

**SOCIOECONOMIC DETERMINANTS OF UNDER-FIVE MORTALITY IN
PRINCIPAL CITIES OF EAST AFRICA COMMUNITY: A CASE STUDY OF
NAIROBI, DAR-ES-SALAAM AND KIGALI.**

STEPHEN OMOLO OGADA

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UNIVERSITY OF NAIROBI**

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DECLARATION

I hereby declare that this is my original work and has not been presented in any other university.

Ogada Stephen Omolo
University of Nairobi

Date

This Research Project has been submitted for examination with the approval of my University supervisors.

Dr. Boniface O. K'Oyugi, MBS
Population Studies and Research Institute
University of Nairobi

Date

Dr. Wanjiru Gichohi.
Population Studies and Research Institute
University of Nairobi

Date

DEDICATION

My Late father Rtd. Mwalimu Christopher Ogada Otieno

My mum Martha and grandsons

George

Dan

Chris

Godfrey

and

Gabriel

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LIST OF ABBREVIATIONS

APHRC- African Population and Health Research Centre

EDHS- Eritrea Demographic Survey

KDHS- Kenya Demographic and Health Survey

MDGs- Millennium Development Goals

RDHS- Rwanda Demographic and Health Survey

TDHS- Tanzania Demographic and Health Survey

UN- United Nations

UNCHS- United Nations Centre For Human Settlements

WHO- World Health Organization

ABSTRACT

Socio-economic determinants in this study have been defined through the wealth status, highest education level and the labour participation of the mother. These factors explain the rising under-five mortality rate in many cities in Sub-Saharan Africa. A phenomenon, currently facing many cities as Africa embraces urbanization. Their measurements were used to determine how they work through proximate determinants of under-five mortality to influence child mortality as expressed in Mosley and Chen framework of 1984. Measuring the socio-economic determinants of under-five mortality helped to explain the underlying reasons through a theoretical framework to causes of under-five mortality in cities of Africa. The dependent variable was under-five mortality in major cities of Nairobi, Kigali and Dar-es-salaam. The study used secondary data from the Demographic Health Survey of the three countries whose cities were covered in the study.

The study used logistic regression to establish the effects of socio-economic determinants on the proximate determinants to influence under-five mortality. The study found out that socio-economic determinants do not influence the occurrence of under-five mortality, but act through the proximate determinants to indirectly influence under-five mortality. Further, this effect was seen through the type of birth where multiple births was negatively statistically significant in the presence of socio-economic factors. An indication that multiple births in well-to-do families has little influence in under-five mortality. Age of the mother at birth was also significant indicating that whether the mother is 35 years and above and as long as they are in the upper quintile of the wealth index, have higher education and are working, older ages does not affect their under-five mortality experiences. This scenario was also seen in households which had proper toilets. Lack of toilets was positively significant, an indication that it increases chances of under-five mortality in the cities.

Deliveries in private health facilities were also found to be positively statistically significant. This indicated that there was more likelihood of under-five mortality in private facilities compared to home deliveries. This may be occasioned by numerous private health-care centres which perhaps may not have very qualified personnel to handle emergencies since many people resort to private healthcare facilities when they are faced with emergencies. In conclusion, improvement in socio-economic status of a household is important in reducing child mortality.

Nevertheless, more research is required in finding out how they influence under-five mortality in the slums of Nairobi, Kigali and Dar-es-Salaam where majority of the urban poor live.

CHAPTER ONE: INTRODUCTION

1.0 Background of the Study

Despite the global decline in childhood mortality, demographic and public health literature indicate that child health outcomes are generally poor in sub-Saharan Africa. The variation in under-five mortality rates between the developing and developed nations is more than 7 to 8-fold, from a high of 180 per 1000 live births in Angola to only 2.31 per 1000 live births in Singapore (World Factbook, 2011). Evidence shows that only about one-third of all countries in Africa show a decline of 30% or more in under-five mortality, while a number of countries sadly show a considerable increase (Becher, 2010).

