practices. Working mothers are expected to have a positive effect on child nutrition by providing greater income for food and hence improved household food security (156). On the other hand, working mothers may have limited time to care for their young children including appropriate feeding. Available literature has demonstrated negative influence of maternal employment on complementary feeding practices among children aged 0-23 months (64, 146, 151). In a cross-sectional study of 251 mother-infant pairs, Li et al (146) assessed feeding practices of infants and their correlates in urban area of Beijing China. In this study employment was significantly correlated with poor complementary feeding practices with the early introduction of complementary foods. In addition, working mothers in Nepal were observed to have inappropriate complementary feeding practices with delayed introduction of complementary foods and inadequate meal frequency compared to non-working mothers in Nepal (144).

Equally, Solomon found a statistically significant relationship between employment and higher rates of mixed feeding in Ghana (64). Owino et al (134) found that although mothers in Lusaka Zambia had wide knowledge of optimal infant feeding, the actual practices were constrained by time availability. A study done in Rukwa Tanzania revealed that, most women who work in fields spent less time cooking and feeding their children (86). Mother's demand to return to work (64, 83, 135), insufficient breast milk, pregnancy (135), infant hunger and poor sleep (151) were among the maternal reasons stated for early introduction of solid foods before the age of 6 months.

Antenatal and postnatal care visits

Utilization of antenatal and postnatal care has significant impact on overall child feeding practices. Data from previous studies revealed that fewer or lack of antenatal clinic visits were associated with delay in the introduction of complementary food, low dietary diversity, inadequate meal frequency and acceptable diet among children in India and Nepal (150). However, postnatal care visits by a midwife was significantly associated with appropriate feeding practices in Sri Lanka (141). Mothers who made antenatal or postnatal clinic visits may have received counselling from health practitioners which promoted optimal child feeding practices. Therefore, ensuring recommended antenatal and postnatal care visits could be an effective strategy to improve complementary feeding among children in many settings.

Caesarean delivery

There is limited data on the influence of caesarean delivery and complementary feeding practices (101, 157). In a large cohort study of 4679 mother-child pairs in Australia, Baxter el al (101) found that caesarean delivery was a risk factor for early transition to complementary breastfeeding in the first postnatal month. Similarly, Asole et al (157) revealed that caesarean delivery increased the risk of complementary breastfeeding during hospital stay 4 times than normal delivery.

Parity

Few studies have established the influence of parity on complementary feeding practices in both developed and developing world (78, 101). These studies however, indicate mixed evidence regarding this factor. In a large cohort study of Australian infants feeding, Baxter et al (101) reported that prim parity was associated with a transition to complementary breastfeeding in the first postnatal month in Australia. In contrast, Patel et al (78) found that multiparous mothers were more likely not to introduce complementary foods at appropriate age in India. The discrepancy of findings from these studies could be due to different study setting between developed and developing countries. More scientific evidence is needed with regards to influence of parity on introduction of complementary foods and other indicators for complementary feeding.

Infant's age

When comparing complementary feeding indicators and their associated factors in five South Asian countries, Senarath and Dibley (158) found that rate of introducing complementary food significantly improved with increasing age of children in Bangladesh, India and Nepal. It has been further demonstrated that rates of dietary diversity and acceptable diet were poor among younger children (6-11 months) than their older counterparts in India (145), Indonesia (155) and Sri Lanka (141). Moreover, younger children (<12 months) in Nepal had significantly higher risk of inadequate meal frequency compared to the older children aged 18-23 months (144).

Infant's gender

There is very little evidence on the correlation between infant gender and complementary feeding practices. In a Norwegian infant nutrition national survey, Lande et al (56) observed a tendency towards stronger effects of infant gender and complementary feeding practices. They found that girls had significantly higher odds of timely introduction of soft, semi-solid or solid foods than boys ($p<0.001$). Furthermore, female children were at higher risk of inadequate meal frequency compared to male children in Indonesia (155). In other studies this variable did not

reveal any significant association after being adjusted with other confounders such as child age, size of the baby (119, 141, 143-145).

1.3.5.2 Household-level factors that may influence complementary feeding practices

Household wealth index

It is generally believed that families with greater incomes and resources tend to have more diverse diets. Children in wealthier households are better off in terms of complementary feeding because of improved nutrient adequacy from diverse diets than children from poor households (144). In a longitudinal study on the effects of socio-demographic factors on adherence of breastfeeding and infant dietary recommendations, Gudnadottir et al (159) reported that, mothers from higher social status were more likely to feed their children fruits and vegetables daily compared to mothers of lower social status.

In addition, household wealth has been found to affect introduction of complementary foods in all socioeconomic groups. Improved household wealth was associated with early introduction of solids foods in Indonesia, Philippines and in Timor-Leste (60). In a cohort study of 276 mothers with infants less than 12 months in South Africa, Mamabolo et al (123) found that mothers in poor households were more likely to introduce solids foods before 6 months due to inadequate knowledge on appropriate child feeding practices. Shirima et al (109) reported that mothers from medium and high-income groups in Morogoro Tanzania introduced complementary foods to infants at early age compared to those in lower income groups. However, sample size for this study was relatively small reducing the statistical power to detect difference.

Lower household wealth index was found to be a consistent determinant of inadequate dietary diversity and acceptable diet in South Asia. For example, results from multivariate analyses of determinants of inappropriate complementary feeding practices in Bangladesh (143), India (145), Indonesia (155), Sri Lanka (141) and Nepal (144) showed that children of mothers from poor and poorest wealth quintiles had the highest odds of poor dietary diversity and acceptable diet than children from the wealthier households. These findings confirmed the relationship

between wealth and feeding practices and food insecurity may have influenced poor dietary diversity in household of lower wealth quintiles (141, 145).

Exposure to media

Media can be used as an effective means of promoting complementary feeding practices. Recent literature reports that women who had limited exposure to media such as radio, newspaper, television had increased risk for poor complementary feeding practices (141, 142, 144, 145). For example, limited exposure to media was a strong determinant of delayed introduction of soft, semi-solid or solid food at 6-8 months, poor dietary diversity, inadequate meal frequency and acceptable diet in India (145). In addition, lack of exposure to media was a significant factor associated with inadequate dietary diversity and meal frequency in Nepal (144) and Sri Lanka (141). These data reflects broadly the influence of media on infant feeding practices and may be used as a means of influencing mother's behaviour for ensuring optimal complementary feeding practices.

1.3.5.3 Community-level factors that may influence complementary feeding practices

Area of residence (urban/rural)

The relationship between area of residence and complementary feeding practices has been documented (56, 135, 137, 138, 146, 160). Urban residence has been found to be associated with higher rates of early introduction of complementary foods before 6 months in some studies in China (135, 146), but positively influence higher rates of timely complementary feeding in Norway (56). Furthermore, urban residence was reported to favour consumption of quality and varied diets. Dang S (135) stated that urban children were given eggs, milk powder, formula and fresh vegetables than rural children in China because many urban dwellers have better income which enable them to purchase variety of foods.

Vaahtera (138) and Faber (137) found that consumption of fresh fruits and vegetables to most of rural Malawian and South African children was uncommon (137, 138). In addition, Chen (160) reported that rural Chinese children are often given food that is mainly carbohydrate and low in

protein. In a cross-sectional study of infant feeding practices in Uganda, Poggensee et al (47) found that women living in semi-urban area had a tendency of introducing additional nutrients and liquids to their infants diets before the age of 6 months. Low economic status and lack of knowledge on how to prepare quality diets and appropriate feeding practices could be the possible limitation for rural mothers. In an analysis of breastfeeding and complementary feeding practices of children under 2 years in rural China, Wand et al (161) concluded that most rural women did not know the proper time of introduction and appropriate methods of complementary foods. Analysis of association between area of residence and complementary feeding practices is critical in Tanzania as majority of people live in rural areas and are less educated.

Geographical area and ethnicity

The available literature indicates the existence of association between complementary feeding practices across different geographical regions and ethnic groups. At the community level, the geographical differences may influence complementary feeding in various ways. The type of food production in a given area has a bearing on the quality and quantity of complementary foods that can be used to feed infants and young children. Existence of poor cultural practices in a given geographical area which restricts consumption of certain foods by women and young children also has an impact on complementary feeding practices. Different food habits across many regions in developing countries including Tanzania have a bearing on what communities feed their infants and young children. For example the *Maasai* tribe in Simanjiro area Tanzania are heavily dependent on animal meat and milk (124, 126) whereas the *Wafipa* of Rukwa region are agriculturalists and their diet is largely based on cereals and vegetables (86).

Pandey et al (79) found significant association between geographical regions and rate of timely introduction of complementary feeding. They found that, infants living in *Terai* zone were at higher risk of not receiving timely complementary foods than for those living in the mountains. In addition, Lande et al (56) reported a significant association between geographical region and timely introduction of complementary foods at 4 months in Norway. Moreover, study

participants belonging to the ethnic groups other than Bakiga and Batooro in Uganda were reported to have a tendency to introduce solid food earlier (47). Furthermore, recent literature from South Asian countries showed regional differences within and across countries with regards to complementary feeding indicators. For example, children from the Northern region of India were at higher risk of poor complementary feeding practices compared to children in other regions due to disparities in penetration of health services in these areas (145). Similarly, there was the large regional variation in complementary feeding indicators in Bangladesh whereby children born in Sylhet, Chittagong and Barisal divisions had higher risks for not meeting minimum dietary diversity, meal frequency and acceptable diet compared to children in Rajshahi ($p<0.001$) (143). The lower levels of parental education (143) and different food cultures or beliefs about variety of foods that are suitable for children or the availability of food could explain these differences.

1.4 Overview and study rationale

As outlined above, research investigating the factors associated with poor infant and young child feeding practices has been carried out in many developed (62, 68, 80, 84, 94, 103, 162) and developing countries (60, 74, 88, 150, 163) including African countries (34, 64, 75, 77, 85, 137). In other countries many individual-, household-, and community-level factors have been reported to vary among the different populations (163) and documented to be either positively or negatively associated with BF and CF practices. The inconsistencies of the results found in different developing country settings makes it difficult to generalize the findings to all developing countries, hence the relevance of this study in determining the factors that are associated with BF and CF practices in Tanzania.

At present there are few published reports about breastfeeding and complementary feeding practices in Tanzania (124, 126, 130, 148). The Tanzania Reproductive and Child Health Survey (TRCHS) (19) and the 2004-05 and 2010 Tanzania Demographic Health Surveys (TDHS) (8, 55) provide a valuable nationally representative data with information about infant

and child feeding practices. However, only few indicators “Ever breastfed”, “Exclusive breastfeeding”, “Continued breastfeeding at 1 year” and “Introduction of soft, semi-solid or solid foods” were analysed and reported in the 1999 TRCHS (19). The WHO country profiles report of Infant and Young Child Feeding (IYCF) indicators reveal that the breastfeeding and complementary feeding practices in Tanzania based on the 2004-05 TDHS were far from optimal (90% coverage) because less than 50% of the infants were exclusively breastfed and only 18.1% of those aged 6-23 months had adequate acceptable diet (11). However, there is lack of detailed description of breastfeeding and complementary feeding practices using the current 2010 TDHS, and the risk factors associated with inappropriate infant and young child feeding practices remain unclear.

1.5 Research aims

The aims of this thesis were to examine prevalence and trends of breastfeeding and complementary feeding practices among children aged 0-23 months in Tanzania based on the 2008 WHO infant feeding indicators, and to determine the individual, household and community level factors associated with poor infant and young child feeding practices in Tanzania.

1.6 Thesis outline

This thesis is comprised of six chapters that address the issues of infant and young child feeding practices in Tanzania. The thesis commenced with an overview and a review of literature as outlined in the current Chapter and followed by general methods (Chapter 2) that provide detailed information regarding the data sources and analytical procedures undertaken in this study. Presentation of results from breastfeeding and complementary feeding analyses are provided in Chapter 3 and 4 to provide better understanding of IYCF practices in Tanzania. An overall discussion of key findings from both breastfeeding and complementary feeding practices is provided in Chapter 5. The thesis closes with the recommendations for future programmes and areas of further research (Chapter 6) based on the findings from this secondary data analysis

of the 1999 Tanzania Reproductive and Child Health Survey, the 2004-05 and 2010 Tanzania Demographic and Health Surveys.

Chapter 2 General Methods

This chapter describes the study area, data sources and study design, data extraction and file construction, conceptual framework, study variables, inclusion and exclusion criteria, sampling procedures/sample size, data analysis and ethics clearance.

2.1 Study area

The present study used data collected from the United Republic of Tanzania, hereby referred to as Tanzania in 1999, 2004-05 and 2010. Tanzania is the union of two countries –Tanzania Mainland (Tanzania) and Zanzibar since 1964 (164). The United Republic of Tanzania is administratively divided into 26 regions, comprising of 21 regions in Mainland and 5 regions in Zanzibar, and each region is further subdivided into several districts. Zanzibar comprises two main islands; Unguja and Pemba (Figure 2:1). Tanzania has an estimated total population of 39.5 million people belonging to over 125 different ethnic groups. The total population for children under-five years is estimated at 5,692,500 with seven percent of children aged less than 2 years (165).

Figure 2:1 Map of Tanzania

Source: Google image (166)

2.2 Data sources and study design

The Demographic and Health Survey (DHS) are nationally-representative household surveys conducted in many developing countries including Tanzania that provide data for monitoring and impact evaluation of indicators in the areas of population, health, HIV and nutrition. These surveys are undertaken after every 3 to 4 years in the developing countries (167). The first Tanzania Demographic and Health Survey (TDHS) was conducted in 1991 to 1992, followed by the 1994 Tanzania Knowledge, Attitude, and Practices Surveys, then 1996 TDHS, the 1999 Tanzania Reproductive and Child Health Survey (TRCHS), the 2003-04 Tanzania HIV/AIDS Indicator Survey, the 2004-05 TDHS, the 2007-08 Tanzania HIV/Malaria Indicator Survey and

the last is the 2010 TDHS. Detailed information of these surveys is outlined at (http://www.measuredhs.com).

The analysis of the present study was based on the 1999 Tanzania Reproductive and Child Health Survey (TRCHS) (19), the 2004-05 and 2010 Tanzania Demographic and Health Surveys (TDHS) (8, 55). The study design for 1999 TRCHS is described separately from the 2004-05 and 2010 TDHS because of differences in sampling design.

1999 Tanzania Reproductive and Child Health Survey

The 1999 Tanzania Reproductive and Child Health Survey (TRCHS) is the fourth in a series of national sample surveys. The primary objective of the 1999 TRCHS was to collect data at the national level on fertility trends of both genders, family planning knowledge and use of family planning methods, infant and child mortality, and indicators of maternal and child health and nutrition including breastfeeding practices. The survey was undertaken by the National Bureau of Statistics in collaboration with the Reproductive and Child Health Section of the Ministry of Health. The data collection took place from September to November 1999.

The TRCHS used a three-stage sample design of which 176 census enumeration areas were selected (146 from the Mainland and 30 in Zanzibar) with probability proportional to size on an approximately self-weighting basis on the Mainland, but with oversampling of urban areas and Zanzibar due to small population size (Figure 2:2). These enumeration areas were selected from the 357 sample points that were used in the 1996 TDHS (168), which in turn were selected from the 1988 census frame of enumeration (169) in a two-stage process (in the first stage was selection of wards with PPS sampling, and the second stage involved selection of enumeration areas within selected wards). Before the data collection, fieldwork teams visited the selected enumeration areas to list all the households. From these lists, 3,826 households were selected for interview. 2,924 households were selected from Mainland and 902 households from Zanzibar. From these households, 3,126 and 992 women of reproductive age group (15-49 years) were interviewed in Mainland and Zanzibar respectively. Overall, 4,118 women aged 15

to 49 years were interviewed, yielding a 97.8% response rate. The sample was designed to provide estimates for the whole country, for urban and rural areas separately, and for Zanzibar and, in some cases, Unguja and Pemba separately due to small population size. Detailed information regarding the sampling procedure and data collection tools are outlined in the 1999 TRCHS report (19).

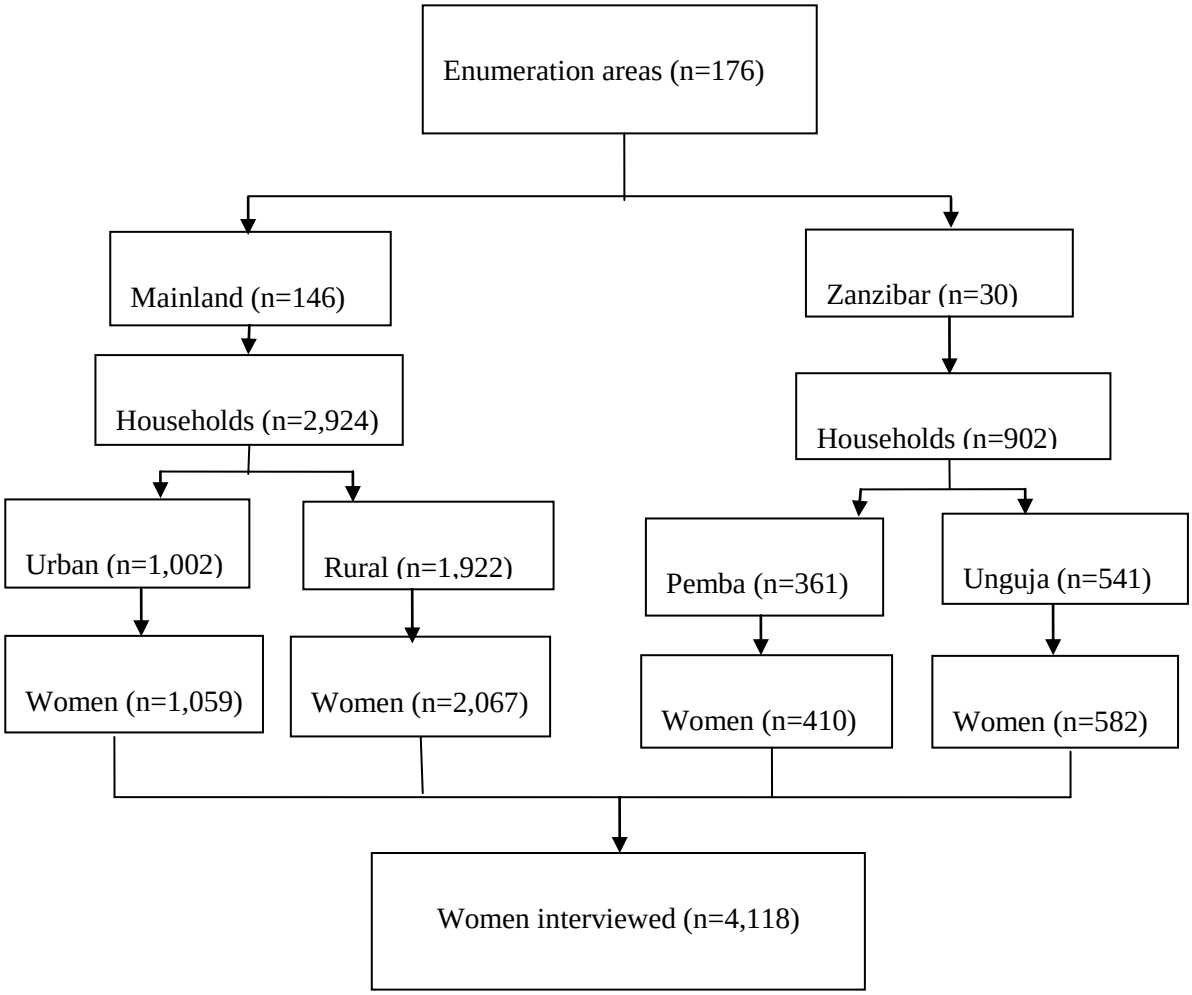

Figure 2:2 Summary diagram of sampling process in Tanzania (1999 TRCHS)

2004-05 and 2010 Tanzania Demographic and Health Surveys

The 2004-05 and 2010 Tanzania Demographic and Health Surveys (TDHS) are the sixth and eighth in a series of national sample surveys conducted in Tanzania. The surveys were designed to measure levels, patterns, and trends in demographic, health and nutrition indicators. The 2004-05 survey was implemented between October 2004 and January 2005, while the 2010 survey was conducted from December 2009 to May 2010 by the National Bureau of Statistics

(NBS) in collaboration with the Office of the Chief Government Statistician –Zanzibar; the Reproductive and Child Health Section and the Policy and Planning Department of the Ministry of Health (8, 55).

The survey samples were designed to provide estimates for the entire country, and for both urban and rural areas of Tanzania Mainland and Zanzibar. A representative probability sample of 10,312 households was selected for the 2004-05 TDHS and 10,300 households were selected for the 2010 TDHS. The two surveys utilised the same cross-sectional study design and a nationally representative survey sample was obtained using stratified two-stage random sampling (see Figure 2:3 and

Figure 2:4 below). In the first stage, 475 clusters were selected from a list of enumeration areas based on the 2002 Population and Housing Census (165). Twenty-five clusters were selected in Dar es Salaam, and 18 clusters were selected in each of the other twenty regions in Mainland. In Zanzibar, 18 clusters were selected in each region. In the second stage, a complete household listing was carried out in each of the selected clusters. The households were then systematically selected for participation in the survey. Twenty-two households were selected from each cluster in all regions except for Dar es Salaam where 16 households were selected.

In 2004-05 survey, 10,300 households were selected for the sample and 9,735 households were successfully interviewed, yielding a household response rate of 99%. From these households, 10,329 women of reproductive age (15-49 years) who were either permanent residents of the households in the 2004-05 TDHS sample or visitors present in the household on the night before the survey were interviewed. In the 2010 survey, a total of 10,300 households were selected for the sample, of which 10,176 were successfully interviewed, yielding a household response rate of 99% (

Figure 2:4). All women of reproductive age (15-49 years) living in these households (n=10,522) were interviewed. Face-to-face interviews were held with the sampled mothers using a

structured questionnaire yielding a women interview response rate of 97%. Comprehensive details regarding the sampling procedure and data collection tools are outlined in the 2005 and 2010 TDHS reports (8, 55).

It is important to note that in both surveys the number of women interviewed was more than the number of households where the interviews were conducted. This could be due to non-sampling error where by enumerators interviewed more than one woman in the same household. However, all analyses in this study were restricted to one woman and her youngest last born child who met the inclusion criteria explained in Section 2.6 of this Chapter.

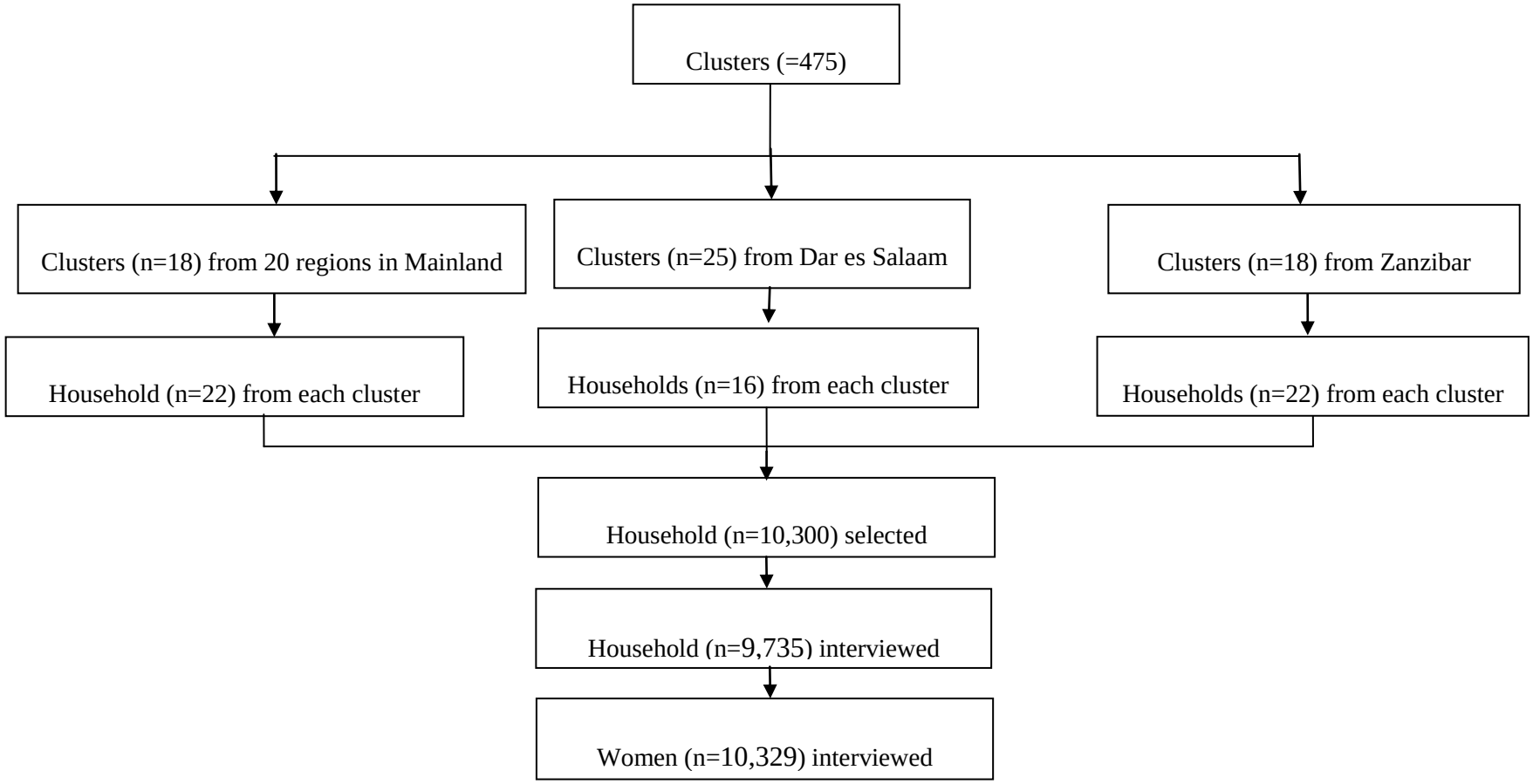

Figure 2:3 Summary diagram of sampling process in Tanzania (2004-05 TDHS)

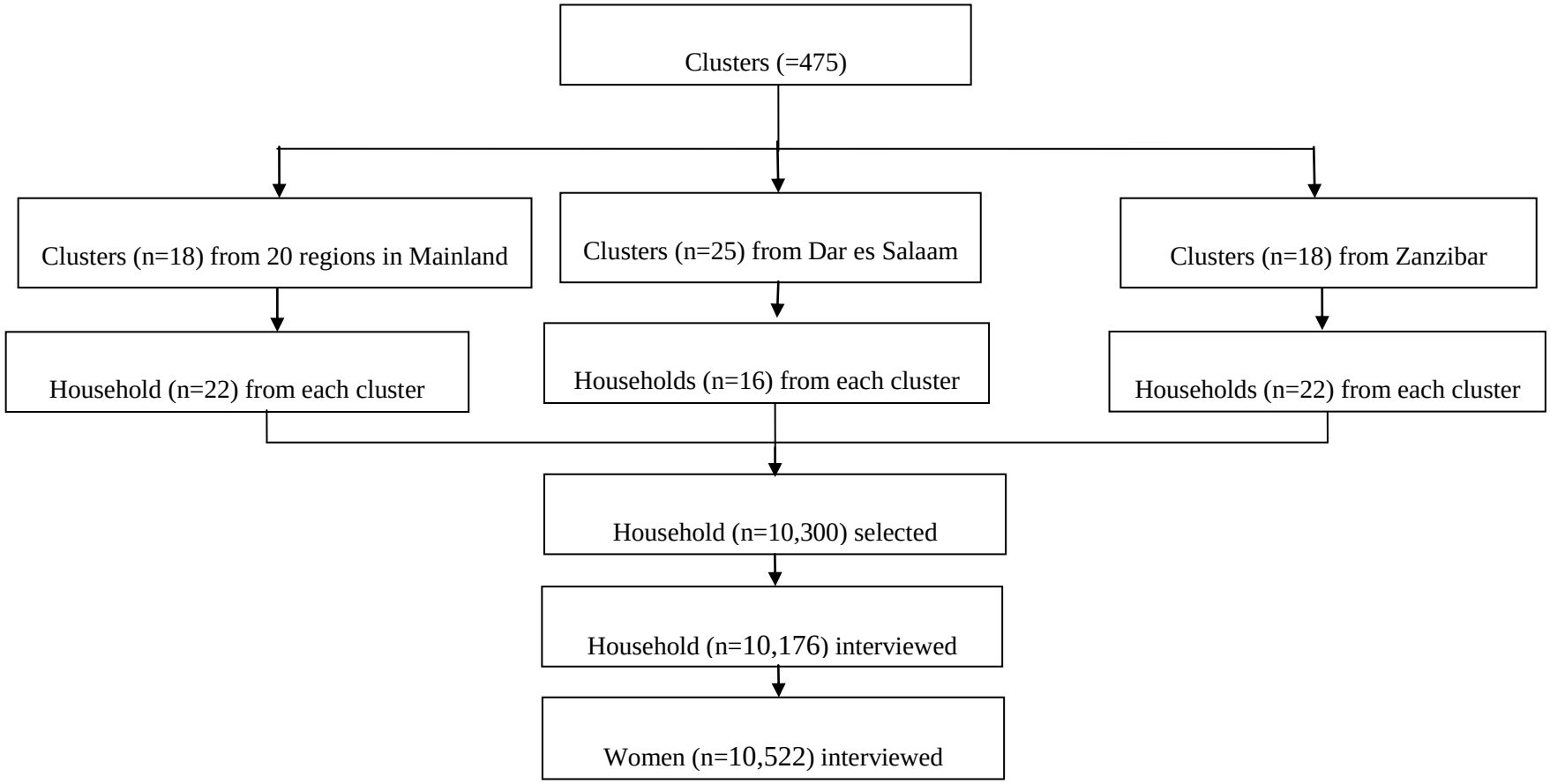

Figure 2:4 Summary diagram of sampling process in Tanzania (2010 TDHS)

2.3 Data extraction and file construction

Initially, permission to download and access the Demographic and Health Survey dataset was requested by the current study investigators (see appendix A), after submission of a brief description of the proposed analysis. Permission was granted and the relevant datasets were downloaded (available at http://www.measuredhs.com/login.cfm) and with listing of the relevant variables from the 1999 TRCHS, 2004-05 and 2010 TDHS datasets. These variables were determined based on the evidence from literature that they have influence on infant and young child feeding practices. The available data for children and their mothers in the DHS database were in de-identified format. The variables were of two types; continuous and categorical variables. Continuous variables included infants and maternal age, mother's body mass index (BMI), mother's level of education and father's level of education. The categorical variables were mother's working status, father's occupation, mother's literacy, mother's marital status, birth order, birth interval, sex of infant, size of baby, place of delivery, mode of delivery, type of delivery assistance, antenatal clinic visits, timing of postnatal check-up, and mothers who have interaction with the mass media (newspaper, radio, television), mother's participation in household decision making, household wealth index, place of residence, geographical regions and data on infant feeding practices.

In the DHS dataset, data were entered into different computer files. For example, the child data were in a different file from the individual maternal data, household and community data files. Given that the present analysis aimed at covering the child feeding practices at all levels, the child data files were merged with individual maternal data, household and community level data files before further analysis. The information on infant and young child feeding practices was obtained from the questionnaires in the 1999, 2004-05 and 2010 surveys. These questionnaires are very large to be attached in this thesis but they can be found in the following website (http://www.measuredhs.com/Where-We-Work/Country-Main.cfm?ctry_id=39&c=Tanzania&Country=Tanzania&cn=&r=1).

In those questionnaires, the information regarding infant and young child feeding breastfeeding practices are outlined in section 4A-page 195 in the 1999 survey; section 4A-page 322 in the 2004-05 survey and section 5-page 390 in 2010 survey.

2.4 Conceptual framework

The Mosley and Chen conceptual framework for the child survival in developing countries (170) was adopted in this analysis based on the available information in 1999, 2004-05 and 2010 TDHS datasets. Figure 2:5 shows the framework used in this study, along with the predictors of breastfeeding and complementary feeding practices in Tanzania. The individual level factors included variables from attributes of parents, infant and mother-infant dyad. Household environmental factors included the household wealth index and community level factors included area of residence and geographical region (170, 171).

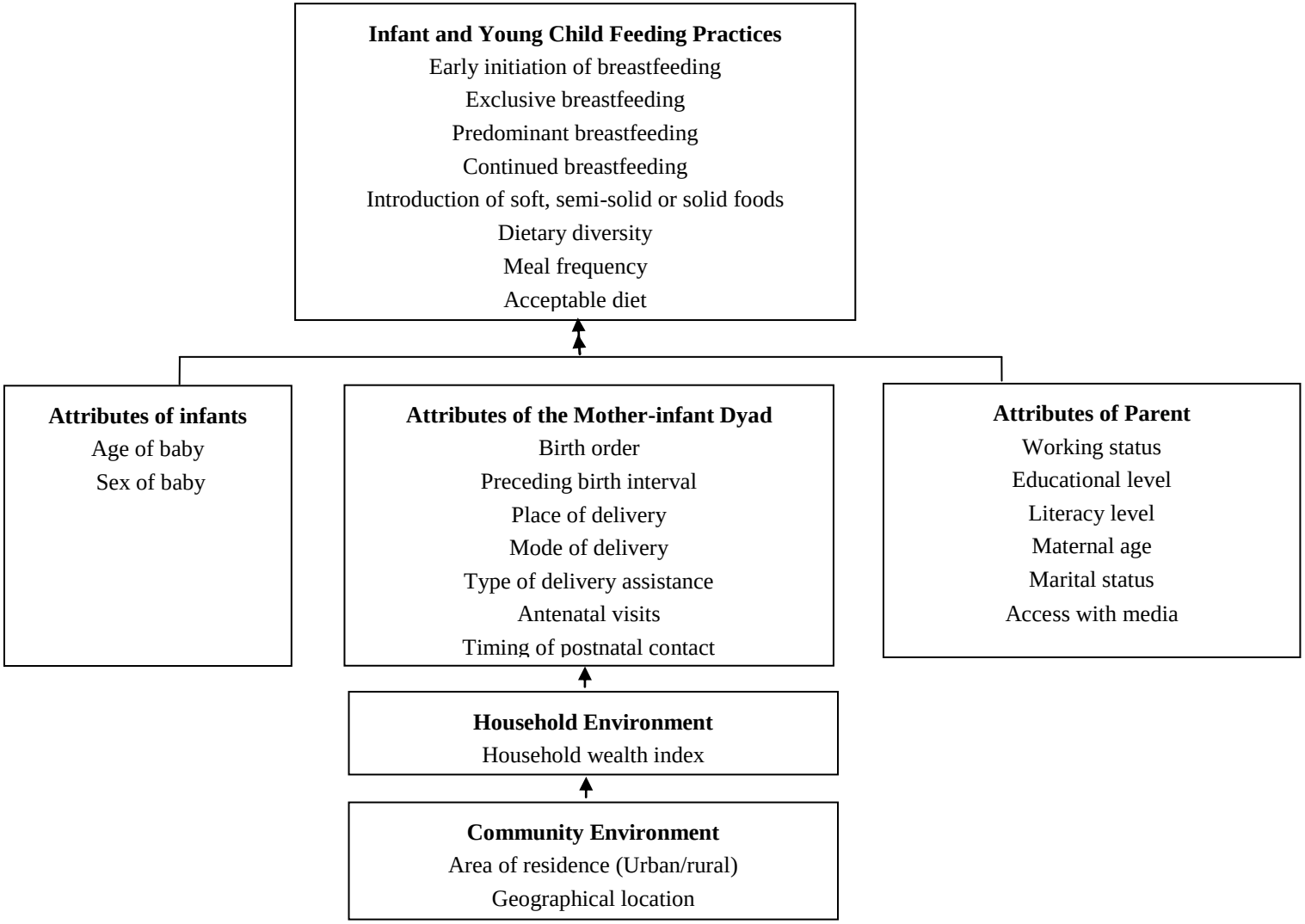

Figure 2:5 Conceptual framework of factors that influence IYCF practices adapted from Mosley and Chen (170)

2.5 Study variables

Dependent variables

The information about breastfeeding and complementary feeding practices was used as dependent variables in this analysis. The core breastfeeding and complementary feeding practices were assessed using the key indicators recommended by the WHO (2008), which were based on a 24 hour recall of food consumption of the infant by the mother. The breastfeeding indicators include: "Early initiation of breastfeeding", "Exclusive breastfeeding", "Continued breastfeeding at 1 year", "Continued breastfeeding at 2 years", "Predominant breastfeeding" and "Ever breastfeeding". Complementary feeding indicators were: "Introduction to soft, semi-solid or solid foods", "Minimum dietary diversity", "Minimum meal frequency" and "Minimum acceptable diet". The detailed information about the indicators for breastfeeding and complementary feeding are described in Chapter 3 and 4 respectively.

Independent variable

The individual-, household-, and community-level factors were used as the independent variables in this study. These independent variables were selected based on previous reports in the literature that they were capable of influencing infant and young child feeding practices. The availability of the variable in the data set also influenced the selection of factors examined. Table 2:1 shows a list of all the independent variables used in this study along with their definitions and categorizations. The individual level factors included infant's sex, infant's age, baby size, birth order, birth interval, place of delivery, type of delivery assistance, antenatal visits, timing of postnatal contacts, mother's working status, mother's occupation, mother's educational level, mother's literacy level, mother's age and mother's contact with media.

The household variable was household wealth index and community variables included area of residence and geographical location presented in zones. While the variable for household wealth index was not available in the 1999 TRCHS dataset, in the 2004-05 and 2010 TDHS the wealth index was constructed using the principal components statistical procedure to determine the weights for the index based on household assets information collected from household

questionnaire which covered information on household ownership of number of consumers items, ranging from a television to a bicycle or car, as well as information on dwelling characteristics, such as source of drinking water, type of sanitation facilities, and type of materials used in dwelling construction. Each asset was assigned a weight (factor score) generated through principle component analysis, and the resulting asset scores were standardized in relation to a standard distribution with a mean of 0 and standard deviations of 1 (172). Each household was then assigned a score for each asset, and the scores were summed for each household. Individuals were ranked according to the total score of the household in which they resided. The wealth index was then divided into five categories/quintiles, and each household was assigned to one of the wealth category. The bottom 40% of households was arbitrarily referred to as poorest (20%) or poorer (20%) household, the next 20% as the middle households and the top 40% as richer (20%) and richest (20%). Similar procedure was used to construct the variable for household wealth index in the analysis for the 1999 TRCHS. It is important to note that variables for father's level of education, father's occupation, timing of postnatal check-up and mother's participation in household decision making were not available in the 1999 TRCHS, hence they are not presented in the analysis of breastfeeding practices for this survey.

Table 2:1 Definition and categorization of the independent variables used in this analysis

VARIABLE	DEFINITION AND CATEGORIZATION
Individual level variables	
Child age	Age of the child (0-5 months; 6-11 months; 12-17 months; 18-23 months)
Sex	Sex of the child (1=male; 2=female)
Birth order	Birth order of child (1=first born; 2=second, third and fourth born; 3=fifth born and above)
Birth interval	Interval between birth (1= 0-23 months; 2= 24 months and above)
Place of delivery	Place where child was born (1= health facility; 2=home)

Type of delivery assistance	Birth attendance during delivery (1=health professional; 2=traditional birth attendant ; 3=other relatives or untrained people)
Mode of delivery	Mode of delivery (1=non-caesarean section; 2=caesarean section)
Antenatal care visits	Number of antenatal care visits (only for most recent birth before the survey)
Timing of postnatal contact	Number of postnatal check-up mothers made after delivery (only for most recent birth before the survey)
Maternal Body Mass Index (BMI)	Mother's BMI (1=<18.5 kg/m^2 ; 2=18.5-<=24.9 kg/m^2; 3=25.0-<=29.9 kg/m^2 ; 4= 30.0 kg/m^2 and above)
Maternal working status	Maternal employment status (1= working in the past 12 months before the survey; 2=not-working)
Maternal age	Mother's age in years (1=15-19; 2= 20-34; 3= 35-49)
Maternal education level	Maternal level of education (1=no education; 2=primary education; 3=secondary and higher education level)
Maternal literacy	Maternal literacy (1=cannot read at all; 2=able to read part or whole sentence)
Maternal marital status	Marital status of the mother (1=currently married; 2=formerly married-divorce, separated, or widowed)
Maternal access to media	Mother's frequency access to media e.g. Radio, television, newspaper (1=not at all; 2=yes)
Household level variable	
Household wealth index	Household wealth index (1=poorer; 2=poor; 3=middle; 4=rich; 5=richest)

Community level variables	
Area of residence	Area of residence (1=urban; 2=rural)
Geographical zone	Geographical zones (1=Central; 2= Eastern; 3= Northern; 4= Southern; 5= Southern Highlands; 6= Lake; 7= Western; 8=Zanzibar)

2.6 Key inclusion and exclusion criteria

Inclusion

The present analysis was restricted to the available number of weighted children 0-23 months that were alive, last born and lived with their mothers during the 1999, 2004-05 and 2010 surveys. In addition, data for women of reproductive age (15-49 years) from both rural and urban areas of Tanzania Mainland and Zanzibar found with children age 0-23 months during these surveys was included in this analysis. This restriction was made in order to reduce recall bias and ensure similar recall periods by mothers. In addition, restriction of this analysis to children who lived with their mothers only was to ensure that the mother answered the question about infant feeding to ensure accuracy.

Exclusion

Children aged more than 24 months of age, twins and those found with missing key data (e.g. place of delivery, assistance at delivery etc.) were excluded in this analytical study. It is important to consider that children of multiple births and those who are not last born are assumed not to have been breastfed in 24 hours preceding the surveys (173). Hence, including those children in the analysis was likely to result in some bias.

NOTE:

In this thesis the age categories of infants and young children were describe as shown in the Table 2:2.