Whereas literature has established that living in a deprived neighbourhood is associated with poor health outcomes of individuals (Harttgen & Misselhorn, 2006; Omariba et al., 2007; Sastry, 1997; Zanini et al., 2009), recent evidences have continued to underscore the importance of neighbourhood characteristics on health outcomes. For instance, Aminzadeh et al., (2013) found an association between neighbourhood deprivation and wellbeing of young people. Unger (2013) observed that areas of broad economic and social disadvantage (due to overcrowding, substandard housing, poor water and sanitation) tend to have higher under-five mortality compared to socially and economically advantaged areas. Becares et al., (2013) suggest that addressing neighbourhood poverty and area deprivation is essential to improving health outcomes of individuals.

In a study by the United Nations Centre for Human Settlements (UNCHS, 1993) for providing a global picture of urban conditions found out that higher child mortality is attributed to the problems found in urban areas worldwide: inadequate portable water access and sewerage connections; income inequality within a city; lack of government commitment especially at the city level over water services management; lack of private sector participation in sewerage system provision and lack of sufficient revenue at the city level.

These findings confirm a view shared by the 1996 UN Global Conference on Human Settlements, Habitat II, and recent urban theorists who point to the adequacy of water access as well as sewerage connections and the efficiency of urban management as the critical components affecting child mortality in urban areas (Mill and Becker 1986, Prudh'homme 1994).

A study by Maurice Mutisya et al., (2012) on whether mortality among under-five children in Nairobi slums was seasonal, found out that the risk of childhood mortality in the slums of Nairobi is high between May and July, hence increasing significantly by about fifty percent compared to the rate of death between October and December. Further, the study established that deterioration of waste disposal and of sanitation systems, as well as probable contamination of drinking water during the rainy season could explain why mortality for children elevates during the second quarter (Muhuri, 1996). Waste disposal becomes a more serious hazard during the rainy season because solid as well as liquid waste filters into broken plastic water pipes that water vendors use to make illegal connections to the city council water system (African Population and Health Research Centre, 2002).

A study on inequalities in child mortality in ten major African cities by Wilm Quentin et al., (2014), and being the first study to systematically investigate socio-economic inequalities in child mortality within and across African cities and their development over time, found out that in most cities, child mortality is considerably higher among the poor than among the rich, with differences between the poorest quintile and the richest quintile reaching as much as 108 deaths per 1000 live births in Abidjan in 2011 to 2012. And that around the year 2000, Dar-es-Salaam had the highest level of inequality while Abidjan and Cairo had rather low absolute (Cairo) and relative (Abidjan) inequality. However, the study did not investigate the underlying reasons for the identified differences in inequalities across the cities, a weakness that this research tries to unravel.

In another study on association of urban slum residency with infant mortality and child stunting in low and middle income countries by Hmwe Hmwe et al., (2013), found out that living in a slum neighbourhood was associated with infant mortality irrespective of individual and household characteristics and this association was consistent across countries. This study adds to concerns raised by Timaeus and Lush about the harmful effects of poor environmental conditions on child health. Nevertheless, this study failed to examine the association longitudinally to establish causal relations. It concluded that living in a slum neighbourhood was associated with infant mortality irrespective of the socio-economic status and other characteristics of households and families and further showed that the risk of stunting in slum neighbourhoods was greater for older children.

Fotso et al., (2007) showed that more rapid rate of urban population growth is associated with increasing or timid declines in urban mortality owing to negative trends in access to safe drinking water among residents, while at the same time, countries with greater improvement in access to safe drinking water among urban dwellers tended to experience higher declines in urban childhood mortality.

This research therefore attempts to address the socio-economic determinants responsible for the observed under-five mortality inequalities observed in selected urban cities of East Africa.

1.2 Problem Statement

Mortality studies in developing countries are often related to the level of economic development of the nations, or have examined mortality differentials by socio-demographic and environmental factors, both at aggregate and individual levels within a nation-Martin et al. (1983). Others have investigated socio-economic inequalities in child mortality within and across African cities and their development over time by Wilm Quentin et al., (2014), but none has attempted to provide theoretical framework to explain the observed outcomes in under-five mortality differentials among African cities or to explain the under-five mortality rates currently witnessed in many urban centres across sub-Saharan Africa using a theoretical framework. There is emerging evidence that child mortality is either increasing or not declining as much as expected in many African countries (Garenne & Gakusi, 2006) raising serious concerns about the continent's capacity to achieve the Millennium Development Goals (MDGs) related to child health.

A study to systematically investigate the socio-economic inequalities in child mortality within and across African cities and their development over time by Wilm Quentin (2014) found out that child mortality is considerably higher among the poor than the rich, with differences between the poorest quintile and the richest quintile being very wide. Nevertheless, the study did not investigate the underlying reasons for the identified differences in inequalities across cities and it is on this basis that this research explored the socio-economic determinants of child mortality using the Mosley and Chen framework (1984) to explain how they work through proximate determinants to influence under-five mortality in selected cities of East Africa: Nairobi, Dar-es-salaam and Kigali using a combined data set from the 2008 to 2010 Demographic Health Survey data for the cities.

1.3 Research Questions

The questions this study sought to address included:

- i. Whether wealth statuses of a family affect under-five mortality in Nairobi, Dar-es-Salaam and Kigali?
- ii. Whether maternal education influences under-five mortality in Nairobi, Dar-es-Salaam and Kigali?
- iii. Whether a mother's labour participation affect under-five mortality in Nairobi, Dar-es-Salaam and Kigali?

1.4 Research Objectives

1.4.1 General Objectives

The general objective was to establish how socio-economic determinants influence under-five mortality in cities of Nairobi, Dar-es-salaam and Kigali.

1.4.2 Specific Objectives

Specifically, the study aimed to:

- i. To establish whether wealth status of a family influenced under-five mortality in Nairobi, Dar-es-Salaam and Kigali?
- ii. To determine whether maternal education influenced under-five mortality in Nairobi, Dar-es-Salaam and Kigali?
- iii. To find out whether a mother's labour participation affects under-five mortality in Nairobi, Dar-es-Salaam and Kigali?

1.4.3 Justification

Under-five mortality rate is a leading indicator of the level of child health and the overall development in countries (McGuire, 2006). It reflects the impact of social, economic and environmental circumstances as well as other causes of death on infants, toddlers and young children including their health care (United Nations Children's Fund, 2007; United Nations Population Fund, 2003)

And as such, the result of rapid urbanization currently being witnessed in many African cities, amidst poor economic performance and governance of urban areas is sprawling slums in cities where the majority of urban populations currently reside (United Nations Human Settlements Programme-UN Habitat, 2003; Ooi & Phua, 2007) pose health risks to the population, but moreso to children. The relatively poor health outcomes among children living in poor slum settlements (APHRC, 2012, Kyobutungi et al., 2008; Ndugwa & Zulu, 2008); the fact that the majority of urban residents live in slum settlements (UN-Habitat, 2003); and the projection that more than half of Africans will live in urban areas by 2030 (United Nations, 2008) pose a new and growing challenge in global and national efforts to reduce child mortality in all urban centres of Africa.

Of the reviewed literature, it was evident that the principal cities of East Africa had not been considered collectively and that little was known about Kigali. Besides, no study had been done comprehensively using a theoretical framework to study any of these cities together. The study used socioeconomic determinants of under-five mortality since they act on the proximate determinants to influence child mortality.

There was, therefore, a need to better understand the factors associated with this high mortality in children in these cities.

1.6 Scope and Limitations

The study used data from the 2008/2009/2010 DHS for Kenya, Tanzania and Rwanda whose cities were examined in this study. The representative sample of 952 women aged 15 to 49 were interviewed for the case of Nairobi-Kenya; 444 women for the case of Dar-es-Salaam-Tanzania in 2010 and 1890 women for the case of Kigali-Rwanda in 2010. The data used in the study was secondary and therefore may not cover additional determinants of under-five mortality mentioned in a wide range of literature reviewed in this study.

On the other hand, one limitation was envisaged. It is generally acknowledged that data on infant and child mortality for sub-Saharan Africa is of uneven quality and grossly inaccurate. This study envisaged underreporting, misreporting of children ever born and children dead errors inherent in the DHS of 2008/2009 for Kenya, 2010 for Tanzania and 2010 for Rwanda. Being sample surveys, they did not give the overall picture of under-five mortality in Nairobi, Dar-es-salaam and Kigali.