Table 2:2 Age categories on infants and young children

Age category	Description
0-1 months	included infants aged less than 2 months
2-3 months	included infants aged 2 and above months and those aged less than 4 months
0-3 months	included infants aged less than 4 months
0-5 months	included infants aged less than 6 months
4-5 months	included infants aged 3 and above and those aged less than 6 months
6-8 months	included infants aged more than 5 months and those aged less than 9 months
6-11 months	included infants aged more than 5 months and those aged less than 12 months
6-23 months	included infants aged 6 and above months and those aged less than 24 months
0-11 months	included infants aged less than 12 months
12-17 months	included children aged more than 11 months and those aged less than 18 months
12-23 months	included children aged 12 and above months and those aged less than 24 months
18-23 months	included children aged more than 17 months and those aged less than 24 months

2.7 Sample size

The sample size for this study was obtained from the sample of 4,118, 10,329 and 10,522 women of reproductive age with children aged less than 59 months who were interviewed during 1999 TRCHS, 2004-05 and 2010 TDHS as described earlier in Section 2.2 of this Chapter. The sample of the current analysis was restricted to those mothers with children aged

0-23 months who met the inclusion criteria for this analysis amongst the surveyed sample for breastfeeding practices. Furthermore, the sample for the analysis of complementary feeding practices was restricted to those mothers with children aged 6-23 months amongst the surveyed sample in 2004-05 and 2010. Therefore, the weighted total sample of children for the breastfeeding and complementary feeding analysis in 2004-05 TDHS were 3,316 and 2,402 respectively. In the 2010 TDHS analysis was restricted to a weighted total of 3,112 for breastfeeding and 2,275 for complementary feeding. For the 1999 TRCHS the sample was restricted to a total of 1131 children for breastfeeding practices only because data on complementary feeding were not available in this survey as outlined in the 1999 TRCHS report (19).

2.8 Data Analysis

All statistical analyses were performed using the Stata 10.0 package (*stata version 10.0; Stata Corporation, College Station, Texas)* with survey "SVY" commands used to allow for adjustments for the cluster sampling design and the calculation of standard errors. The Taylor series linearization method was used when estimating confidence intervals around prevalence estimates. Breastfeeding and complementary feeding indicators were expressed as dichotomous variables, with variable 1 for not meeting indicator and 0 for meeting indicator. The breastfeeding and complementary feeding indicators were examined against a set of independent variables (individual-, household-, and community-level factors) in order to determine their prevalence and factors associated with poor IYCF practices. Chi-square tests were used to test for significance of associations. Univariate and multiple regression method were used in a stepwise backwards model in order to determine the factors significantly associated with poor IYCF indicators. In all multivariate statistical modelling, we created an indicator variable for missing data and restricted our analysis to non-missing data. The odds ratios with 95% confidence intervals were calculated in order to assess the adjusted risk of independent variables. Those variables with $p<0.05$ were retained in the final model for each

outcome indicator. Practically significant variables were not included in the final model if they were not statistically significant even after being adjusted with other confounders.

In the trend analysis for breastfeeding practices, differences in prevalence estimates in breastfeeding indicators were expressed as percentages comparing between the three surveys periods. Whereas in the trend analysis for complementary feeding practices, differences in prevalence estimates in complementary feeding indicators were expressed as percentages comparing the two surveys periods (2004-05 and 2010 TDHS) because data for complementary feeding were not available in the 1999 TRCHS. In all comparison, differences were estimated using a chi-square to test the significance of differences at $p<0.05$. The level of significance was set at $p \leq 0.05$ for all analyses.

2.9 Ethics Consideration and clearance

This research study was approved by the Human Research Ethics Committee of the University of Newcastle (protocol approval number H-2011-0249). The permission to download and access the Demographic and Health Survey dataset was requested and granted from DHS Measure (see Appendix A).

Chapter 3 Breastfeeding practices among children aged 0-23 months in Tanzania

This chapter presents data on breastfeeding practices among children aged 0-23 months in Tanzania. The chapter begins with an introduction, followed by presentation of findings on prevalence and determinants of breastfeeding practices using the 1999 Tanzania Reproductive and Child Health Survey (TRCHS), the 2004-05 and 2010 Tanzania Demographic and Health Survey (TDHS) data. This chapter also describes trends of breastfeeding indicators in Tanzania from 1999 to 2010. The last section of this chapter discusses the findings of breastfeeding practices in Tanzania.

3.1 Introduction

The WHO infant feeding guidelines (6) recommend that all infants should be breastfed within one hour of birth and exclusively breastfed from birth until 6 months of life. Thereafter, they should be introduced to nutritionally adequate and safe complementary foods with continued breastfeeding for up to two years or beyond. According to the Tanzania Demographic and Health Survey (TDHS) of 2010 (8) breastfeeding was almost universal at 99% in all socio-demographic categories, however, early initiation of breastfeeding within one hour of birth was reported by 46.1% of women who recently delivered a baby, while the prevalence of exclusive breastfeeding (EBF) was 50% among infants less than six months (8). This implies that a considerable proportion of infants aged 0-5 months are introduced to other liquids and solid foods before the recommended age of 6 months and thereby limiting the full benefits of breastfeeding. Low adherence to optimal breastfeeding including exclusive breast feeding for the first 6 months of age is believed to contribute to under nutrition observed in young children (1). For instance, the 2010 TDHS reported that 35% of children under-five years of age were stunted while 21% were underweight indicating that undernutrition is a public health problem in Tanzania that needs to be addressed at a very early stage of infant's life (8).

It is well established that optimal breastfeeding confers protective effects against gastrointestinal infections and improves child survival.(33, 34, 115) A cohort study carried out in Ghana revealed that 22% of neonatal deaths could be prevented if all infants were put to the breast within the first hour of birth (34). It has also been reported that exclusive breastfeeding from birth and until 6 months of age has the potential to prevent 13% of all deaths among children aged less than 5 years annually in developing countries (31). Furthermore, evidence from epidemiological studies shows that infants who are either partially breastfed or not breastfed at all had a 14-fold risk of dying from diarrhoea and a 3.6 fold risk of dying from respiratory infections in the first year of their life compared to those who were exclusively breastfed (115, 174).

Research on factors associated with suboptimal breastfeeding practices in developed and developing countries, including Africa, shows that delayed initiation of breastfeeding after birth and non-exclusive breastfeeding during the first 6 months were influenced by factors like maternal age (56, 60, 62), maternal education level (56, 60, 103), maternal employment status (85, 103), maternal nutritional status (162), place of delivery (78, 138), mode of delivery (88, 94), area of residence (88), household wealth status (103) and geographical differences (77, 88). These factors have been documented to be either positively or negatively associated with breastfeeding practices and inconsistencies of results found in different countries make it difficult to generalize the findings to all countries, hence need to identify factors that are associated with breastfeeding practices in Tanzania.

The aim of this secondary data analysis study was to describe prevalence of breastfeeding practices using the current WHO recommended breastfeeding indicators (10) and to determine the factors associated with Delayed initiation of breastfeeding, Non-exclusive breastfeeding and Predominant breastfeeding among children 0-23 months of age in Tanzania using the 1999 TRCHS and the 2004-05 and 2010 TDHS data after controlling for individual, household and community characteristics. This study also aimed at comparing the trends of breastfeeding

practices and their associated factors in Tanzania from 1999 to 2010 to see whether Tanzania had any improvement in breastfeeding practices in the 10 years.

3.2 Methodology

Data sources and study design

The present analysis of breastfeeding indicators was based on the 1999 TRCHS, the 2004-05 TDHS and 2010 TDHS data. The details of the survey methodologies, sampling procedures and questionnaires is outlined in Chapter 2 as well as in the TRCHS (19) and TDHS reports (8, 55). The present analysis was confined to alive last-born children aged 0-23 months living with their mothers. This included 1175 children in the 1999 TRCHS, 3,316 children in 2004-05 TDHS and 3,112 in 2010 TDHS (Total sample = 7,603 children).

Breastfeeding indicators

The breastfeeding indicators reported in these surveys were estimated according to the new WHO recommended definitions of key indicators for assessing infant and young child feeding practices (10, 11). The indicators include:-

- "***Early initiation of breastfeeding*:** Proportion of children born in the last 24 months who were put to the breast within one hour of birth-this indicator is based on historical recall";
- "***Exclusive breastfeeding under 6 months*:** Proportion of infants 0-5 months of age who were exclusively fed with breast milk -this indicator is based on mother's recall on feeds given to the infant in the previous day";
- "***Continued breastfeeding at 1 year*:** Proportion of children 12-15 months of age who were fed breast milk";
- "***Continued breastfeeding at 2 years*:** Proportion of children 20-23 months of age who were fed breast milk";
- "***Predominant breastfeeding*:** Proportion of infants 0-5 months of age who were fed with breast milk from the mother (either directly or expressed) and certain liquids

(water, water-based drinks and fruit juice), ritual fluids and ORS, drops, syrup consisting of vitamins, mineral supplements or medicine".

- **"*Children ever breastfed*:** Proportion of children born in the last 24 months who were ever breastfed".

- **"*Bottle feeding*:** Proportion of children 0-23 months of age who are fed with a bottle"

- **"*Age appropriate breastfeeding*:** Proportion of children 0-23 months of age who are appropriately breastfed". This indicator comprised the information of "infants 0-5 months of age who received only breast milk during the previous day" and "children 6-23 months of age who received breast milk, as well as soft, semi-solid or solid foods during the previous day".

The WHO recommendations for the EBF indicator outline categorization for the following age ranges 0-1month, 2-3months, 4-5 months and 0-3 months. The "Ever breastfed" and "Early initiation of breastfeeding" indicators were further disaggregated and reported for live births occurring 0-12, 12-23 and 0-23 months prior to interview. It should be noted that the EBF indicator defined above does not represent the percentage of infants who are exclusively breastfed at their sixth month of age (10, 11) but rather the average prevalence of exclusive breastfeeding of children 0-5 months of age.

The breastfeeding indicators were examined by individual level factors, which included mother's age, mother's body mass index (BMI) measured by weight (kg)/height (m^2) mother's literacy, mother's education, mother's working status, mother's marital status, partner's education, partner's occupation, birth order, birth interval, sex of child, age of child, place of delivery, type of birth delivery assistance, number of antenatal clinic visits, timing of postnatal check-up, mode of delivery, mother's access to mass media; household level factors included household wealth index and mother's autonomy in household decision making; and community level factors included place of residence and geographic zones.

“Early initiation of breastfeeding within one hour of birth” and “Exclusive breastfeeding” were examined in the multivariate analysis because of their low prevalence and vital roles in protecting infants against diarrhoeal diseases, and reducing mortality among many infants in developing countries (1). The indicator for predominant breastfeeding was also included in the multivariate analysis due to its higher prevalence rate (over 20%) in 1999 and 2004-05 and due to its impact on increasing risk of diarrhoeal diseases and childhood mortality (1). The rates of “Ever-breastfed” and “Continue breastfeeding” were very high (>90%) hence, they were not included in the multivariate analysis. In addition, bottle feeding was not considered in the multivariate analysis because the prevalence was low (4%) in the two most recent surveys (2004-05 and 2010).

Data analysis

The breastfeeding analysis was restricted to the alive, youngest last born infants aged 0-23 months, living with their mothers (women age 15-49 years) during the 1999 TRCHS, 2004-05 TDHS and the 2010 TDHS and the total weighted sample was 7,603. The analysis of determinants of “Early breastfeeding initiation” was based on the entire sample (7,603 children) while those of “Exclusive breastfeeding” and “Predominant breastfeeding” were based on 2,000 infants aged 0-5 months. Non-exclusive breastfeeding was expressed as a dichotomous variable with category 1 for non- EBF and category 0 for EBF. Delayed initiation of breastfeeding was expressed as a dichotomous variable with category 0 for early initiation of breastfeeding and category 1 for delayed initiation of breastfeeding. Predominant breastfeeding was expressed as a dichotomous variable with category 1 for predominant breastfeeding and category 0 for non-predominant breastfeeding. These variables were examined against a set of independent variables (individual, household and community characteristics) in order to determine the prevalence of Delayed initiation of breastfeeding, Non-exclusive breastfeeding and Predominant breastfeeding indicators and factors associated with Delayed initiation of breastfeeding, Non-exclusive breastfeeding and Predominant breastfeeding indicators.

Analyses were performed using Stata version 10.0 as previously outlined in Chapter 2 section 2.8. Univariate and multiple regression methods were used in a stepwise backward regression model in order to determine factors significantly associated with Delayed initiation of breastfeeding, Non-exclusive breastfeeding and Predominant breastfeeding indicators. The odds ratios with 95% confidence intervals were calculated in order to assess the adjusted risk of independent variables, and those with $p<0.05$ were retained in the final model. The linear interpolation method was used to compute the median duration of Exclusive breastfeeding. Differences in prevalence estimates in breastfeeding indicators were expressed as percentages comparing trends between the three surveys periods except for Early initiation of breastfeeding indicator whereby the comparison was made between two surveys (2004-05 and 2010). This is because data on early initiation of breastfeeding was not available in the 1999 survey.

3.3 Results

3.3.1 Basic characteristics of the study subjects

Table 3:1 summarizes the individual-, household-, and community-level characteristics of children aged 0-23 months and their parents. The total weighted sample were 1175 in 1999 TRCHS, 3316 in 2004-05 TDHS and 3112 in 2010 TDHS. The majority (80.0%) of children lived in rural areas during the three surveys. More than half (55.1%) of the children were from poor families in the 1999 survey compared to 44.1% in 2004-05 and 45.2% in the 2010 surveys. The age and sex of children were nearly equally represented in all surveys. However, the proportion of children from Zanzibar was very small (2.5-2.7%) compared to other geographic zones in all three surveys.

More than half of mothers in all surveys were literate and more than 66.0% had primary school education in all three surveys. There was a high proportion (85.0%) of working mothers in 2004-05 and 2010 (85.6%) compared to 76.3% in 1999. Most of mothers in all surveys were aged between 20 and 34 years and were currently married. Many mothers (69.4%) had made more than four antenatal clinic visits during pregnancy in 1999 compared to 2004-05 (42.0%) and 2010 (38.7%). Few (8.1%) mothers had post-natal checks within 41 days after delivery in

2004-05 compared to 31.4% in 2010. More than half (58.7% and 52.3%) of mothers gave birth at home in 1999 and 2004-05 respectively and the remaining proportion gave birth at health facility. In 2010, the proportion of mother who gave birth at home was equally the same to those mothers who gave birth at a health facility (49.1% vs. 50.9% respectively). Proportion of mothers who delivered by caesarean section was low and ranged from 3.3% in 1999 and 2004-05 to 5.1% in 2010. Of all birth deliveries, less than half were assisted by trained health professionals in all surveys, and a high proportion of the mothers were multiparous (>76.0%).

Table 3:1 Individual, household and community level characteristics for children aged 0-23 months and their parents in Tanzania, 1999 to 2010.

Characteristic	1999		2004-05		2010	
	n	%	n	%	n	%
Individual level factors						
Maternal working status						
Non-working	278	23.7	497	15.0	448	14.4
Working (past 12 mo)	897	76.3	2819	85.0	2664	85.6
Maternal education						
No education	317	26.9	855	25.8	799	25.7
Primary	815	69.3	2302	69.4	2084	67.0
Secondary and above	44	3.8	160	4.8	229	7.4
Partner's occupation						
Non agriculture	n/a	n/a	734	22.2	907	29.1
Agriculture	n/a	n/a	2371	71.5	1977	63.5
Not working	n/a	n/a	211	6.3	229	7.3
Partner's education **						
No education	n/a	n/a	582	18.7	534	18.5
Primary	n/a	n/a	2277	73.2	2079	72.0
Secondary and above	n/a	n/a	252	8.1	276	9.5
Mother's age						
15-19years	468	39.8	1318	39.7	1160	37.3
20-34years	499	42.4	1465	44.2	1342	43.1
35-49years	209	17.8	533	16.1	611	19.6
Marital status						
Currently married	1017	86.5	2887	87.1	2637	84.7
Formerly married (div/sep/widow)	81	6.9	228	6.9	263	8.4
Never married	78	6.6	201	6.0	213	6.8
Birth order						
First-born	250	21.2	707	21.3	611	19.6
2nd-4th	538	45.7	1601	48.3	1518	48.8

5 or more	388	33.0	1008	30.4	983	31.6
Preceding birth interval *						
No previous birth	250	21.2	708	21.4	611	19.7
<24 months	113	9.6	502	15.2	358	11.5
>24 months	813	69.2	2098	63.4	2137	68.8
Sex of baby						
Male	608	51.7	1644	49.6	1539	49.5
Female	568	48.3	1672	50.4	1573	50.6
Child's age in months						
0-5 months	326	27.7	837	25.2	837	26.9
6-11 months	303	25.8	903	27.2	793	25.5
12-17 months	293	24.8	858	25.9	772	24.8
18-23 months	254	21.6	719	21.7	710	22.8
Place of delivery						
Home	689	58.7	1733	52.3	1528	49.1
Health facility	486	41.4	1583	47.7	584	50.9
Mode of delivery **						
Non-caesarean	1137	96.7	3199	96.7	2949	94.9
Caesarean section	39	3.3	108	3.3	158	5.1
Type of delivery assistance **						
Health professional	483	41.1	1533	48.3	1487	47.9
Traditional birth attendant.	145	12.3	290	9.1	388	12.5
Relatives or untrained people	548	46.7	1349	42.5	1229	39.6
Antenatal Clinic visits *						
None	29	2.5	78	2.7	65	2.1
1-3 visits	350	30.0	392	13.4	1839	59.2
4+ visits	785	67.4	1223	42.0	1201	38.7
Timing of postnatal check-up *						
No check-ups (including missing)	n/a	n/a	3050	92.0	2097	68.6
0-2 days	n/a	n/a	204	6.2	466	15.2
3-6 days	n/a	n/a	25	0.8	176	5.8
7+ days	n/a	n/a	36	1.1	319	10.4
Mother's BMI (kg/m^2)						
<=18.5	n/a	n/a	259	7.8	303	9.7
>18.5 - <=24.9	n/a	n/a	2599	78.4	2277	73.2
>24.9 - <=29.9	n/a	n/a	358	10.8	397	12.8
>=30	n/a	n/a	101	3.0	135	4.3
Mother’s literacy*						
Can’t read	529	45.0	1177	35.5	1273	41.3
Can read	646	55.0	2139	64.5	1812	58.7
Mother's frequency of reading newspaper **						
Not at all	1131	96.3	2831	85.4	2702	86.9
Yes	44	3.7	484	14.6	407	13.1
Mother's frequency of listening to radio **						
Not at all	900	76.6	1369	41.3	1509	48.6

Yes	275	23.4	1943	58.7	1600	51.5
Mother's frequency of watching TV*						
Not at all	1140	97.0	2980	89.9	2669	85.8
Yes	35	3.0	334	10.1	443	14.2
Household level factors						
Wealth Index*						
Poorest (lowest quintile)	185	16.8	741	22.4	656	21.1
Poorer	420	38.3	720	21.7	751	24.1
Middle	170	15.5	708	21.4	675	21.7
Richer	217	19.8	649	19.6	581	18.7
Richest (highest quintile)	105	9.6	498	15.0	450	14.5
Decisions women have final say						
None	n/a	n/a	422	12.7	1383	44.4
One-two	n/a	n/a	1320	39.8	577	18.5
Three-four	n/a	n/a	783	23.6	459	14.8
Five and more	n/a	n/a	791	23.9	693	22.3
Community level factors						
Residence						
Urban	217	18.5	635	19.2	631	20.3
Rural	958	81.5	2681	80.9	2481	79.7
Geographical Zone						
Northern	209	17.8	406	12.3	451	14.5
Eastern	295	25.1	350	10.6	514	16.5
Western	164	13.9	736	22.2	496	15.9
Southern Highlands	115	9.7	489	14.7	346	11.1
Lake	133	11.3	725	21.9	405	13.0
Southern	68	5.8	243	7.3	222	7.1
Central	163	13.9	286	8.6	594	19.1
Zanzibar	30	2.5	82	2.5	84	2.7

NOTE: BMI: body mass index; TV: television; n/a: data were not available. Total weighted sample in was 1175 in 1999, 3316 in 2004-05 and 3112 in 2010 unless indicated with (*). Data on partner's education, partner's occupation, maternal BMI, timing of postnatal check-ups and maternal participation on household decisions were not available in the 1999 TRCHS.

3.3.2 Breastfeeding indicators

The prevalence of breastfeeding indicators of all children aged 0-23 months in Tanzania from 1999 to 2010 are presented in Table 3:2. More than half of the mothers (58.1%) had initiated breastfeeding within the first hour of birth in 2004-05 compared to less than half (46.1%) who did so in 2010. There was no data for early initiation of breastfeeding within one hour of birth in the 1999 survey. Almost all mothers (>97%) reported they had "Ever breastfed" their infants in all three surveys. Half (50.0%) of the infants 0-5 months of age were "Exclusively breastfed" in 2010 compared to 41.3% in 2004-05 and 31.8% in 1999. The median duration for Exclusive

breastfeeding ranged between 2.4 and 2.6 months in Tanzania since 1999 to 2010. The prevalence of Exclusive breastfeeding were high (57.9%, 70.0% and 80.7%) during the first month, but decreased to 15.5%, 13.4% and 22.9% when the infants reached 4-5 months in 1999, 2004-05 and 2010 respectively.

The proportion of infants aged 0-5 months who were "Predominantly breastfed" was high (59.8%) in 1999 compared to 20.2% in 2004-05 and 16.8% in 2010. More than 90% of mothers "Continued to breastfeed their infants until the end of first year" in all three surveys. However, the proportion of mothers who "Continued to breastfeed their children until the end of second year" was 57.2% in 1999 and further reduced to 55.5% in 2004-05 and 51.1% in 2010. Few children (<10%) aged 0-23 months were "Bottle-fed" in Tanzania in all surveys. Infants less than six months who were Bottle-fed in 1999 were 9.1% compared to 4.3% in 2004-05 and 4.7% in 2010.

Table 3:2 Prevalence of breastfeeding indicators among children aged 0-23 months in Tanzania, 1999-2010

	1999				2004-05				2010			
	Size of subsample (weighted)	**n (weighted)**	**Rate (%)**	**[95% CI]**	**Size of subsample (weighted)**	**n (weighted)**	**Rate (%)**	**[95% CI]**	**Size of subsample (weighted)**	**n (weighted)**	**Rate (%)**	**[95% CI]**
Early initiation of breastfeeding 0-23 months	n/a	n/a	n/a	n/a	3316	1933	58.3	[55.72,60.78]	3112	1434	46.1	[43.44, 48.76]
Early initiation of breastfeeding 0-11 months	n/a	n/a		n/a	1739	997	57.3	[54.41,60.14]	1630	750	46.0	[42.58, 49.45]
Early initiation of breastfeeding 12-23 months	n/a	n/a		n/a	1577	936	59.3	[55.85,62.75]	1482	685	46.2	[43.00,49.43]
Children ever breastfed 0-23 months	1175	1148	97.7	[95.97, 98.67]	3316	3247	97.9	[97.02, 98.56]	3112	3065	98.5	[97.68, 99.00]
Children ever breastfed 0-11 months	629	612	97.3	[95.22, 98.45]	1739	1704	98.0	[96.76, 98.71]	1630	1604	98.4	[97.31, 99.07]
Children ever breastfed 12-23 months	546	536	98.2	[95.68, 99.22]	1577	1544	97.9	[96.75, 98.65]	1482	1461	98.6	[97.63, 99.11]
Exclusive breastfeeding rate 0-5 months	326	104	31.8	[24.45, 40.22]	837	345	41.3	[37.54, 45.15]	837	418	49.9	[45.65, 54.15]
Exclusive breastfeeding 0-1 month	97	56	57.9	[44.14, 70.53]	256	179	70.0	[63.42, 75.97]	245	197	80.7	[74.13, 85.94]
Exclusive breastfeeding 2-3 months	123	31	25.42	[16.77, 36.57]	304	129	42.3	[36.50, 48.48]	299	153	51.1	[44.38, 57.80]
Exclusive breastfeeding 4-5 months	106	16	15.49	[7.30, 29.9]	280	38	13.4	[9.41, 19.11]	293	67	22.9	[17.69, 29.10]
Exclusive breastfeeding 0-3 months	220	87	39.7	[30.8249.31],	560	308	55.0	[50.20, 59.80]	544	350	64.4	[58.82, 69.66]
Predominant breastfeeding 0-5 months	326	195	59.84	[50.57, 68.46]	837	169	20.2	[17.35, 23.43]	837	141	16.8	[13.46, 20.74]
Continued breastfeeding rate at 1 year	193	177	91.7	[81.71, 96.48]	545	496	91.0	[87.49, 93.53]	524	492	94.0	[91.02, 96.09]
Continued breastfeeding rate at 2 year	156	89	57.2	[46.51, 67.28]	481	267	55.5	[50.43, 60.53]	419	214	51.1	[45.19, 57.04]
Bottle feeding rate at 0-23 months	1175	78	6.7	[5.07, 8.69]	3316	123	3.7	[2.86, 4.74]	3112	200	3.8	[2.97, 4.97]
Bottle feeding rate at 0-5 months	326	30	9.1	[5.85, 13.82]	837	36	4.3	[3.05, 6.09]	837	39	4.7	[3.06, 7.17]
Bottle feeding rate at 6-11 months	303	25	8.1	[4.41, 14.51]	903	38	4.2	[2.68, 6.46]	793	43	5.4	[3.75, 7.73]
Bottle feeding rate at 12-23 months	546	24	4.4	[2.6, 7.37]	1577	49	3.1	[2.16, 4.38]	1482	37	2.5	[1.66, 3.83]

C.I: Confidence interval; n/a: data not available

Figure 3:1 below shows that, the prevalence of EBF increase with decreasing rate of predominant breastfeeding among infants aged 0-5 months in Tanzania.

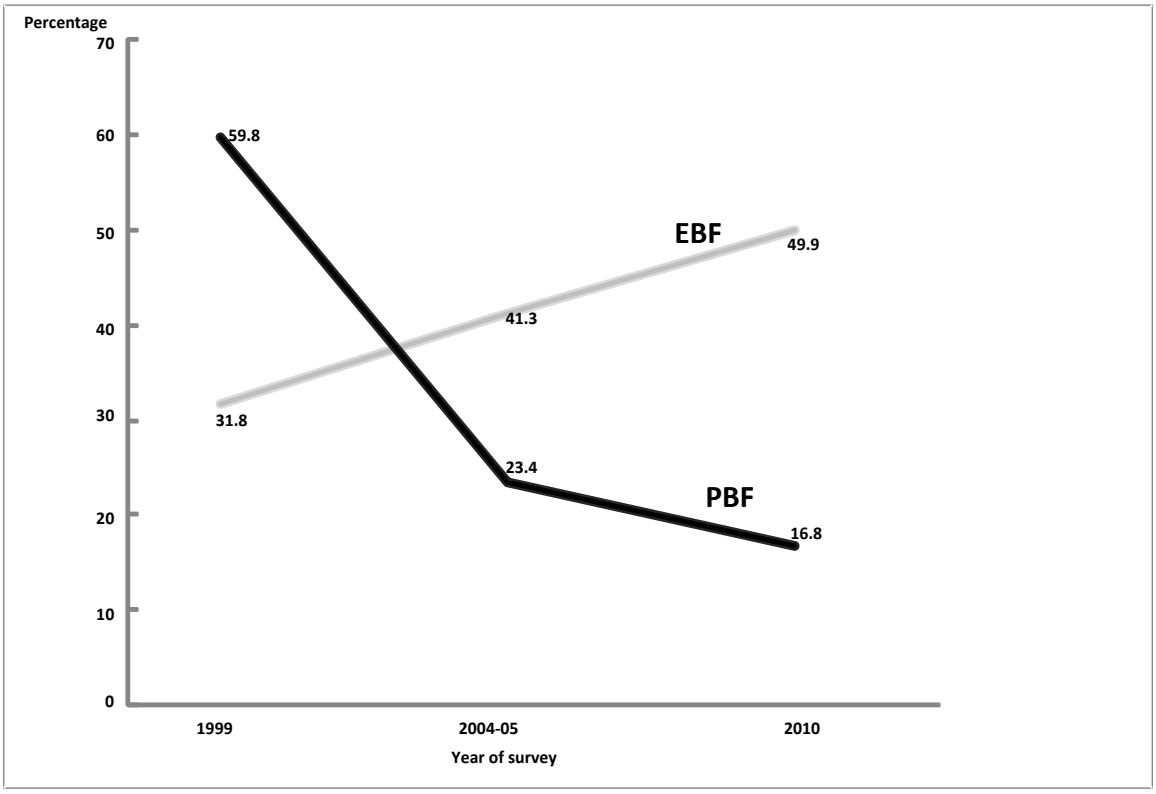

Figure 3:1 Prevalence of exclusive breastfeeding and predominant breastfeeding among infants aged 0-5 months, Tanzania 1999, 2004-05 and 2010.

Figure 3:2 to 3:4 below shows that 3.5%, 3.6% and 3.0% of infants were not breastfed at birth in Tanzania during 1999, 2004-05 and 2010 respectively. However, the prevalence of EBF at birth increased from 76.4% in 1999 and 2004-05 to 86.0% in 2010. Similarly, at birth 16.0% of infants were given breast milk plus water in 1999 and 2004-05 but the prevalence reduced to 8.0% in 2010. The proportion of infants who were given breast milk and other milk at birth was low (2%) in both surveys. The percentage of infants given BF plus complementary foods at birth decreased over time from 2.1% in 1999 and 2004-05 to 1.0% in 2010. The proportion of BF plus water tends to increase as infant grows.

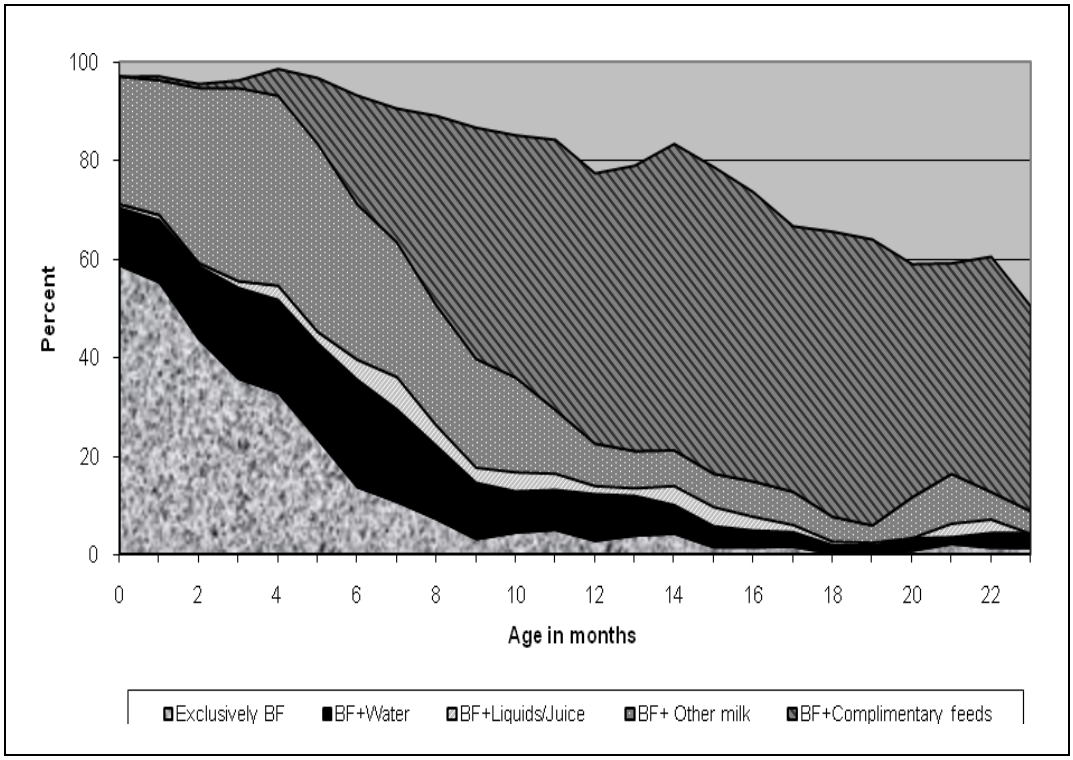

Figure 3:2: Distribution of children by breastfeeding (BF) status, according to age, in Tanzania 1999.

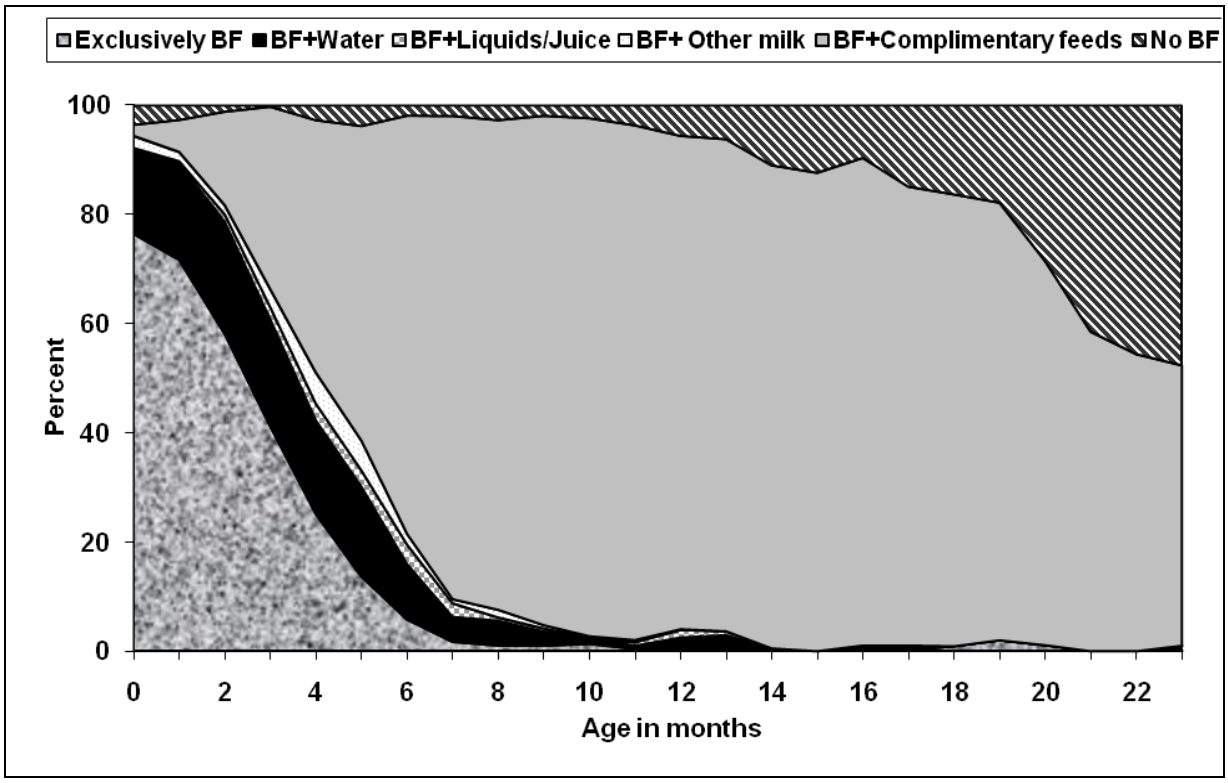

Figure 3:3: Distribution of children by breastfeeding (BF) status, according to age, in Tanzania 2004-05.

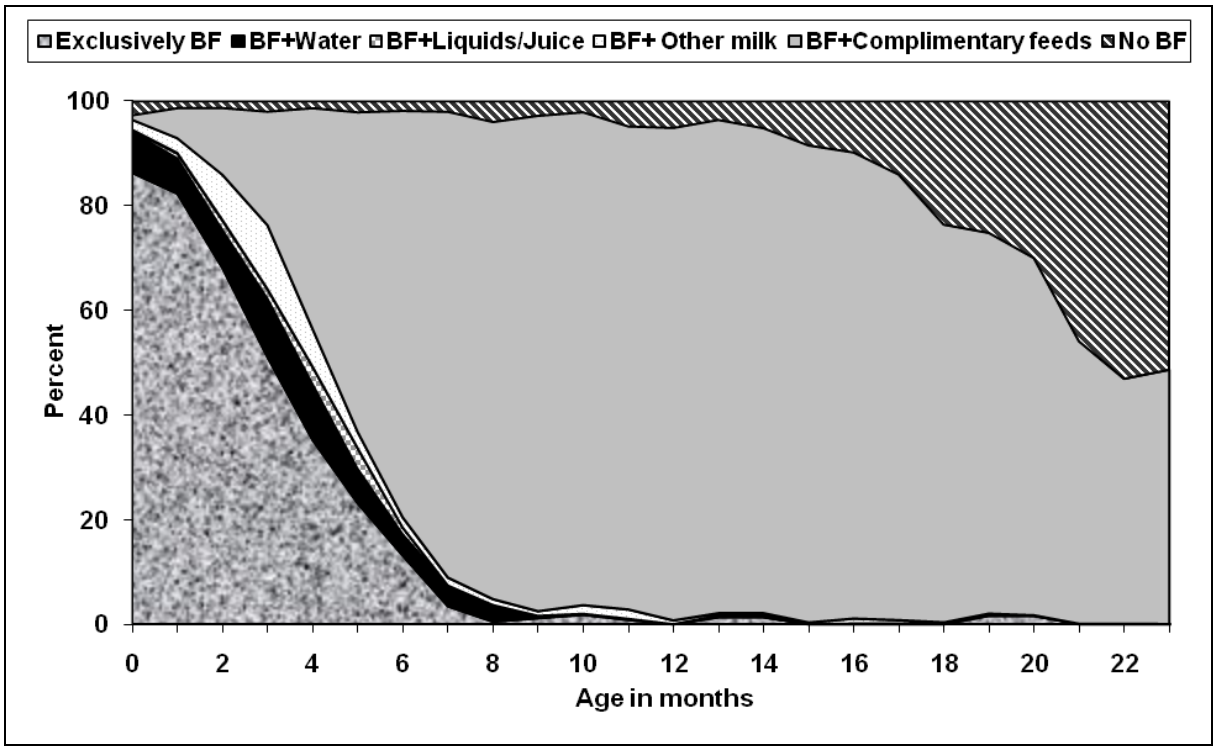

Figure 3:4: Distribution of children by breastfeeding (BF) status, according to age, in Tanzania 2010.

3.3.3 Differentials of breastfeeding indicators across individual-, household-, and community-level characteristics

Table 3:3 to Table 3:5 describe how the selected breastfeeding indicators "Early initiation of breastfeeding", "Exclusive breastfeeding" and "Predominant breastfeeding" varied across individual-, household-, and community-level characteristics. The prevalence of early initiation of breastfeeding within one hour of birth was significantly higher among mothers from Central, Eastern, Northern and Lake Zones in 2004-05 compared to 2010 ($p<0.001$) (Table 3:3). Mothers with secondary school education or higher education had significantly higher rates (67.0%) of early initiation of breastfeeding within one hour of birth in 2004-05 compared to 62.7% in 2010. The rate of early initiation of breastfeeding was significantly lower (63.2%) among working mothers than non-working mothers in 2010 ($p<0.001$). About 50.0% of the mothers aged 25-34 years had breastfed their infants within hour of birth in 2010. Multiparous mothers had significantly higher rates of early initiation of breastfeeding within one hour of birth compared

to primiparous mothers in 2004-05 (p<0.001). Mothers who gave birth at the health facilities had significantly higher rates of early initiation of breastfeeding than those who gave birth at home in both surveys (p<0.001). These rates were reported by many mothers (64.7%) in 2004-05 than those who did so in 2010 (57.7%). The rates of early initiation of breastfeeding was low among mothers who delivered by caesarean section compared to those who had non-caesarean section in both surveys. Illiterate mothers, those who did not listen to radio or watched television, mothers from poor households and those in rural areas also reported low rates of early initiation of breastfeeding in the 2004-05 and 2010 surveys.