Further, the results for Nairobi, Dar-es-Salaam and Kigali may not be representative of all urban areas in East Africa.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

In this section, related literature looked at the socio-economic determinants of child mortality in Nairobi, Dar-es-Salaam and Kigali. Views of scholars and empirical research done were addressed. First, the theoretical perspective on under-five mortality, then in-depth analysis of the socio-economic and proximate determinants of under-mortality as depicted in Mosley and Chen's framework. Besides, the operational framework and definition of key concepts and variables were presented.

2.1 Theoretical background

According to Mosley and Chen (1984), all social and economic determinants of child mortality necessarily operate through a common set of biological mechanisms, or proximate determinants (intermediate variables) to directly influence the risk of mortality. This study adopts this approach to compare how socio-economic factors contribute to under-five mortality in cities of Nairobi, Dar-es-Salaam and Kigali.

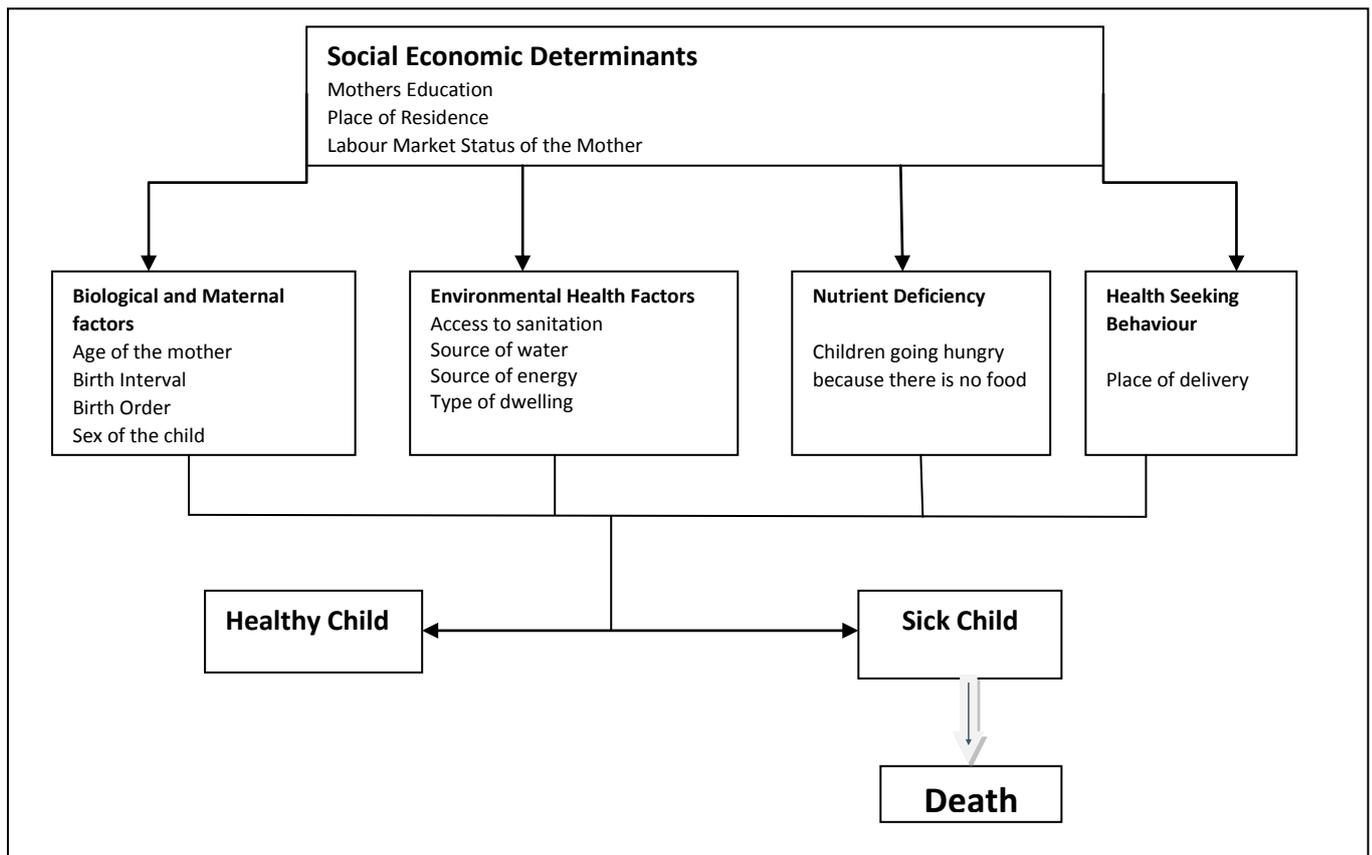
Figure 1 below illustrates the path to a healthy child or a sick child and eventual death. The socioeconomic factors operate through maternal, biological, environmental, nutritional and health seeking behaviour factors leading to a healthy child or sick child.