Table 3:3 Rates of Early initiation of breastfeeding by individual, household and community level characteristics, Tanzania 2004-05 and 2010

	2004-05			2010		
Characteristic	**%**	**95% CI**	**p**	**%**	**95% CI**	**p**
Individual level factors						
Maternal working status						
Working (past 12 mo)	60.5	[54.28,66.31]	0.455	43.2	[40.49,45.97]	<0.001
Non-working	57.9	[55.07,60.66]		63.2	[57.15,68.93]	
Maternal education						
No education	54.8	[49.73,59.67]	0.055	41.7	[36.23,47.30]	<0.001
Primary	59.0	[56.26,61.66]		45.9	[42.91,49.04]	
Secondary and above	66.9	[57.35,75.17]		62.7	[55.11,69.73]	
Partner's education						
No education	51.7	[45.7,57.55]	0.009	45.2	[39.65,50.83]	<0.001
Primary	59.2	[56.52,61.80]		43.7	[40.77,46.64]	
Secondary and above	66.5	[58.87,73.35]		62.0	[53.78,69.60]	
Partner's occupation						
Non agriculture	68.3	[63.99,72.24]	<0.001	54.9	[50.08,59.59]	<0.001
Agriculture	55.4	[52.24,58.49]		41.4	[38.52,44.41]	
Not working	55.9	[47.58,63.96]		51.5	[43.70,59.26]	
Mother's age						
15-24years	57.9	[54.45,61.19]	0.605	43.5	[39.63,47.47]	0.027
25-34years	59.3	[55.78,62.71]		49.5	[45.68,53.37]	
35-49years	56.5	[51.12,61.75]		43.5	[38.85,48.19]	
Marital status						
Currently married	58.6	[55.88,61.28]	0.686	45.5	[42.64,48.30]	0.247
Formerly married (div/sep/widow)	55.2	[46.93,63.18]		47.0	[39.2,54.98]	
Never married	57.0	[48.43,65.16]		52.9	[44.58,60.98]	
Birth order						

First-born	54.7	[50.17,59.06]	0.001	47.4	[41.98,52.88]	0.087
2nd-4th	62.0	[59.08,64.76]		47.9	[44.32,51.67]	
5 or more	55.0	[50.91,58.96]		42.4	[50.91,58.96]	
Preceding birth interval						
No previous birth	54.7	[50.17,59.06]	0.282	47.4	[41.98,52.88]	0.207
<24 months	58.7	[44.38,71.60]		40.6	[33.62,47.91]	
>24 months	59.1	[50.76,63.14]		46.7	[43.67,49.82]	
Sex of baby						
Male	57.3	[54.03,60.42]	0.335	44.8	[41.32,48.24]	0.230
Female	59.3	[55.91,62.55]		47.4	[44.02,50.81]	
Place of delivery						
Home	52.4	[48.69,56.07]	<0.001	34.0	[30.99,37.21]	<0.001
Health facility	64.7	[61.24,68.03]		57.7	[54.19,61.19]	
Mode of delivery						
Non-caesarean	59.2	[56.50,61.78]	<0.001	47.4	[44.60,50.29]	<0.001
Caesarean section	28.2	[18.82,40.06]		20.9	[14.12,29.79]	
Type of delivery assistance						
Health professional	65.3	[62.04,68.45]	<0.001	58.6	[55.02,62.26]	<0.001
Traditional birth attendant.	48.8	[41.79,55.93]		40.2	[34.34,46.37]	
Relatives or untrained people	53.8	[49.88,57.68]		32.7	[29.35,36.29]	
Antenatal Clinic visits						
None	51.5	[35.30,67.34]	0.050	52.5	[36.46,68.08]	<0.001
1-3.	50.5	[44.75,56.18]		42.3	[39.39,45.35]	
4+.	61.4	[56.66,62.21]		51.6	[47.87,55.41]	
Timing of postnatal check-up						
No check-ups (including missing)	58.9	[56.23,61.55]	0.007	41.7	[38.64,44.90]	<0.001
0-2 days	53.4	[46.05,60.63]		54.9	[49.44,60.41]	
3-6 days	63.4	[43.08,79.81]		62.9	[53.53,71.32]	
7+	28.2	[13.96,48.85]		51.1	[44.49,57.67]	
Mother’s literacy						
Can’t read	53.4	[49.27,57.65]	0.002	38.9	[35.07,42.88]	<0.001
Can read	60.9	[58.13,63.62]		51.1	[47.73,54.38]	
Mother's frequency of reading newspaper						
Not all	57.9	[55.02,60.68]	0.479	44.0	[41.22,46.88]	<0.001
Yes	60.5	[55.22,65.54]		59.8	[53.65,65.62]	
Mother's frequency of listening radio						
Not all	54.6	[50.61,58.61]	0.010	41.5	[38.13,45.13]	0.003
Yes	60.9	[57.89,63.81]		50.4	[46.96,53.89]	
Mother's frequency of watching TV						
Not all	57.4	[54.68,60.10]	0.021	44.1	[41.32,46.92]	<0.001
Yes	65.7	[59.36,71.57]		58.1	[51.50,64.42]	
Mother's BMI						

<=18.5	52.4	[45.13,59.63]	0.086	48.4	[40.60,56.18]	0.459
>18.5 - <=24.9	58.0	[55.03,60.87]		45.0	[42.02,48.02]	
>24.9 - <=29.9	64.0	[56.92,70.39]		48.1	[41.36,54.99]	
>=30	60.8	[48.46,71.89]		53.5	[40.22,66.29]	
Household level factors						
Wealth Index						
Poorest (lowest quintile)	52.5	[47.45,57.55]	<0.001	39.3	[34.56,44.22]	<0.001
Poorer	51.8	[46.29,57.24]		42.0	[37.14,47.03]	
Middle	56.9	[51.85,61.86]		43.8	[38.64,49.07]	
Richer	62.7	[57.89,67.21]		48.7	[42.19,55.26]	
Richest (highest quintile)	72.4	[67.25,77.01]		62.9	[56.37,69.06]	
Mother's decision in category						
None	48.6	[43.24,54.01]	<0.001	43.1	[39.73,46.54]	0.018
One - two.	55.6	[51.63,59.57]		44.7	[39.85,49.71]	
Three - four.	63.1	[58.59,67.46]		51.7	[46.14,57.21]	
Five and more	63.0	[58.62,67.23]		49.5	[44.41,54.58]	
Community level factors						
Residence						
Urban	67.5	[61.17,73.21]	0.004	61.2	[54.61,67.47]	<0.001
Rural	56.1	[52.98,59.16]		42.2	[39.47,45.06]	
Geographical Zone						
Northern	60.5	[54.07,66.60]	<0.001	39.3	[33.99,44.94]	<0.001
Eastern	77.3	[70.95,82.65]		36.5	[30.50,43.15]	
Western	35.6	[30.08,41.62]		51.4	[44.97,57.68]	
Southern Highlands	44.8	[39.91,49.73]		53.0	[46.95,58.99]	
Lake	80.4	[76.77,83.64]		44.2	[36.53,52.17]	
Southern	54.5	[48.63,60.16]		45.4	[35.66,55.53]	
Central	60.5	[53.08,67.44]		52.1	[44.65,59.52]	
Zanzibar	57.3	[52.23,62.15]		49.1	[44.23,53.90]	

BMI: Body Mass Index; CI: Confidence Interval; TV: television. Chi squire test was applied to test for statistical significance. Information on early initiation of breastfeeding within one hour of birth was not available for 1999 survey.

As shown in Table 3:4 below, the rate of EBF of infants aged 0-5 months was significantly high among mothers who had worked in the last 12 months (58.9%) in 2010 than working mothers (43.3%) in 2004-05 and 1999 (33.9%). Mothers who gave birth at home had higher rates of EBF compared to those who gave birth at the health facilities in 1999. There was no significant difference in the rates of EBF among mothers who gave birth at home or health facility in 2004-05 and 2010. The rates of EBF were also high among mothers who got assistance from trained health providers during birth than those assisted by untrained birth attendants in 2004-05.

In contrast, the rates of EBF were significantly lower among mothers who watched television and were from wealthier households in 1999 and 2010. Similarly, mothers from urban areas had lower rates of EBF compared to their rural counterparts in 2010. The rates of EBF were not significantly different among rural and urban mothers in 1999 and 2004-05 surveys. Except for Western zones (57.9%), children from other geographic zones had low rates (<50.0%) of EBF in 1999. Likewise, the rate of EBF was 62.0% among infants in Lake Zone and less than 50.0% in other geographic zones. Furthermore, exclusive breastfeeding rates in infants aged 0-5 months varied from 10.4% in Zanzibar to 66.5% in Eastern zone in 2010.

Table 3:4 Rates of Exclusive breastfeeding by individual, household and community level characteristics, Tanzania 1999-2010

Characteristic	1999			2003-4			2010		
	%	95% CI	p	%	95% CI	p	%	95% CI	p
Individual level factors									
Maternal working status									
Working (past 12 mo)	30.7	[22.44,40.49]	0.713	32.0	[22.99,42.68]	0.050	48.0	[43.23,52.75]	0.035
Non-working	33.9	[20.79,50.14]		43.3	[39.26,47.37]		58.9	[49.92,67.39]	
Maternal education									
No education	39.7	[22.18,60.27]	0.346	41.6	[33.24,50.41]	0.794	50.6	[41.94,59.29]	0.943
Primary	28.9	[22.73,36.06]		40.7	[36.25,45.39]		49.8	[44.54,55.04]	
Secondary and above	19.2	[4.91,52.30]		47.6	[29.29,66.51]		47.8	[34.17,61.70]	
Partner's education									
No education	n/a	n/a		48.4	[38.82,58.06]	0.055	50.3	[36.44,64.07]	0.350
Primary	n/a	n/a		41.3	[36.8,45.99]		52.1	[47.05,57.03]	
Secondary and above	n/a	n/a		40.9	[27.29,56.15]		37.3	[23.76,53.23]	
Partner's occupation									
Non agriculture	n/a	n/a		37.2	[28.53,46.87]	0.019	49.6	[42.05,57.24]	0.726
Agriculture	n/a	n/a		44.3	[39.77,48.99]		50.7	[44.90,56.55]	
Not working	n/a	n/a		22.3	[12.54,36.45]		44.6	[32.33,57.64]	
Mother's age									
15-24years	29.4	[19.78,41.36]	0.289	37.4	[31.45,43.66]	0.099	50.4	[44.38,56.49]	0.858
25-34years	37.5	[26.34,50.09]		41.8	[35.96,47.77]		50.4	[43.73,57.03]	
35-49years	21.9	[9.99,41.45]		51.2	[40.32,61.93]		47.5	[37.96,57.23]	
Marital status									

Currently married	33.7	[24.99,43.64]	0.385	42.3	[38.13,46.49]	0.034	51.0	[46.12,55.91]	0.396
Formerly married (div/sep/widow)	24.6	[9.73,49.59]		48.4	[32.12,65.01]		42.1	[28.10,57.43]	
Never married	20.9	[8.57,42.98]		22.0	[12.00,36.71]		44.5	[32.09,57.53]	
Birth order									
First-born	24.6	[13.01,41.67]	0.493	36.9	[27.94,46.80]	0.231	50.1	[41.42,58.79]	0.997
2nd-4th	35.3	[26.53,45.07]		39.8	[34.49,45.29]		49.9	[44.19,55.65]	
5 or more	32.2	[19.67,47.93]		46.1	[39.32,53.08]		49.7	[42.44,57.01]	
Preceding birth interval									
No previous birth	24.6	[13.01,41.67]	0.548	36.9	[27.94,46.80]	0.303	50.1	[41.42,58.79]	0.578
<24 months	30.5	[12.75,56.85]		35.2	[25.31,46.45]		55.4	[43.14,67.03]	
>24 months	34.7	[26.77,43.62]		43.8	[39.23,48.37]		48.8	[44.08,53.70]	
Sex of baby									
Male	25.5	[17.87,34.95]	0.087	44.3	[38.48,50.29]	0.169	50.2	[44.47,55.87]	0.892
Female	38.0	[26.77,50.71]		38.5	[33.41,43.90]		49.6	[43.51,55.71]	
Place of delivery									
Home	40.3	[30.8,50.51]	0.006	41.3	[36.16,46.53]	0.983	50.4	[43.59,57.22]	0.808
Health facility	20.2	[12.11,31.66]		41.3	[35.18,47.79]		49.4	[44.38,54.37]	
Mode of delivery									
Non-caesarean	32.0	[24.52,40.65]	0.729	41.8	[37.87,45.73]	0.3408	49.5	[45.16,53.89]	0.492
Caesarean section	24.0	[3.226,75.03]		27.5	[9.27,58.36]		60.1	[40.33,77.14]	
Type of delivery assistance									
Health professional	21.9	[13.13,34.31]	0.059	41.6	[35.52,47.90]	0.017	51.1	[45.68,56.43]	0.326
Traditional birth attendant.	35.2	[21.00,52.52]		34.8	[24.46,46.74]		40.8	[29.14,53.54]	
Relatives or untrained people	39.3	[28.16,51.69]		39.5	[33.40,45.95]		51.1	[44.00,58.05]	
Antenatal Clinic visits									
None	58.4	[20.23,88.55]	0.137	34.3	[14.31,62.02]	0.5758	47.3	[17.12,79.59]	0.767

1-3.	37.9	[26.17,51.44]		45.7	[36.29,55.44]		48.9	[43.89,54.06]	
4+.	26.6	[19.17,35.71]		41.2	[37.17,45.34]		52.3	[45.13,59.31]	
Timing of postnatal check-up									
0-2 days	n/a	n/a		32.9	[20.27,48.51]	0.1399	44.6	[34.89,54.74]	0.466
3-6 days	n/a	n/a		43.1	[14.47,77.27]		61.7	[41.52,78.61]	
7+	n/a	n/a		0.00	0		42.8	[29.27,57.44]	
No check-ups (including missing)	n/a	n/a		42.3	[38.29,46.38]		50.9	[45.45,56.37]	
Mother's literacy									
Can't read	36.7	[23.96,51.74]	0.250	41.36	[34.45,48.62]	0.983	47.8	[41.59,54.16]	0.636
Can read	27.7	[20.71,36.07]		41.26	[36.46,46.22]		51.4	[45.66,57.02]	
Mother's frequency of reading newspaper									
Not all	32.2	[24.68,40.75]	0.533	42.7	[38.66,46.85]	0.101	51.0	[46.49,55.53]	0.255
Yes	21.2	[4.255,61.95]		32.6	[22.85,44.04]		41.4	[28.78,55.30]	
Mother's frequency of listening radio									
Not all	31.5	[23.53,40.72]	0.885	44.4	[38.23,50.75]	0.262	53.2	[46.94,59.4]	0.208
Yes	32.9	[17.91,52.47]		39.4	[34.27,44.69]		46.1	[34.27,44.69]	
Mother's frequency of watching TV									
Not all	32.5	[24.92,41.06]	<0.001	41.5	[37.61,45.58]	0.731	51.9	[47.11,56.57]	0.008
Yes	1.1	[0.13,7.91]		39.7	[26.19,55.03]		33.9	[23.61,46.05]	
Mother's BMI (kg/m^2)									
<=18.5	n/a	n/a		43.4	[31.21,56.38]	0.742	54.8	[38.25,70.37]	0.0203
>18.5 - <=24.9	n/a	n/a		40.0	[35.79,44.37]		52.27	[47.82,56.69]	
>24.9 - <=29.9	n/a	n/a		45.9	[33.43,58.82]		40.0	[23.41,46.40]	
>=30	n/a	n/a		53.8	[29.68,76.29]		43.6	[26.74,62.13]	
Household level factors									
Wealth Index									

Poorest (lowest quintile)	52.7	[31.29,73.19]	0.014	41.5	[33.18,50.39]	0.877	58.3	[49.21,66.83]	0.028
Poorer	29.2	[18.70,42.50]		44.4	[36.44,52.61]		54.0	[44.94,62.87]	
Middle	22.5	[8.76,46.87]		39.8	[32.68,47.28]		51.5	[42.35,60.52]	
Richer	43.2	[26.34,61.79]		43.0	[34.20,52.22]		42.5	[33.80,51.61]	
Richest (highest quintile)	5.9	[1.351,22.27]		37.9	[27.38,49.6]		37.0	[27.07,48.20]	
Mother's decision in category									
None	n/a	n/a		38.0	[26.50,51.12]	0.870	46.6	[40.62,52.77]	0.243
One - two.	n/a	n/a		41.0	[35.03,47.23]		47.8	[37.41,58.46]	
Three - four.	n/a	n/a		41.5	[33.53,49.83]		59.0	[48.10,69.10]	
Five and more	n/a	n/a		44.1	[35.46,53.12]		52.9	[44.62,61.03]	
Community level factors									
Residence									
Urban	21.9	[12.95,34.58]	0.139	35.7	[26.12,46.56]	0.259	40.3	[31.06,50.27]	0.034
Rural	34.0	[25.08,44.20]		42.6	[38.30,47.02]		52.2	[47.44,56.92]	
Geographical Zone									
Northern	22.5	[12.27,37.70]	0.001	21.8	[14.01,32.27]	<0.001	44.3	[36.74,52.08]	0.002
Eastern	47.3	[28.99,66.44]		27.4	[16.87,41.14]		66.5	[57.66,74.28]	
Western	57.9	[35.77,77.18]		46.1	[37.52,54.99]		53.6	[40.87,65.85]	
Southern Highlands	11.4	[4.445,26.41]		41.5	[29.57,54.47]		46.4	[36.39,56.71]	
Lake	30.8	[18.01,47.42]		62.0	[53.66,69.71]		40.6	[25.90,57.23]	
Southern	20.2	[7.19,45.13]		22.8	[14.67,33.61]		51.6	[36.76,66.24]	
Central	24.1	[12.79,40.69]		45.0	[36.76,53.46]		48.9	[39.96,57.85]	
Zanzibar	7.2	[3.06,15.88]		8.90	[4.89,15.84]		10.4	[6.218,16.73]	

BMI: Body Mass Index; CI: Confidence Interval; TV: television. Chi squire test was applied to test for statistical significance. Data on partner's education, partner's occupation, maternal BMI, timing of postnatal check-ups and maternal participation on household decisions were not available in the 1999 TRCHS

Table 3:5 shows that children whose mothers had worked in the past 12 months before the 2004-05 survey had higher rates of predominant breastfeeding compared to those whose mothers who did not work. The rates of predominant breastfeeding were significantly higher among children whose mothers watched television frequently (<0.001), from rich households (0.015) and from all geographical zones except in Western (0.002) in 1999. Likewise, the rates of predominant breastfeeding were significantly higher (>20%) in Eastern, Northern, Western, Southern and Zanzibar geographic zones. The rates of predominant breastfeeding did not differ significantly across other individual characteristics such as maternal age, maternal education and child gender in 2004-05 and 1999. Furthermore, the rates of predominant breastfeeding were not significantly different across all individual-, household-, and community-level characteristics in the 2010 survey.

Table 3:5 Rates of Predominant breastfeeding by individual, household and community-level characteristics, Tanzania 1999-2010

Characteristic	1999			2003-4			2010		
	%	95% CI	p	%	95% CI	p	%	95% CI	p
Individual level factors									
Maternal working status									
Working (past 12 mo)	58.0	[42.38,72.22]		30.9	[23.83,38.91]	0.032	17.0	[13.29,21.37]	0.822
Non-working	60.8	[50.20,70.42]	0.754	22.1	[18.74,25.76]		16.0	[10.12,24.47]	
Maternal education									
No education	55.4	[35.8,73.51]	0.401	22.0	[16.36,28.95]	0.8459	17.6	[11.74,25.78]	0.315
Primary	60.3	[51.71,68.36]		24.1	[20.59,28.04]		17.2	[13.47,21.57]	
Secondary and above	80.3	[47.73,94.76]		23.9	[13.29,39.17]		8.6	[4.104,17.29]	
Partner's education									
No education	n/a	n/a		17.2	[11.62,24.57]	0.1918	24.3	[14.36,38.01]	0.286
Primary	n/a	n/a		24.7	[21.04,28.70]		15.1	[11.69,19.23]	
Secondary and above	n/a	n/a		29.9	[19.40,43.06]		15.5	[7.766,28.65]	
Partner's occupation									
Non agriculture	n/a	n/a		29.0	[18.72,33.87]	0.2212	15.6	[10.78,21.90]	0.551
Agriculture	n/a	n/a		22.2	[16.00,22.91]		18.1	[13.82,23.23]	
Not working	n/a	n/a		22.0	[7.315,25.6]		11.8	[4.373,28.06]	
Mother's age									
15-24years	60.3	[46.60,72.60]	0.498	24.3	[19.43,29.82]	0.5266	17.0	[12.31,23.03]	0.660
25-34years	56.3	[44.03,67.98]		24.5	[19.70,30.10]		15.3	[10.83,21.29]	
35-49years	68.9	[50.86,82.65]		18.8	[12.10,27.95]		19.5	[12.75,28.69]	
Marital status									

Currently married	57.3	[46.45,67.47]	0.235	24.4	[21.17,27.99]	0.1726	17.3	[13.60,21.71]	0.694
Formerly married (div/sep/widow)	71.2	[46.57,87.55]		12.5	[5.614,25.38]		16.8	[7.713,32.91]	
Never married	73.9	[50.89,88.58]		23.0	[13.54,36.17]		11.9	[4.40,28.23]	
Birth order									
First-born	69.5	[52.36,82.59]	0.194	22.3	[14.88,32.12]	0.7708	13.1	[7.191,22.59]	0.347
2nd-4th	53.5	[42.89,63.74]		22.8	[18.62,27.58]		19.0	[14.73,24.14]	
5 or more	61.8	[47.17,74.61]		25.6	[19.57,32.62]		15.8	[11.16,22.07]	
Preceding birth interval									
No previous birth	69.5	[52.36,82.59]	0.283	22.3	[14.88,32.12]	0.0908	13.1	[7.191,22.59]	0.227
<24 months	65.3	[39.70,84.30]		42.8	[19.06,70.37]		22.0	[14.18,32.58]	
>24 months	55.2	[45.46,64.52]		21.5	[18.11,25.32]		16.9	[13.48,21.14]	
Sex of baby									
Male	65.7	[54.37,75.49]	0.120	20.2	[15.89,25.22]	0.0677	17.9	[13.76,23.14]	0.413
Female	54.1	[42.03,65.74]		26.8	[22.34,31.71]		15.5	[11.47,20.72]	
Place of delivery									
Home	51.3	[41.40,61.07]	0.004	23.4	[18.86,28.58]	0.8987	18.3	[13.88,23.82]	0.342
Health facility	71.7	[59.42,81.36]		23.9	[19.32,29.07]		15.2	[11.07,20.58]	
Mode of delivery									
Non-caesarean	59.6	[50.08,68.48]	0.732	23.3	[20.27,26.62]	0.4237	17.3	[13.88,21.37]	0.104
Caesarean section	67.6	[23.05,93.54]		33.1	[13.17,61.65]		4.6	[1.21,16.26]	
Type of delivery assistance									
Health professional	70.3	[57.40,80.65]	0.048	23.3	[18.75,28.67]	0.1279	14.9	[10.62,20.72]	0.378
Traditional birth attendant.	54.4	[35.88,71.69]		21.4	[13.77,31.77]		24.6	[15.41,36.96]	
Relatives or untrained people	52.3	[40.40,63.99]		26.0	[20.51,32.33]		16.5	[12.26,21.87]	
Antenatal Clinic visits									
None	41.6	[11.45,79.77]	0.212	22.5	[8.026,49.13]	0.8172	14.4	[3.594,43.15]	0.749

1-3.	52.8	[39.97,65.32]		25.2	[18.47,33.26]		17.5	[13.76,21.87]	
4+	64.9	[54.68,74.04]		23.8	[20.19,27.72]		15.3	[10.50,21.86]	
Timing of postnatal check-up									
0-2 days	n/a	n/a		30.0	[18.18,45.17]	0.2661	20.8	[13.06,31.58]	0.540
3-6 days	n/a	n/a		18.8	[3.644,58.66]		13.7	[4.598,34.17]	
7+	n/a	n/a		44.9	[13.73,80.64]		20.9	[10.96,36.18]	
No check-ups (including missing)	n/a	n/a		22.9	[19.70,26.52]		16.1	[12.49,20.51]	
Mother’s literacy									
Can’t read	54.1	[40.04,67.53]		23.55	[18.44,29.55]	0.981	18.6	[13.80,24.68]	0.281
Can read	64.6	[54.81,73.31]	0.171	23.63	[19.79,27.96]		15.5	[11.75,20.25]	
Mother's frequency of reading newspaper									
Not all	59.4	[49.97,68.25]	0.492	23.3	[20.13,26.88]	0.6966	16.8	[13.28,21.08]	0.912
Yes	71.6	[35.06,92.17]		25.3	[17.15,35.6]		16.8	[8.743,29.86]	
Mother's frequency of listening radio									
Not all	59.5	[49.10,69.13]	0.897	22.1	[17.56,27.46]	0.6424	17.0	[12.27,23.13]	0.854
Yes	60.9	[40.66,78.06]		24.5	[20.59,28.97]		16.7	[12.61,21.71]	
Mother's frequency of watching TV									
Not all	59.0	[49.53,67.88]	<0.001	24.1	[20.99,27.59]	0.5742	16.9	[13.40,21.24]	0.762
Yes	98.9	[92.09,99.87]		19.3	[11.49,30.55]		15.4	[8.335,26.73]	
Mother's BMI(kg/m^2)									
<=18.5	n/a	n/a		23.2	[14.18,35.54]	0.937	15.4	[5.26,37.45]	0.344
>18.5 - <=24.9	n/a	n/a		23.4	[19.99,27.08]		16.5	[13.15,20.48]	
>24.9 - <=29.9	n/a	n/a		29.0	[19.74,40.45]		14.5	[8.02,24.78]	
>=30	n/a	n/a		5.5	[1.607,17.26]		32.1	[13.71,58.34]	
Household level factors									

Wealth Index									
Poorest (lowest quintile)	35.2	[19.62,54.72]	0.015	20.3	[14.35,27.87]	0.4044	16.9	[11.13,24.76]	0.683
Poorer	60.6	[47.02,72.7]		24.5	[17.67,32.92]		19.6	[13.21,28.11]	
Middle	71.7	[47.66,87.6]		28.8	[22.49,36.14]		16.4	[10.53,24.54]	
Richer	53.9	[34.92,71.76]		20.6	[14.99,27.67]		17.0	[10.85,25.70]	
Richest (highest quintile)	83.2	[59.5,94.33]		22.7	[15.02,32.42]		10.9	[5.086,21.96]	
Mother's decision in category									
None	n/a	n/a		21.2	[14.39,30.02]	0.3611	19.2	[14.02,25.61]	0.383
One.	n/a	n/a		26.5	[21.30,32.33]		17.9	[10.94,27.82]	
Two.	n/a	n/a		24.2	[18.31,31.34]		14.8	[9.053,23.18]	
Three and more	n/a	n/a		18.8	[12.72,26.76]		12.1	[7.334,19.31]	
Community level factors									
Residence									
Urban	73.4	[59.69,83.71]	0.064	28.7	[21.06,37.78]	0.1498	12.4	[6.75,21.60]	0.238
Rural	56.9	[45.96,67.16]		22.4	[19.26,25.90]		17.9	[14.13,22.30]	
Geographical Zone									
Northern	76.4	[61.08,86.97]	0.002	30.5	[22.58,39.78]	<0.001	18.0	[11.37,27.24]	0.317
Eastern	41.8	[23.50,62.64]		24.3	[15.32,36.29]		17.1	[10.45,26.76]	
Western	28.9	[10.17,59.45]		32.3	[25.42,39.94]		10.7	[4.96,21.40]	
Southern Highlands	74.1	[50.61,88.84]		14.5	[8.39,23.82]		11.6	[5.96,21.61]	
Lake	55.4	[37.62,71.88]		20.4	[13.98,28.75]		21.1	[9.46,40.53]	
Southern	66.9	[47.23,82.08]		22.1	[13.51,33.96]		13.2	[6.28,25.67]	
Central	75.9	[59.31,87.21]		7.6	[3.458,15.82]		19.7	[12.34,30.07]	
Zanzibar	82.5	[72.17,89.58]		40.0	[31.74,48.90]		36.7	[29.52,44.57]	

BMI: Body Mass Index; CI: Confidence Interval; TV: television. Chi squire test was applied to test for statistical significance. Data on partner's education, partner's occupation, maternal BMI, timing of postnatal check-ups and maternal participation on household decisions were not available in the 1999 TRCHS

3.3.4 Determinants of breastfeeding indicators

Adjusted odds ratios were calculated to estimate the effect of the independent variables on three adverse infant feeding outcomes: delayed initiation of breastfeeding within one hour of birth, non-exclusive breastfeeding, and predominant breastfeeding.

Risk factors for Delayed initiation of breastfeeding

As seen in Table 3:6, home delivery and caesarean section delivery were consistent negative factors for delayed initiation of breastfeeding in 2004-05 and in 2010. Maternal underweight (Body Mass Index (BMI) less than 18.5 kg/m^2), prim parity and lower household wealth were determinants of delayed initiation of breastfeeding in 2004-05, whereas older maternal age (>25 years) and maternal higher education (secondary school or higher education) were positive protective factors for early initiation of breastfeeding within one hour of birth in 2010. Infants whose mothers had worked in the last 12 months and those residing in rural areas were at higher risk of delayed initiation of breastfeeding compared to urban infants of non-working mothers in 2010. Infants from Lake, Northern, Western and Zanzibar were at higher risk of delayed initiation of breastfeeding within one hour of birth since 2004-05 until 2010 as compared to infants from other geographic zones.

Table 3:6 Determinants of Delayed initiation of breastfeeding within one hour of birth, Tanzania 2004-05 -2010

	Year of survey					
	2004-05			2010		
Characteristic	**AOR**	**[95%CI]**	***p***	**AOR**	**[95%CI]**	***p***
Mother's age						
15-24 years				1.0		
25-34 years				0.6	[0.52,0.81]	<0.001
35-49 years				0.7	[0.55,0.94]	0.016
Work status						
Not working				1.0		
Working				2.3	[1.62,3.29]	<0.001
Mother's education						
No education				1.0		
Primary				1.0	[0.77,1.32]	0.966
Secondary or more				0.5	[0.33,0.83]	0.009
Mother's BMI (kg/m^2)						
>18.5 - <=24.9	1.0					
>24.9 - <=29.9	1.1	[0.69,1.67]	0.732			
>=30	1.5	[0.82,2.59]	0.193			
<=18.5	1.6	[1.13,2.16]	0.007			
Place of delivery						
Health facility	1.0			1.0		
Home	1.9	[1.51,2.37]	<0.001	1.7	[1.09,2.62]	0.019
Mode of delivery						
Non-caesarean	1.0			1.0		
Caesarean section	9.4	[4.51,19.62]	<0.001	8.9	[4.72,16.79]	<0.001
Delivery assistant						
Health professional				1.0		
TBA				1.4	[0.82,2.28]	0.210
Relatives/others				1.9	[1.21,3.08]	0.004
Preceding birth interval						
>24 months	1.0					
<=24 months	1.2	[0.90,1.64]	0.235			
No previous birth	1.5	[1.20,1.91]	<0.001			
Wealth Index						
Richest	1.0					
Richer	1.2	[0.84,1.76]	0.209			
Middle	1.4	[0.97,2.01]	0.041			
Poorest	1.5	[1.05,2.25]	0.015			
Poor	1.5	[1.03,2.18]	0.019			
Area of residence						
Urban				1.0		
Rural				1.4	[1.00,2.03]	0.050

Geographic zone						
Western	8.5	[5.95,12.14]	<0.001	1.0*		
Southern Highlands	6.1	[4.39,8.37]	<0.001	1.1	[0.70,1.65]	0.680
Central	2.7	[1.84,4.03]	<0.001	1.2	[0.81,1.76]	0.319
Lake	1.0*			1.6	[1.02,2.45]	0.039
Southern	4.3	[3.01,6.15]	<0.001	1.6	[0.94,2.73]	0.059
Northern	2.9	[2.02,4.19]	<0.001	1.7	[1.14,2.46]	0.006
Zanzibar	3.7	[2.71,5.09]	<0.001	2.3	[1.48,3.68]	<0.001
Eastern	1.2	[0.78,1.82]	0.247	2.1	[1.37,3.26]	0.001

AOR: adjusted odds ratio; CI: confidence interval. Survey logistic regression models for determinants of delayed initiation of breastfeeding within one hour of birth among children aged 0-23 months. The independent variables adjusted for were: child sex, child age, mother's age, mother's education, mother's literacy, mother's employment status, mother's BMI, marital status, father's education, father's occupation, birth order, preceding birth interval, antenatal visits, place of delivery, mode of delivery, type of delivery assistance, postnatal visits, mother's access to media (radio, television and newspapers), household wealth index, area of residence and geographical zones. P-values for odds ratios are based on multiple logistic regression model that includes all predictor variables retained by backward elimination, and also taking account of the clustering. The categories of independent variables have been ordered by placing the category with the lowest risk of adverse breastfeeding pattern first, except for geographical zones where (*) represent the reference category.

Risk factors for Non-exclusive breastfeeding

Male infants from the richest households and those of literate mothers aged more than 34 years were less likely to be exclusively breastfed in the first six months in 1999 (Table 3:7). Similarly, infants whose mothers had no formal education and delivered their babies at home had higher risks of non-exclusive breastfeeding in 2004-05. The adjusted odds of non-exclusive breastfeeding were significantly higher in urban infants and those whose mothers were assisted by traditional birth attendants at birth in 2010. When type of delivery assistant was removed from the final model and replaced by place of delivery, we found that place of delivery was not significantly associated with non-exclusive breastfeeding. Hence, type of delivery assistance was retained in the final model for non-EBF in 2010. In 1999, infants from Western zone were at lower risk of non-EBF than infants from other geographic zones. However, infants from Western, Lake, Southern and Eastern zones were at greater risk of non-EBF in 2004-05 and those from Zanzibar had higher risks of non-EBF compared to infants from other geographic zones in 2010.

Table 3:7 Determinants of non-exclusive breastfeeding among infants aged 0-5 months in Tanzania, 1999, 2004-05 and 2010

	Year of survey								
	1999			2004-05			2010		
Characteristic	**AOR**	**[95%CI]**	***p***	**AOR**	**[95%CI]**	***p***	**AOR**	**[95%CI]**	***p***
Child age in months	2.05	[1.49,2.81]	*<0.001*	2.1	[1.86,2.48]	<0.001	2.1	[1.78,2.40]	<0.001
Sex of child									
Male	1.00								
Female	0.39	[0.19,0.78]	*0.008*						
Mother's age(yrs)									
15-24	1.00								
25-34	0.99	[0.40,2.43]	*0.974*						
35-49	3.98	[1.31,12.07]	*0.015*						
Mother's literacy									
Can't read	1.00								
Read easily	2.35	[1.05,5.30]	*0.039*						
Maternal education									
Secondary and higher				1.0					
Primary				2.3	[0.79,6.87]	0.121			
No education				3.3	[1.09,10.22]	0.034			
Place of delivery									
Health facility				1.0					
Home				1.6	[1.07,2.50]	0.024			
Delivery assistant									
Health professional							1.0		
Relatives and/or untrained person							1.4	[0.82,2.23]	

Traditional birth attendant							2.3	[1.15,4.57]	0.019
Area of residence									
Rural							1.0		
Urban							2.1	[1.08,3.89]	0.028
Wealth Index									
Poorest (lowest quintile)	1.0								
Poorer	3.5	[0.78,15.78]	*0.100*						
Middle	3.0	[0.63,14.42]	*0.164*						
Richer	1.5	[0.44,4.97]	*0.522*						
Richest (highest quintile)	21.8	[2.43,19.32]	*0.006*						
Geographical Zone									
Zanzibar	4.2	[0.93,18.93]	*0.062*	1.0*			10.8	[5.23,22.22]	<0.001
Central	1.1	[0.28,4.21]	*0.894*	2.9	[1.62,5.34]	<0.001	1.0*		
Southern Highlands	2.9	[0.56,15.38]	*0.198*	3.0	[1.55,5.84]	0.01	1.6	[0.84,3.13]	0.152
Northern	1.0*			3.5	[1.81,6.75]	<0.001	1.4	[0.73,2.77]	0.299
Eastern	0.3	[0.08,1.42]	*0.137*	7.4	[3.51,15.54]	<0.001	0.3	[0.17,0.62]	0.001
Southern	0.6	[0.10,3.39]	*0.563*	8.0	[3.46,18.60]	<0.001	1.4	[0.50,3.64]	0.550
Lake	0.5	[0.11,2.52]	*0.411*	8.6	[4.53,16.24]	<0.001	2.6	[0.91,7.29]	0.076
Western	0.1	[0.03,0.64]	*0.012*	39.2	[14.68,104.81]	<0.001	0.6	[0.32,1.28]	0.205

AOR: adjusted odds ratios; CI: confidence interval. The independent variables adjusted for included child sex, child age, mother's age, mother's literacy, mother's employment status, mother's BMI, marital status, father's education, father's occupation, birth order, preceding birth interval, antenatal visits, postnatal check-ups, place of delivery, type of delivery assistance, mode of delivery, mother's access to media (radio, television and newspapers), household wealth index, area of residence and geographical zones. The categories of independent variables have been ordered by placing the category with the lowest risk of adverse breastfeeding pattern first except for geographic zones whereby (*) represent the reference category.

Risk factors for Predominant breastfeeding

The risks of being predominantly breastfed were significantly lower among female infants whose mothers listened to radio frequently and were from the Eastern, Southern and Western geographic zones (Table 3:8). On contrary, the adjusted odds of predominant breastfeeding were significantly higher among infants of literate mothers aged more than 34 years in 1999. Compared to Southern highlands, the occurrence of predominant breastfeeding was significantly higher across the following geographic zones: Zanzibar, Southern; Eastern; Lake, Central and Western in 2004-05. In addition, the risk of infants being predominantly breastfed was significantly higher among mothers who had 0-23 months of preceding birth interval compared with mothers who had >= 24 months preceding birth interval. Geographic zone was the only factor that revealed significant influence on predominant breastfeeding in the multivariate analysis in 2010, where by infants from Zanzibar were at higher risk of being predominantly breastfed than infants from other geographic zones.

Table 3:8 Determinants of Predominant breastfeeding among infants aged 0-5 months in Tanzania, 1999, 2004-05 and 2010

	Year of survey								
	1999			2004-05			2010		
Characteristic	**AOR**	**[95%CI]**	***p***	**AOR**	**[95%CI]**	***p***	**AOR**	**[95%CI]**	***p***
Child age in months	1.4	[1.12,1.80]	*0.004*						
Sex of child									
Male	1.0								
Female	0.5	[0.25,0.97]	*0.042*						
Mother's age (years)									
15-24	1.0								
25-34	1.3	[0.55,3.21]	*0.521*						
35-49	3.8	[1.39,10.65]	*0.010*						
Mother's literacy									
Can't read	1.0								
Read easily	2.3	[1.01,5.03]	*0.047*						
Mother's frequency listening to radio									
Not at all/once a week	1.0								
Yes	0.4	[0.14,0.95]	*0.040*						
Preceding birth interval									
>24 months				1.0					
No previous birth				1.0	[0.50,1.84]				
<24 months				2.6	[1.52,4.35]	<0.001			
Wealth Index									
Poorest (lowest quintile)	1.0								
Poorer	2.6	[0.91,7.51]	*0.074*						

Middle	3.9	[0.97,15.73]	*0.055*						
Richer	3.9	[1.23,12.05]	*0.021*						
Richest (higher quintile)	11.8	[2.24,61.47]	*0.004*						
Geographical Zone									
Southern Highlands	0.7	[0.17,2.78]	*0.601*	1.0*			1.4	[0.45,4.82]	0.528
Northern	1.0*			1.9	[0.57,6.10]	0.297	2.3	[0.76,6.82]	0.140
Zanzibar	1.6	[0.54,4.88]	*0.389*	3.0	[1.01,9.12]	0.047	4.8	[1.76,13.22]	0.002
Southern	0.2	[0.06,0.82]	*0.025*	3.5	[1.04,12.04]	0.043	1.6	[0.47,5.67]	0.439
Eastern	0.2	[0.07,0.73]	*0.014*	4.1	[1.30,12.75]	0.016	1.7	[0.57,5.37]	0.325
Lake	0.6	[0.19,1.74]	*0.326*	5.7	[1.95,16.81]	0.002	2.6	[0.61,11.02]	0.197
Central	1.1	[0.38,3.12]	*0.870*	6.6	[2.34,18.78]	<0.001	2.4	[0.79,7.17]	0.125
Western	0.1	[0.01,0.49]	*0.007*	8.3	[2.89,23.77]	<0.001	1.0*		

AOR: adjusted odds ratios; CI: confidence interval. The independent variables adjusted for included child sex, child age, mother's age, mother's literacy, mother's employment status, mother's BMI, marital status, father's education, father's occupation, birth order, preceding birth interval, antenatal visits, place of delivery, mode of delivery, type of delivery assistance, postnatal visits, mother's access to media (radio, television and newspapers), household wealth index, area of residence and geographical zones. The categories of independent variables have been ordered by placing the category with the lowest risk of adverse feeding pattern first except for geographic zones whereby (*) represent the reference category.

3.3.5 Trends in breastfeeding indicators in Tanzania from 1999 to 2010

This analysis aimed at comparing the trends in the prevalence of breastfeeding indicators among children aged 0-23 months in Tanzania from 1999 to 2010.

Infant and young child feeding indicators

The prevalence and differences as percentage-points of breastfeeding indicators for the three surveys are tabulated in Table 3:9, and the patterns are presented in Figure 3:5 to Figure 3:8. Finding from this trend analysis shows a significant increasing trend in the proportion of infants who were ever breastfed in Tanzania. There was a 0.8 percentage point increase from 1999 to 2010 (Figure 3:5). The difference as a percentage change between 2004-05 and 2010 survey periods was not statistically significant (Table 3:9). The prevalence of early initiation of breastfeeding within one hour of birth was 58.6% in 2004-05 which decreased to 46.1% in the year 2010, resulting in a 12.2 percentage-point decrease ($p<0.001$) (Table 3:9 and Figure 3:5).

There was a progressive increase in the proportion of infants aged 0-5 months who were exclusively breastfed from1999 to 2010 (Figure 3:6). A 9.5 percentage-point increase was observed between 1999 and 2004-05, and improved further by 8.6 percentage-point from 2004-05 and 2010. Overall there was 18.1 per cent increase in prevalence of excusive breastfeeding over the three survey periods (Table 3:9). The trend of predominant breastfeeding decreased by 36.2 percentage- points from 1999 to 2004-05 and by 6.8 percentage-point from 2004-05 to 2010. The overall decrease was 43.0 percentage-points from 1999 to 2010 ($p<0.001$) (Table 3:9 and Figure 3:6).