This framework assumes that in an optimal setting, over ninety-seven per cent of newborn infants can be expected to survive through the first five years of life, and that reduction in this survival probability in any society is due to the operation of social, economic, biological and environmental forces. It further assumes that socioeconomic determinants (independent variables) must operate through more basic proximate determinants that in turn influence the risk of disease and the outcome of disease processes.

And that specific diseases and nutrient deficiencies observed in a surviving population may be viewed as biological indicators of the operations of the proximate determinants.

Growth faltering and ultimately mortality too in children (the dependent variable) are the cumulative consequences of multiple disease processes (including their biosocial interactions). Only infrequently is a child's death the result of a single isolated episode (Ibid).

Fig. 1 Analytical Framework for the Study of Child Survival Mosley and Chen (1984)



Adapted from Mosley and Chen (1984)

The framework identifies a set of proximate determinants, or intermediate variables that directly influence the risk of morbidity and mortality. And that all social and economic determinants must operate through these variables to affect child survival. The four groups of the proximate determinants operate on the health dynamics of a population. They influence the rate of shift of healthy individuals toward sickness. Specific states of sickness (infection or nutrient deficiency) are basically transitory: ultimately there is either complete recovery or

irreversible consequences manifested by increasing degrees of permanent growth faltering (or other disability among the survivors) and/or death.

The maternal factors such as age, parity and birth interval have been shown to exert an independent influence on pregnancy outcome and infant survival through its effects on maternal health. Environmental contamination that refers to the transmission of infectious agents to children (and mothers) can be seen in the light of the following four categories: One, where infectious agents are transmitted to the human host through air- the route of spread for the respiratory and many “contact” transmitted diseases. Second, through food, water and fingers- the principal routes of spread for diarrheas and other intestinal diseases. Third, skin, soil and inanimate objects- the routes for skin infections, and lastly, insect vectors which transmit parasitic and viral diseases (Ibid).

Depending on where a child is born and to the family it is born, these factors influence their survival rates; children born in environments where conditions of the environment is good and well taken care of survive more than those born in deplorable environments like slum areas of urban centres where contamination of the environment, lack of quality water for domestic use and limited toilet facilities are a characteristic. For example, air contamination and risk of contact-acquired respiratory infections can be inferred from the intensity of household crowding (persons per room); water contamination can be scaled by source of supply (ditch, pond, open well, protected well, hand-pump, piped supply); household contamination, by cleaning, cooking, and storage practices; and potential fecal contamination, by the presence of latrines or toilets, or the use of soap and water. Nutrient deficiency relates to the intake of the three major classes of nutrients- calories, protein and the micronutrients which are essential to the survival of children and the mother alike.

The socioeconomic determinants (independent variables) operate through the proximate determinants to influence the level of growth faltering and mortality. At individual

level, the productivity of household members is determined by the skills (typically measured by educational level), health and time. For fathers, particularly in cities, educational levels usually correlate strongly with occupation and therefore with household income. Fathers' education is a strong determinant of the household's assets and the marketable commodities the household consumes. It influences the attitudes and thus preferences in choice of consumption goods, including child care services. This effect is likely to be most significant for child survival when more educated fathers are married to less educated mothers. On the other hand, mothers' skills, time and health operate directly on the proximate determinants.