Table 3:9 Prevalence and differences as percentage-points of breastfeeding indicators according to child's age in Tanzania, 2004-05-2010

	Year of survey and Prevalence			Difference as percentage-point					
	1999	2004-05	2010	1999-2004-05		2004-05-2010		1999-2010	
Breastfeeding Indicators	**%[95 CI]**	**%[95 CI]**	**%[95 CI]**	**%**	**p**	**%**	**p**	**%**	**p**
Child ever breastfed 0-23 months	97.7[95.8,98.7]	97.9[97.00,98.60]	98.5[97.60,99.00]	0.2	0.261	0.6	0.001	0.8	0.001
Early initiation of breastfeeding 0-23 months	N/A	58.3[54.80,61.60]	46.1[43.10,49.10]	N/A	N/A	-12.2	<0.001	N/A	N/A
Exclusive breastfeeding 0-5 months	31.8[23.80,41.10]	41.3[37.20,45.50]	49.9[45.50,54.30]	9.5	0.057	8.6	0.007	18.1	<0.001
Predominant breastfeeding 0-5 months	59.8[49.90,69.00]	23.6[20.60,26.90]	16.8[13.50,20.70]	36.2	<0.001	6.8	0.006	43.0	<0.001
Continued breastfeeding rate at 1 year	91.7[82.30,96.40]	91.0[87.40,93.60]	94.0[91.10,96.10]	0.7	0.838	3.0	0.121	2.3	0.517
Continued breastfeeding rate at 2 year	57.2[45.70,68.00]	55.5[49.90,61.00]	51.1[45.10,57.10]	1.7	0.797	4.4	0.303	6.1	0.363
Bottle feeding 0-23 months	6.7[4.90,9.00]	3.7[2.90,4.80]	3.8[2.90,5.00]	-3.0	0.011	-0.1	0.835	-2.9	0.015
Age appropriate breastfeeding 0-23 months	59.7[55.30,63.90]	71.7[69.70,73.70]	73.0[71.00,74.90]	11.4	<0.001	1.3	0.381	13.3	<0.001

N/A: Not available (unable to calculate because data are not available)

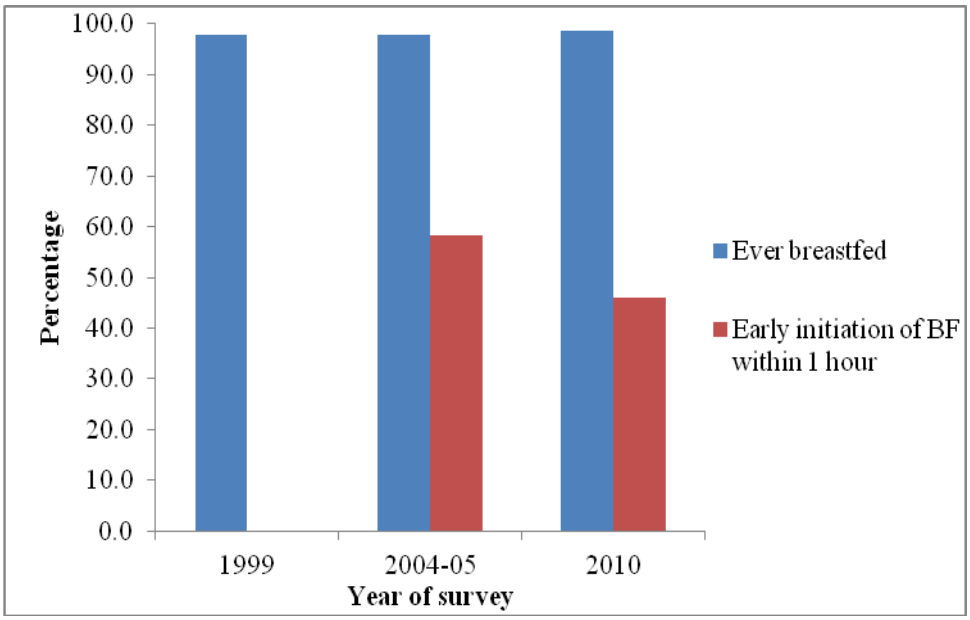

Figure 3:5 Time trends of Ever breastfed and Early initiation of breastfeeding within one hour for children aged 0-23 months in Tanzania, 1999-2010

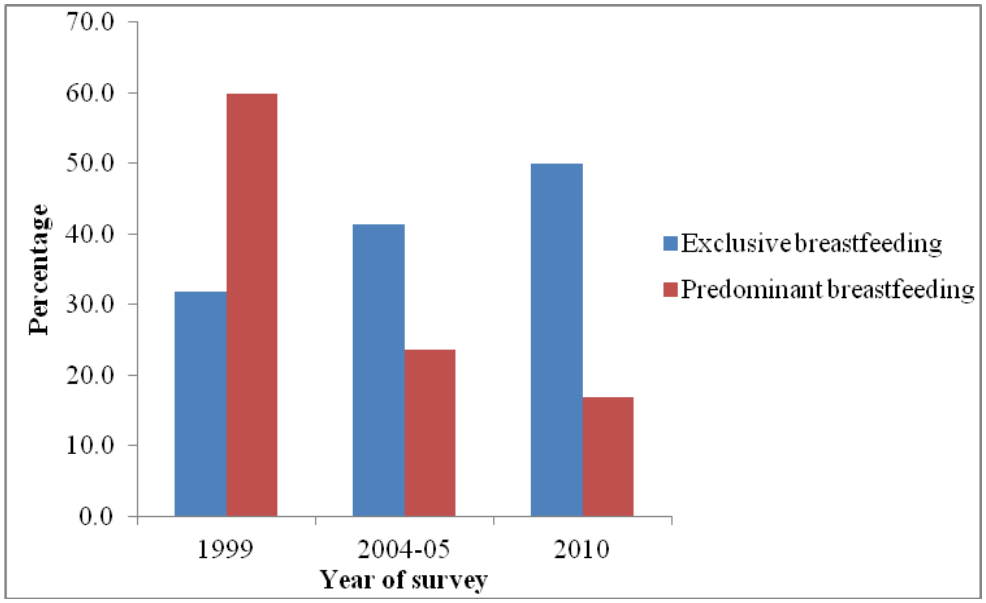

Figure 3:6 Time trends of exclusive breastfeeding and predominant breastfeeding among infants aged 0-5 months in Tanzania, 1999-2010

More than 90% of mothers continued to breastfeed their infants until the end of first year in Tanzania in 1999, 2004-05 and 2010 surveys (Table 3:9). The prevalence of continued breastfeeding until the end of 1 year was almost constant from 1999 to 2004-05 but improved slightly by 3.1 percentage-points from 2004-05 to 2010 Figure 3:7). On the other hand, proportion of mothers who continued to breastfeed their children up to 2 years or beyond declined by 4.4 percentage-points from 2004-05 to 2010, yielding an overall of 6.1 percentage-points decrease during the three periods studied (Table 3:9 and Figure 3:7).

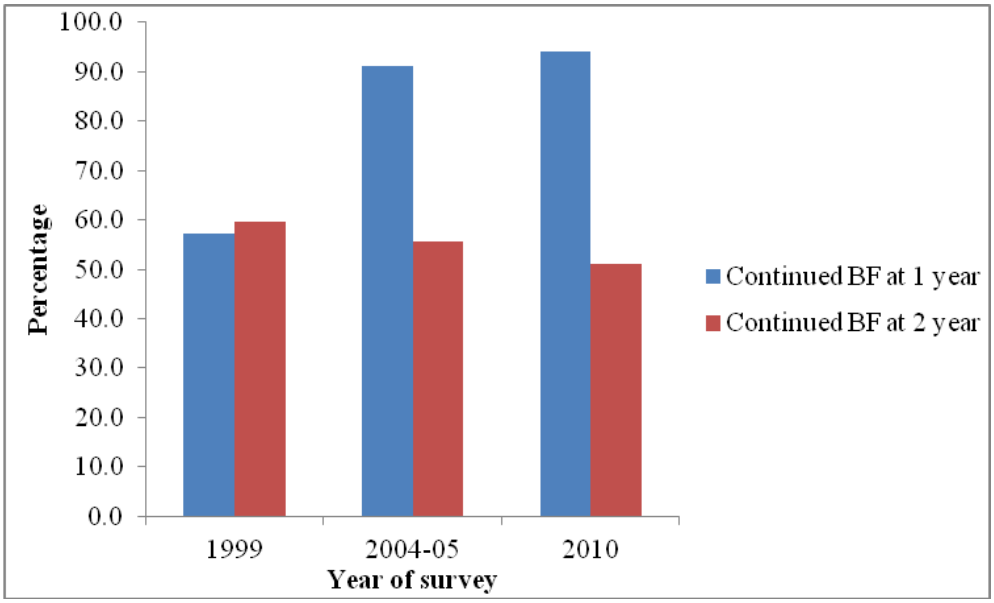

Figure 3:7 Trends of continued breastfeeding among children aged 12-15 and 20 - 23 months in Tanzania, 1999-2010

As shown in Table 3:9 and Figure 3:8, the proportion of children aged 0-23 months who were appropriately breastfed meaning that those infants aged 0-5 months who received only breast milk and children aged 6 to <24 months who received breast milk as well as soft, semi-solid or solid foods during 24 hours preceeding survey was low (59.7%) in 1999 but increased to 71.7% in 2004-05 and 73.0% in 2010. There was a 13.3 percentage-point increase in the trends of age-appropriate breastfeeding in the three periods ($p<0.001$).The prevalence of bottle feeding among children aged 0-23 months was low (<10%) in Tanzania. This prevalence showed a 1.7

percentage-point decrease from 1999 to 2004-05. The overall decreasing trend for the three study periods was 2.3 percentage-points (Table 3:9 and Figure 3:8).

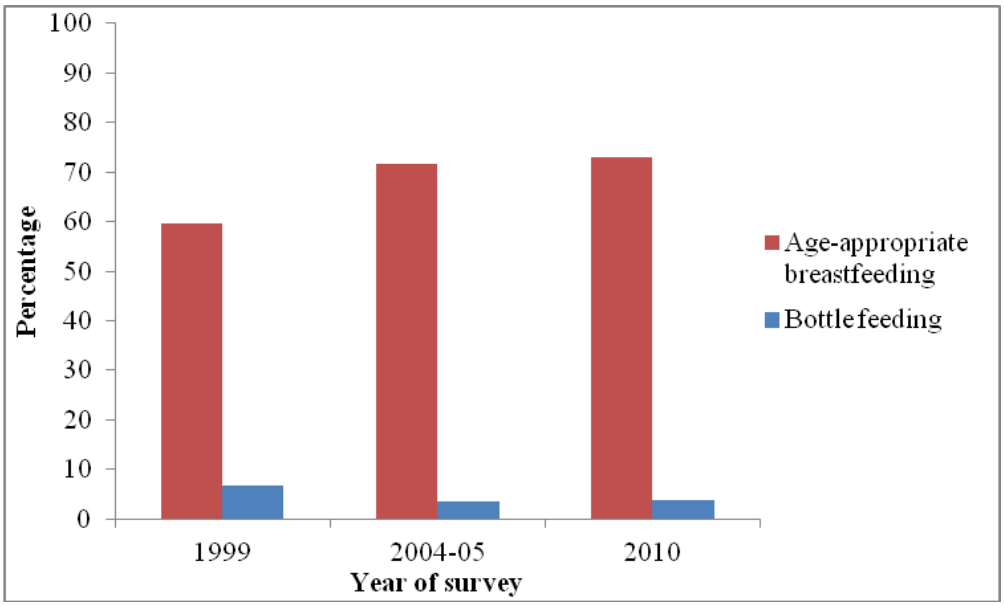

Figure 3:8 Trends of age-appropriate breastfeeding and bottle feeding among children aged 0-23 months in Tanzania, 1999-2010

3.3.6 Discussion

The present analysis examined the prevalence of breastfeeding practices using currently recommended WHO indicators and determined factors associated with suboptimal practices "Delayed initiation of breastfeeding"; "Non-exclusive breastfeeding"; and "Predominant breastfeeding" among children aged 0-23 months in Tanzania from 1999 to 2010. The study showed that, breastfeeding is universal in Tanzania as almost all mothers (98%) breastfed their children in the three surveys conducted over the 10 year period. However, the prevalence of early initiation of breastfeeding has declined from 59% in 2004-05 to 46.1% in 2010 highlighting the need for improving these rates. The prevalence of exclusive breastfeeding (EBF) in Tanzania was low but improved with time from 31.8% in 1999 to 49.9% in 2010. This findings suggest that the Tanzania has made some progress to improve the proportion of exclusive breastfed infants although this prevalence is still low in comparison with other neighbouring African countries such as Uganda (60.1%) (175), Zambia (61%) (176) and Malawi (56.7%) (177). The reason for the sharp increase of EBF may be due to increased efforts

to strengthen programmes implemented in the country to promote EBF such as Training health works on appropriate IYCF practices at both facility and community levels, Commemorations of World Breastfeeding Week and Baby Friendly Hospital Initiatives. Also there have been increased numbers of Non-Governmental Organizations (NGO) promoting EBF in the communities hence contribute to improve people's knowledge on importance of EBF compared in the 1990's whereby promotion used to be done at national level. It is also worth thinking that the increased rates of EBF seen today may be due to the impact of the programmes initiated and implemented in the past since most programmes started in 2000's.

There was a notable progress in reducing the prevalence of predominant breastfeeding in Tanzania from 1999 to 2010 but still there is a considerable proportion (17%) of infants aged 0-5 months who are currently at risk of diarrhoeal and respiratory illness associated with predominant breastfeeding. These findings suggest a need for counselling mothers, caregivers and key family members on the risks associated with predominant feeding in Tanzania. This strategy may help to change their behaviours which ultimately improve EBF. Majority (>90%) of children are still being breastfed at 1 year but the proportion tended to decline from 57.2% in 1999 to 51% in 2010 at the second year. These findings indicate the need for scaling up promotion of breastfeeding to the second year of life while continuing to provide children with nutritionally adequate and safe complementary foods. In addition, we found that very few infants and young children received any food or drink from a bottle in Tanzania probably due to the effective monitoring and implementation of the National Regulation that discourage bottle feeding practice (4). The practices of bottle feeding in Tanzania are lower than that of Kenya where one quarter of the children under 6 months are fed using a bottle with a nipple (178). However, it is still important for Tanzania to continue discouraging this feeding practice as it interfere breast feeding success such as longer duration of breastfeeding (179) and it may also puts the infant at a risk of infections when associated with unhygienic conditions and poor preparation of infant formula (11).

Results from multivariate analyses of the three surveys revealed a number of determinants significantly associated with poor breastfeeding practices in Tanzania from 1999 to 2010. These include: young maternal age (15-24 years); lower maternal education (no formal education); maternal working status; maternal underweight; home delivery; unprofessional delivery assistance; and caesarean delivery. Other factors were poor household wealth status, area of residence and difference in geographical zones.

There was a significant association between maternal young age (15-24 years) and delayed initiation of breastfeeding in 2010. This result is similar with findings from India which showed that older mothers (≥35 years) were at lower risk of delayed initiation of breastfeeding compared to young mothers (AOR for older mothers ≥ 35 years= 0.72, 95% CI, 0.50 to 1.02) (78). We further explored this association with parity and found that most of the young mothers in 2010 were first time mothers. This finding is also in line with the association observed in 2004-05 where mother's with their first child had a greater likelihood of delayed initiation of breastfeeding compared to mothers who had given birth twice or more times. Young and first time mothers may have inadequate knowledge or experience about appropriate breastfeeding practices (79). Hence the need for health professionals and traditional birth attendants to provide adequate support to encourage the young and first time mothers to establish early initiation of breastfeeding within one hour after giving birth.

On the other hand, in the 1999 survey, infants of older mothers (> 34 years) had higher risk of non-exclusive breastfeeding compared to infants of young mothers. Similar findings have been reported by researchers from Bangladesh (59), Philippines (60) and Nigeria (65) that increasing maternal aged (30 years or above) was a risk factor for non-exclusive breastfeeding. It may be that older mothers could be breastfeeding using their past infant feeding experience, as literature does suggest that mothers are more likely to breastfeed their infants in the same way as they fed other siblings (66). Thus future health promotion programs to promote protect and support optimal breastfeeding practices should target young women aged less than 25 years and the older women aged over 34 years in Tanzania.

Shorter preceding birth intervals (< 2years) have been reported to be associated with increased risk of infant and child mortality in many countries and including Tanzania (180). In this study, we found that a shorter preceding birth interval (0-23 months) was a determinant for predominant breastfeeding among infants aged 0-5 months in Tanzania 2004-05. These findings support the analysis in Bangladesh where infants of mothers who had shorter birth interval (14 months) had greater risk of being breastfed with the addition of other liquids such as sugar water (59). Occurrence of new pregnancy may influence mothers with shorter birth interval to complement breast milk with other solids or liquid foods before 6 months which would ultimately interrupt exclusive breastfeeding practices and the duration of exclusive breastfeeding (50).

This analysis also found that lower maternal education was a strong and consistent determinant of both delayed initiation of breastfeeding within one hour of birth and non-exclusive breastfeeding in the first six months of infants life. This finding is in agreement with many other studies that show that low levels of maternal education are associated with higher risk of delayed initiation of breastfeeding within one hour of birth (78) as well as lower prevalence of EBF in the first six months of life (70, 181, 182). This may be explained by the fact that, mothers with higher level of education have more exposure to various sources of information and better knowledge about appropriate infant and young child feeding compared to uneducated mothers. Hence mothers with lower level of education should be given extra support to help maintain exclusive breastfeeding until 6 months.

Women in African culture, including Tanzania, are thought to be the primary child-care providers in households while men participate in various activities outside to ensure provision of adequate income to meet their family needs such as food, clothing and medical services for all family members. The situation is slightly changing nowadays due to economic hardships and many mothers are currently also engaging in different economic activities to improve the family income. This change has limited women's time available for childcare activities including breastfeeding (85). The present analysis showed a negative association between maternal

working status and early initiation of breastfeeding within one hour of birth. There have been limited studies in Africa and other developing countries to compare with this data. However, our sub-analysis to examine the relationship between maternal working status and mode of delivery found that, mothers who have worked for the past 12 months were significantly more likely to deliver their babies by caesarean-section compared to non-working mothers (74% vs. 26%). Further investigation of this association is needed to provide better understanding of why working mothers in Tanzania delay initiation of breastfeeding within one hour of birth.

The present analysis found a significant negative association between maternal underweight and delayed initiation of breastfeeding in 2004-05. This finding contradicts with previous studies (103, 162) which found that maternal overweight was a risk factor for delayed initiation of breastfeeding with one hour of birth. Hilson and colleague (104) suggested that overweight and/or obese women delayed initiation of breastfeeding due to the fact that they may have had complicated labour which resulted to caesarean section. There are few studies available currently with which to compare these findings. Giovannini et al (106) investigated the relationship between low pre-pregnant BMI and breastfeeding practices among 1272 women in Italy. They found no relation between low maternal BMI and initiation of breastfeeding within one hour of birth. Hence there is a need to further investigate this association.

Home delivery was a strong and consistent negative predictor of suboptimal breastfeeding practices in Tanzania. In 2004-05 and 2010 the risk of delayed initiation of breastfeeding within one hour of birth was significantly higher among mothers who delivered at home compared to those who delivered at health facilities. Similarly, mothers who were assisted by Traditional Birth Attendants (TBAs) during delivery were more likely not to exclusive breastfeed their infants up to six month. A recent study in South Asia reported similar findings where mothers who delivered their babies at the health facilities reported higher odds of early initiation of breastfeeding than those mothers who delivered their babies at home (88). In addition, cross-sectional studies in Ghana (71), Nigeria (183) and Malawi (92) have also reported that women who gave birth at home were at more risk of stopping EBF before 6 months.

A possible reason for delayed initiation of breastfeeding among mothers who delivered at home in Tanzania could be the influence of traditional birth attendants who often hold negative beliefs about initial breast milk. For example, a qualitative study conducted in Tanzania showed that, mothers who delivered at home gave their newborns water and maize gruel because the first breast milk was thought to be dirty (49). These findings highlight a need to educate traditional birth attendants and key family members about the benefits of initial breast milk to the newborns so that they can encourage mothers who deliver at home to establish breast-feeding immediately after birth and EBF up to 6 months.

It was also important to note that rate of EBF was significantly low among infants who were born in the health facilities compared to the infants born at home in the univariate analysis in 1999 survey. However, this association was not apparent in the multivariate analysis after adjusting with other confounders such as mode of delivery or delivery assistance; hence this variable was not included in the final model for EBF in the 1999 survey. This finding contradict with other cross-sectional studies in India (78), Ghana (71) and Malawi (92) which suggested that hospital delivery favours exclusive breastfeeding due to the fact that mothers who gave birth at health facilities had contact with health workers and they can get some appropriate breastfeeding information.

Delivery by caesarean section was a risk factor for delayed initiation of breastfeeding in Tanzania in 2004-05 and 2010. This finding is consistent with previous reports from India (78), Nepal (79) and Sri-Lanka (108). This association may be linked to the effects of anaesthesia delaying the onset of lactation (184). A recent systematic review and meta-analysis of observational studies that examined influence of caesarean delivered on early breastfeeding showed that caesarean delivery has a significant adverse association with early breastfeeding (185). Appropriate guidelines for caesarean deliveries are needed to minimize delays in initiation of breastfeeding. Prospective mothers and health workers should be informed about the negative association between caesarean delivery and breastfeeding and the implications for infant well-being (185).

Male infants were less likely to be exclusively breastfed until six month compared to female infants in the 1999 survey which is similar with the findings reported from Nigeria (77). This could be due to the belief among mothers and family members that boy infants have greater nutritional needs than a girl, and thus required other foods in addition to breast milk at an early age (69). This belief may not be important in Tanzania as results from the multivariate analysis of the 2004-05 and 2010 surveys did not reveal any significant association between infant gender and exclusive breastfeeding.

Prevalence of EBF decreased with increasing age of children in Tanzania in both the 1999, 2004-05 and the 2010 surveys. This finding was in conformity with other secondary analyses of Demographic and Health Surveys conducted in Nigeria (77), India (78), Bangladesh (59), Sri-Lanka, Cambodia, Indonesia, Philippines and Timor-Leste, and Vietnam (60) and Malawi (138) which have also reported a declining prevalence of EBF as the age of the child increased. This finding suggests that mothers should be given adequate support from their families and health workers to sustain EBF until 6 months.

In this study, rural infants had significantly higher risk of delayed initiation of breastfeeding within one hour of birth compared with urban infants. This finding is in agreement with the previous studies from the Morogoro region in Tanzania (50) and from Ethiopia (90). The difference in early initiation of breastfeeding between rural and urban mothers might be explained by the high percentage of rural women who delivered at home (93%) assisted by TBAs and other people. These birth attendants may have had inadequate knowledge of the benefits of this feeding practice and thus failed to support mothers to initiate breastfeeding early. Furthermore, negative cultural beliefs about colostrums and lower level of education among rural mothers might also have contributed. Rural women may need more support to overcome the barriers to early initiation of breastfeeding. On the other hand, mothers from urban areas were at greater risk of poor EBF practices than mothers from rural areas, possibly because of the demand to return to work after maternity leave (85) since most of these urban mothers were in paid employment. Also most mothers in urban areas were from families with

higher socioeconomic status compared to rural areas and that may have facilitated their access to breast milk substitutes. For example, data from a multilevel analysis of factors associated with non-EBF in nine East and Southeast Asian countries revealed that improved socioeconomic status both at individual and community levels was a negative factor for EBF (60).

Household wealth status was found to have influence on breastfeeding practices in 2004-05 whereby infants from households with lower wealth index had higher risk of delayed initiation of breastfeeding within one hour of birth. This finding is in agreement with the previous studies in Bangladesh (59), India (186) and Iceland (159) where mothers from higher socio-economic status families were observed to have higher rates of early initiation of breastfeeding within one hour of birth than those from lower socio-economic status. In Tanzania, the lower level of education among mothers from lower socio-economic status may account for this association, since in this analysis we found that the overwhelming majority of mothers (98.1%) from households with low wealth index had lower levels of education (no education/primary education).

There were differences in the breastfeeding practices across geographic zones of Tanzania. For example, the risks of delayed initiation of breastfeeding within one hour of birth were consistently higher among infants from Lake, Northern, Western and Zanzibar compared to infants from other geographic zones in the 2004-05 and 2010 surveys. This could be due to cultural differences and taboos towards breastfeeding newborns with first breast milk in some parts of Tanzania (48-50). Studies in Igunga, Mbulu and Morogoro rural districts of Tanzania (48-50) found that, majority of mothers 46%, 79% and 53% respectively reported discarding colostrums due to negative cultural beliefs. These regions should be given intervention priority to improve early initiation of breastfeeding. It would be also interesting to investigate why early initiation of breastfeeding continues to fall in these zones.

In addition, the risk of non-exclusive breastfeeding appeared to be high in many geographic zones in Tanzania. Of the major concern is persistence of very low prevalence of EBF in Lake and Zanzibar geographic zones since 2004-5 until 2010. Similarly, the risk of predominant breastfeeding was significantly higher in all zones except Southern Highlands. It is important to note that the geographic zones which had higher risk of predominant breastfeeding were the same zones which had increased risk of non-EBF breastfeeding. This could be due to limited implementation of the Baby Friendly Hospital Initiative (BFHI) in many areas of Tanzania (187) and especially the lack of adequate community component of the BFHI to promote optimal breastfeeding (107). Provision of adequate support and educating mothers and their families from these zones on the importance of giving the initial breast milk to infants and EBF until 6 months may have a positive effect on improving rates of early initiation of breastfeeding and EBF and potentially reduce the risks of infections and death among newborns (34).

Concluding remarks

This secondary analysis of breastfeeding practices data found that the prevalence of early initiation of breastfeeding is falling while prevalence of exclusive breastfeeding is improving in Tanzania. The prevalence of continued breastfeeding at 1 year and ever-breastfed rates are at optimal levels. This analysis has also identified the predictors of suboptimal breastfeeding practices and target groups of women who need more breastfeeding support. These groups include the young, uneducated, and employed women < 25 years of age, both from rural and urban areas in the Lake, Northern, Eastern and Zanzibar geographical zones of Tanzania who also lack proper care during and after birth.

Chapter 4 Complementary feeding practices among children aged 6 - 23 months in Tanzania

This chapter presents the findings for complementary feeding practices among children aged 6-23 months in Tanzania based on the 2004-05 and 2010 Tanzania Demographic and Health Survey (TDHS) data. It is important to note that data on complementary feeding practices were not available in the 1999 TRCHS survey thus this chapter presents data for 2004-05 and 2010 TDH surveys only. The chapter begins with introduction of complementary feeding practices and study methods. The next section presents results for prevalence of complementary feeding indicators, differentials of complementary feeding indicators by individual, household and community level factors, and determinants of inappropriate complementary feeding practices in Tanzania. This chapter also presents trends in complementary feeding indicators among children aged 6-23 months in Tanzania from 2004-05 to 2010. The last section of this chapter discusses the findings of complementary feeding practices in Tanzania between 2004-05 and 2010.

4.1 Introduction

Appropriate complementary feeding (CF) is an important determinant for achievement of healthy growth and survival of young children in their early years of life. It has been established that appropriate CF has the potential to prevent 6% of all under-five deaths particularly in the developing world (188). In recognition of the importance of complementary feeding for optimal growth and development the World Health Organization (WHO) recommends that infants should be exclusively breastfed for the first 6 months of life and thereafter should receive nutritionally adequate and safe complementary foods with continued breastfeeding up to 2 years or beyond (6). Despite this recommendation, inappropriate complementary feeding practices remain a major public health problem in many developing countries and contributes to child growth retardation and under nutrition, morbidity and mortality (189). For example, in Tanzania infants are not introduced to complementary feeding at an appropriate age, they are fed infrequently, the nutritional quality of the complementary foods is mostly poor and unsafe

hygienically (125, 126). These poor practices put children under greater risk of growth retardation and poor nutritional status.

Previous studies on complementary feeding practices show that younger maternal age (64, 70, 144), lower maternal education (64, 141-145, 154), unemployment (141, 144), inadequate antenatal clinic visits (141, 145), lack of postnatal care visits (141), young infant age (141-143, 145, 154, 158), poor household wealth status (141-143, 145, 154), inadequate maternal exposure to mass media such as newspapers, radio or television (144, 145), and geographical differences (141-145, 154) are the main risk factors associated with inappropriate complementary feeding practices among children aged 6-23 months in developing countries. Factors such as lower maternal education and lower household wealth index were found to be the most consistent determinants of inappropriate complementary feeding practices in Bangladesh, India, Nepal, Pakistan and Sri Lanka (158).

There are few published reports about complementary feeding practices in Tanzania (124-126). The WHO country profiles report of Infant and Young Child Feeding (IYCF) indicators reveal that the complementary feeding practices in Tanzania based on the 2004-05 TDHS were far from optimal (11) as less than quarter (18.1%) of all surveyed children aged 6-23 months had inadequate acceptable diet (meaning that the frequencies of feeding minimum number of times and the practices of feeding children complementary foods from minimum number of food groups per day was poor). However, there is lack of detailed description of complementary feeding practices using the current 2010 TDHS and the risk factors associated with inappropriate complementary feeding practices remain unclear. This study aims to describe the prevalence of the new WHO complementary feeding indicators regarding “Introduction of food”, “Minimum dietary diversity”, “Minimum meal frequency”, and “Minimum acceptable diet" using the recent 2010 TDHS data and to identify the individual-, household- and community-level factors associated with inappropriate complementary feeding practices in Tanzania The study also aimed at comparing trends of key complementary feeding indicators in

children aged 6-23 months to show whether Tanzania had any improvement in CF practices from 2004-05 to 2010.

4.2 Methods

Data sources and study design

The present analysis used data from the 2004-05 (55) and 2010 (8) Tanzania Demographic and Health Surveys (TDHS). A representative probability sample of 10,300 households was selected for 2004-05 and 2010 TDHS. The surveys employed a cross-sectional design and the survey sample was obtained using stratified two-stage random sampling which provides estimates for the entire country (representing both urban and rural areas) in the 26 regions of Tanzania Mainland and Zanzibar. Detailed information about the sampling procedure has been outlined in Chapter 2.2 and also in the respective TDHS reports (8, 55). A list of variables required for this analysis was obtained from the 2004-05 and 2010 TDHS data sets. The present analysis was restricted to children who were alive, of singleton births, last-born and lived with their mothers (women of reproductive aged 15-49 years), yielding a weighted total of 2,480 and 2,275 children aged 6-23 months from 2004-05 and 2010 TDHS datasets respectively.

Definitions of complementary feeding indicators

Complementary feeding practices in this study were defined according to the current WHO (10, 11) recommended definitions of the key indicators for assessing Infant and Young Child Feeding (IYCF) practices. The indicators include introduction of soft, semi-solid or solid foods, minimum dietary diversity, minimum meal frequency, and minimum acceptable diet calculated for the age ranges, 6-11, 12-17 and 18-23 months of age, and were based on a 24 hour recall of the child's dietary intake. These indicators are defined as follows:

- **"Introduction to soft, semi-solid or solid foods**: The proportion of infants 6-8 months of age who receive soft, semi-solid or solid foods".

- **"Minimum dietary diversity:** The proportion of children 6-23 months of age who received foods from 4 or more food groups. The seven food groups used for tabulation

of this indicator included: grains, roots and tubers; legumes and nuts; dairy products (milk, yogurt, cheese); flesh foods (meat, fish, poultry and liver/organ meats); eggs; vitamin-A rich fruits and vegetables; and other fruits and vegetables". The consumption of any amount of food from each group is sufficient to "count", i.e. there is no minimum quantity, except if an item is used as a condiment. It is important to note that only six food groups were used instead of the recommended seven groups since eggs and flesh were combined as one group in the 2004-05 TDHS data.

- **"Minimum meal frequency:** The proportion of breastfed and non-breastfed children 6-23 months of age, who received soft, semi-solid or solid foods (including milk feeds for non-breastfed children) the minimum number of times or more". The minimum was defined as: 2 times for breastfed infants 6-8 months; 3 times for breastfed children 9-23 months; 4 times for non-breastfed children 6-23 months in the previous day. It is important to note that the information on number of non-breast milk feeds received by non-breastfed children was not available in the TDHS surveys.

- **"Minimum acceptable diet:** The proportion of children 6-23 months of age who received a minimum acceptable diet (apart from breast milk). This composite indicator is calculated from the following two fractions: breastfed children 6-23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day, and non-breastfed children 6-23 months of age who received at least two milk feedings and had at least the minimum dietary diversity not including milk feeds and the minimum meal frequency during the previous day". The calculation of minimum acceptable diet was not possible for non-breastfed children because the minimum number of non-breast milk feeds as in the definition was not available in the TDHS survey data, thus this indicator was confined to breastfed children only.

Study variables

The complementary feeding indicators defined above were used as the outcome /explanatory variables in the present study. The independent variables were socio-demographic and economic characteristics of mothers and children and these variables were classified into three levels: individual, household and community level factors. These variables have been described in the previous Chapter 2 and 3. However, the variable for body mass index was categorised into two categories in the present analysis in steady of four due to the smaller sample size.

Statistical analysis

Complementary feeding indicators were expressed as dichotomous variables with category 1 for not meeting the indicators criteria, and category 0 for meeting the indicators criteria described above. These indicator variables were examined against the set of independent variables (individual, household and community-level characteristics) in order to assess the prevalence of the complementary feeding indicators for the categories of the independent variables, and to identify factors associated with not meeting the criteria of the indicators (inappropriate complimentary feeding practices).

Similar statistical procedures were conducted as described in the breastfeeding analysis (Chapter 3). Survey logistic regression was performed using stepwise backwards model in order to determine the factors significantly associated with not meeting the "Introduction to soft, semi-solid or solid foods", "Minimum dietary diversity", "Minimum meal frequency" and "Minimum acceptable diet". The level of significance was set at $p \leq 0.05$ for all complementary feeding analyses.

4.3 Results

4.3.1 Characteristics of the study population

Table 4:1 summarizes the individual, household and community level characteristics of the 4,755 children aged 6-23 months based on the 2004-05 and 2010 TDHS data. Majority of the children's mothers were aged between 25 and 34 years in both surveys. Less than 15% of all surveyed mothers had secondary or higher education. Most mothers (87.0%) had worked in the past 12 months. The majority of mothers were currently married, and their husband's occupation was dominated by agricultural activities. More than half (52.1%) of the children were born at home in 2004-05 but less than half (48.6%) were born at home in 2010. Half of the children's mothers (50.0%) were assisted by untrained personnel at delivery. Among those who delivered in health facilities during 2004-05 and 2010 surveys, few (3.3% and 5.6% respectively) had undergone caesarean section. Most mothers had more than one child and had a preceding birth interval of more than 24 months.

The proportion of mothers who made more than three antenatal clinic visits during pregnancy was very high in 2004-05 (86.4%), but low (42.3%) in 2010. Majority of mothers did not have any post-natal check up by 41 days after delivery in Tanzania. More than half of surveyed mothers in 2004-05 and 2010 listened to radio frequently and few (<16%) read newspapers or watch television. The gender of the children was almost equally represented across all geographical zones in both surveys. Half of the sampled children were aged 6 to 11 months during the 2004-05 survey, but the age of the children in the 2010 were nearly equally represented across all three child age categories. In both surveys, a high proportion of children were from rural areas and low proportion was from the richest households.

Table 4:1 Individual, household and community level characteristics of children 6-23 months of age, Tanzania 2004-05 and 2010

	Year of survey			
	2004-05 (n=2480)		2010 (n=2275)	
Characteristic	**n**	**%**	**n**	**%**
Individual level factors				
Maternal working status				
Non-working	350	14.1	301	13.2
Working (past 12 months)	2130	85.9	1974	86.8
Maternal education				
No education	652	26.3	574	25.2
Primary	1711	69.0	1522	66.9
Secondary and above	117	4.7	180	7.9
Partner's occupation				
Non agriculture	556	22.4	665	29.2
Agriculture	1771	71.4	1453	63.9
Not working	153	6.2	157	6.9
Partner's education *				
No education	433	18.5	382	18.0
Primary	1716	73.6	1526	71.8
Secondary and above	183	7.9	218	10.3
Mother's age (yrs)				
15-24	978	39.4	805	35.4
25-34	1087	43.8	1009	44.3
35-49y	415	16.7	462	20.3
Marital status				
Currently married	2156	86.9	1925	84.6
Formerly married (divorce/separated/widow)	178	7.2	210	9.2
Never married	146	5.9	141	6.2
Birth order				
First-born	552	22.3	440	19.3
2nd - 4th	1191	48.0	1118	49.1
5 or more	737	29.7	718	31.5
Preceding birth interval *				
No previous birth	552	22.3	440	19.4
<24 months	290	11.7	258	11.4
>24 months	1631	66.0	1571	69.2
Sex of baby				
Male	1244	50.2	1110	48.8
Female	1236	49.8	1166	51.2
Child's age (months)				
6-11	903	50.6	793	34.9
12-17	163	9.1	772	33.9

18-23	719	40.3	710	31.2
Place of delivery				
Home	1293	52.1	1106	48.6
Health facility	1187	47.9	1169	51.4
Mode of delivery *				
Non-caesarean	2389	96.7	2145	94.4
Caesarean section	81	3.3	127	5.6
Type of delivery assistance *				
Health professional	1151	48.6	1099	50.0
Traditional birth attendant.	217	9.2	368	16.7
Relatives and other untrained personnel	1000	42.2	731	33.3
Antenatal Clinic visits *				
None	77	3.1	52	2.3
1-2.	260	10.5	1257	55.4
3+	2137	86.4	958	42.3
Timing of postnatal check-up *				
No check-ups (including missing)	2282	92.1	1511	67.6
0-2 days	151	6.1	342	15.3
3-6 days	18	0.7	127	5.7
7+ days	28	1.1	2534	11.4
Child had diarrhoea recently				
No	1892	76.3	1735	76.3
Yes	588	23.7	540	23.7
Child had ARI				
No	2195	88.5	2052	90.2
Yes	285	11.4	224	9.8
Child had fever in last two weeks				
No	1611	65.0	1605	70.5
Yes	869	35.0	671	29.5
Mother's BMI (kg/m^2)*				
<=18.5	195	7.9	263	11.6
> 18.5	2267	92.1	1996	88.4
Mother’s literacy*				
Can’t read at all	1025	41.3	918	40.8
Can read	1455	58.7	1333	59.2
Mother's frequency of reading newspaper or magazine*				
Not at all	2110	85.1	1957	86.1
Yes	368	14.8	317	13.9
Mother's frequency of listening to radio				
Not at all	1035	41.8	1084	47.7
Yes	1443	58.2	1191	52.4
Mother's frequency of watching TV				
Not at all	2231	90.0	1924	84.6
Yes	248	10.0	351	15.4
Household level factors				

Wealth Index				
Poorest (lowest quintile)	554	22.4	499	21.9
Poorer	566	22.8	535	23.5
Middle	503	20.3	479	21.1
Richer	493	19.9	412	18.1
Richest (highest quintile)	363	14.6	351	15.4
Decisions women have final say				
None	298	12.0	1003	44.1
One-two	969	39.1	760	33.4
Three and more	1213	48.9	513	22.5
Community level factors				
Residence				
Urban	476	19.2	469	20.6
Rural	2003	80.8	1806	79.4
Geographic Zones				
Northern	317	12.8	284	12.5
Eastern	442	17.8	292	12.8
Western	391	15.8	490	21.5
Southern Highlands	272	11.0	300	13.2
Lake	376	15.1	461	20.3
Southern	169	6.8	172	7.5
Central	454	18.3	214	9.4
Zanzibar	59	2.4	63	2.8

*ARI: acute respiratory infection; BMI: body mass index; TV: television. *Data available for less than 2480 children and their mothers in 2004-05 and 2275 in 2010.*

4.3.2 Types of food given to child by age

Table 4:1 and Table 4:2 describes food groups given to the children 24 hours preceding the surveys. Consumption of all food groups was higher among older children (18-23 months) and lowest among younger children aged 6-11 months old in both surveys. The diets of children aged 6-23 months were mainly dominated by staple foods made from grains, roots and tubers (95.7% in 2004-05 and 92.9% in 2010). Many children (63.2% and 67.2%) consumed vitamin-A rich fruits and vegetables and few children consumed other fruits and vegetables (22.2% and 17.9%), flesh foods such as meat, fish and poultry (32.4% and 33.9%), dairy products (29.1% and 31.3%) in 2004-05 and 2010 respectively. Only 8.1% of children consumed eggs in 2010 (Table 4:2). It is important to note that information on consumption of eggs and flesh were combined as one group in the 2004-05 TDHS (see Section 4.2.2).

Table 4:1 Types of food groups given to children aged 6-23 months by age group, Tanzania 2004-05

	Grains, roots & tubers		Legumes & nuts		Dairy products		Flesh foods & eggs		Vitamin A rich fruits & vegetables		Other fruits & vegetables	
Child's age in months (n=2402)	**Rate**	**95 %C.I**	**Rate**	**95 % C.I**	**Rate**	**95% C.I**	**Rate**	**95% C.I**	**Rate**	**95% C.I**	**Rate**	**95% C.I**
6-11 months (n= 870)	91.3	[88.68,93.34]	34.1	[30.39,37.93]	29.2	[24.85,33.95]	24.7	[21.51,28.14]	48.6	[44.5,52.68]	17.1	[14.11,20.47]
12-17 months(n=825)	97.2	[95.24,98.33]	42.8	[38.66,47.01]	28.5	[24.56,32.75]	33.2	[29.72,36.90]	64.8	[60.24,69.00]	23.0	[20.13,26.10]
18-23 months(n=707)	96.7	[94.53,98.05]	48.9	[44.71,53.10]	29.6	[24.93,34.63]	37.7	[33.11,42.57]	73.6	[69.31,77.41]	25.5	[21.76,29.67]
6-23 months (n=2,402)	95.7	[94.53,96.63]	42.6	[39.98,45.35]	29.1	[26.11,32.27]	32.4	[29.92,35.04]	63.2	[60.63,65.76]	22.2	[20.12,24.41]

Table 4:2 Types of food groups given to children aged 6-23 months by age group, Tanzania 2010

	Grains, roots & tubers		Legumes & nuts		Dairy products		Flesh foods		Eggs		Vitamin A rich fruits & vegetables		Other fruits & vegetables	
Child's age in months (n=2,275)	**%**	**95 %C.I**	**%**	**95 % C.I**	**%**	**95% C.I**	**%**	**95% C.I**	**%**	**95% C.I**	**%**	**95% C.I**	**%**	**95% C.I**
6-11 months (n= 674)	88.7	[84.72, 91.69]	34.8	[30.62, 39.29]	30.3	[25.56, 35.59]	27.7	[23.38, 32.55]	7.5	[5.42, 10.21]	59.2	[54.51, 63.73]	16.4	[12.67, 20.91]
12-17 months(n=772)	93.2	[90.07, 95.36]	42.1	[37.38, 46.97]	32.0	[27.80, 36.55]	36.7	[32.22, 41.38]	8.8	[6.31, 12.22]	72.9	[68.49, 76.93]	19.2	[15.85, 23.11]
18-23 months(n=710)	96.5	[94.49, 97.75]	44.9	[40.45, 49.54]	31.6	[27.30, 36.19]	41.1	[36.40, 45.86]	8.7	[6.54, 11.59]	73.4	[69.08, 77.29]	19.2	[15.44, 23.63]
6-23 months (n=2,275)	92.9	[91.24,94.28]	40.7	[37.72, 43.89]	31.4	[28.35, 34.51]	33.9	[30.97, 36.93]	8.4	[6.92, 10.10]	67.2	[64.46, 69.75]	17.9	[15.45, 20.6]

4.3.3 Prevalence of complementary feeding indicators

The prevalence of the four complementary feeding indicators is tabulated by year of survey in Table 4:3. These indicators will be described separately by the year of survey to provide better understanding of how their prevalence's varied across child age group and breastfeeding status.

Prevalence of complementary feeding indicators in 2004-05

The prevalence of Introduction of soft, semi-solid or solid foods in infants aged 6-8 months in 2004-05 was 79.6% (Table 4:3). The proportion of breastfed and non-breastfed children who had received foods from four or more food groups increased with age from 30.6% at 6-11 months to 41.6% at 18.23 months. For non-breastfed children, the prevalence of minimum dietary diversity was 19.0% for infants aged 6-11 months, 40.2% for children aged 12-17 months and 48.1% for children aged 18-23 months. More than half (54.7%) of breastfed infants aged 6-11 months received food at least twice and less than half (46.8%) of children aged 9-23 months received food at least three times on the day prior to the survey. The proportion of non-breastfed children aged 6-23 months who were given soft, semi-solid or solid foods at least four times on the day prior to the survey were only 22.5%.