Mother's health and nutritional status as well as her reproductive pattern influence the health and survival of the child noting the biological link between the mother and the infant during pregnancy. Her educational level can affect child survival by influencing her choices and increasing her skills in health care practices related to contraception, nutrition, hygiene, preventive care, and disease treatment. In fact, so many proximate determinants may be directly influenced by a mother's education to radically alter chances for child survival (Mosley, 1983). A mother's time for prenatal visits, attendance at the well-baby clinic, breastfeeding, food preparation, washing clothes, bathing the child, house cleaning, and sickness care ensure a healthy child. Besides, in transitional societies characteristic of many developing countries, child care time often competes with time needed for income-generating work (Birdsall and Greevey, 1978; Eagle, 1981). The consequences for infant health and mortality depend largely upon the general economic circumstances of the household. For poor families, a mother's outside work may result in child neglect or care by a less skilled sibling, while a wealthy family may hire a skilled and attentive nursemaid (Popkin, 1975; Kumar, 1977).

Household level variables such as income, wealth and effects such as goods available in the homestead, services accessible by the family and assets at the household level operate

on child health and mortality through the proximate determinants: Stable availability of a basic minimum food supply of sufficient variety to ensure adequate amounts of all nutrients and the sanitary quality of food (clean, fresh, free from spoilage) is important in preventing disease transmission; both quantity and quality of water supply are important determinants of exposure to disease- adequate quantity is essential to permit bathing, washing and cleaning, and quality (not only at the source, but also in the household) for drinking and food preparation are vital in reducing child mortality.

Housing size and quality also influence child survival. Poor ventilation and crowded sleeping conditions predispose household members to respiratory and skin infections. Adequate sanitation requires vermin-proof screens, construction materials that can be cleaned and separate rooms for cooking, bathing, toilets, sleeping, storage of food and water, and for livestock.

Adequate supply of fuel is essential for proper cooking of food, boiling water, and sterilizing stored food and utensils. Energy is needed for refrigeration to prevent diarrheal diseases due to bacterial overgrowth in stored food as well as for warmth to reduce the likelihood of respiratory infections in cold climates.

Physical infrastructure such as railroad, roads, electricity, water, sewage and telephone systems can influence health, particularly through their impact on the relative price of staples as well as of health-related goods, services and information. Many studies have shown, for example, that the poor pay more in money, time and effort for poor quality water than do the rich, who have access to an equivalent supply of pure piped water.

The purpose of this analytical framework in the study of child survival, albeit child mortality, is to clarify the understanding of the many factors involved in the family's production of healthy children in order to provide foundation for formulating health policies and strategies. Its significance lies in the organization of seemingly disparate measures of

environmental conditions; of dietary, reproductive, and health care practices; and of disease states into a coherent framework in which they are linked to one another and to child survival/death on the one hand and to socioeconomic factors on the other hence making it feasible for the integrated analysis of the biological and social determinants of mortality. It is on this basis that this research will establish the underlying determinants of under-five mortality in the selected urban centres.

A major theory of the linkage between increased maternal education and reduced child mortality is that education gives women the power and the confidence to take decision-making into their own hands. Caldwell (1979) has argued that three factors are of importance in this regard. In ascending order, these are (1) a reduction in fatalism in the face of children's ill health; (2) a greater capability in manipulating the world (e.g., in knowing where facilities are, and in securing the attention of doctors and nurses); and (3) a change in the traditional balance of family relationships that shifts the focus of power away from the patriarch and the mother-in-law and ensures that a greater share of available resources is devoted to children.

This fact is elaborated on by Caldwell in his hypothesis of the cultural context in which a mother with education finds herself. Caldwell's original data came from the Yoruba areas of Western Nigeria, depicts a culture in which wives keep separate budgets from their husbands. This is important in that it facilitates the woman to make decisions that can save the life of the child in the absence of the father hence increasing child survival. Even in a highly traditional enclave within this culture, found that little more than half of the men and fewer of the women thought that a woman should ask the opinion of the household head before taking a sick child to the hospital. With the Nigerian data Caldwell (1979) was able to show that, in comparison with mothers having no formal education, mothers with primary education experienced 42 percent less child mortality, and those with secondary education 36 percent less.