The prevalence of minimum meal frequency criterion for both breastfed and non-breastfed children was 44.5% at 6-11 months, improved to 48.1% at 12-17 months and decreased to 40.3% at 18-23 months. The prevalence of minimum acceptable diet for breastfed children was low (21.1%) in 2004-05 and was found to be much lower (15.9%) among infants aged 6-11 months compared to children aged 18-23 months (21.1%).

Prevalence of complementary feeding indicators in 2010

As shown in Table 4:3 below, in 2010 majority (92.1%) of the infants aged between 6 and 8 months receive soft, semi-solid or solid foods compared to 79.6% in 2004-05. Overall, less than half (38.2%) of the children aged 6-23 months meet the minimum dietary diversity criteria, and this prevalence was higher among non-breastfed children (45.3%) as compared to breastfed children (36.9%). The prevalence of minimum dietary diversity was low (28.1%) for both

breastfed and non-breastfed children aged 6-11 months old, but it increased to 42.6% and 43.0% at 12-17 months and 18-23 months of age respectively.

The prevalence of minimum meal frequency among breastfed and non-breastfed children aged 6-23 month was 38.6%. Compared to breastfed, non-breastfed children had lower rates of minimum meal frequency (34.2% vs. 11.4%). The prevalence of breastfed children (6-8 months) who received meals at least twice per day was 64.6%. The proportion of breastfed children (9-23 months) who consumed meals at least three times per day was 32.3%. Only 11.4% of non-breastfed children aged 6-23 months were fed meals at least 4 times a day. The rate of minimum meal frequency decreased with increasing age of children. Only 15.9% of breastfed children aged 6-23 months had the minimum acceptable diet. The prevalence of minimum acceptable diet was lower (13.3%) for infants (6-11 months) than for children aged 12-17 months (15.5%). There was an increase in the prevalence of minimum acceptable diet after the age of 17months.

Table 4:3 Complementary feeding indicators (percentage and 95% confidence intervals) among children 6-23 months of age Tanzania, 2004-05 and 2010

Indicator	Year of survey							
	2004-05				2010			
	Sample size (weighted)	n (weighted)	Rate (%)	[95%CI]	Sample size (weighted)	n (weighted)	Rate (%)	[95%CI]
Introduction of solid, semi-solid or soft foods (6-8 months)	458	364	79.6	[79.60, 4.0]	386	356	92.3	[88.38,95.00]
Minimum dietary diversity rate								
Minimum dietary diversity, all (6-11 months)	903	276	30.6	[26.90,34.40]	793	224	28.2	[24.53,32.14]
Minimum dietary diversity, breastfed (6-11 months)	880	271	30.9	[27.10, 4.80]	767	216	28.1	[24.41,32.19]
Minimum dietary diversity, non-breastfed (6-11 months)	23	4	19.0	[5.41, 48.96]	27	8	29.4	[11.79,56.44]
Minimum dietary diversity, all (12-17 months)	858	357	41.6	[37.90, 5.30]	772	323	41.9	[37.50,46.43]
Minimum dietary diversity, breastfed (12-17 months)	762	306	40.2	[36.30, 4.20]	706	301	42.6	[38.08,47.29]
Minimum dietary diversity, non-breastfed (12-17 months)	96	50	51.9	[39.50,64.41]	66	22	34.0	[21.71,49.00]
Minimum dietary diversity, all (18-23 months)	719	350	48.7	[44.00, 3.50]	710	323	45.5	[40.81,50.27]
Minimum dietary diversity, breastfed (18-23 months)	462	222	48.1	[42.50,53.80]	431	185	42.9	[37.53,48.47]
Minimum dietary diversity, non-breastfed (18-23 months)	256	128	49.8	[42.24,57.42]	279	138	49.5	[42.15,56.85]
Minimum dietary diversity, all (6-23 months)	2480	983	39.6	[37.10, 2.20]	2275	870	38.2	[35.45,41.10]

Minimum dietary diversity, breastfed (6-23 months)	2480	800	38.0	[35.30, 0.80]	1904	702	36.9	[34.04,39.76]
Minimum dietary diversity, non-breastfed (6-23 months)	376	182	48.5	[42.26,54.83]	372	168	45.3	[38.78,52.02]
Minimum meal frequency rate								
2 times for breastfed (6-8 months)	447	244	54.7	[46.8, 2.5]	374	242	64.6	[58.08,70.58]
3 times for breastfed (9-23 months)	1657	777	46.8	[43.8, 9.8]	1530	494	32.3	[29.10,35.63]
4 times for non-breastfed (6-23 months)	376	85	22.5	[17.39,28.58]	372	42	11.4	[8.05, 15.78]
Minimum meal frequency, all (6-11 months)	903	402	44.5	[40.50, 8.50]	793	340	42.9	[38.05,47.89]
Minimum meal frequency, breastfed (6-11 months)	880	401	45.6	[41.60, 9.70]	767	339	44.3	[39.26,49.37]
Minimum meal frequency, non-breastfed (6-11 months)	23	0	0.6	[0 .07, 5.69]	27	1	3.9	[0.61, 21.65]
Minimum meal frequency, all (12-17 months)	858	413	48.1	[43.80, 2.50]	772	236	30.6	[26.82,34.57]
Minimum meal frequency, breastfed (12-17 months)	762	386	50.5	[45.80, 5.10]	706	230	32.5	[28.45,36.82]
Minimum meal frequency, non-breastfed (12-17 months)	96	29	29.6	[18.64,43.66]	66	6	9.7	[3.99,21.76]
Minimum meal frequency, all (18-23 months)	719	290	40.3	[36.00, 4.80]	710	201	28.4	[24.61,32.41]
Minimum meal frequency, breastfed (18-23 months)	462	234	50.6	[45.30, 6.00]	431	167	38.7	[33.13,44.48]
Minimum meal frequency, non-breastfed (18-23 months)	256	56	21.8	[15.92,29.00]	279	35	12.5	[8.53, 17.83]
Minimum meal frequency, all (6-23 months)	2480	1104	44.5	[42.30, 6.80]	2275	778	34.2	[31.34,37.12]
Minimum meal frequency, breastfed (6-23 months)	2104	1020	48.5	[46.00,51.00]	1904	735	38.6	[35.38,41.97]

Minimum meal frequency, non-breastfed (6-23 months)	376	85	22.5	[17.39,28.58]	372	42	11.4	[8.05, 15.78]
Minimum acceptable diet rate								
Minimum acceptable diet, breastfed (6-11 months)	880	140	15.9	[13.10, 9.30]	767	101	13.2	[10.42,16.64]
Minimum acceptable diet, breastfed (12-17 months)	762	188	24.7	[21.40,28.40]	706	110	15.5	[12.60,18.96]
Minimum acceptable diet, breastfed (18-23 months)	462	115	24.8	[20.40,29.90]	431	91	21.2	[16.80,26.37]
Minimum acceptable diet, breastfed (6-23 months)	2104	443	21.1	[18.90,23.40]	1904	302	15.9	[13.74,18.28]

CI: confidence interval

4.3.4 Differentials of complementary feeding indicators by individual, household and community level factors

Table 4:4 and Table 4:5 describes the prevalence of introduction of complementary foods, minimum dietary diversity, minimum meal frequency and minimum acceptable diet according to attributes of the individual, household and community level factors. The prevalence of introduction to soft, semi-solid or solid foods was significantly lower (83.8%) among children of younger mothers in 2004-05 compared to 2010 (95.4%) (Table 4:4). Children whose mothers had limited access with mass media (radio and television) had lower prevalence of introduction to complementary foods at 6-8 months than children of mothers who had frequent access with mass media in 2010. There was no significant difference in the prevalence of introduction to complementary foods at 6-8 months across other individual, household and community level variables.

Table 4:4 also shows that, the prevalence of minimum dietary diversity was significantly higher in children whose parents had higher education, whose fathers were not working in agricultural activities, first born children older than 12 months and those born at health facilities in 2004-05 and 2010. The minimum dietary diversity was also high among children's mothers who had made more than four antenatal clinic visits, those whose mothers undergone caesarean section in 2004-05, children of primiparous mothers and those whose mothers had made some postnatal check-ups after birth in 2010. Children of illiterate mothers, those with limited exposure to mass media, from poorest households and those who lived in rural areas of Central and Western had significantly lower prevalence of minimum dietary diversity in both surveys.

Table 4:4 Introduction of soft, semi-solid or solid foods and minimum dietary diversity across individual-, household-, and community-level factors, Tanzania 2004-05 and 2010

Characteristic	Introduction of solid, semi-solid or soft foods rate						Minimum dietary diversity					
	2004-05			2010			2004-05			2010		
	%	95%CI	p	%	95%CI	p	%	95%CI	p	%	95%CI	p
Individual level factors												
Maternal working status												
Non-working	74.4	[58.09,85.90]		93.2	[83.14,97.42]		42.0	[36.29,47.91]		40.8	[34.47,47.46]	
Working (past 12 mo)	80.6	[74.87,85.33]	0.395	92.2	[87.63,95.13]	0.799	39.2	[36.42,42.12]	0.408	37.9	[34.79,41.01]	0.423
Maternal education												
No education	81.2	[72.71,87.50]		89.1	[77.74,95.07]		31.5	[26.16,37.44]		27.1	[21.83,33.05]	
Primary	79.6	[72.59,85.22]		94.2	[89.97,96.65]		40.9	[38.25,43.62]		39.9	[36.79,43.27]	
Secondary and above	69.1	[37.63,89.22]	0.612	87.6	[59.51,97.16]	0.393	66.0	[54.41,75.92]	<0.001	59.1	[48.96,68.43]	<0.001
Partner's occupation												
Non agriculture	77.8	[66.49,86.09]		91.5	[80.64,96.50]		55.8	[50.64,60.81]		48.4	[43.57,53.18]	
Agriculture	79.9	[73.57,84.99]		92.3	[87.35,95.41]		34.0	[30.96,37.11]		32.7	[29.43,36.16]	
Not working	82.4	[55.79,94.58]	0.897	96.8	[79.48,99.57]	0.718	46.3	[36.98,55.89]	<0.001	46.6	[36.81,56.60]	<0.001
Partner's education*												
No education	82.8	[69.91,90.84]		88.6	[74.67,95.31]		32.5	[25.49,40.38]		24.8	[17.97,33.19]	
Primary	78.8	[72.02,84.31]		92.8	[88.14,95.74]		38.3	[35.67,41.05]		37.8	[34.71,40.99]	
Secondary and above	75.4	[52.79,89.37]	0.867	91.6	[59.75,98.78]	0.699	63.9	[55.02,71.94]	<0.001	58.2	[50.08,65.91]	<0.001

Mother's age (yrs)												
15-24	83.8	[76.64,89.05]		95.4	[87.45,98.43]		40.5	[36.76,44.26]		39.8	[35.45,44.34]	
25-34	73.0	[63.69,80.70]		90.5	[83.45,94.76]		39.5	[35.88,43.32]		39.5	[35.70,43.38]	
35-49	86.0	[75.14,92.56]	0.041	90.8	[81.2,95.77]	0.392	37.9	[32.69,43.35]	0.733	32.8	[27.51,38.55]	0.091
Marital status*												
Currently married	79.0	[73.58,83.62]		93.1	[89.31,95.64]		38.6	[35.91,41.43]		37.2	[34.41,40.03]	
Formerly married (div/sep/widow)	83.9	[60.51,94.67]		82.1	[50.50,95.37]		46.3	[38.04,54.69]		39.8	[31.05,49.30]	
Never married	82.2	[55.34,94.52]	0.839	96.5	[77.93,99.53]	0.198	46.2	[36.77,55.89]	0.085	50.3	[39.73,60.91]	0.052
Birth order*												
First-born	84.3	[72.32,91.70]		93.0	[84.64,96.98]		44.6	[39.70,49.54]		45.3	[39.70,51.05]	
2nd-4th	75.8	[68.66,81.73]		93.6	[86.84,97.03]		39.5	[36.24,42.84]		39.1	[35.42,42.80]	
5 or more	82.1	[70.95,89.65]	0.323	90.0	[81.05,95.00]	0.606	36.1	[31.78,40.70]	0.031	32.6	[28.48,37.09]	0.001
Preceding birth interval*												
No previous birth	84.3	[72.32,91.70]		93.0	[84.64,96.98]		44.6	[39.70,49.54]		45.3	[39.70,51.05]	
<24 months	82.2	[66.51,91.48]		96.7	[84.17,99.37]		37.3	[29.76,45.47]		35.9	[28.48,44.11]	
>24 months	77.7	[71.12,83.11]	0.174	91.5	[86.1,94.94]	0.533	38.5	[35.59,41.45]	0.100	36.8	[33.65,40.04]	0.033
Sex of baby												
Male	81.2	[74.22,86.67]		92.9	[86.79,96.33]		37.9	[34.40,41.61]		38.0	[33.85,42.36]	
Female	77.9	[69.68,84.43]	0.498	91.6	[85.32,95.35]	0.498	41.3	[38.15,44.55]	0.146	38.5	[35.04,41.98]	0.870
Child's age in months												
6-11 months	40.3	[36.71,44.05]		44.9	[40.69,49.15]		30.6	[26.88,34.47]		28.2	[24.51,32.17]	
12-17 months	0.0	0		0.0	0		43.4	[35.40,51.81]		41.9	[37.47,46.45]	

18-23 months	0.0	0	<0.001	0.0	0	<0.001	48.7	[43.91,53.56]	<0.001	45.5	[40.76,50.32]	<0.001
Place of delivery												
Home	81.4	[74.02,87.09]		90.5	[83.99,94.50]		31.9	[28.84,35.17]		31.6	[28.06,35.39]	
Health facility	77.2	[69.06,83.72]	0.401	93.7	[87.33,97.02]	0.376	48.0	[44.59,51.44]	<0.001	44.5	[40.79,48.30]	<0.001
Antenatal Clinic visits												
None	72.4	[38.66,91.59]		94.7	[67.93,99.33]		23.6	[12.81,39.42]		33.2	[18.97,51.24]	
1-3.	76.7	[68.00,83.59]		94.4	[89.62,97.10]		37.8	[33.72,42.05]		35.6	[32.16,39.11]	
4+	82.6	[75.6,87.87]	0.449	89.3	[81.28,94.11]	0.400	41.8	[38.57,45.03]	0.023	42.1	[37.95,46.42]	0.083
Timing of postnatal check-up												
No check-ups (including missing)	78.8	[73.13,83.48]		89.5	[83.63,93.46]		39.7	[37.01,42.37]		33.8	[30.51,37.20]	
0-2 days	87.7	[66.86,96.2]		95.3	[86.45,98.46]		37.5	[29.35,46.51]		48.2	[42.12,54.30]	
3-6 days	100.0	0		100.0	0		21.7	[8.522,45.27]		48.9	[37.46,60.57]	
7+ days	100.0	0	0.522	96.8	[80.22,99.56]	0.522	57.6	[32.82,79.12]	0.183	42.8	[35.37,50.66]	<0.001
Mother's BMI(kg/m^2**)**												
<=18.5	86.4	[67.52,95.10]		88.3	[71.49,95.81]		40.9	[32.89,49.48]		31.9	[25.58,39.00]	
>18.5	78.9	[73.31,83.53]	0.395	92.7	[88.41,95.49]	0.696	39.5	[36.82,42.21]	0.905	39.2	[36.21,42.20]	0.140
Mother’s literacy												
Cant’ read at all				90.1	[82.51,94.61]					30.1	[26.14,34.54]	
Can read				93.9	[88.5,96.90]	0.470				43.3	[39.91,46.70]	<0.001
Mother's frequency of reading newspaper or magazine												
Not at all	80.6	[75.02,85.13]		92.9	[88.71,95.67]		36.9	[33.96,39.83]		35.6	[32.74,38.51]	
Yes	72.9	[55.45,85.38]	0.310	89.2	[75.27,95.74]	0.418	55.3	[49.23,61.27]	<0.001	54.9	[48.09,61.49]	<0.001

Mother's frequency of listening to radio												
Not at all	82.3	[73.86,88.40]		87.3	[80.08,92.14]		33.5	[29.72,37.48]		30.9	[27.12,35.00]	
Yes	77.9	[70.76,83.64]	0.383	97.4	[92.98,99.07]	0.002	44.1	[40.95,47.27]	<0.001	44.9	[41.12,48.73]	<0.001
Mother's frequency of watching TV												
Not at all	80.1	[74.52,84.73]		90.9	[86.38,94.14]		37.6	[34.95,40.36]		34.1	[31.29,36.97]	
Yes	74.6	[56.25,86.97]	0.478	99.7	[98.55,99.92]	<0.001	57.8	[48.99,66.19]	<0.001	61.1	[54.71,67.07]	<0.001
Household level factors												
Wealth Index												
Poorest	84.1	[73.84,90.81]		87.8	[77.69,93.75]		30.7	[25.85,36.05]		24.3	[19.65,29.66]	
Poorer	81.3	[67.49,90.10]		92.3	[82.76,96.76]		33.9	[29.37,38.76]		31.5	[26.85,36.48]	
Middle	73.5	[62.02,82.54]		93.8	[76.69,98.59]		34.7	[29.63,40.22]		38.3	[33.27,43.65]	
Richer	80.1	[66.45,89.06]		97.1	[90.22,99.20]		45.0	[39.47,50.56]		43.0	[37.20,49.07]	
Richest	80.4	[64.06,90.39]	0.673	90.9	[73.30,97.34]	0.538	61.7	[53.32,69.46]	<0.001	62.6	[56.65,68.14]	<0.001
Decisions women have final say												
None	86.4	[72.14,93.93]		90.5	[83.51,94.77]		35.1	[28.80,41.98]		38.4	[34.17,42.87]	
One-two	73.7	[64.94,80.87]		91.7	[83.45,96.09]		30.8	[27.26,34.53]		37.3	[33.09,41.68]	
Three and more	82.4	[76.54,91.55]		96.8	[88.45,99.19]	0.328	47.8	[40.78,50.82]	<0.001	39.3	[33.79,45.06]	0.852
Community level factors												
Residence												
Urban	79.1	[66.34,87.94]		95.3	[80.65,99.00]		54.4	[47.91,60.88]		53.6	[48.02,58.98]	
Rural	79.7	[73.74,84.55]	0.928	91.5	[87.03,94.48]	0.437	36.1	[33.24,39.05]	<0.001	34.3	[31.17,37.49]	<0.001

Geographic Zones												
Northern	85.9	[73.87,92.89]		96.3	[86.34,99.07]		28.8	[23.60,34.72]		44.3	[36.68,52.14]	
Eastern	76.4	[62.54,86.25]		93.4	[66.70,99.02]		42.0	[36.90,47.36]		48.5	[41.04,55.98]	
Western	83.9	[74.43,90.3]		91.6	[82.16,96.29]		38.8	[32.38,45.64]		28.9	[23.09,35.49]	
Southern Highlands	84.8	[68.45,93.43]		95.1	[85.06,98.47]		40.1	[32.04,48.75]		51.6	[45.18,57.89]	
Lake	79.8	[62.18,90.42]		86.8	[74.37,93.71]		44.8	[38.13,51.64]		40.1	[33.10,47.55]	
Southern	68.6	[53.51,80.50]		90.4	[73.36,96.95]		46.0	[37.60,54.55]		34.1	[26.93,42.04]	
Central	73.3	[54.62,86.28]		97.4	[84.47,99.60]		37.2	[31.02,43.82]		18.7	[13.31,25.57]	
Zanzibar	92.2	[84.20,96.34]	0.401	95.7	[88.28,98.49]	0.502	50.3	[44.81,55.82]	0.012	36.9	[31.96,42.28]	<0.001

*BMI: body mass index; TV: television. *Data available for less than 2480 children and their mothers in 2004-05 and 2275 in 2010. Chi-square test was applied to test statistical significance*.

The prevalence of minimum meal frequency was significantly low in both surveys among children's mothers who had worked in the past 12 months, those with husband not working in agricultural activities, and those who gave birth at home (Table 4:5). Children of mothers with lower education, who don't listen to radio frequently and those assisted by untrained birth attendants in 2004-05, had lower prevalence of minimum meal frequency. Likewise, female and older children (18-23 months) and those whose mothers had not made any postnatal check-ups after birth had significantly lower prevalence of minimum meal frequency in 2010. The prevalence of minimum meal frequency was significantly lower across all geographic zones, especially in Southern Highlands and Lake in both surveys and extended to be lower in Central and Western in 2010 survey.

As shown in Table 4:5, the prevalence of minimum acceptable diet was significantly higher in both surveys among children whose mother had completed secondary or higher education and among children whose fathers were not involved in agricultural activities. Children of mothers who had made more than four antenatal clinic visits in 2010, those who were born at health facilities (in both surveys), children whose mothers got professional delivery assistance in 2004-05 and those whose mothers had made some postnatal check-ups after birth in 2010 had higher prevalence of minimum acceptable diet. On contrary, the prevalence of minimum acceptable diet was significantly low among children's mothers who were illiterate in 2010 and had no autonomy in household decision making in the 2004-05. Similarly, the prevalence of minimum acceptable diet were lower for children whose mothers had limited exposure to mass media and those from rural areas across all geographic in both surveys zones especially in Central and Zanzibar.

Table 4:5 Minimum meal frequency and minimum acceptable diet across individual-, household-, and community-level factors, Tanzania 2004-05 and 2010

Characteristic	Minimum meal frequency						Minimum acceptable diet					
	2004-05			2010			2004-05			2010		
	%	95%CI	p	%	95%CI	p	%	95%CI	p	%	95%CI	p
Individual level factors												
Maternal working status												
Non-working	35.5	[29.95,41.43]		44.3	[37.08,51.77]		15.5	[11.55,20.55]		17.1	[12.70,22.52]	
Working (past 12 mo)	46.0	[43.54,48.52]	0.002	32.6	[29.69,35.70]	0.002	18.3	[16.17,20.53]	0.325	12.7	[10.78,14.93]	0.092
Maternal education												
No education	40.6	[36.35,45.06]		29.8	[24.90,35.14]		14.8	[10.96,19.59]		8.1	[5.775,11.19]	
Primary	45.4	[42.70,48.07]		35.1	[31.85,38.44]		17.9	[15.96,19.98]		14.1	[11.96,16.45]	
Secondary and above	54.1	[44.32,63.51]	0.03	40.6	[31.28,50.56]	0.080	35.0	[26.38,44.71]	<0.001	23.4	[16.65,31.86]	<0.001
Partner's occupation												
Non agriculture	51.2	[45.84,56.62]		40.3	[35.46,45.38]		26.5	[22.15,31.35]		18.1	[14.79,21.91]	
Agriculture	41.7	[39.01,44.38]		31.1	[27.85,34.50]		14.8	[12.68,17.16]		11.0	[9.079,13.32]	
Not working	53.3	[43.48,62.77]	0.001	36.8	[27.43,47.18]	0.004	22.2	[15.17,31.31]	<0.001	13.9	[8.312,22.37]	0.001
Partner's education*												
No education	41.6	[36.41,46.88]		28.3	[22.61,34.86]		15.8	[10.45,23.25]		6.9	[4.539,10.39]	
Primary	43.2	[40.45,45.89]		35.0	[31.99,38.23]		16.4	[14.40,18.55]		14.2	[12.06,16.55]	
Secondary and above	57.4	[48.64,65.7]	0.003	37.0	[28.19,46.83]	0.243	33.6	[26.23,41.96]	<0.001	17.9	[12.43,25.01]	0.005
Mother's age (years)												
15-24	46.1	[42.13,50.12]		34.2	[30.15,38.41]		18.1	[15.40,21.20]		13.7	[10.94,16.99]	

25-34	43.5	[40.18,46.79]		32.8	[29.16,36.67]		18.7	[15.78,21.98]		13.5	[11.29,16.09]	
35-49	43.7	[38.26,49.22]	0.572	37.2	[31.47,43.24]	0.389	15.1	[11.72,19.32]	0.394	12.1	[8.986,16.10]	0.745
Marital status*												
Currently married	44.1	[41.65,46.48]		33.8	[30.89,36.79]		17.5	[15.55,19.68]		12.9	[11.11,14.81]	
Formerly married (div/sep/widow)	43.6	[34.90,52.71]		36.8	[29.03,45.31]		18.7	[13.04,26.17]		16.5	[10.87,24.10]	
Never married	52.9	[42.85,62.63]	0.240	35.7	[26.29,46.30]	0.734	22.0	[14.78,31.34]	0.509	14.6	[8.566,23.64]	0.467
Birth order*												
First-born	48.9	[43.57,54.22]		35.3	[29.51,41.63]		20.7	[16.89,25.08]		15.7	[11.82,20.60]	
2nd-4th	43.0	[39.99,46.04]		34.9	[31.38,38.67]		17.1	[14.70,19.71]		14.3	[11.83,17.12]	
5 or more	43.8	[40.00,47.62]	0.120	32.3	[28.02,36.84]	0.564	17.1	[13.81,20.88]	0.268	10.3	[8.043,13.01]	0.040
Preceding birth interval*												
No previous birth	48.9	[43.57,54.22]		35.3	[29.51,41.63]		20.7	[16.89,25.08]		15.7	[11.82,20.60]	
<24 months	45.4	[38.68,52.22]		37.5	[30.64,44.83]		17.4	[12.28,24.00]		16.2	[11.31,22.56]	
>24 months	42.9	[40.37,45.47]	0.249	33.4	[30.19,36.72]	0.567	17.1	[14.97,19.41]	0.329	12.2	[10.28,14.39]	0.260
Sex of baby												
Male	43.5	[40.53,46.57]		37.1	[33.43,41.03]		16.6	[14.02,19.43]		13.9	[11.43,16.99]	
Female	45.6	[42.33,48.80]	0.363	31.3	[27.92,34.97]	0.012	19.2	[16.75,21.90]	0.161	12.6	[10.53,15.07]	0.430
Child's age (months)												
6-11	44.5	[40.45,48.58]		42.9	[38.00,47.94]		15.5	[12.78,18.74]		12.8	[10.07,16.09]	
12-17	50.2	[40.28,60.11]		30.6	[26.71,34.70]		21.5	[15.31,29.33]		14.2	[11.50,17.41]	
18-23	40.3	[35.97,44.84]	0.113	28.4	[24.55,32.49]	<0.001	16.0	[13.00,19.44]	0.009	12.8	[10.21,16.07]	0.727

Place of delivery												
Home	41.4	[38.13,44.77]		30.9	[27.21,34.98]		13.6	[11.54,16.05]		10.2	[8.019,12.86]	
Health facility	47.9	[44.56,51.32]	0.010	37.2	[33.38,41.20]	0.021	22.5	[19.88,25.29]	<0.001	16.2	[13.66,19.14]	0.001
Antenatal Clinic visits												
None	32.7	[19.29,49.63]		28.5	[14.40,48.65]		7.1	[2.56,18.68]		13.8	[4.81,33.57]	
1-3.	42.7	[38.70,46.72]		33.0	[29.51,36.74]		16.7	[13.73,20.04]		11.0	[8.904,13.54]	
4+	46.3	[43.30,49.37]	0.234	35.9	[32.10,40.05]	0.630	19.3	[16.95,21.80]	0.080	16.1	[13.46,19.24]	0.055
Timing of postnatal check-up												
No check-ups (including missing)	44.3	[41.98,46.56]		31.4	[28.17,34.82]		17.4	[15.54,19.48]		10.5	[8.658,12.74]	
0-2 days	47.7	[39.25,56.32]		36.4	[30.79,42.30]		22.4	[15.90,30.63]		17.9	[13.48,23.60]	
3-6 days	50.6	[27.70,73.28]		51.1	[40.24,61.84]		5.4	[13.38,30.57]		25.3	[16.90,36.00]	
7+ days	47.1	[24.00,71.56]	0.834	37.9	[30.48,46.05]	0.003	38.1	[16.03,66.48]	0.068	17.2	[12.70,22.93]	<0.001
Mother's BMI (kg/m^2**)**												
<=18.5	48.2	[39.86,56.65]		31.0	[24.19,38.86]	31.0	17.5	[12.10,24.74]		10.5	[6.70,16.12]	
..> 18.5	43.9	[41.54,46.25]	0.004	34.7	[31.78,37.82]	34.7	17.7	[15.75,19.83]	0.063	13.8	[11.91,15.86]	0.206
Mother’s literacy												
Cant’ read at all				31.6	[27.73,35.65]	31.6				9.8	[7.754,12.35]	
Can read				35.9	[32.47,39.40]	35.9				15.4	[13.14,17.92]	<0.001
Mother’s frequency of reading newspapers												
Not at all	43.5	[41.02,46.01]		34.0	[31.04,37.13]	34.0	16.2	[14.16,18.47]		12.3	[10.43,14.38]	
Yes	50.3	[44.11,56.41]	0.076	35.3	[28.32,42.97]	35.3	27.1	[22.28,32.56]	<0.001	19.6	[14.18,26.56]	0.023

Mother's frequency of listening to radio												
Not at all	40.7	[37.29,44.26]		33.3	[29.31,37.63]		14.0	[11.37,17.04]		10.7	[8.401,13.49]	
Yes	47.2	[44.14,50.31]	0.011	34.9	[31.38,38.65]	0.552	20.7	[18.43,23.15]	0.001	15.7	[13.26,18.39]	0.007
Mother's frequency of watching television												
Not at all	44.4	[41.98,46.8]		33.4	[30.44,36.40]		16.6	[14.73,18.73]		11.8	[10.09,13.82]	
Yes	45.8	[37.74,54.06]	0.554	38.6	[31.74,46.01]	0.153	29.0	[23.26,35.57]	<0.001	21.3	[16.66,26.77]	<0.001
Household level factors												
Wealth Index												
Poorest	39.6	[34.80,44.68]		30.6	[25.77,35.98]		14.7	[10.98,19.45]		8.4	[5.792,11.98]	
Poorer	40.0	[35.11,45.01]		32.6	[27.63,38.07]		13.3	[10.37,16.83]		8.8	[6.327,11.99]	
Middle	47.8	[42.60,53.12]		35.0	[29.86,40.57]		16.3	[12.62,20.88]		16.2	[12.68,20.47]	
Richer	44.6	[40.22,49.02]		33.1	[26.77,40.07]		17.8	[14.06,22.33]		12.3	[9.057,16.61]	
Richest	54.5	[47.81,61.09]	0.001	41.6	[34.08,49.60]	0.142	32.0	[26.03,38.72]	<0.001	24.3	[19.09,30.36]	<0.001
Decisions women have final say												
None	42.5	[35.85,49.45]		38.1	[34.12,42.28]		13.0	[9.41,17.61]		14.9	[12.19,18.15]	
One-two	43.6	[39.78,47.49]		31.1	[27.02,35.40]		12.8	[10.43,15.52]		13.1	[10.53,16.02]	
Three and more	45.7	[41.43,50.04]	0.768	31.1	[26.12,36.47]	0.014	23.2	[18.91,26.88]	<0.001	10.5	[7.444,14.52]	0.146
Community level factors												
Residence												
Urban	48.1	[41.82,54.38]		37.3	[29.83,45.37]		24.3	[19.8,29.44]		17.2	[13.06,22.41]	
Rural	43.7	[41.17,46.26]	0.226	33.4	[30.31,36.56]	0.363	16.3	[14.32,18.58]	0.001	12.3	[10.36,14.45]	0.040

Geographic Zones												
Northern	45.8	[39.84,51.98]		51.2	[43.78,58.49]		14.2	[11.25,17.85]		20.4	[14.84,27.27]	
Eastern	55.3	[50.11,60.40]		35.9	[28.08,44.65]		16.4	[12.80,20.67]		16.2	[12.08,21.48]	
Western	43.3	[36.86,50.01]		26.5	[21.13,32.57]		15.7	[11.54,20.87]		7.8	[4.603,12.99]	
Southern Highlands	45.1	[39.43,50.89]		27.7	[19.62,37.42]		21.3	[15.74,28.08]		15.1	[10.19,21.68]	
Lake	37.3	[31.80,43.12]		35.7	[29.65,42.32]		22.0	[16.69,28.38]		15.6	[11.41,20.85]	
Southern	34.1	[28.45,40.22]		43.5	[34.68,52.84]		18.6	[12.86,26.07]		13.8	[9.723,19.45]	
Central	43.7	[37.63,49.87]		23.5	[16.33,32.68]		17.3	[13.11,22.40]		3.7	[1.628,8.059]	
Zanzibar	45.0	[39.71,50.39]	<0.001	39.6	[34.69,44.65]	<0.001	24.1	[20.16,28.42]	0.186	16.2	[12.63,20.60]	<0.001

*BMI: body mass index; TV: television. *Data available for less than 2480 children and their mothers in 2004-05 and 2275 in 2010. Chi-square test was applied to test statistical significance.*

4.3.5 Determinants of inappropriate complementary feeding practices

Unadjusted and adjusted odds ratios were calculated to determine the independent variables that were significantly associated with inappropriate complementary feeding indicators: (delayed introduction of soft, semi-solid or solid foods; not meeting minimum dietary diversity; not meeting minimum meal frequency; and not meeting minimal acceptable diets). Table 4:6 shows that the prevalence of introduction to soft, semi-solid or solid foods significantly improved with increasing age. Infants whose mothers were aged 25-34 years old were less likely to be introduced to complementary foods at 6-8 months compared to infants of the older mothers in 2004-05 (adjusted odd ratios (AOR) =2.7; 95% CI: 1.19 to 6.32; p=0.018). The risk of delayed introduction of complementary feeding was significantly higher among children whose mothers had no access to mass media (radio or television) compared to children whose mothers frequently listen to radio and/or watch television in 2010 (AOR for radio =0.2; 95% CI: 0.06 to 0.64; p=0.007 and AOR for watching television= 0.1; 95% CI: 0.01 to 0.27; p=<0.001). When replaced access to media like radio or television with household wealth index, the variable for household wealth was not significantly associated with delayed introduction of soft, semi-sold or solid foods at 6-8 months. Hence accesses to media (radio and television) were retained in the final model for delayed introduction of complementary foods at 6-8 month.

As shown in Table 4:7, the risk of not meeting minimum dietary diversity consistently decreased with increasing age of the children. Older children (12-23 months) had a lower risk of not meeting minimum dietary diversity compared to younger children (6-11 months).The risk of not meeting minimum dietary diversity was significantly higher among children of mothers with no formal education than children whose mother had secondary or higher education in 2004-05. In addition, children whose mothers did not have any postnatal check-ups in 2010 had higher risk for not meeting minimum dietary diversity than those whose mothers had postnatal check-ups within 41 days after delivery. The risk of not meeting minimum dietary diversity was gradually increasing with lowering wealth index quintiles in both surveys. Compared to Lake

and Southern Highlands, children from Central, Eastern, Northern, Southern, Western and Zanzibar had higher risk of inadequate dietary diversity.

Table 4:8 shows that, inadequate meal frequency was significantly associated with lower paternal education, female children (AOR= 1.4; 95% CI: 1.11 to 1.76; p=0.004), older children aged >12 months and lack of postnatal check-ups. Similarly, the risk of not meeting minimum meal frequency was significantly higher among children whose mothers had not worked in the past 12 months, children from poor households and those from Central, Eastern, Southern, Southern Highlands, Western and Zanzibar.

The risk factors associated with poor acceptable diet in children aged 6-23 months are summarized in Table 4:10. The adjusted odds for not meeting minimum acceptable diet were significantly lower among children whose mothers had worked in the past 12 months, had attended postnatal check-ups after delivery and those whose father's had at least primary school education. In contrast, the adjusted odds for not meeting minimum acceptable diet were significantly higher among children from the poorest households compared to those from the richest households, and those from Central, Eastern, Northern, Southern Highlands and Western compared to children from Lake, Southern and Zanzibar geographic regions.

Table 4:6 Determinants of delayed introduction of soft, semi-solid or solid foods to infants at 6-8 months, Tanzania 2004-05 and 2010

	2004-05			2010		
	Adjusted odds ratios			**Adjusted odds ratios**		
Characteristic	**OR**	**[95% CI]**	**p**	**OR**	**[95% CI]**	**p**
Child's age (months)	0.51	[0.35,0.73]	<0.001	0.53	[0.32,0.90]	0.018
Mother's age (years)						
35-49	1.00					
15-24	1.32	[0.58,3.02]	0.504			
25-34	2.74	[1.19,6.32]	0.018			
Mother's frequency of listening to radio						
Not all/once a week				1.00		
Yes				0.20	[0.06,0.64]	0.007
Mother's frequency of watching television						
Not all/once a week				1.00		
Yes				0.06	[0.01,0.27]	<0.001

CI: confidence interval; OR: odds ratio. The independent variables adjusted for were: child sex, child age, mother's age, mother's education, mother's literacy, mother's employment status, mother's BMI, marital status, father's education, father's occupation, birth order, preceding birth interval, antenatal visits, place of delivery, postnatal visits, mother's access to media (radio, television and newspapers), household wealth index, area of residence and geographical zones. P-values for odds ratios are based on multiple logistic regression model that includes all predictor variables retained by backward elimination, and also taking account of the clustering.

Table 4:7 Determinants of not meeting minimum dietary diversity among children aged 6-23 months, Tanzania 2004-05 and 2010

	Year of survey					
	2004-05			2010		
	Adjusted odds ratios			Adjusted odds ratios		
Characteristic	**OR**	**[95% CI]**	**p**	**OR**	**[95% CI]**	**p**
Child's age (months)						
18-23	1.0			1.0		
12-17	1.42	[1.11,1.84]	0.006	0.56	[0.42,0.74]	<0.001
6-11	2.70	[2.07,3.52]	<0.001	0.47	[0.34,0.64]	<0.001
Mother's education						
Secondary and above	1.0					
Primary	1.72	[0.86,3.45]	0.128			
No education	2.14	[1.01,4.50]	0.046			
Timing of postnatal visits						
No visit				1.0		
1-2 days				0.58	[0.42,0.81]	0.002
3+ days				0.74	[0.52,1.06]	0.096
Wealth Index						
Richest (highest quintile)	1.0			1.0		
Rich	2.05	[1.28,3.27]	0.003	2.48	[1.64,3.77]	<0.001
Middle	2.99	[1.88,4.77]	<0.001	2.65	[1.82,3.87]	<0.001

Poor	3.02	[1.93,4.73]	<0.001	3.15	[2.11,4.71]	<0.001
Poorest (lowest quintile)	3.32	[2.13,5.18]	<0.001	4.13	[2.73,6.21]	<0.001
Geographic Zones						
Southern Highland	1.04	[0.66,1.65]	0.856	1.00*		
Lake	0.66	[0.39,1.12]	0.122	1.33	[0.78, 2.29]	0.297
Northern	1.60	[1.04,2.47]	0.032	1.30	[0.79,2.16]	0.305
Eastern	0.94	[0.62,1.44]	0.804	1.84	[1.08,3.12]	0.024
Southern	0.66	[0.39,1.09]	0.103	1.89	[1.08, 3.26]	0.023
Western	0.86	[0.55,1.33]	0.492	2.46	[1.45,4.14]	0.001
Zanzibar	1.00*			2.76	[1.69,4.51]	<0.001
Central	1.33	[0.83,2.14]	0.235	3.66	[2.02,6.63]	<0.001

CI: confidence interval; OR: odds ratio. Survey logistic regression model for risk factors associated with not-meeting minimum dietary diversity among children aged 6-23 months. The independent variables adjusted for were: child sex, child age, mother's age, mother's education, mother's literacy, mother's employment status, mother's BMI, marital status, father's education, father's occupation, birth order, preceding birth interval, antenatal visits, place of delivery, postnatal visits, mother's access to media (radio, television and newspapers), household wealth index, area of residence and geographical zones. P-values for odds ratios are based on multiple logistic regression model that includes all predictor variables retained by backward elimination, and also taking account of the clustering. The categories of independent variables have been ordered by placing the category with the lowest risk of adverse feeding pattern first, except for geographical zones where (*) represent the reference category.

Table 4:8 Determinants of inadequate meal frequency among children aged 6-23 months, Tanzania 2004-05 and 2010

	Year of survey					
	2004-05			2010		
	Adjusted odds ratios			Adjusted odds ratios		
Characteristic	**OR**	**[95% CI]**	**p**	**OR**	**[95% CI]**	**p**
Child gender						
Male				1.00		
Female				1.40	[1.11,1.76]	0.004
Child's age (months)						
6-11				1.0		
12-17				1.66	[1.28,2.17]	<0.001
18-23				1.97	[1.48,2.61]	<0.001
Maternal working status						
Working (past 12 mo)	1.00					
Not-working	2.35	[1.76,3.14]	<0.001			
Timing of postnatal visits						
No visit				1.0		
1-2 days				0. 87	[0.63,1.21]	0.424
3+ days				0.64	[0.46,0.88]	0.006
Wealth Index						
Richest (highest quintile)	1.00					
Rich	1.90	[1.35,2.75]	<0.001			
Middle	1.92	[1.32,2.72]	0.001			
Poor	2.54	[1.76,3.67]	<0.001			
Poorest (lowest quintile)	2.48	[1.72,3.59]	<0.001			
Geographic Zones						
Northern	1.31	[0.93,1.84]	0.125	1.00		
Southern	2.09	[1.46,2.98]	<0.001	1.39	[0.84,2.31]	0.201
Zanzibar	0.35	[0.95,1.93]	0.096	1.62	[1.11,2.37]	0.012
Lake	1.91	[1.33,2.75]	<0.001	1.85	[1.21,2.83]	0.005
Eastern	1.00			2.05	[1.25,3.35]	0.004
Southern Highlands	1.45	[1.05,2.01]	0.024	2.95	[1.90,4.57]	<0.001
Western	1.47	[1.01,2.13]	0.044	3.02	[1.79,5.08]	<0.001
Central	1.64	[1.13,2.38]	0.009	3.54	[1.89,6.59]	<0.001

CI: confidence interval; OR: odds ratio. Survey logistic regression model for risk factors associated with not-meeting minimum meal frequency among children aged 6-23 months. The independent variables adjusted for were: child sex, child

age, mother's age, mother's education, mother's literacy, mother's employment status, mother's BMI, marital status, father's education, father's occupation, birth order, preceding birth interval, antenatal visits, place of delivery, postnatal visits, mother's access to media (radio, television and newspapers), household wealth index, area of residence and geographical zones. P-values for odds ratios are based on multiple logistic regression model that includes all predictor variables retained by backward elimination, and also taking account of the clustering. The categories of independent variables have been ordered by placing the category with the lowest risk of adverse feeding pattern first, categories of independent variables have been ordered by placing the category with the lowest risk of adverse feeding pattern first, except for geographical zones where (*) represent the reference category.

Table 4:9 Determinants of inadequate minimum acceptable diet among children aged 6-23 months, Tanzania 2004-05 and 2010

	Year of survey					
	2004-05			**2010**		
	Adjusted odds ratios			**Adjusted odds ratios**		
Characteristic	**OR**	**[95% CI]**	**p**	**OR**	**[95% CI]**	**p**
Maternal working status						
Working (past 12 mo)	1.0					
Not-working	2.52	[1.69,3.77]	<0.001			
Partner's education						
No education				1.0		
Primary				0.59	[0.36,0.96]	0.035
Secondary and higher				0.97	[0.46,2.05]	0.937
Timing of postnatal visits						
No visit				1.0		
1-2 days				0. 55	[0.35,0.70]	0.012
3+ days				0.52	[0.35,0.76]	0.001
Wealth Index						
Richest (highest quintile)	1.0			1.0		
Rich	2.98	[1.83,4.85]	<0.001	2.28	[1.84,3.82]	0.002
Middle	3.57	[2.20,5.77]	<0.001	1.55	[0.92,2.62]	0.102
Poor	4.66	[2.88,7.55]	<0.001	2.87	[1.55,5.32]	0.001
Poorest (lowest quintile)	3.75	[2.34,6.01]	<0.001	2.56	[1.33,4.97]	0.005
Geographic Zones						
Northern	1.89	[1.13,3.16]	0.015	1.0		
Southern	1.25	[0.68,2.31]	0.466	1.18	[0.67,2.08]	0.564
Zanzibar	1.20	[0.74,1.96]	0.458	1.56	[0.83,2.94]	0.168
Lake	1.00			1.57	[0.88,2.83]	0.129
Eastern	2.06	[1.19,3.59]	0.011	1.69	[0.91,3.15]	0.095
Southern Highlands	1.36	[0.78,2.40]	0.277	2.02	[1.12,3.67]	0.020
Western	1.59	[0.92,2.78]	0.097	2.73	[1.41,5.30]	0.003

Central	1.94	[1.13,3.24]	0.016	7.86	[2.92,21.16]	<0.001

CI: confidence interval; OR: odds ratio. Survey logistic regression models for risk factors associated with poor acceptable diet among children aged 6-23 months. The independent variables adjusted for were: child sex, child age, mother's age, mother's education, mother's literacy, mother's employment status, mother's BMI, marital status, father's education, father's occupation, birth order, preceding birth interval, antenatal visits, place of delivery, postnatal visits, mother's access to media (radio, television and newspapers), household wealth index, area of residence and geographical zones. P-values for odds ratios are based on multiple logistic regression model that includes all predictor variables retained by backward elimination, and also taking account of the clustering. The categories of independent variables have been ordered by placing the category with the lowest risk of adverse feeding pattern first, except for geographical zones where (*) represent the reference category.

4.3.6 Trends of complementary feeding indicators in children aged 6-23 months in Tanzania from 2004-05 to 2010

Introduction

The aim of this study was to compare trends of key complementary feeding indicators in children aged 6-23 months in Tanzania using data from the two most recent Tanzania Demographic and Health Surveys (2004-05 and 2010). Findings from this study provide better understanding of complementary feeding practices and shows whether Tanzania had any improvement in CF practices between the two survey periods to achieve its Millennium Development Goal of reducing child mortality by two-thirds in 2015.This information would be useful to health policy makers for designing interventions to improve complementary feeding practices among young children in Tanzania.

Methods

The present trend analysis utilized data on child feeding practices from the 2004-05 and 2010 Tanzania Demographic and Health Surveys (TDHS). The details of survey methodology, sampling procedure and questionnaires have been described under the general methodology (Chapter 2 and also in Section 4.2 of this chapter) and also in the individual TDHS reports (8, 55). The similar statistical analyses were performed using Stata 10.0 as detailed in Section 4.2 of this chapter. In addition, differences in prevalence estimates in complementary feeding indicators were expressed as percentages comparing between the two surveys periods. In all comparisons, differences were estimated using a chi-square to test and a p-value of less than

0.05 was used as the cut-off for statistical significance. The outcome measures of interest were the differences in percentage point of complementary feeding indicators in 2004-05 and 2010 surveys.

Results

Trends of complementary feeding indicators

The four complementary feeding indicators are tabulated by year of survey in Table 4:10, and their trends are shown in Figure 4:1. The proportion of children aged between 6-8 months who receive soft, semi-solid or solid foods was satisfactory in both surveys, indicating more than 12 percentage point increase from 2004-05 to 2010. The prevalence of minimum dietary diversity were considerably low (40%) in 2004-05 and decreased to 38% in 2010. Similarly, the prevalence of minimum meal frequency fell from 45% in 2004-05 to 34% in 2010 suggesting a decrease of 10.3 percentage point. The prevalence of minimum acceptable diet among breastfed children was very low in both surveys but this prevalence was further decreased by 5 percentage point in 2010 compared to 2004-05.

Table 4:10 Comparison of complementary feeding indicators in Tanzania, 2004-05 to 2010

Indicator	**Year of survey**		**Difference as percentage-point**	
	2004-05	**2010**	**2010 – 2004-05**	
	% [95CI]	**% [95CI]**	**%**	**p**
Introduction to solid, semi-solid or soft foods	79.6[74.4,84.0]	92.3 [88.4,95.0]	12.7	<0.001
Minimum dietary diversity	39.5[36.8,42.3]	38.0[35.1,41.0]	-1.4	0.501
Minimum meal frequency	45.0[42.5,47.6]	34.7[31.6,38.0]	-10.3	<0.001
Minimum acceptable diet	18.4[16.4,20.4]	13.4[11.5,15.5]	-4.9	0.001

CI: confidence interval

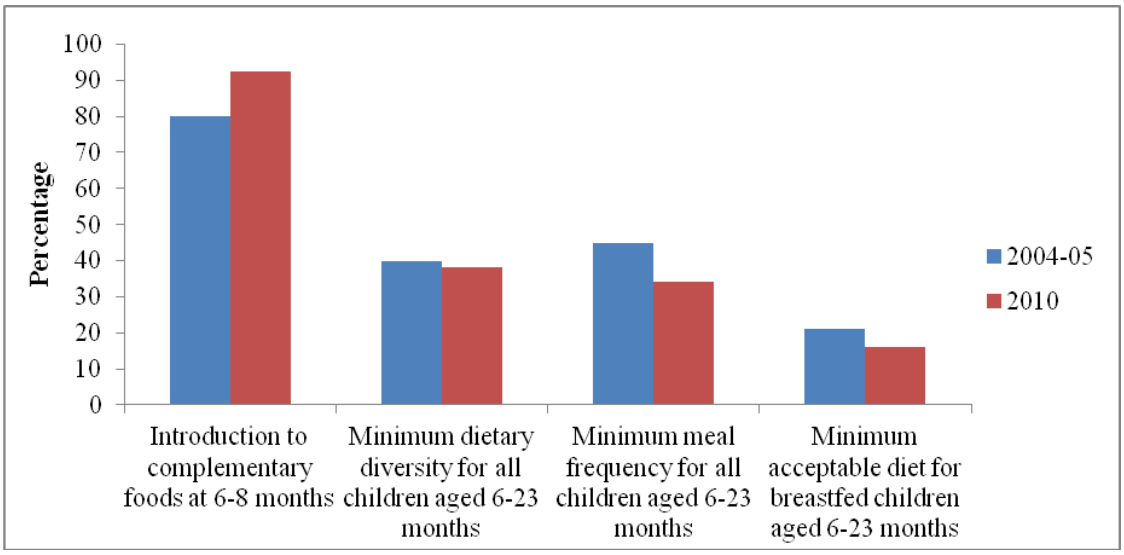

Figure 4:1 Comparison of complementary feeding indicators in Tanzania, 2004-05 to 2010

Trends in consumption of food groups

Proportion of children who were given food made of grains, roots and tubers were high (96% and 93% respectively) in 2004-05 and 2010 surveys (Figure 4:2). However, practice of feeding children food made from legumes and nuts slightly decreased from 43% in 2004-05 to 41% in 2010. Similarly, the proportion of children who received other fruits and vegetables was very low (18%) in 2010 compared to 22.2% in 2004-05. Consumption of foods of animal origin slightly increased among young children in Tanzania since 2004-05 to 2010. Further, there was an increase trend in consumption of vitamin A rich fruits and vegetables in 2010 compared to 2004-05 (63.2%-67.2% respectively).

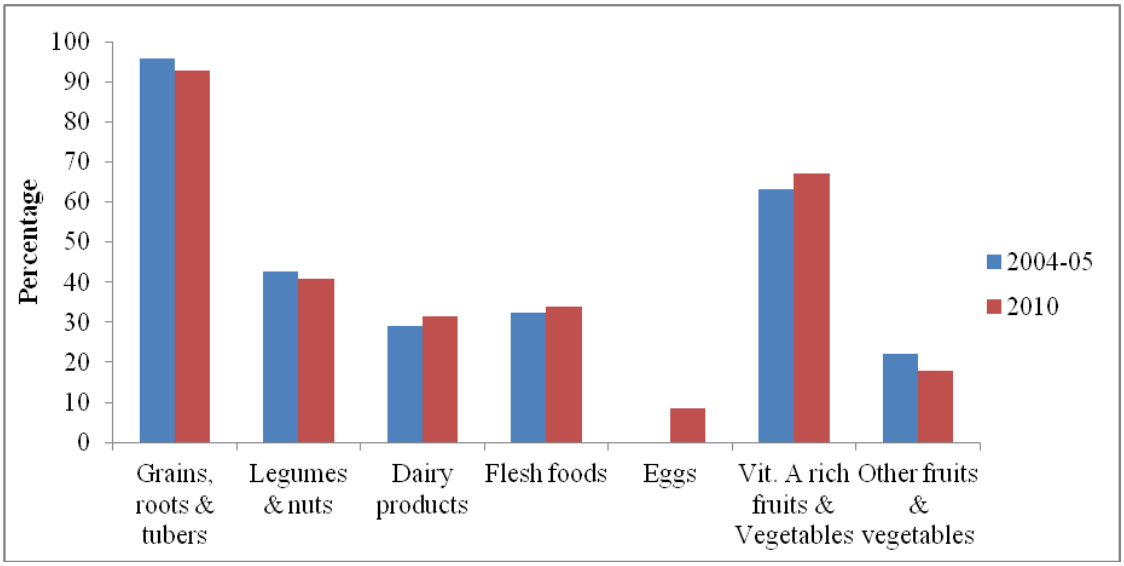

Figure 4:2 Trends in consumption of food groups among children aged 6-23 months in Tanzania, 2004-05 to 2010

Further, the present analysis explored the trends in complementary feeding indicators across child age categories. As shown in Figure 4:3, the trends in minimum dietary diversity was improving with increasing age of the children in both surveys, but young children (<12 months) had very low rates of minimum dietary diversity in 2004-05 and 2010 surveys. The trends in minimum meal frequency decreased as with increasing age in both surveys (Figure 4:4). Compared to 2004-05, very few children aged 18-23 months had adequate meal frequency in 2010 (40.3% vs. 28.4%) The prevalence of minimum acceptable diet among was low (<22%) across all age categories in both surveys. However, proportion of children who received adequate acceptable diet was slightly high in 2004-05 compared to 2010 in all age categories (Figure 4:5).

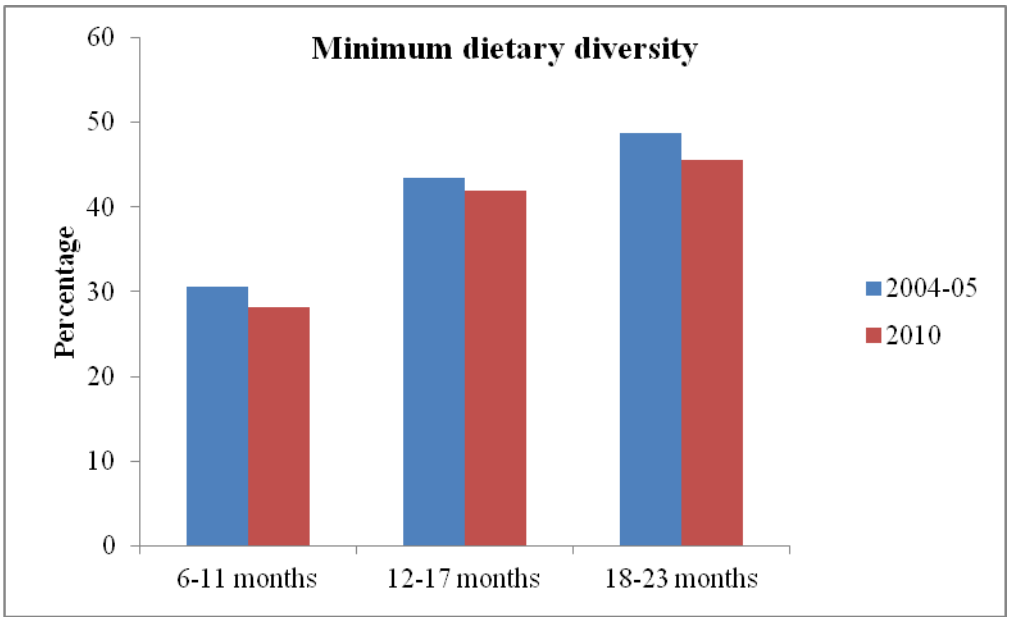

Figure 4:3 Trends in minimum dietary diversity by child age, Tanzania 2004-05 to 2010.

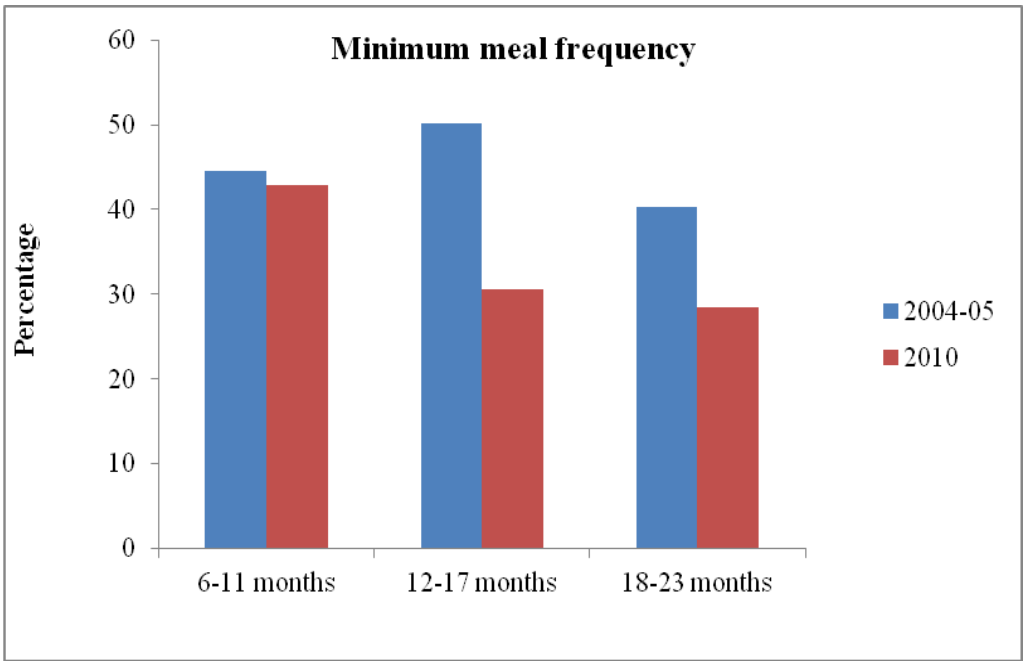

Figure 4:4 Trends in minimum meal frequency by child age, Tanzania 2004-05 to 2010

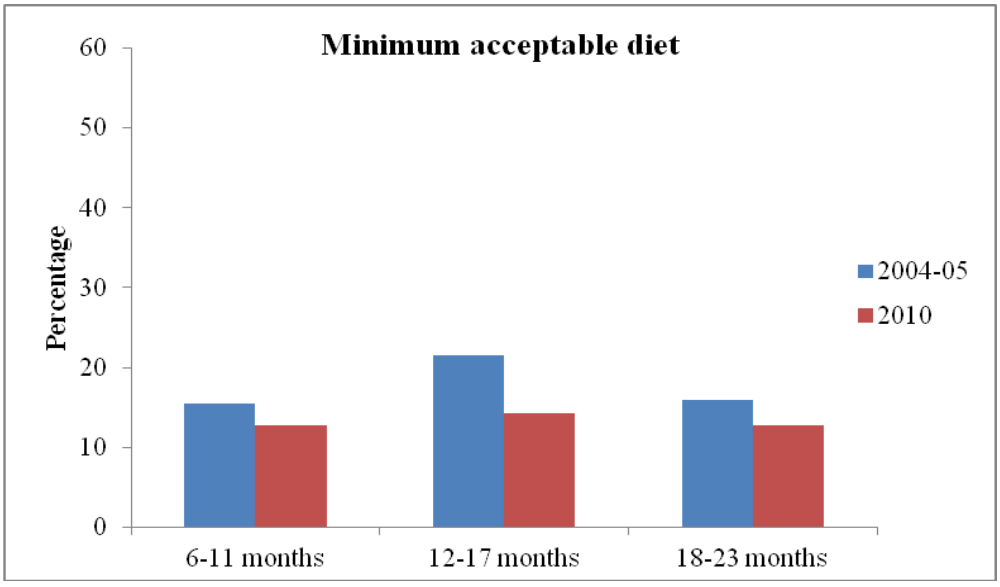

Figure 4:5 Trends in minimumacceptable diet by child age ,Tanzania 2004-05 to 2010

In addition, there was a significant increase in trends of prevalence of complementary feeding indicators with the household wealth (Figure 4:6 to Figure 4:9). This trend was observed across all indicators from 2004-05 to 2010, indicating that wealth is a strong positive predictor of appropriate complementary feeding in Tanzania.

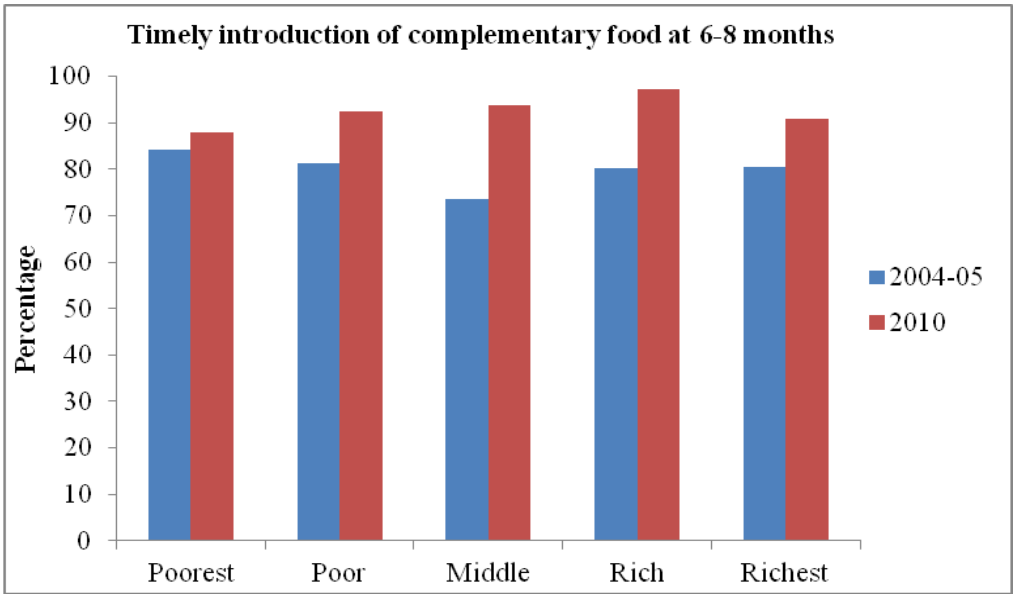

Figure 4:6 Trends in introduction of soft, semi-solid or solid foods across household wealth quintiles in Tanzania from 2004-05 to 2010

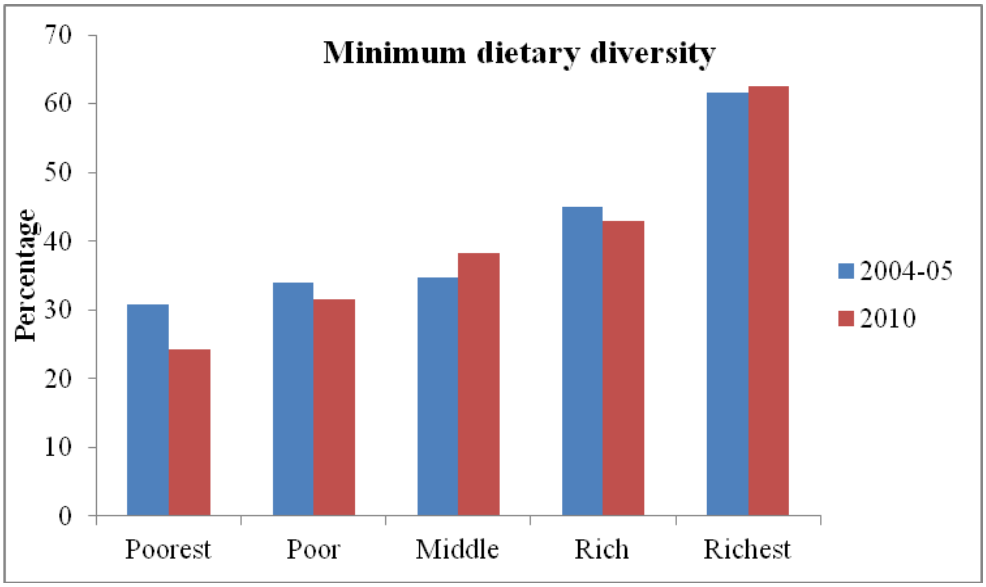

Figure 4:7 Trends of minimum dietary diversity across household wealth quintiles in Tanzania from 2004-05 to 2010

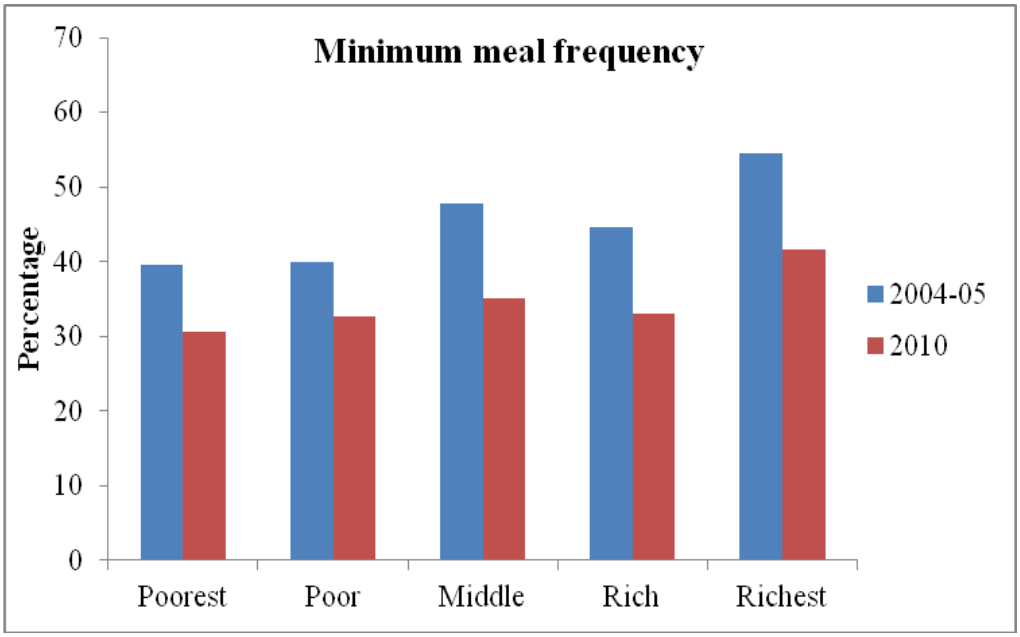

Figure 4:8 Trends of minimum meal frequency across household wealth quintiles in Tanzania from 2004-05 to 2010

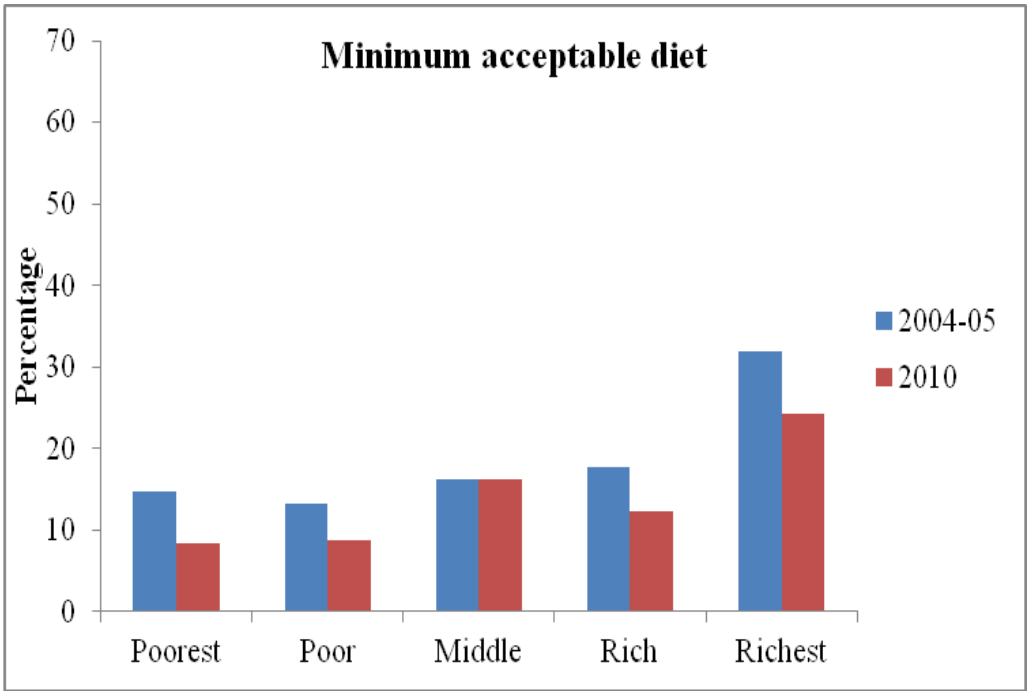

Figure 4:9 Trends of minimum acceptable across household wealth quintiles in Tanzania from 2004-05 to 2010

Trends in complementary feeding indicators across geographical zones of Tanzania

Figure 4:10 to Figure 4:13 shows the patterns of introduction of complementary foods, minimum dietary diversity, minimum mealy frequency and minimum acceptable diet across geographic zones. The proportion of children aged 6-8 months who received complementary foods improved across all geographic zones of Tanzania since 2004-05 to 2010 (Figure 4:10). But the highest (>90%) proportion of children aged 6-8 months received complementary foods in 2010 compared to 2004-05 in all geographical zones. The marked increase of more than 15% was observed in the Central, Eastern and Southern zones in 2010 than in 2004-05.

The trend in minimum dietary diversity was not consistent since there were some significantly improvement in some zones while dietary diversity significantly declined in other zones (Figure 4:11). For example, there was a significantly increasing trend of more than 5% in Eastern, Lake, Northern and Southern Highlands from 2004-05 to 2010. It is important to note the 10% increasing trends in dietary diversity in Southern Highlands than in other zones. However, there was a significantly decrease in trends of dietary diversity in some geographic zones, but the

decrease was almost two folds in Central while more than 10% decrease was noted in Southern and Zanzibar in 2010.

As in minimum dietary diversity, the trends in minimum meal frequency was not consistent across geographic zones of Tanzania (Figure 4:12). Only two geographic zones (Northern and Southern) had a marked improvement in terms of meal frequency during the 5 years period. Other geographic regions such as Central, Eastern, Southern Highlands and Western showed a decreasing trend of about 17-20% from 2004-05 to 2010.The prevalence of minimum meal frequency did not change in Lake Zone since 2004-05 to 2010. Only children from Northern zone seem to have improved acceptable diet since 2004-05 to 2010 (Figure 4:13). Other children appeared to be at increased risk of inadequate acceptable diet during the two survey periods. The notable high decrease was observed in Central, Western and Zanzibar. There was no change in trends of minimum acceptable diet in Eastern zone for the past 5 year's period.

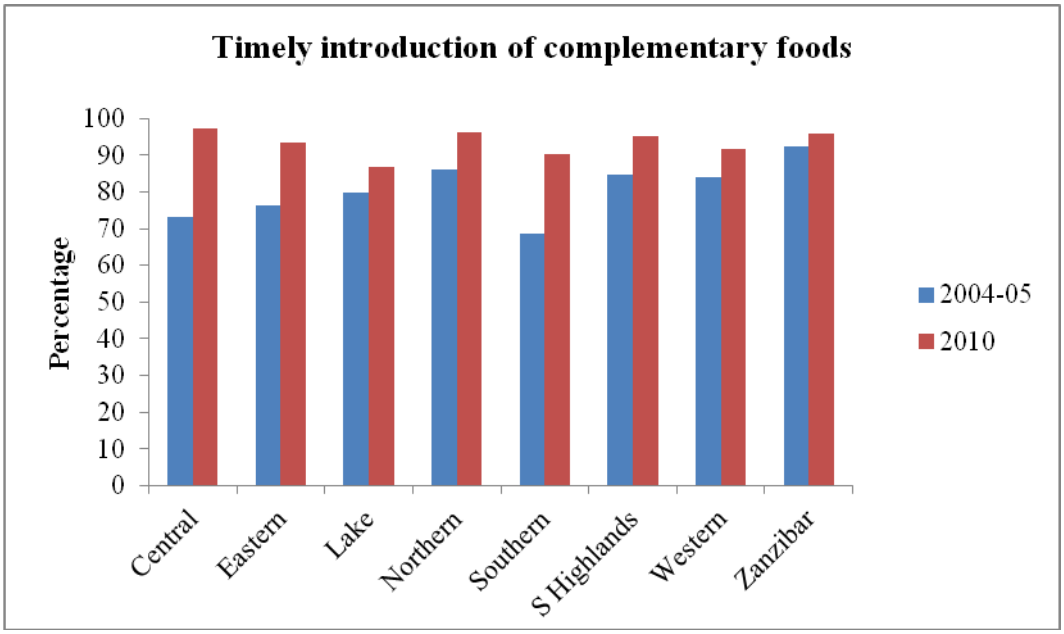

Figure 4:10 Trends in introduction of soft, semi-solid or solid foods among infants aged 6-8 months across geographic zones of Tanzania from 2004-05 to 2010

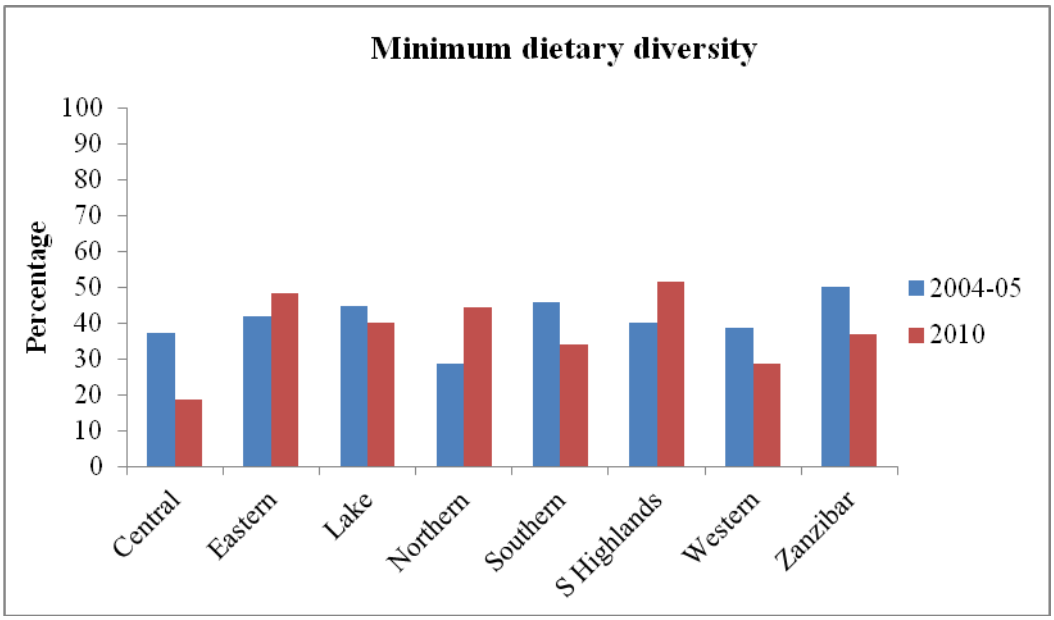

Figure 4:11 Trends in minimum dietary diversity indicator across geographic zones of Tanzania from 2004-05 to 2010

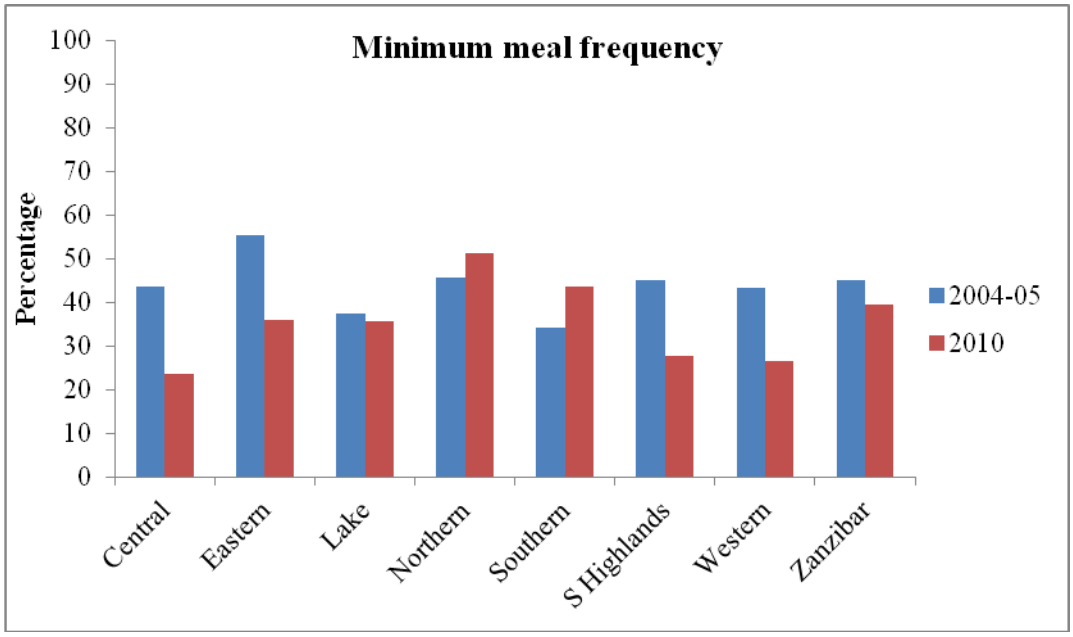

Figure 4:12 Trends in minimum meal frequency indicator across geographic zones of Tanzania from 2004-05 to 2010

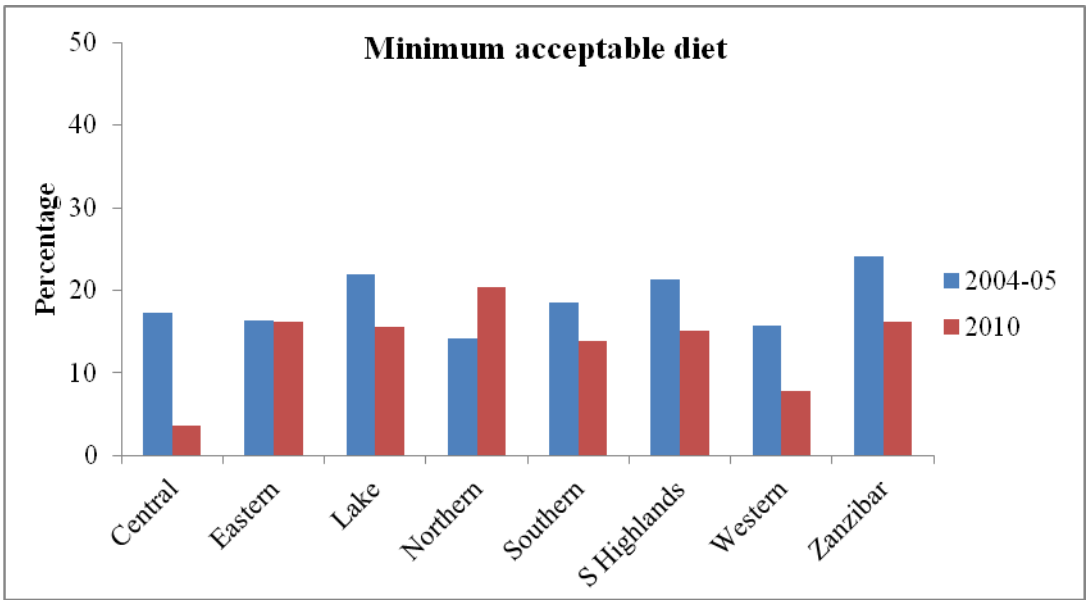

Figure 4:13 Trends in minimum dietary diversity indicators across geographic zones of Tanzania from 2004-05 to 2010

Trends in complementary feeding across residential areas

Figure 4:14 to Figure 4:17 demonstrate the trends of complementary feeding indicators across residential areas of Tanzania. There was an increasing trend on the introduction of complementary foods at 6-8 months in both rural and urban areas of Tanzania in the two surveys period (Figure 4:14) although this trend was not significantly different between the urban and rural areas. The prevalence of dietary diversity did not change in urban areas during the 5 years period, but there was a 5% decreased in trends in rural areas from 2004-05- to 2010 (Figure 4:15). More than 40% of children met minimum meal frequency in both rural and urban areas in 2004-05 (Figure 4:16). However, the prevalence decreased for more than 10% in both areas during 2010. Similarly, children from urban areas had higher prevalence in minimum acceptable diet in the two survey period. But the proportion decreased by 4 to 7% in 2010 in both rural and urban areas respectively (Figure 4:17).