Data from ten developing countries, however, showed that a much more common situation is that the fall in child mortality levels associated with the move from primary to secondary education of mothers is twice as important as the original step to primary schooling (Caldwell and McDonald, 1981).

Klaauw and Wang (2003) develop a flexible parametric framework for analyzing infant and child mortality. This framework is based on widely used hazard rate models: The model allows individual characteristics and household's socio-economic and environmental characteristics to have different impacts on infant and child mortality at different ages. Second, they allow for frailty at multiple levels, which can be correlated with each other. The first feature of the framework seems to be particularly relevant in describing infant and child mortality. Child specific and household's socio-economic and environmental characteristics have significantly different impacts on mortality rates at different ages of the child. The model predicts that a significant number of under-five year deaths can be averted by providing access to electricity, improving the education of women, providing sanitation facilities and reducing indoor air pollution. In particular, reducing indoor air pollution and increasing the educational level of women might have substantial impacts on child mortality. Derose and Kulkarni (2005) using multi-level logistic analysis found community HIV rates, women's education and immunization as significant determinants of child mortality in Zambia. In Egypt, Aly and Grabowski (1990) used logit analysis to model child death probability using Egypt's World Fertility Survey in 1980.

They concluded that source of drinking water and sanitation was significantly and negatively related to child mortality. Woldemicael (1988) employed logistic regression to examine the effect of some environmental and socioeconomic factors that determine childhood diarrhoea in Eritrea using data from the 1995 Eritrea Demographic and Health

Survey (EDHS). The results show that type of floor material, household economic status and place of residence are significant predictors of diarrhoea.

In their study on Bangladesh, Bairagi et al.,(1999) using a duration model concluded that changes in mother's education, birth interval and birth order had little effect on mortality decline. Duration modeling was applied by Hala (2002) to assess water and sanitation impact on child mortality in Egypt and the results showed that access to municipal water decreases the risk of child mortality, but sanitation is found to have a more significant impact on mortality than water.

In Malawi, Baker (1999) and Espo (2002) used indirect methods to estimate levels and trends of mortality in Malawi. The main findings were that source of drinking water and sanitation facilities are strong predictors of infant mortality. Berger et al., (2002) analyzed the causes of under-five mortality in Zambia using Bayesian dynamic logit model for discrete time survival data and Markov-Chain Monte Carlo methods. The study showed that several variables, including the age of the mother and the breastfeeding duration exhibited distinct age-dependencies. In view of the foregoing, it is evident that the level of education of the mother, the place of residence of the family, the environmental facilities like source of water, nature of waste disposal facilities available to the family and the public infrastructural amenities found in the living areas play an important role in determining the survival of the children in the family.

2.2.1 Socio-economic determinants of child mortality

The survival of a child in the first and subsequent weeks and years depends on a number of socioeconomic, biological, environmental and cultural factors (Venkatacharya and Tesfay, 1986).

It has emerged from cross-country comparisons that mothers' education (Caldwell 1979, Mensch et al. 1983; Simmons and Bernstein, 1982) and together with the work of other

studies, have established a correlation between variables such as literacy, mother's place of residence and expenditure on health and infant and child mortality. Other factors such as personal hygiene of the mother and child, toilet facilities, safe water supply and prevalence of diseases in the environment also influence child survival.

In developing countries, background characteristics such as mother's literacy, urban or rural residence, and household economic status are likely to affect a child's condition at birth as well as its environment, thus affecting infant and child mortality (Hobcraft, et al., 1984; Mosley and Chen, 1984; United Nations, 1985)

Child mortality is caused mainly by childhood diseases and accidents. Whether children become ill depends to some extent on their nutritional level, their environment, and their mothers' preventive health-care behaviour. When children do become ill, their survival depends largely on the knowledge and behaviour of the adults who care for them on their access to health-care facilities. These factors are related in turn to background characteristics. The risk of accident is also closely related to background characteristics (Mosley and Chen, 1984).