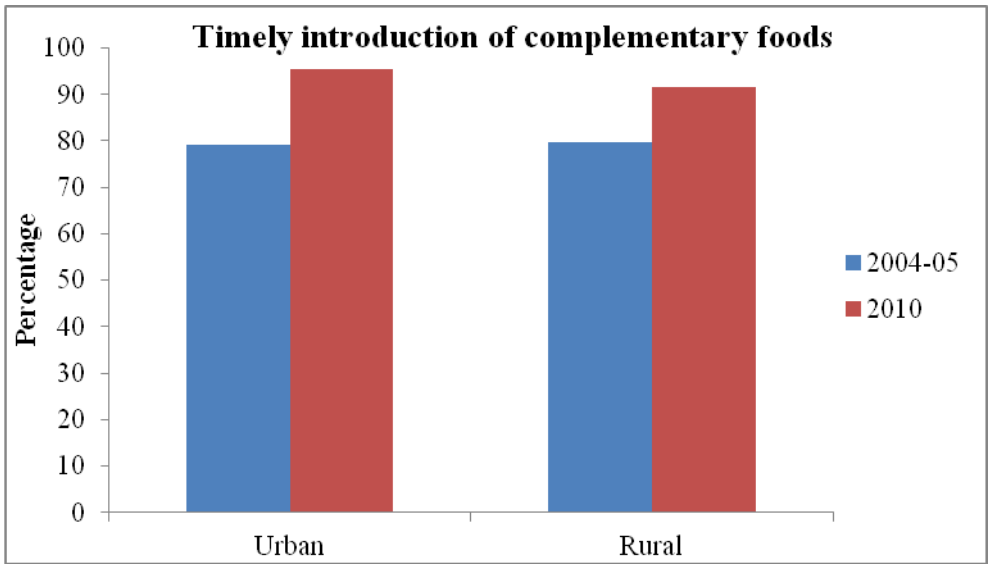

Figure 4:14 Trends of introduction of soft, semi-solid or solid foods indicators by residential areas of Tanzania, 2004-05 to 2010

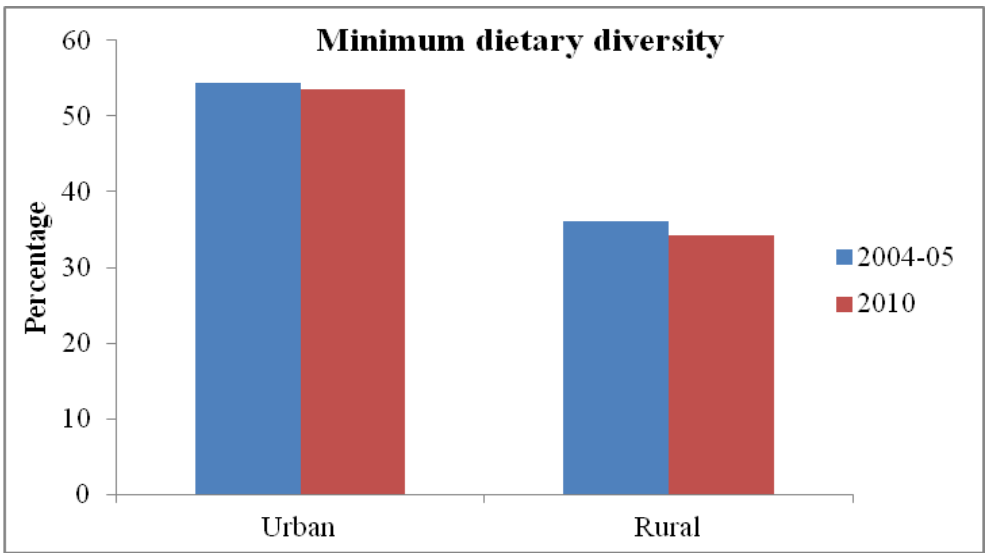

Figure 4:15 Trends of minimum dietary diversity indicators by residential areas of Tanzania, 2004-05 to 2010

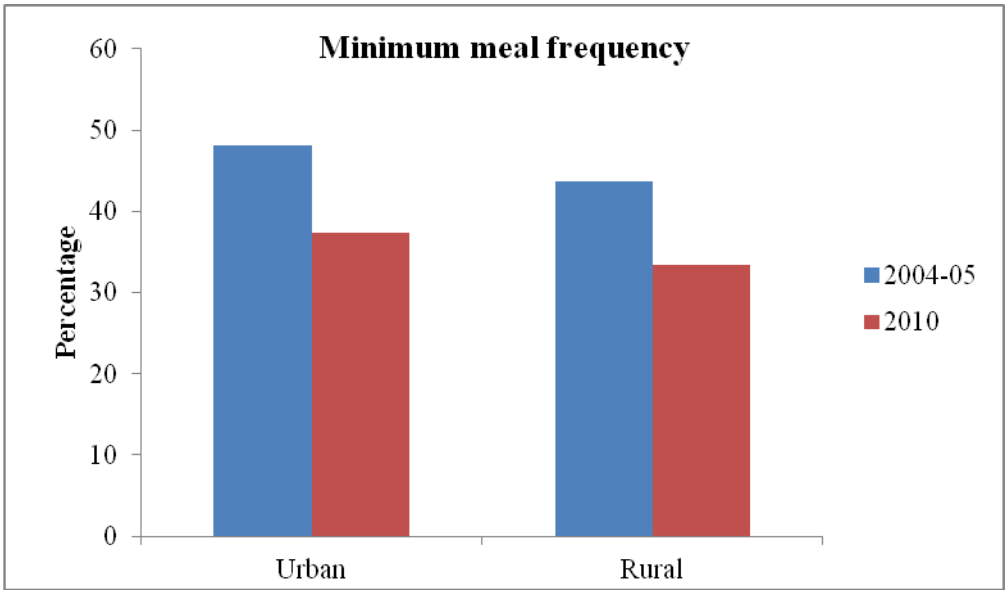

Figure 4:16 Trends of minimum meal frequency indicators by residential areas of Tanzania, 2004-05 to 2010

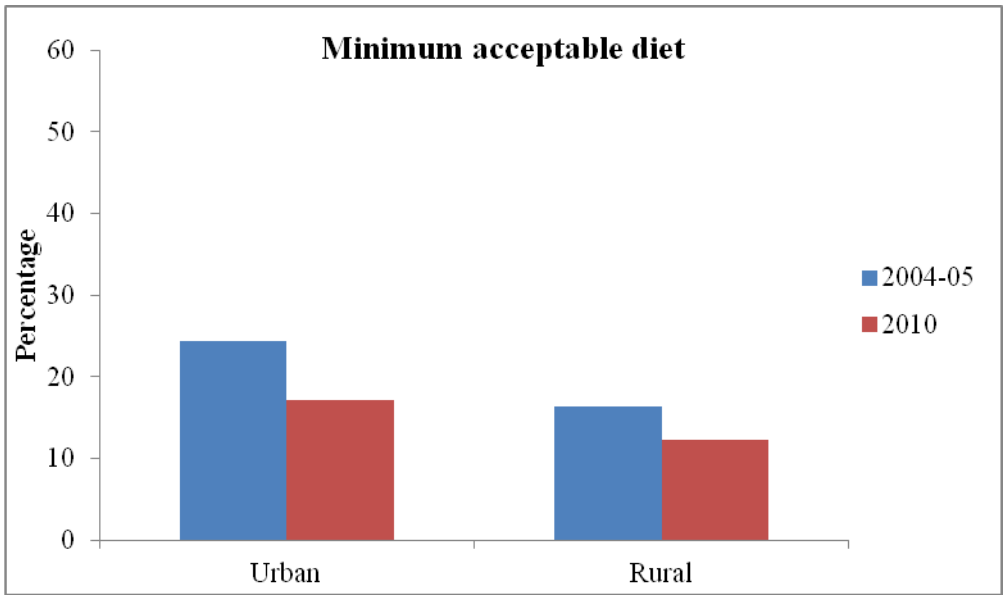

Figure 4:17 Trends of minimum acceptable diet indicators by residential areas of Tanzania, 2004-05 to 2010

4.3.7 Discussion

This study revealed that, in Tanzania the majority of children aged 6-8 months receive complementary foods. However, very few children aged 6-23 months met the requirements for minimum dietary diversity, minimum meal frequency and minimum acceptable diet which is a

cause of concern as poor complementary feeding (CF) practices are associated with poor nutritional status (190). There were also decreasing trends in meeting minimum dietary diversity, meal frequency and acceptable diet among children aged 6-23 months in Tanzania from 2004-05 to 2010. Lower parental education, poor household economic status, absence of postnatal check-ups after delivery and young child age were consistent determinants of inappropriate CF practices in both 2004-05 and 2010 TDH surveys. Other negative predictors of poor CF practices in Tanzania were young maternal age, lack of employment, inadequate access to mass media and residence in rural areas.

Introduction of nutritionally adequate and safe complementary foods promotes growth and good nutritional status among infants and young children (6). Overall, majority (92.3%) of children aged 6-8 months in this study had received soft, semi-solid or solid foods in the previous day (Table 4:3). This result reveals a significant improvement of more than 12% from 2004-05 to 2010 (Table 5-11). A limitation of the TDH surveys is that they did not determine when food was initially introduced to the child. Despite high prevalence of the timely introduction of complementary foods, very few children aged 6-23 months met minimum requisites for dietary diversity, meal frequency and acceptable diet which is a cause of concern given the potential negative effect on child growth and development (190). This study also found decreasing trends in the attainment of minimum requirements for dietary diversity, meal frequency and acceptable diet among children 6-23 months in Tanzania from 2004-05 to 2010. The proportion of children aged 6-23 months who were given complementary foods made from a minimum number of four food groups in Tanzania was very low 40% in 2004-05 and further decreased slightly to 38.0% in 2010 (Table 4:10). These results indicate that the complementary feeding practices as measured by minimum dietary diversity are poor and have not improved from 2004-05 to 2010, highlighting the need for intervention to promote consumption of variety of foods to ensure nutritional adequacy for young children.

Similarly, the frequency of feeding complementary foods for all study children aged 6-23 months remains poor in Tanzania. Of major concern is the 10% decrease in the proportion of

children 6-23 months who meet minimum meal frequency from 45% in 2004-05 to 35% in 2010 as seen in Table 4:10. Furthermore, this study also found very low (21.1% vs. 15.9%) prevalence of minimum acceptable diet among young children in Tanzania in 2004-05 and 2010 respectively. The low prevalence of minimum dietary diversity, meal frequency and minimum acceptable diet observed in this study indicates that most infants and young children in Tanzania are not getting adequate foods that provide sufficient nutrients to support optimal growth and development. Nutrition interventions are therefore essential to improve the current CF practices in Tanzania which will ultimately reduce malnutrition among this group of young children.

One of the key problems with complementary feeding in Tanzania found in this study is the lack of dietary diversity. We found that, the complementary foods given to most children are mainly made from grains, roots and tubers, both of which have relatively low nutrient density. This dietary pattern is similar to that reported in previous studies conducted in Tanzania (86, 117, 125, 126) and other Sub-Saharan African countries (64, 137-139). This study also found that, meat products, fish, poultry, dairy products and other vitamin rich foods are consumed infrequently by young children in Tanzania but consumption trends tend to increase with children's age. There was also a decreasing trend in feeding young children foods made from legumes and nuts as well as other fruits and vegetables in the 5 years period, highlighting the need for promoting consumption of such food items by young children through policies and programmes. Studies in Kenya (139), South Africa (137) China (135) and other South Asian countries (136, 141, 143-145), have also reported similar trends in the consumption of these nutrient dense foods. For example, in India (145), consumption of animal origins foods was found to be poor especially for younger age group and less than 8% of all children aged 6-23 months had consumed eggs, meat, poultry and fish during the past 24 hours. This could be due to negative beliefs (191) and inadequate knowledge about the importance of feeding young children variety of foods among mothers and caregivers (144). Lack of affordability of these foods has also been reported to be the main limiting factor for their daily consumption (135,

144). In addition, inadequate knowledge on diet diversity among mothers and carers could contribute to low intake of these foods in Tanzania.

This study provides data to better understand the individual-, household-, and community-level factors determining complementary feeding practices in order to provide information that may help to design interventions to improve nutritional practices in Tanzania. Several factors were found in this study to influence inappropriate CF practice in Tanzania. For example, lower parental education, poor household economic status, absence of postnatal check-ups after delivery and young child age (<12months) were consistent determinants of inappropriate CF practices since 2004-05 until 2010. Other negative predictors of poor CF practices in Tanzania were young maternal age, lack of employment, inadequate access to mass media and residing in rural areas.

Attendance to antenatal and postnatal care clinics is believed to be beneficial to mothers as a source of information/knowledge about appropriate infant and young child feeding practices. In this study we found that children whose mothers had made some postnatal check-ups were more likely to meet the requirements for minimum dietary diversity, minimum meal frequency and minimum acceptable diet compared to children whose mothers did not make any postnatal check-ups within 41 days after delivery. These findings are consistent with those reported in Sri Lanka (141) whereby lack of postnatal home visits by midwives was a predictive factor for inappropriate complementary feeding practices.

Furthermore, this study found a positive association between exposure to mass media and complementary feeding practices. Children of mothers that had frequent access to mass media such as radio/ television had a lower risk of delayed introduction to complementary foods after 6 months. Patel and others (145) also reported the influence of mass media on introduction of complementary foods at a timely manner in India. They found that mothers who did not read newspapers at all or read it at least once a week had 3 times greater risk of non-introduction of complementary foods compared to those who read newspapers almost every day. In other

studies (144) limited exposure to mass media was found to have significant influence on minimum dietary diversity, meal frequency and acceptable diet but not on introduction to complementary feeding. It is possible that women who had access to mass media are wealthy hence has greater food security because in this analysis it was also found that children from the highest household quintile had better dietary diversity and feeding frequency than those from the lowest household quintile (see table 4.5 and table 4.6).

Nutrition education interventions that aim to improve child feeding in Tanzania should target all family members, including fathers, since they often provide the main source of family income and lead decisions made at the household-level in matters related to women's and children's well-being. This recommendation is made because lower parental education was found to be a consistent determinant of inappropriate CF practices in both surveys. For example, father's education had a protective effect towards attainment of child's minimum acceptable diet in this study in 2010 whereas lower maternal education was a negative factor for inadequate dietary diversity in 2004-05. There is evidence suggesting that father's and other key household members education improve infant and child nutrition (192) for example, lower maternal education was found as a strong predictor and consistency factor associated with inadequate dietary diversity, meal frequency and acceptable diet in some Asian countries such as Bangladesh (143), India (145), Indonesia (155), Nepal (144) and Sri Lanka (141). However, in Bangladesh (143) children whose fathers had lower education (primary or no formal education) were at higher risk of not meeting minimum dietary diversity (adjusted OR being 1.8 and 2.5 respectively). These findings suggest that parental education is a potential protective factor which might be linked to dietary knowledge, dietary diversity, quality of food and feeding frequency (143, 153). Similarly, educated parents are likely to have better income that enables them to purchase adequate and variety of foods for their children compared to uneducated parents.

Maternal work/employment status is the factor, which can positively or negatively affect child feeding practices. It is believed that working mothers are expected to have a positive effect on

child nutrition by providing income for improving household food security (156). On the other hand, it is believed that working mothers may have limited time to feed their young children due to work demand hence causing a negative effect on child feeding practices. Previous studies from developing world have reported negative influence of maternal unemployment on complementary feeding practices among children aged 0-23 months (64, 146, 151). We found in our study that children whose mothers who were not in paid employment in 2004-05 were at greater risk of not meeting minimum meal frequency and minimum acceptable diet compared to those children whose mothers were in paid employment. This finding confirms the relationship between maternal working/employment status and good complementary feeding practices, indicating that income was a factor in purchasing varieties of foods which improved household food security (156) consequently enhancing food intake for children. Similar results were found in a cross-sectional study in Ghana whereby working mothers fed their young children more frequently a greater variety of foods than the non-working mothers (64).

UNICEF has observed in some communities that some of the unemployed mothers in Tanzania are involved in farming activities and often leave their young children to the older siblings with one meal such as porridge much of the time (193). Similarly, a study done in Rukwa Tanzania revealed that, most women who work in fields spent less time cooking and feeding their children (145). Unlike non-working mothers, the majority of working mothers in Tanzania employ some house helpers to take care of their young children while they are at work. This practice helps to ensure that the child is fed properly throughout the day. Strategies to empower non-working women may help to enhance availability of adequate food in their families and hence improve the quality of complementary foods for their young children.

Consistent with previous studies (137, 138, 141, 143-145, 155), this study also confirmed that, improved household wealth has a significant effect on appropriate complementary feeding practices (i.e. meeting requirement for minimum dietary diversity and minimum acceptable diet). Financial constraints might be the limiting factor for poor people to adequately secure nutritious foods for their children on a daily basis. High quality processed foods are available in

the supermarkets but they are expensive and the vast majority of the low-income population in Tanzania cannot afford these foods. For example, a recent study that assessed knowledge, practices and socio-economic correlates of infant and young child feeding in western Uganda found that, lack of financial resources was a barrier for majority of mothers to provide adequate and diverse diet to their children although these mothers were aware that dietary diversity plays an important role in child's health (194). This suggests that cash transfers for the poorest might allow the families to purchase more nutritious foods for their children which will lead to improvements in their nutritional status.

The present analysis also found a large variation in complementary feeding practices across geographic regions of Tanzania. Of major concern was the higher risk of inappropriate complementary feeding consistently observed among children in Central, Eastern, Western and Zanzibar compared to other geographic zones. Large regional variations in prevalence of complementary feeding indicators have also been reported in recent studies from Bangladesh (143), India (145), Indonesia (155), Nepal (144) and Sri Lanka (141). Different cultural practices and lower levels of adults education were the reasons sought for these variations in other countries (143, 155). In Tanzania, however, different agro-ecological characteristics, ethnicity and taboos could be some possible explanations for the geographic differences in not meeting dietary diversity. Variability in the agricultural potential would account for the discrepancy in food potential observed in the various agro-ecological zones. Some zones have high agricultural potential while others (e.g. Central) (195) have very low potential which accounts for the variability in their compliance to recommended complementary feeding practices. Existence of negative cultural beliefs that prohibit young children from eating some nutritious foods have been observed in some communities (191) and may also contribute to variation in CF practices, particularly in not meeting the minimum dietary diversity. For example, most recently Paul and fellows (191) found that young children (<24 months) in Zanzibar were not given some nutritious foods like fish and vegetables due to indigenous beliefs that young children cannot chew such foods. Consequently, educational strategies are also

needed to change some of the beliefs that prevent adoption of good CF practices in different communities together with nutrition counselling to mothers, caregivers and key family members using specific messages that emphasize consumption of animal origin foods, fruits and vegetables among young children.

In addition, analysis of comparison of complementary feeding practices in 2004-05 and 2010 shows that children from rural areas had a lower prevalence of minimum dietary diversity and minimum acceptable diet than their urban counterparts. There was also a 5-10% decreasing trend on the prevalence of these indicators among rural children during the 5 years period (Figure 4:14 to Figure 4:17), suggesting that rural children remain vulnerable to inadequate diet which may put them into increased risk of undernutrition. There are several potential reasons to explain this finding, these include high workload of farming activities for women in rural areas (86), seasonal variation in diets (124), household food insecurity (124, 126) and economic constraints. Majority of women in rural areas of Tanzania are responsible for fetching water for domestic use, collecting fire wood and participating in agricultural activities away from their home, all of which deny them valuable time to take care of their children. These activities limit the amount of time women spend in caring for their young children (86) and often the mothers leave the younger children under the care of other young children. The influence of household food insecurity on child feeding and nutritional status has been reported in Tanzania (126, 196) indicating that children from households which experience food insecurity have lower meal frequencies and are more likely to be undernourished. Low economic status and inadequate knowledge about dietary diversity and other CF practices among rural families in Tanzania may also contribute to the observed variation. Based on these results, specific interventions could target these areas to improve CF practices. Formative research would be needed to design these interventions in order to understand the community and caretakers perceptions about complementary feeding.

Concluding remarks

This study aimed at examining the prevalence of complementary feeding indicators and determines individual, household and community level factors associated with inappropriate complementary feeding practices among children aged between 6-23 months in Tanzania using the 2004-05 and 2010 TDHS datasets as primary data sources. The study also aimed to compare the trends of complementary feeding indicators in Tanzania from 2004-05 to 2010. The individual-, household- and community-level factors like the young child age, lower parental education, inadequate access to mass media, absence of postnatal check-ups, rural residence and poor household wealth index were significantly associated with inappropriate complementary feeding practices. Overall, Tanzania has made good progress in terms of meeting WHO recommendation for introduction of complementary foods since a high proportion (92.3%) of children 6-8 months receive soft, semi-solid or solid foods. However, very few children meet the minimum requirements for dietary diversity (38.2%), meal frequency (34.2%) or acceptable diet (15.9%) and there is a significant decrease in trends of prevalence for these indicators from 2004-05 to 2010, indicating the need for more efforts to improve the current situation.

Chapter 5 General Discussion

In this thesis, a secondary data analysis of the infant and young child feeding practices based on the new WHO recommended indicators was carried using data extracted from the 1999 Tanzania Reproductive and Child Health Survey (TRCHS), the 2004-05 and 2010 Tanzania Demographic and Health Surveys (TDHS). The analysis was divided into two main sections: breastfeeding (BF) and complementary feeding (CF) practices among children aged 0-23 months. In this chapter, the key findings of both breastfeeding and complementary feeding practices will be discussed and the chapter closes with the strengths and limitations of the study.

Discussion

Poor infant and young child feeding (IYCF) practices remain the major cause of poor nutritional status in young children. Better understanding of the factors associated with poor IYCF is critical for planning nutritional interventions by targeting individuals, families and communities at risk of suboptimal feeding practices. The aim of this thesis was to examine the prevalence of breastfeeding and complementary feeding indicators and to determine individual-, household-, and community-level factors associated with suboptimal breastfeeding and complementary feeding practices among children aged 0-23 months in Tanzania. This thesis also examined whether Tanzania has made some progress towards improving breastfeeding and complementary feeding practices by comparing the data from the 1999 Tanzania Reproductive and Child Health Survey (TRCHS), the 2004-05 and 2010 Tanzania Demographic and Health Surveys (TDHS).

Breastfeeding practices

Appropriate BF practices such as the “Early initiation of breastfeeding within one hour of birth” and “Exclusive breastfeeding up to 6 months” has proven effects in the nutritional status and reducing the incidence and severity of gastrointestinal and respiratory infections (42), improve cognitive development (197, 198) and reduce overall neonatal mortality (34). The present study showed that, breastfeeding is universal in Tanzania as almost all mothers (98%)

breastfed their children in the 1999, 2004-05 and 2010 surveys. However, the prevalence of "Early initiation" (46.1%) and "Exclusive breastfeeding" (49.9%) indicators fell below national targets of 80%, implying that the majority of infants are at risk of childhood undernutrition associated with suboptimal breastfeeding. A high proportion (>90%) of mothers reported to continued breastfeeding their infants until the end of first year in all three surveys but proportion decreased at the second year to 57.2% in 1999 and further decreased to 55.5% in 2004-05 and 51.1% in 2010. This suggests the need for further promotion of continued breastfeeding up to the second year or beyond. Low prevalence of continued breastfeeding has been reported in the neighbouring countries -Kenya, Uganda and Zambia (11) as well as in other developing countries such as India (78) and Sri Lanka (108), implying that the practice of continued BF up to 2 years is problematic in many countries. The current study also found a considerable proportion of infants aged 0-5 months who were predominantly breastfed, suggesting a need for counselling mothers, caregivers and key family members on the risks associated with predominant feeding which ultimately helps to improve rate EBF practices. Very few children were fed using the bottles in Tanzania probably due to effective enforcement of national regulations that discourage the use of bottle feeding with breast milk substitutes (4).

The present study also found a significant decline in the prevalence of early initiation of breastfeeding in Tanzania. Of major concern was the decrease of more than 21% on prevalence of early initiation of breastfeeding within one hour of birth in Eastern, Northern and Lake Zones in the last 5 years. This finding implies that most infants in these geographic zones are at higher risk of malnutrition. Previous studies (49, 50) have also reported a considerable proportion of mothers who discarded colostrums due to existence of cultural beliefs in some parts of Tanzania. Further investigation would be required while interventions to promote early initiation of breastfeeding are being implemented in these regions. While other developing countries have made a good progress on improving the prevalence of EBF by 33-37 per cent over the past 10 years (2), the prevalence of EBF in Tanzania has only increased by 18 per cent from 1999-2010. The current prevalence of EBF practices in Tanzania is not at levels that would

promote better growth and development for the Tanzanian child. Therefore, there is an urgent need to scale up current interventions such as Baby Friendly Hospital Initiative (Chapter 1 Section 1.1) that promote and support EBF in the country as well as training TBAs on the importance of EBF and risk associated with lack of EBF since a considerable proportion of women give birth at home where they get delivery assistance from TBAs.

The decline in breastfeeding indicators such as early initiation of breastfeeding and continued breastfeeding up to the end of second year in the last 5 years suggest the need to evaluate the effectiveness, approaches and coverage of the currents BF promotional activities. One of the reasons for Tanzania to have poor breastfeeding indicators could be due to inadequate knowledge about optimal BF practices among mothers, carers and key family members. Shirima et al (50) found that more than half of the mothers in rural and urban areas of Morogoro Tanzania don't know the importance of colostrums and they had inadequate knowledge on key issues regarding breastfeeding management and maintenance. This might be due to shortage of trained staff in health facilities to support and help mothers adhere to optimal IYCF practices. A recent report on infant and young child nutrition in Tanzania showed that few counsellors have been trained on infant feeding practices due to limited resource (199). Previous studies suggested that mothers who get adequate support including counselling on optimal feeding practices have better infant and young child feeding practices compared to mothers who lack such support (200). The present analysis supports the notion that provision of infant feeding support and advice to mothers enhances their feeding practices. This is because we found a higher prevalence of early initiation of breastfeeding and EBF among children's whose mothers had more contacts with antenatal and postnatal staff.

This study also found poor breastfeeding practices in all geographical zones of Tanzania, probably due to inadequate implementation of nutrition programmes such as Baby Friendly Hospital Initiative (BFHI). Most recently, Nyambo (187) reported inadequate training on implementation of BFHI in health facilities as one of the major challenges of achieving optimal IYCF practices in Tanzania. Consequently, there is a need to strengthen and adopt the BFHI

community support program so as to make the initiative more relevant to the situation of the majority of rural mothers by developing a baby friendly community initiative.

Complementary feeding practices

Appropriate complementary feeding practices are vital in reducing undernutrition, morbidity and mortality in young children in developing countries. The World Health Organization recommend that infants should be introduced to safe and nutritionally adequate soft, semi-solid or solid foods at 6 months while continued breastfeeding until 2 years or beyond (131). Delayed introduction and inappropriate complementary foods at 6 months may result in growth faltering among infants (201). It has been also established that even breastfed children may become undernourished if they do not receive adequate quantity and quality complementary foods after 6 months of age (202). In this study we found that the majority of mothers (92%) reported feeding their infants aged 6-8 months soft, semi-solid or solid foods. This prevalence is high in comparison with other neighbouring countries such as Kenya (81%) and Uganda (75%) (11) and in other developing countries (203).

Although the majority of infants aged 6-8 months receive soft, semi-solid or solid foods, according to this study very few children aged 6-23 months meet the requirements for dietary diversity, meal frequency or acceptable diet in Tanzania. This indicates that most children are at risk of undernutrition. These findings are in agreement with data reported by the WHO (2010) which indicated that CF practices in many developing countries was poor and only a few countries have reported a prevalence of minimum acceptable diet more than 50% (11). Similarly in South Asia, the minimum acceptable diet was reported to be less than 50% in all countries except Sri Lanka (158) suggesting that the attainment of dietary diversity and meal frequency is problematic in many countries. It is well known that dietary diversity is an important component of IYCF as it is associated with overall dietary quality, micronutrient intake of young children, household food security and better nutritional status of children in developing countries (204-209). In this study however, inadequate dietary diversity was one of the key problem with

complementary feeding because most of the complementary foods were made from grain, roots and tubers and less animal sources for protein. Similar problem have been reported in other countries in the region (118, 139) and in developing countries (141-145). This could be due to inadequate knowledge on importance of dietary diversity or lack of affordability of some animal rich protein foods, particularly for some families with low income status (144). Provision of nutrition counselling and education to mothers and carers regarding appropriate foods and frequency of feeding young children may enhance their knowledge and consequently improve complementary feeding practices in Tanzania. This strategy has been found to be effective in improving infant feeding and nutritional status of young children in other developing countries such as Pakistan (91, 210-212).

In the current study, CF practices as measured by "minimum dietary diversity" were particularly poor amongst the younger aged children (6-11 months) despite of high prevalence of introduction to soft, semi-solid or solid foods at 6-8 months. This finding is in agreement with literature from Bangladesh (143), India (145), Indonesia (142), Nepal (144) and Sri Lanka (141) which demonstrated that rates of dietary diversity and acceptable diet were poor among younger children (6-11 months) than their older counterparts. Poor cultural belief and inadequate knowledge among mothers and carers on the importance of feeding young children varieties of foods (191) may contribute to inadequate dietary diversity in younger infants.

The finding from the present study also showed that older infants (18-23 month) were at higher risk of inadequate meal frequency compared to younger infants aged 6-11 months. This finding is in contrary with data from Nepal which shows that children aged 18-23 months were less likely to have inadequate meal frequency compared to younger infants aged 6-11 months (144). The fact that most infants aged 6-11 months are still being breastfed in Tanzania, it may be possible that their mothers get adequate time to feed them other complementary foods than those aged 18-23 months. It is important to note that in Tanzania, it is common practice for most families to eat 3 main meals per day i.e. breakfast, lunch and dinner. This habit may have

influence in the feeding patterns for young children as it has been observed in some communities that children are fed at the time when other family members are eating (117).

Another important observation made in this study was a decreasing trend in the prevalence of minimum dietary diversity, meal frequency and acceptable diet among children aged 6-23 months in Tanzania from 2004-05 to 2010. This may imply that undernutrition will continue to be a major cause of high mortality rates among children under the age of five years in Tanzania if measures are not implemented to improve the current situation. The high levels of undernutrition as measured by stunting (35.0%) in Tanzania (8) indicates that poor complementary feeding practices could be a contributory factor. Thus, there is a need to improve complementary feeding practices in order to reduce the problem of child undernutrition in Tanzania.

Determinants of IYCF practices in Tanzania

Identification of determinants for IYCF practices is important as it can guide implementation of appropriate programs to improve IYCF practices. In the present study we found that lower maternal education was a consistent determinant of BF and CF indicators in Tanzania. These findings are similar to those reported in Bangladesh (59, 143), India (78, 145) and Pakistan (154, 181) whereby lower level of education was important factor negatively associated with both breastfeeding and complementary feeding practices. In other studies, lower maternal education was found to be a significant determinant for breastfeeding (70) or complementary feeding indicators (141, 142, 144, 149).

Another important consistent determinant of poor breastfeeding and complementary feeding practices in Tanzania was lower household wealth. We found that children in households from the lower household wealth were at higher risk of delayed initiation of breastfeeding within one hour of birth, have low dietary diversity and minimum acceptable diet. Studies in Bangladesh (59, 143) and India (78, 145) have also found poor breastfeeding and complementary feeding practices among children from households of lower wealth status. However, poor household

wealth status was a negative predictor of inappropriate complementary feeding practices in Uganda (194), Malawi (138), South Africa (137), Nepal (144), Indonesia (142) and Sri Lanka (141). It has been suggested that households with lower wealth status are likely to experience food insecurity which could be a proxy determinant for inadequate feeding, undernutrition and ill child health (144). In Tanzania, the lower level of education among mothers from lower socio-economic status may also account for this association, since in this analysis we found that the overwhelming majority of mothers (98.1%) from households with low wealth index had lower levels of education (no education/primary education).

Rural residence was also a significant consistent determinant of suboptimal breastfeeding and complementary feeding in Tanzania. This study found that the infant and young child feeding practices such as early initiation of breastfeeding and complementary feeding were poor in rural areas compared to urban areas in Tanzania. This finding is in disagreement with results from Bangladesh (59) which indicated that breastfeeding practices especially early initiation of breastfeeding was better in rural areas compared to urban areas. However, previous studies have also reported that the situation in rural areas of Tanzania is of particular concern as infant feeding practices such as exclusive breastfeeding was rare and high proportion of rural infants are being deprived of the immunological and nutritional benefits of colostrums (50, 130). In addition, Mamiro et al (125) found high stunting levels (35%) and anaemia (68%) among rural children in Kilosa district as a result of poor complementary feeding. Similar findings have been reported in Malawi (118) and China (135) that complementary feeding practices were poor in rural areas. This could be due to that fact that rural mothers are less educated and are less informed regarding appropriate infant feeding practices compared to urban mothers from urban areas (130).

Previous studies in developing countries including Africa have found large variation of breastfeeding and complementary feeding practices across the geographical regions (39, 59, 77-79, 108, 141-145). In this study there were also a wide variation in the rates of early initiation of breastfeeding, exclusive breastfeeding, minimum dietary diversity; minimum meal frequency

and minimum acceptable diet across geographical zones. The major concerns are Lake, Northern, Western and Zanzibar Zones which have higher risk of poor breastfeeding and complementary feeding practices. Other geographic zones such as Central and Eastern were also at higher risk of inappropriate complementary feeding practices. Existence of negative cultural beliefs in some communities (49, 50, 191) and different agro-ecological characteristics (195) may contribute to the observed variation in breastfeeding and complementary feeding practices across the geographic zones of Tanzania. Similarly, different cultural practices and lower levels of adult education were the reasons sought for these variations in other countries (142, 143).

Similar to findings from Sri Lanka (141), the present analysis found that, lack of postnatal check-ups was the most consistent predictor of inadequate dietary diversity, meal frequency and acceptable diet among children aged 6-23 months in Tanzania. This association could be due to the fact that mothers who had contact with postnatal staff were given information on infant feeding and this may have resulted in better feeding practices compared to mothers who do not attend postnatal care clinics.

It is also important to note that maternal employment was a risk factor for delayed initiation of breastfeeding within one hour of birth but it was a protective factor for appropriate complementary feeding practices in Tanzania. Further investigation of this association is needed to provide better understanding of why working mothers in Tanzania delay initiation of breastfeeding within one hour of birth. However, our sub-analysis to examine the relationship between maternal working status and mode of delivery found that, mothers who have worked for the past 12 months were significantly more likely to deliver their babies by caesarean-section compared to non-working mothers (74% vs. 26%). In other countries such as Kenya (85), Ethiopia (147) and in East and Southeast Asia (39) maternal employment was associated with lower rates of exclusive breastfeeding up to 6 months due to the demand to return to work after maternity leave. Unlike unemployed mothers, mothers who are employed earn income which enables them to purchase varieties of foods which improved household food security consequently enhancing food intake for children. In addition, most employed mothers are more

likely to be exposed to different sources of information that improve their knowledge on infant feeding compared with unemployed mothers. Unemployment has been also reported to be a risk factor for poor complementary feeding practices in other developing countries (64, 144, 151).

We also found that a high proportion of mothers with suboptimal feeding practices were those who gave birth at home and were assisted by traditional birth attendants or relatives. These people may have inadequate knowledge on IYCF practices to provide appropriate support to mothers. Therefore there is need to target them for training on recommended IYCF practices since most mothers depend on health workers, maternal mothers, traditional birth attendants and village health workers as sources of the nutritional information (50).

5.1 Strength and limitation of the study

There are currently few published studies from Africa including Tanzania that have reported analyses of feeding indicators using the most recent national surveys and examined risk factors associated with inappropriate breastfeeding and complementary practices based on the new WHO indicators (WHO 2008). The findings from this study will help guide health programs to target groups with suboptimal infant and young child feeding practices in Tanzania and other African countries.

The main limitation was the cross-sectional nature of the survey, which limited inferences about causality from the analyses. In addition, exclusive breastfeeding was based on a 24-hour recall rather than a longer recall period, and this short recall may have missed some infants who were fed other liquids or foods prior to the 24 hours before the survey. The analysis in the present study was not able to examine the prevalence and trends of early initiation of BF and CF indicators due to lack of information in the 1999 TRCHS regarding breastfeeding initiation and complementary feeding practices. Furthermore, the present research was not able to examine the nutritional adequacy of diet due to lack of information in the surveys regarding the amount of food fed. Moreover, there was a lack of data regarding milk feeds given to non-breastfed children and therefore the indicator for minimum meal frequency for non-breastfed children was

based on number of times a non-breastfed child consumed soft, semi-solid or solid foods on the previous day only. Similarly, we were unable to estimate the prevalence of minimum acceptable diet for non-breastfed children in Tanzania due to lack of data on number of milk feeds in the TDHS dataset. However, the proportion of non-breastfed children aged 6-23 months was relatively small at 16.3% and made a small influence on the overall estimation of the minimum acceptable diet. Collection of data on the number of milk feeds given to non-breastfed children need to be considered in the future DHS surveys.

However, the use of a large nationally representative survey sample with very high response rate (96.4%), the appropriate statistical adjustments for survey design and modelling for confounding effects add strength to the validity of the findings in the present study. Furthermore, restricting the sample to only children less than 2 years who lived with their mothers helped ensure greater accuracy of information regarding breastfeeding practices. In addition, findings from our trend analysis describe the country's situation regarding IYCF practices over the past 10 years, hence providing useful information for indicators that need attention for improvement regarding child health in Tanzania.

Chapter 6 Conclusion and recommendations

The findings from the present study shows that the current prevalence of breastfeeding and complementary feeding indicators are not at acceptable levels to ensure good health and better nutritional status of young Tanzanian children, and millions of children are thus at risk of childhood malnutrition associated with inappropriate feeding. The current prevalence of early initiation of breastfeeding (46.1%) and exclusive breastfeeding (49.9%) were below the national targets of 80%. Seventeen per cent of infants aged 0-5 months were "predominantly breastfed" and less than four per cent of children aged 0-23 months were bottle fed. More than 94.0% of children were still breastfed at the end of first year but the proportion decreased to 51.1% by end of second year. In terms of complementary feeding practices, a high percentage (92.3%) of children aged 6-8 months received soft, semi-solid or solid foods as per 2008 WHO recommendations. However, very few children aged 6-23 months met the minimum requirements for indicators for dietary diversity (38.2%), meal frequency (38.6%) or acceptable diet (15.9%), given their important role in improving nutritional status of children. Based on findings from this secondary data analysis it is evident that most infants and young children in Tanzania might be at risk of early childhood malnutrition associated with poor feeding practices particularly inadequate dietary diversity and infrequent feeding after the age of 6 months.

Tanzania has made a remarkable progress in reducing the proportion of infants who are predominantly breastfed from 59.8% in 1999 to 16.8 in 2010, although there has been little progress in improving the prevalence of exclusive breastfeeding practices from 1999 to in 2010 (18.1percentage point increase). Tanzania has also made significant progress in increasing the proportion of infants aged 6-8 months who receive soft, semi-solid or solid foods and those who continued to be breastfed until the end of first year as determined by the 1999, 2004-05 and 2010 surveys. However, there is need for effective programs to improve the following indicators that have shown significant decline from 2004-05 to 2010: "Early initiation of breastfeeding", "Continued breastfeeding up to two years", "Minimum dietary diversity", "Minimum meal frequency" and "Minimum acceptable diet".

The most consistent determinants of suboptimal breastfeeding and inappropriate complementary feeding practices in Tanzania include young maternal age, lower maternal education, unemployment, poor household economic status, home delivery and lack of professional assistance at birth. Other determinants for suboptimal breastfeeding practices were caesarean delivery, absence of postnatal check-ups after delivery, young child age, inadequate access to mass media and residence in the rural areas.

6.1 Recommendations/Future Directions

Recommendations from this thesis are based on findings from the secondary data analysis of the 1999 Tanzania Reproductive and Child Health Survey, the 2004-05 and 2010 Tanzania Demographic and Health Surveys. These recommendations will help to inform policies/ programs to improve breastfeeding and complementary feeding practices among children aged 0-23 months in Tanzania. The recommendations from the current study will also inform areas that need further research to improve infant and young child feeding practices in Tanzania.

6.1.1 Recommendations for future programmes

- The improvement of breastfeeding and complementary feeding practices will require effective national level nutrition programmes and with a focus on the target groups with sub-optimal practices. These programs should target young, uneducated mothers and carers who deliver at home, assisted by untrained health personnel, those who deliver by caesarean section, mothers who lacked postnatal contacts with health workers and/or mass media, from poor families and residing in the Central, Eastern, Lake, Northern, Western and Zanzibar zones.
- There is a need to train more health workers and traditional birth attendants on recommended infant and young child feeding practices since they are primary source of nutrition information for mothers and carers.
- Mothers should also be encouraged to attend antenatal and postnatal care clinics where they are likely to be taught appropriate infant and young child feeding practices, as this

thesis found mothers who had contacts with antenatal and postnatal care providers had appropriate infant feeding practices. In addition, community support initiatives such as peer counselling should be strengthened to reach mothers/carers who do not visit health facilities frequently in order to improve their knowledge and skills on appropriate breastfeeding and complementary feeding practices. This strategy was reported to be effective to increase the practice of exclusive breastfeeding in other African countries such as Burkina Faso, Uganda and South Africa months (200) as well as complementary feeding and nutritional status of young children other developing countries such as Pakistan (91, 210-212).

6.1.2 Recommendation for further research

- The observed declining trends among key indicators highlight the urgent need to evaluate the effectiveness, approaches and coverage of all nutrition interventions being implemented to promote optimal breastfeeding and complementary feeding practices in Tanzania.

- Community-based nutrition interventions are needed in Tanzania to improve food production at household level and ensure food security. Interventions to improve nutritional quality of the complementary foods are also recommended based on the finding from this study that complementary foods given to children had inadequate dietary diversity. These interventions may include micronutrient fortification and should be implemented in the whole country with focus in rural areas of Eastern, Northern, Lake and Southern Highlands.

- Future studies on knowledge, attitudes and practices on complementary feeding practices among mothers and/or carers across geographic regions of Tanzania are necessary to provide information for the development of appropriate interventions that suit the cultural context of each region.

- Further research is also recommended to validate the complementary feeding indicators before recommending them for wider application in Tanzania and other East African countries.

References

1. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M et al. Martenal and Child Undernutrition: Global and regional exposures and health consequences. *Lancet*. 2008;371(9608):243-60.

2. UNICEF. Tracking Progress on Child and Maternal Nutrition. A survival and development priority. New York ,NY 10017,USA 2009.

3. Government of Tanzania and UNICEF. Situataion analysis of children and women in Tanzania. Dar es Salaam: Ministry of Health; 2009.

4. Ministry of Health Tanzania. Tanzania National Strategy on Infanta and Young Child Nutrition Implementation Plan 2004-2009. Dar es Salaam, Tanzania 2004.

5. Mukuria AG, Kothari MT, Adbderrahim N. Infant and Young Child Feeding Update. Calverton, Maryland: ORC Macro; 2006.

6. World Health Organization. Global strategy for infant and young child feeding. Geneva WHO; 2003.

7. World Health Organization. Strengthening action to improve feeding of infant and young children 6-23 months of age in nutrition and child health programmes. Geneva WHO; 2008.

8. National Bureau of Statistics (NBS) [Tanzania] and ICF Macro. Tanzania Demographic and Health Survey 2010. Dar es Salaam, Tanzania: NBS and ICF Macro 2011.

9. Rutishauser I.H. Food and Nutrition. In: ML W, editor. Food and nutrition Australia and New Zealand. 2nd ed. Crows Nest, New South Wales: Allen & Unwin; 2002. p. 302-11.

10. World Health Organization. Indicators for assessing infant and young child feeding practices. Part I: Defenitions.Conclusion of a consensus meeting held 6-8 November 2007 in Washington, DC, USA. Geneva WHO 2008.

11. World Health Organization. Indicators for assessing infant and young child feeding practices. Part 3: Country Profile. Geneva WHO 2010.

12. World health Organization. International Code of Marketing Breastfe-milk Substitutes. Geneva: WHO; 1981 [cited 2012 21st May]; Available from: http://www.International_Code_of_Marketing_of_Breast-milk_Substitutes.

13. World Health Organization. Baby-friendly Hospital Initiative. WHO; 1991 [cited 2011 21 June]; Available from: http://www.who.int/nutrition/topics/bfhi/en.

14. UNICEF. The Baby-Friendly Hospital Initiative. UNICEF; 1991 [cited 2012 21 June 11]; Available from: http://www.unicef.org/programme/breastfeeding/baby.htm.

15. UNICEF. Innocenti Declaration on the Protection, Promotion and Support of Breastfeeding. Adopted at the WHO/UNICEF meeting on "Breastfeeding in the 1990s: A Global Initiative" held at the Spedale degli Innocenti, Florence, Italy, 30 July-1

August 1990. Italy: UNICEF; 1990 [cited 2012 28th May]; Available from: http://www.unicef.org/programme/breastfeeding/innocenti.htm.

16. World Health Organization. 10 facts on breastfeeding. WHO; 2012 [cited 2012 20 June]; Available from: http://www.who.int/features/factfiles/breastfeeding/en/index.html.

17. Ministry of Health and Social Welfare. Tanzania National Strategy on Infant and Young Child Nutrition. Dar es Salaam, Tanzania 2004.

18. World Health Organization. Guiding principles for feeding non-breastfed children 6-24 months of age Geneva WHO 2005.

19. National Bureau of Statistics [Tanzania] and Macro International Inc. Tanzania Reproductive and Child Health Survey 1999. Calverton, Maryland: National Bureau of Statistics and Macro International Inc; 2000.

20. World Medical Dictionary [database on the Internet]2008. Available from: http://www.medicinenet.com/script/main. .

21. World Health Organization. Indicator for assesing breastfeeding practices. Report for an informal meeting in June. Geneva: WHO; 1991.

22. American Academy of Pediatrics. Breastfeeding and the use of human milk. *Pediatrics*. 2005;115:496-506.

23. Leung AK, Sauve RS. Breast-feeding is best for babies. *J Natl Med Assoc*. 2005;97:1010-9.

24. Raisler J, Alexander C, O'Campo P. Breastfeeding and infant illness: a close-response relationship. *Am J Public Health*. 1999;89:25-30.

25. Kramer MS, Chalmers B, HodNnett ED, Sevkovskaya Z, Dzikovich I, Shapiro S et al. Promotion of Breastfeeding Intervention Trial (PROBIT): a randomized trial in the Republic of Belarus. *JAMA*. 2001;285:413-20.

26. De Zoysa I, Rea M, Martines J. Why promote breast feeding in diarrhoeal disease control programmes? *Health Policy Plan*. 1991(6):371-9.

27. Bachrach V, Schwarz E, Bachrach L. Breastfeeding and the risk of hospitalization for respiratory diseases in infancy: a meta-analysis. *Arch Pediatr Adolesc Med*. 2003(157):237-43.

28. Wright AL, Holberg CJ, Martinez FD, Morgan WJ, Taussig LM. Breastfeeding and lower respiratory tract illness in the first year of life. Group Health Medical Associates. *Br Med J*. 1989;299(6705):946-9.

29. 10 Facts on breastfeeding [database on the Internet]2009 [cited 2009]. Available from: http://www.who.int/features/factfiles/breastfeeding/facts/en/index9.html.

30. UNICEF. Infant and young child feeding. Dar es Salaam, Tanzania: UNICEF/URC/TFNC; 2009.

31. Jones G, Steketee RW, Black RE, Bhuta ZA, Morris SS, Bellagio Child Survival Study Group. How many child deaths can we prevent this year? *Lancet*. 2003;362(9377):65-71.

32. Perez-Escamilla R et al. Infant feeding policies in maternity wards and their effects on breastfeeding success: an analytical overview. *American Journal of Public Health*. 1994;84(1):89-97.

33. Edmond KM et al. Effect of early infant feeding practices on infection-specific neonatal mortality: ana investigation of causal links with observational data from Ghana. *American Journal of Clinical Nutrition*. 2007;86(4):1126-31.

34. Edmond K, Zandoh C, Quigley MA, Amenga-Etego S, Owusu-Agyei S, Kirkwood BR. Delay Breastfeeding initiation increases Risk of Neonatal Mortality. *Pediatrics*. 2006;117:e380-e6.

35. UNICEF. State of the world's children New York: UNICEF; 2010 [cited 2011 3rd January]; Available from: http://www.who.int/pmnch/media/membernews/2011/20110301_unicef_2010_statewor ldchildren/en/index.html.

36. Centre for Disease Control and Prevention. Breastfeeding among U.S children born 1999-2007: CDC National Immunization Survey. U.S.A CDC; 2005.

37. Australian Institute of Family Studies (AIFS). Growing Up In Australia: The Longitudinal Study of Australian Children, Annual Report 2006-07. Canbbera: AIFS; 2008.

38. WHO. WHO Global Data Bank on Infant and Young Child Feeding. Geneva 2009.

39. Dibley MJ, Senarath U, Agho KE. Infant and young child feeding indicators across nine East and Southeast Asian countries:an analysis of National Survey Data 2000-2005. *Public Health Nutrition*. 2010;13(9):1296-303.

40. Hanif HM. Trends in breastfeeding and complementary feeding practices in Pakstan, 1990-2007. *International Breastfeeding Journal*. 2011;6(15):1-7.

41. United Nations. The Millenium Development Goals Report. New York: United Nations 2005.

42. Arifeen S, Robert EB, Athelman G, Baqui A, Caulfield L, Becker S. Exclusive breastfeeding reduces acute respiratory infection and diarrhoea deaths among infants in Dhaka slums. *Pediatrics*. 2001;108(e67):1-8.

43. Kulwa KB, Kinabo JL, Modest B. Constraints on good child-care practices and nutritional status in urban Dar-es-Salaam, Tanzania. *Food and Nutrition Bulletin*. 2006 Sep;27(3):236-44.

44. WHO. Effect of breastfeeding on infant and childhood mortality due to infectious diseases in less developed countries: a pooled analysis. *Lancet,*. 2000(355:):451-5.

45. WHO. Infant and young child feeding. Geneva 27: WHO Press.; 2009.

46. UNICEF. UK Breastfeeding Rates. United Kingdom: UNICEF UK Baby Friendly Initiative; 2006; Available from: http://www.babyfriendly.org.uk/.

47. Gabriel P, Katja S, Ilaria M, Paulina M, Chris B, Gundel H. Infant feeding practices in western Tanzania and Uganda. *Trop Med Int Health*. 2004;9(4):477-85.

48. Sellen DW. Infant and young child feeing practices among African pastoralist. *J biosoc Sci*. 1998;30:481-99.

49. Agnasson I, Mpello A, GunnLaugsson G, Hofvander Y, Greiner T. Infant feeding practices during the first six moths of life in a rural areas of Tanzania. *East Afr Med J*. 2001;4(2):9-13.

50. Shirima R, Greiner T, Kylberg E, Gebre-Medhin M. Exclusive breast-feeding is rarely practised in rural and urban Morogoro, Tanzania. *Public Health Nutrition*. 2001;4(2):147-54.

51. Giovannini M, Rive E, Banderali G, Salvioni M, Radaelli G, Agostoni C. Exclusive versus Predominant Breastfeeding in Italian Maternity Wards and Feeding Practices Through the First Year of Life. *J human Lactation*. 2005;21:259-65.

52. Brown K, Humphrey J, Moulton L. Infant feeding practices and their relationship with diarrhoeal diseases in Huascar (Lima) Peru. *Paediatrics*. 1989;83:31-40.

53. Koyanagi A, Humphrey J, Moulton L, Ntozini R, Mutasa K, Iliff P, et al. Effect of early exclusive breastfeeding on morbidity among infants born to HIV-negative mothers in Zimbabwe. *Am J Clin Nutr*. 2009;89(5):1375-82.

54. Hector D, Hebden L, Innes-Hughes C, King L. Update of the evidence base to support the review of the NSW Health Breastfeeding Policy (PD2006_012): A rapid appraisal. Sydney 2010.

55. National Bureau of Statistics (NBS) Tanzania and ORC Macro. Tanzania Demographic and Health Survey 2004-05. Dar es Salaam, Tanzania: National Bureau of Statistics and ORC Macro 2005.

56. Lande B, Andersen LF, Baerug A, Trygg KU, Lund-Larsen K, Veierod MB et al. Infant feeding practices and associated factors in the first six months of life: the Norwegian infant nutrition survey. *Acta Paediatr*. 2003;92(2):152-61.

57. Scott JA, Binns CW. Factors associated with the initiation and duration of breastfeeding: a review of literature. *Breastfeeding Rev*. 1999;7:5-16.

58. Williams PL, Innis SM, Vogel AMP. Breastfeeding and weaning practices in Vancouver. *Canadian Journal of Public Health*. 1996;87(4):231-6.

59. Mihrshahi S, Kabir I, Roy SK, Agho KE, Senarath U, Dibley MJ, et al. Determinants of IYCF practices in Bangladesh: Secondary data analysis of Demographic Health Survey 2004. *Food and Nutrition Bulletin* 2010;31(2):295-313.

60. Senarath U, Dibley MJ, Agho KE. Factors associated with Nonexclusive breastfeeding in 5 East and Southeast Asian Countries: A multileve analysis. *Journal of Human Lact ation*. 2010;26:248-57.

61. Riva E, Banderali G, Agostoni C, Silano M, Radaelli G, Giovannini M. Factors associated with inititation and duration of breastfeeding in Italy. *Acta Paediatr*. 1999;88:411-5.

62. Theofilogiannakou M, Skouroliakou M, Gounaris A, Panagiotakos D, Markantonis SL. Breastfeeding in Athens, Greece: Factors associated with its initiation and duration. *Journal of Pediatric Gastroenterology Nutrition*. 2006;43(3):379-84.

63. Riva et al. Factors associated with inititation and duration of breastfeeding in Italy. *Acta Paediatr* 1999;88:411-15.

64. Solomon SIKA-BRIGHT. Socio-cultural factors influencing infant feeding practices of mothers attending welfare clinic in Cape Coast. Accra: University of Cape Cost; 2010.

65. Uchendu UO, Ikefuna AN, Emodi IJ. Factors associated with exclusive breastfeeding among mothers seen at the University of Nigeria Teaching Hospital. *South Africa Journal of Child Health*. 2009;3(1):14-9.

66. Meyerink RO, Marguis GS. Breastfeeding initiation and duration among low-income women in Alabama: The importance of personal and familial experiences in making infant feeding choices. *J Hum Lact*. 2002;18(1):38-45.

67. Cherop CE, Keverenge-Ettyang AG, Mbagaya GM. Barriers to exclusive breastfeeding among infants aged 0-6 months in Eldoret municipality, Kenya. *East African Journal of Public Health*. 2009;6(1):69-72.

68. Rossem L, Oenema A, Steegers EA, Moll HA, Jaddoe WV, Hofman A, et al. Are starting and Continuing Breastfeeding Related to Education Background? The General R Study. *Pediatrics*. 2009;123(6):e1017-28.

69. Venancio SI, Monteiro CA. Individual and contextual determinants of exclusive breast-feeding in Sao Paulo Brazil: a multilevel analysis. *Public Health Nutrition*. 2006;9(1):40-6.

70. Senarath U, Dibley MJ, Agho KE. Breastfeeding practices and associated factors among children under 24 months of age in Timor-Leste. *European Journal Clinical Nutrition*. 2006;61(3):387-97.

71. Aidam BA, P'erez-Escamilla R, Lartey A, Aidam J. Factors associated with Exclusive breastfeeding in Accra Ghana. *European J Clin Nutr*. 2005;59:789-96.

72. Senarath U, Dibley MJ, Agho KE. Factors associated with nonexclusive breastfeeding in 5 East and Southeast Asian countries: a multilevel analysis. *Journal of Human Lactation*.26(3):248-57.

73. Mahgoub SEO, Bandeke T, Nneypi M. Breastfeeding in Botswana: Practices, attitudes, patterns, and the socio-cultural factors affecting them. *J Trop Pediatr*. 2002;48(195-199).

74. Tan KL. Factors associated with exclusive breastfeeding among infants under 6 months of age in peninsular malaysia. *International Breastfeeding Journal*. 2011;6:2-7.

75. Alemayehu T, Haidar J, Habte D. Determinants of exclusive breastfeeding practices in Ethiopia. *Ethiop J Health Dev*. 2009;23(1):12-8.

76. Chudasama R, Patel A, Kavishwar A. Breastfeeding initiation practices and factos affecting breastfeeding in South Gujarat region in India. *J Fam Pract*. 2009;7(2):24-9.

77. Agho KE, Dibley MJ, Odiase JI, Ogbonmwan SM. Determinants of exclusive breastfeeding in Nigeria. *BMC Pregnancy Childbirth*. 2011;11(11):2-8.

78. Patel A, Badhoniya N, Khadse S, Senarath U, Agho KE, MJ; D, et al. Infant and young child feeding indicators and determinants of poor feeding practices in India: Secondary data analysis of National Family Health Survey 2005-06. *Food and Nutrition Bulletin*. 2010;31(2):314-33.

79. Pandey S, Tiwari K, Senarath U, Agho KE, MJ; D, South Asia Infant Feeding Research Network. Determinants of IYCF practices in Nepal: Secondary data analysis of Demographic and Health Survey 2006. *Food and Nutrition Bulletin*. 2010;31(2):334-51.

80. Callen J, Pinelli J. Incidence and duration of breastfeeding for term infants in Canada, United States, Europe, and Australia: A literature review. *Birth*. 2004;31(4):285-92.

81. World Health Organization. MCH Community Newsletter Breastfeeding Month Special. 2008.

82. UNICEF. Programmming guide for infant and young child feeding. New York: UNICEF; 2011.

83. Breastfeeding rates [database on the Internet]2009b [cited 11 April 2011]. Available from: www.oecd.org/els/social/family/database.

84. Beeger LM, Hill J, Waldfogel J. Maternity leave, early maternal employment and child health and development in the US. *Economic Journal*. 2005;115:29-47.

85. Lakati A, Binns C, Stevenson M. The Effect of Work Status on Exclusive Breastfeeding in Nairobi. *Asia Pac J Public Health*. 2001;14(2):85-90.

86. Wandel M, Holmboe-Ottesen G. Women's work in agriculture and child nutrition in Tanzania. *Journal of Tropical Paediatrics*. 1992(29):252-5.

87. Vieira TO, Vieira GO, Giugliani EJ, Mendes MC, Martins C, Silva LR. Determinants of breastfeeding initiation within the first hour of life in a Brazilian population: cross-sectional study. *BMC Public Health*. 2010;10:760.

88. Dibley MJ, Roy SK, Senarath U, Patel A, Tiwari K, Agho KE, et al. Across-country comparisons of selected infant and young child feeding indicators and associated factors in four South Asian countries. *Food and Nutrition Bulletin*. 2010;31(2):366-74.

89. GunnLaugsson G, Silva MC, Smedman L. Determinants of delayed initiation of breastfeeding: a community and hospital study from Guinea-Bisau. *Int J Epidemiol*. 1992;21(5):935-40.

90. Setegn T, Gerbaba M, Belachew T. Determinants of timely initiation of breastfeeding among mothers in Goba Woreda, South East Ethiopia: A cross-sectional study. *BMC Public Health*. 2011;11(217).

91. Santos I, Victora CG, Martines J, Goncalves H, Gigante DP, Valle NJ, et al. Nutrition caounselling increases weight gain among Brazilian children. *J Nutrition*. 2001;131:2866-73.

92. Kamudon P, Maleta K, Shi Z, Holmboe-Ottesen G. Infant feeding practices in the first 6 months and associated factors in a rural and semiurban community in Mangochi district Malawi. *J human Lactation*. 2007;23(4):325-32.

93. Carvalhaes MA, Correa CR. Identification of difficulties at the begining of breastfeeding by means of protocal application in Portuguese. *J Pediatr (Rio J)*. 2003;79:13-20.

94. Hauck YL, Fenwick J, Dhaliwal SS, Butt J. A Western Australian survey of breastfeeding initiation, prevalence and early cessation patterns. *Maternal Child Health Journal*. 2011;15(2):260-8.

95. Nakao Y, Moji K, Honda S, Oishi K. Initiation of breastfeeding within 120 minutes afer birth is associated with breastfeeding at four months among Japanese women:a self-administered questionnaire survey. *International Breastfeeding Journal*. 2008;3(1):1-7.

96. Boccolini CS, Carvalho ML, Oliveira MI, Leal MC, Carvalho MS. Factors that affect time between birth and first breastfeeding. *Cad Saude Publica*. 2008;24:2681-94.

97. Rowe-Murray HJ, Fisher JRW. Baby Friendly hospital practices: cesarean section is a persistent barrier to early initiation of breastfeeding. *Birth*. 2002;29:124-31.

98. World Health Organization and UNICEF. Breastfeeding counselling: A training course. Geneva: WHO 1993.

99. Li R, Jewel S, Grummer-Strawn L. Maternal obesity and breastfeeding practices. *Am J Clin Nutr*. 2003;77(4):931-6.

100. Forde KA, Miller LJ. 2006-07 north metropolitan Perth breastfeeding cohort study: how long are mothers breastfeeding? *Breastfeeding Rev*. 2010;18(2):14-24.

101. Baxter J, Cooklin AR, Smith J. Which mothers wean their babies prematurely from full breastfeeding? An Australian cohort study. *Acta Paediatr*. 2009;98(8):1274-7.

102. Global Database on Body Mass Index [database on the Internet]. WHO. 2006 [cited 16 June 2011]. Available from: www.apps.who.int/bmi/index.jsp?introPage=intro_3.html.

103. Amir L, Donath S. Socioeconomic status and rates of breastfeeding in Australia: evidence from three recent national health surveys. *Med J Aust*. 2008;189(5):254-56.

104. Hilson JA, Rasmussen KM, Kjolhede CL. Maternal obesity and breastfeeding success in rural population of white women. *Am J Clin Nutr*. 1997;66:1371-8.

105. Krause KM, Lovelady CA, Ostbye T. Predictors of breastfeeding in overweight and obese women: data from Active Mothers Postpartum(AMP). *Maternal Child Health J*. 2011;15(3):367-75.

106. Guoannini M, Radaelli G, Rive E, Banderali G. Low Prepregnant BMI and breastfeeding practices. *J human Lactation*. 2007;23(1):44-51.

107. Tanzania Food and Nutrition Centre. TFNC Stratergic Plan 2005/2006-2009/2010. Dar es Salaam Tanzania: Tanzania Food and Nutrition Centre 2005.

108. Senarath U, Dibley MJ, Godakandage SS, Jayawickrama H, Wickramasinghe A, Agho KE, et al. Determinants of IYCF practices in Sri Lanka: Secondary data analysis of Demographic and Health Survey 2000. *Food and Nutrition Bulletin*. 2010;31(2):352-65.

109. Shirima R, Gebre-Medhin M, Greiner T. Information and socioeconomic factors associated with early breastfeeding practices in rural and urban Morogoro, Tanzania. *Acta Paediatr*. 2001;90(8):936-42.

110. Dahlen HG, Homer CS. Infant feeding in the first 12 weeks following birth: a comparison of patterns seen in Asian and non-Asian women in Australia. *Women Birth*. [Comparative Study]. 2010 Mar;23(1):22-8.

111. World Health Organization. Guiding principles for complementary feeding of the breastfed child. Geneva: WHO 2001.

112. Altrena GM, Monica TK, Noureddine A. Infant and Young Child Feeding Update. Calverton, Maryland USA 2006.

113. Michaelsen KF, Weaver L, Branca F, Robertson A. Feeding and Nutrition of Infants and Young Children: Guidelines for the WHO European Region. Copenhagen: WHO; 2000.

114. World Health Organization. Indicators for assessing breastfeeding practices. Geneva: WHO; 1991.

115. WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality. Effect of Breastfeeding on Infant and Child Mortality Due to Infectious Diseases in Less Developed Countries. A pooled analysis. *Lancet*. 2000;355(9202):451-55.

116. Cohen RJ, Brown KH, Rivera LL, Dewey KG. Determinants of growth from birth to 12 months among breastfed Honduran infants in realation to age of introduction of complementary foods. *Paediatrics*. 1995;96:504-10.

117. Maseta E, Kogi-Makau W, Omwega AM. Childcare practices and nutritional status of children aged 6-36 months among short- and long-term beneficiaries of the Child Survival Protection and Development Programmes (the case of Morogoro, Tanzania). *South African Journal of Clinical Nutrition*. 2008;21 (1):16-20.

118. Hotz C, Gibson R. Complementary feeding practices and dietary intakes from complementary foods amongst weanlings in rural Malawi. *European J Clin Nutr*. 2001;55:841-49.

119. Rebhan B, Kohlhuber M, Schwegler U, Koletzko B, Fromme H. Infant Feeding Practices and Associated Factors Through the First 9 Months of life in Bavaria, Germany. *Journal of Paediatric Gastroenterology and Nutrition*. 2009;49:467-73.

120. Hornell A, Hofuander Y, Kylberg E. Introduction of solids and formula to breastfed infants: a longitudinal prospective study in Uppsala, Sweden. *Acta Paediatr*. 2001;90:477-82.

121. Foster K, Lader D, Cheesbrough S. Infant feeding 1999. London: The Statistics Office: Social Survey Division of ONS 1997; 1999.

122. Hotz C, Gibson RS. Participatory nutrition education and adoption of new practices are associated with improved adequacy of complementary diets among rural Malawian children: a pilot study. *European J Clin Nutr*. 2005;59:226-37.

123. Mamabolo RL, Alberts M, Mbenyane GX, Steyn NP, Nthangeni NG, Ha, et al. Feeding practices and growth of infants from birth to 12 months in the central region of the Limpopo Province of South Africa. *Nutrition*. 2004;20(3):327-33.

124. Sellen DW. Weaning, complementary feeding and maternal decision making in a rural east African pastoral population. *J human Lactation*. 2001;17(3):233-44.

125. Mamiro PS, Kolsteren P, Roberfroid D, Tatala S, Opsomer AS, Van Camp JH. Feeding practices and factors contributing to wasting, stunting, and iron-deficiency anaemia among 3-23-month old children in Kilosa district, rural Tanzania. *J Health Popul Nutr*. 2005;23(3):222-30.

126. Nyaruhucha CN, Msuya JM, Mamiro PS, Kerengi AJ. Nutritional status and feeding practices of under-five children in Simanjiro District, Tanzania. *Tanzan Health Res Bull*. 2006;8(3):162-7.

127. Mabilia M. Beliefs and practices in infant feeding among the Wagogo of Chigongwe (Dodoma Rural District), Tanzania. *Ecol Food Nutr*. 2003;35:195-207.

128. Serventi M, Dal AM, Kimaro DN. Early cessation of breastfeeding as a major cause of severe malnutrition in under twos: a hospital based study-Dodoma region Tanzania. *East Afr Med J*. 1994;26:132-34.

129. Onyango C. et al. Early breastfeeding cessation among HIV exposed negative infants and risk of serious gastroenteritis: finding from a perinatal prevention trial in Kampala Uganda Los Angeles 2007.

130. Hussein AK. Breastfeeding and Complementary Feeding Practices in Tanzania. *East African Journal of Public Health*. 2005;2(1):27-31.

131. Pan American Health Organization (PAHO) WHO. Guiding principles for complementary feeding of the breastfed child. Washington DC, 2002.

132. Food and Nutrition Technical Assistance (FANTA), Working group on infant and young child feeding. Developing and validating simple indicators of dietary quality and enery intake of infants and young children in developing countries Washington DC, USA: Project/Academy for Educational development (AED); 2007.

133. Hope LT, Gross R, Giay T, Sastroamidjojo S, Schultink W, Lang NT. Premature Complementary Feeding Is associated with Poorer Growth of Vietnamese Children. *J Nutr*. 2000;130(11):2683-90.

134. Owino V, Amadi B, Sinkala M, Filteau A, Tomkins A. Complementary Feeding practices and Nutrient intake from habitual complementary foods of Infants and Young Children aged 6-18 months old in Lusaka, Zambia. *African Journal of Food, Agriculture, Nutrition and Development*. 2008;8(1):28-47.

135. Dang S, Yan H, Yamamoto S, Wang X, Zeng L. Feeeding practices among younger Tibetan children living at high altitudes. *Eur J Clin Nutr*. 2005;59(9):1022-29.

136. Kudlova E, Rames J. Food consumption and feeding patterns of Czech infants and toddlers living in Prague. *Eur J Clin Nutr*. 2007;61(2):239-47.

137. Faber M. Complementary foods consumed by 6-12 months-old rural infants in South Africa are inadequate in micronutrients. *Public Health Nutr*. 2004;8(4):373-81.

138. Vaahtera M, Kulmala T, Hietanen A, Ndekha M, Cullinan T, Salin ML, et al. Breastfeeding and complementary feeding practices in rural Malawi. *Acta Paediatr*. 2001;90(3):328-32.

139. Macharia-Mutie CW, Brouwer ID, Mwangi AM, Kok FJ. Complementary feeding practices and dietary intake among children 12-23 months in Mwingi district, Kenya. *Journal of Food Safety*. 2010;3(1):45-56.

140. Mutie M, Catherine W, Ige DB, Alice M, Fransis KJ. Complementary feeding practices and dietary intake among children 12-23 months in Mwingi district, Kenya. *International Journal of Food Safety, Nutrition and Public Health*. 2010;3(1):45-56.

141. Senarath U, Godakandage SSP, Jayawickrama H, Siriwardena I, Dibley MJ. Determinants of inappropriate complementary feeidng practices in young children in Sri Lanka: secondary data analysis of Demograhic and Health Survey 2006-2007. *Matern Child Nutr*. 2012;8(Suppl.1):60-77.

142. Ng CS, DiBley MJ, Agho KE. Complementary feeding indicators and determinants of poor feeding practices in Indonesia: a secondary analysis of 2007 Demographic and Health Survey data. *Public Health Nutr*. 2011;15(5):827-39.

143. Kabir I, Khanam M, Agho KE, Mihrshahi S, Dibley MJ, Roy SK. Determinants of inappropriate complementary feeding practices in infant and young children in Bangladesh: secondary data analysis of Demographic and Health Survey 2007. *Maternal & Child Nutrition*. 2012;8(Suppl.1):11-27.

144. Joshi N, Agho KE, Dibley MJ, Senarath U, Tiwari K. Determinants of complementary feeding practices in young children in Nepal: secondary data analysis of Demographic and Health Survey 2006. *Matern Child Nutr*. 2012;8(Suppl.1):45-59.

145. Patel A, Pusdekar Y, Badhoniya N, Borkar J, Agho KE, Dibley MJ. Determinants of inappropriate complementary feeding practices in young children in India: secondary analysis of National Family Health Survey 2005-2006. *Maternal & Child Nutrition*. 2012;8(Suppl.1):28-44.

146. Li M, Li S, Ali M, Ushijima H. Feeding practices of infants and their correlates in urban areas of Beijing, China. *Pediatr Int*. 2003;45(4):400-6.

147. Abate G, Kogi-Makau W, Muroki NM. Child-feeding practices as predictors of nutritional status of children in slum area in Addis Ababa, Ethiopia. *Ethiop J Health Dev*. 1999;13(3):229-42.

148. Peter M, Patric K, Dominique R, Simon T, Ann O, John V. Feeding practices and factors contributing to wasting, stunting and iron-deficiency anaemia among 3-23 month old children in Kilosa district, rural Tanzania. *J Health population Nutrition* 2005;23(3):222-30.

149. Senarath U, Dibley MJ. Complementary feeding practices in South Asia: analyses of recent national survey data by the South Asia Infant Feeding Research Network. *Matern Child Nutr*. 2012;8(Suppl.1):5-10.

150. Senarath U, Agho KE, Akram D, Godakandage SP, Hazir T, Jayawickrama H et al. Comparisons of complementary feeding indicators and associated factors in children aged 6-23 months across five South Asian counties. *Maternal and Child Nutrition*. 2012;8(Suppl.1):89-106.

151. Tarrant RC, Younger KM, Sheridan-Pereira M, White M, Kearney JM. Factors associated with weaning practices in term infants: a prospective observational study in Ireland. *Br J Nutr*. 2010:1-11.

152. Dratva J, Merten S, Ackermann-Liebrich U. The timing of complementary feeding of infants in Switzerland: Complience with the Swiss and WHO guidelines. *Acta Paediatr*. 2006;95:818-25.

153. Liaqat P, Rizvi MA, Qayyum A, Ahmed H. Association between complementary feeding practices and mothers education status in Islamabad. *J Human Nutr Diet*. 2007;20(4):340-4.

154. Hazir T, Senarath U, Agho KE, Akram D, Kazmi N, Abbas S, et al. Determinants of inappropriate timing of introducing solid, semi-solid or soft food to infants in Pakistan: Secondary data analysis of Demographic and Health Survey 2006-2007. *Matern Child Nutr*. 2012;8(Suppl.1):78-88.

155. Charmaine SN, Dibley MJ, Agho KE. Complementary feeidng indicators and detarminats of poor feeding practices in Indonesia: a secondary analysis of 2007 Demographic and Health Survey data. *Public Health Nutr*. 2011:1-13.

156. Ukwuani FA, Suchindran CM. Implications of women's work for child nutritional status in sub-Saharan Africa: a case study of Nigeria. *Soc Sci Med*. 2003;56(10):2109-21.

157. Asole S, Spinelli A, Antinucci LE, Bergman N. Effect of hospital practices on breastfeeding: a survey in the Italian region of Lazio. *J human Lactation*. 2009;25(3):333-40.

158. Senarath U, Agho KE, Dur-e-Samin A, Godakandage SSP, Hazir T, Jayawickrama H et al. Comparisons of complementary feeding indicators and associated factors in children aged 6-23 months across five South Asian countries. *MaternChild Nutr*. 2012;8(Suppl1.):89-106.

159. Gudnadottir M, Sigurdur B, Thorsdottir I. Effects of sociodemographic factors on adherence to breastfeeding and other important infant dietary recommendations. *Acta Peadiatrica*. 2006;95(4):419-24.

160. Chen C. Fat intake and nutritional status of children in China. *Am J Clin Nutr*. 2000;72(5 Suppl):1368S-72S.

161. Wang XL, Wang Y, Shi L. Analysis of breastfeeding and complementary feeding of children under 2 years of age in rural China. *Chin J Child Health Care*. 2000;8:144-46.

162. Liu J, Smith MG, Dobre MA et al. Maternal obesity and breastfeeding practices among white and black women. *Obesity*. 2009;18:175-82.

163. Cordovia L, Oliveira L, Giugliani E. Factors associated with Low Incidence of Exclusive Breastfeeidng for the first 6 months. *Birth*. 2007;34(3):212-9.

164. UNESCO Country program Tanzania. UNESCO Country Programming Document for Tanzania: MoHSW; 2008.

165. National Bureau of Statistics (NBS) Tanzania. Population and Housing Census 2002. General report. Dar es Salaam: National Bureau of Statistics 2002.

166. Map of Tanzania [database on the Internet]. Available from:

http://www.mapsofworld.com/tanzania/tanzania-political-map.html.

167. MEASURES DHS. Demographic and Health Surveys. Calverton USA 1984 [cited 2010 May]; Available from: http://www.measuredhs.com.

168. Bureau of Statistics [Tanzania] and Macro International. Tanzania Demographic and Health Survey 1996. Calverton, Maryland Bureau of Statistics and Macro International; 1997.

169. Bureau of Statistics [Tanzania]. Population Census 1988 National profile. Dar es Salaam: Bureau of Statistics; 1988.

170. Mosley WH, Chen LC. An analytical framwork for the study of child survival in developing countries. Population and Developmenet Review. *Supplement*. 1984;10:25-45.

171. Hector D, King L, Wedd K. Factors affecting breastfeeding practices applying a conceptual framework. *NSW Public Health Bulletin*. 2005;16(3-4):52-5.

172. Gwatkin DR, Rutstein S, Johnson K et al. Socio-economic differences in health, nutrition and poverty. Washington, D.C HNP/Poverty Thematic Group of the World Bank 2000.

173. Rutstein SO, Rojas G. Guide to DHS Statistics. In: Surveys DaH, editor. Calverton, Maryland 2006.

174. Victoria CG et al. Evidence of protection by breastfeeding against infant deaths from infectious diseases in Brazil. *The Lancet*. 1987;2:317-22.

175. Uganda Bureau of Statistics (UBOS) and Macro International Inc. Uganda Demographic and Health Survey 2006. Calverton, Maryland USA: UBOS and Macro International Inc 2007.

176. Central Statistical Office (CSO), Ministry of Health (MOH), Macro International et al. Zambia Demographic and Health Survey 2007. Calverton Maryland USA: CSO and Macro International Inc 2009.

177. National Statistical Office (NSO) and ORC Macro. Malawi Demographic and Health Survey 2004. Calverton Maryland USA: NSO and ORC Macro 2005.

178. Kenya National Bureau of Statistics (KNBS) and ICF Macro. Kenya Demographic and Health Survey 2008-09. Calverton, Maryland: KNBS and ICF Macro; 2010.

179. Collins CT, Ryan P, Growther CA, McPhee AJ, Paterson S, Hiller JE. Effects of bottles, cups and dummes on breastfeedin in preterm infants: a randomized controlled trial. *Br Med J*. 2004;329:193-98.

180. Mturi AJ, Curtis SL. The determinants of infant and child mortality in Tanzania. *Health Policy Planning*. 1995;10(4):384-94.

181. Nawaz R, Ur Rehman S, Nawaz S, Mohammad T. Factors causing non-breastfeeding in children under six months of age in district Nowshera, Pakstan. *J Ayub Med Coll Abbottabad*. 2009;21(4):93-5.

182. Mascarenhas MLW, Albernez EP, Silva MB, Silveria RB. Prevalence of exclusive breastfeeding and its determinants in the first 3 months of life in South Brazil. *J Pediatr*. 2006;82(4):289-94.

183. Lawoyin et al. Factors Associated with Exclusive Breastfeeding in Ibadan, Nigeria. *J human Lactation*. 2001;17(4):321-25.

184. Matthews MK. The relationship between maternal labour analgesia and delay in initiation of breastfeeding in healthy neonates in the early neonatal period. *Midwifery*. 1989;5(1):3-10.

185. Prior E, Santhakumaran S, Gale C, Philipps LH, Modi N, Hyde MJ. Breastfeeding after caesarean delivery:a systematic review and meta-analysis of world literature. *Am J Clin Nutr*. 2012;95:1113-35.

186. Kumar D, Agarwal N, Swami HM. Socio-demographic correlates of breast-feeding inurban slums of Chandigarh. *Indian J Med Sci*. 2006;60(11):461-6.

187. Nyambo M. Baby Friendly Hospital Initiatives situation in Tanzania. Dar es Salaam: University Research Centre; 2012.

188. Lutter C. Meeting the challenges to improve complementary feeding. *SCN News*. 2003;27:4-9.

189. WHO. Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: a pooled analysis. *Lancet*. 2000;355:451-55.

190. Brown K, Dewey K, Allen L. Complementary Feeding of Young Children in Developing Countries: A Review of Current Scientific Knowledge. Geneva: World Health Organization; 1998.

191. Paul K.H, Muti M, Khalfan S.S, Humphrey J.H, Caffarella R, Scoltzfus R.J. Beyond food insecurity:how context can improve complementary feeding interventions. *Food Nutr Bull*. 2011;32(3):244-53.

192. Moestue H, Huttly S. Adult education and child nutrition: the role of family and communty. *J Epidemiol Community Health*. 2008;62:153-59.

193. UNICEF. Formative Research on Infant and Young Child feeding practices. Dar es Salaam2007.

194. Wamani H, Astrom AN, Peterson S, Tylleskar T, Tumwine JK. Infant and young child feeding in western Uganda:knowledge, practices and socio-economic correlates. *J Trop Pediatr*. 2005;51(6):356-61.

195. Ministry of Agriculture Food Security and Co-operatives (MAFC), Food Security Information Team (FSIT). Papid Vulnerability Assessment Report on Food Shortage Areas in Tanzania for the 2008/2009 Marketing Year. Dar es Salaam: Prime Minister's Office/Ministry of Agriculture Food Security and Co-operatives; 2009.

196. Mosha AC, Kavishe FP, Nyang'li EE, Sangana LH. Household food security and nutritional surveillance in Tanzania: methodology and use in developnet planning policy interventions. Dar es Salaam Tanzania: TFNC/SUA; 1992.

197. Richards M, Hardy R, Wadsworth ME. Lond-term effects of breast-feeding in a national birth cohort: educational attainment and midlife cognitive function. *Public Health Nutr*. 2002;5(5):631-35.

198. Temboury MC, Otero A, Polanco I, Arribas E. Influence of breast-feeding on the infant's intellectual development. *J Pediatr Gastroenterol Nutr*. 1994;18(1):32-9.

199. Joshua N. Progress report on infanta and young child nutrition in Tanzania: March 2011-April 2012. Dar es Salaam: Tanzania Food and Nutrition Centre; 2012.

200. Tylleskar T, Jackson D, Meda M, Engebretsen IM, Chopra M, Diallo AH, et al. Exclusive breastfeeding promotion by peer counselors in sub-Saharan Africa (PROMISE-EBF): a cluster randomised trial. *Lancet*. 2011;378:420-27.

201. World Health Organization. The optimal duration of exclusive breastfeeding. Report of an Expert Consultation. Geneva: WHO; 2001.

202. Victoria CG et al. Maternal and child undernutrition;consequences for adult health and human capital. *Lancet*. 2008;371:340-57.

203. Arabi M, Frongillo EA, Avula R. Infant and young child feeding in developing countries *Child Dev*. 2012;83(1):32-45.

204. Haltoy A, Hallund J, Diarra MM, Oshaug A. Food variety, socioeconomic status and nutritional status in urban and rural areas in Koutiala (Mali). *Public Health Nutr*. 2000;3:57-65.

205. Arimond M, Ruel MT. Dietary Diversity Is Associated with Child Nutrional Status:Evidence from 11 Demographic and Health Surveys. *J Nutr*. 2004;134:2579-85.

206. Sawadogo PS, Martin-Prevel Y, Savy M, Kameli Y, Traissac P, Traore AS, et al. An infant and child feeding index is associated with the nutritional status of 6- to 23-month-old children in rural Burkina Faso. *J Nutr*. [Research Support, Non-U.S. Gov't]. 2006 Mar;136(3):656-63.

207. Steyn NP, Nel JH, Nantel G, Kennedy GL, Labadarios D. Food variety and dietary diversity scores in children: are they good indicators of dietary adequacy? *Public Health Nutr*. 2006;9:644-50.

208. Kennedy GL, Pedro MR, Segheiri C, Nantel G, Brouwer I. Dietary diversity score is a useful indicators of micronutrient intake in non-breast-feeding Filipino children. *J Nutr*. 2007;137:472-7.

209. Moursi MM, Arimond M, Dewey KG, Treche S, Ruel MT, Delpeuch F. Dietary diversity is a good predictor of micronutrient density of the diet of 6 to 23 month old children in Madagascar. *J Nutrition*. 2008;138:2448-53.

210. Zaman S, Ashraf RN, Martines J. Training in complementary feeding counselling of healthcare workers and its influence on maternal behaviours and chhild growth: a cluster-randomized controlles trial in Lahore, Pakistan. *J Heath Popul Nutr*. 2008;26(2):210-22.

211. Penny ME, Creed-Kanashiro HM, Robert RC, Narro MR, Caulfield LE, Black RE. Effectiveness of an educational intervention delivered through the health services to improve nutrition in young children: a cluster-randomised controlled trial. *Lancet*. 2005;365:1863-72.

212. Pelto GH, Santos I, Victora CG, Martines J, Habicht JP. Nutrition counseling training changes physician behaviour and improves caregivers knowledge acquisition. *J Nutr*. 2004;134:357-62.

213 Agunbiade O.M and Ogunleye O.V. Constrants to exclusive breastfeeding practices among breastfeeding mothers in Southwest Nigeria: implications for scaling up. *Int Breastfeed J*. 2012;7:7-5.

214 Ekanem I.E, Ekanem A.P, Asuguo A, Eyo V.O. Attitudes of Working Mothers towards Exclusive Breastfeeding in Calabar Municipality, Cross River State, Nigeria. J ournal of Food Research. 2012;1(2):71-75.

215 Swanson V and Power K.G. Attitudes and normative beliefs:factors influencing initiation and continuation of breastfeeding. *Journal of Advanced Nursing*.2005;50(3)272-82

216 Earle S. Factors affecting the initiation of breastfeeding:implications for breastfeeding promotion. *Health Promot Int*. 2002;17(13)2005-14

Appendix A: DHS Download Account Application

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You have been authorized to download data from the Demographic and Health surveys (DHS) on-line archive. This authorization is for unrestricted countries requested on your application.

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The files you will download are in zipped format and must be unzipped before analysis. Following are some guidelines:

* Download the zipped data and use WINZIP to unzip the files. After unzipping, print the file with the .DOC extension (found in the Individual Recode Zips). This file contains useful information on country specific variables and differences in the Standard Recode definition.

* Download the DHS Recode Manual at http://www.measuredhs.com/accesssurveys/technical_assistance.cfm. The DHS Recode Manual contains the documentation and map for use with the data. The Documentation file contains a general description of the recode file, including the rationale for recoding; description of the physical structure in which the recode file is available; how to weight the data for any analysis; coding standards used in the data file; location of identification information; use of century

month codes for dates and imputation of partial dates; DHS model questionnaires; sections and occurrences; description of each variable in the data file, giving additional information that is not available in the dictionary. The Map file contains a listing of the standard dictionary with basic information relating to each variable.

We also recommend that you make use of the Data Tools and Manuals on: http://www.measuredhs.com/accesssurveys/technical_assistance.cfm.

* It is essential that you consult the questionnaire for a country, when using the data files. Questionnaires are in the appendices of each survey's final report, which can be downloaded or ordered from: http://www.measuredhs.com/pubs.

DHS statistics can also be obtained using the STATcompiler tool at: http://www.statcompiler.com. This online database tool allows users to select numerous countries and hundreds of indicators to create customized tables that serve their specific data needs. It accesses nearly all of the population and health indicators that are published in DHS+ final reports. Authorization is not needed to use the STATcompiler.

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All DHS data should be treated as confidential, and no effort should be made to identify any household or individual respondent interviewed in the survey.

The data sets must not be passed on to other researchers without the written consent of DHS. Users are requested to submit an electronic or hard copy of any reports/publications resulting from using the DHS data files. These reports should be sent to the attention of the DHS Data Archive, so that it may be forwarded to the country(ies) whose data has(ve) been used.

To begin downloading datasets, please login at http://www.measuredhs.com/login.cfm. Once you are logged in, you may also edit your contact information, change your email/password, request additional countries or Edit/Modify an existing Description of Project.

The files you will download are in zipped format and must be unzipped before analysis. Following are some guidelines:

* Download the zipped data and use WINZIP to unzip the files. After unzipping, print the file with the .DOC extension (found in the Individual Recode Zips). This file contains useful information on country specific variables and differences in the Standard Recode definition.

* Download the DHS Recode Manual at http://www.measuredhs.com/accesssurveys/technical_assistance.cfm. The DHS Recode Manual contains the documentation and map for use with the data. The Documentation file contains a general description of the recode file, including the rationale for recoding; description of the physical structure in which the recode file is available; how to weight the data for any analysis; coding standards used in the data file; location of identification information; use of century month codes for dates and imputation of partial dates; DHS model questionnaires; sections and

occurrences; description of each variable in the data file, giving additional information that is not available in the dictionary. The Map file contains a listing of the standard dictionary with basic information relating to each variable.

We also recommend that you make use of the Data Tools and Manuals on: http://www.measuredhs.com/accesssurveys/technical_assistance.cfm.

* It is essential that you consult the questionnaire for a country, when using the data files. Questionnaires are in the appendices of each survey's final report, which can be downloaded or ordered from: http://www.measuredhs.com/pubs.

DHS statistics can also be obtained using the STATcompiler tool at: http://www.statcompiler.com. This online database tool allows users to select numerous countries and hundreds of indicators to create customized tables that serve their specific data needs. It accesses nearly all of the population and health indicators that are published in DHS+ final reports. Authorization is not needed to use the STATcompiler.

Please send questions to archive@measuredhs.com.

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