Much recent demographic research on child health focuses on maternal education as a precursor to improved child health. Support for this hypothesis has come from large cross-national surveys conducted under the rubric of the World Fertility Surveys and the Demographic and Health Surveys (Bicego and Boerma 1991; Boerma, et al., 1991; Cleland and Kaufmann, 1993; Hobcraft, et al. 1984; Mensch et al., 1985).

Virtually all studies based on these two large data sets have shown strong correlations between maternal education and child health and survival. However, given the close link between education and other favourable socioeconomic conditions, researchers vary in the propensity of move beyond this correlation to argue that maternal education cause low child

mortality. Education is linked to family socioeconomic situation, which in itself is a determinant of child health. But, above and beyond this, maternal education is hypothesized to bring about certain changes in individual behavior that result in better child health. A recent review of the literature by Caldwell and Caldwell (1993) suggests two potential paths: (1) education improves child health solely by enhancing the use of modern health services; and (2) education results in a wide range of favourable behaviour- mostly connected with child-care that play a role in improving child health.

Empirical evidence for these paths, however, is rather weak and mixed. For example, if maternal education has a positive effect on child health by increasing the use of medical services, a greater effect of maternal education should be observed in urban areas, where better quality services are located. However, empirical research shows that the effect of maternal education is greater in rural areas than in urban areas (Caldwell, 1993; Schultz, 1993). Similarly, arguments regarding the reduction in diarrheal deaths with better implementation oral rehydration therapy by educated mothers fail to focus on the importance of this behavior to actual mortality.

A study sponsored by the World Health Organization (Victoria et al., 1993) suggests that although oral dehydration therapy reduces deaths due to dehydration for children with acute diarrhea, it fails to reduce deaths due to chronic diarrhea or dysentery. Historical research on mortality transition adds a further note of caution. Two arguments deserve special attention: First, composition analysis conducted by Cleland, et al., (1991) shows that between the 1970s (when World Fertility Surveys were conducted) and the 1980s (when Demographic and Health Surveys were conducted), female education increased and infant mortality decreased in twelve developing countries with comparative data. However, this decline in mortality occurred in all education groups with the result that differences in child mortality by maternal education remained relatively constant. Moreover, only a modest percentage of

the decline in child-mortality can be attributed to increasing education as reflected in the compositional change. Ten percent or less of the mortality decline in seven of twelve countries studied can be attributed to increasing education (Cleland et al., 1991).

Second, historical research documents situations in which high maternal education does not lead to differential improvement in child health; that is improvements in mortality seem to occur independent of improvements in female education. Preston and Haines (1991) found few differences by maternal education in infant mortality patterns in the United States at the turn of the century. Conversely, Kunstadter (1995), examining changes in mortality among Hmong in Thailand, shows that mortality can decline without concurrent improvements in education.

In the light of these caveats, it is important to reevaluate the link between maternal education and child health and to control for some key explanatory variables. In particular, it is important to recognize that educated mothers come from high socioeconomic strata and that controlling for socioeconomic status of the family is likely to attenuate the impact of maternal education on child health. Educated mothers also tend to live in more economically developed areas. Areas that are rich and powerful enough to have schools are probably also rich and powerful enough to have medical facilities (Palloni, 1981). Given the disproportionate concentration of educated women in cities and other advantaged regions, maternal education may be a proxy for better health systems as well as water and sanitation systems in inter-country comparisons.

For Latin America, Palloni (1981) has shown that literacy has a much greater influence on child mortality than on infant mortality. Instances of excess child mortality are associated with a disproportionate contribution of the complex of water-food-airborne diseases. At one level, simply persuading mothers not to cease giving food or drink to

children with diarrhea could be extremely beneficial; at another level, major improvements in sanitation and water supply are needed. As Palloni has argued, the extent of illiteracy in a society reflects not only the limitations of families, but more importantly limitations in the capacity to organize and mobilize to fulfill societal necessities. "From this point of view, the proportion illiterate in a population is less an indication of the fraction of mothers with inadequate knowledge to treat and feed a sick child or to challenge the authority of elders than a reflection of the degree of social and political maturity of the system above and beyond the amounts of wealth at its disposal and the degree of equality of its distribution" (Palloni, 1981: 643). Boone and Zhan (2006) employed logistic regression for analyzing child mortality in a cross-section of countries. The study found mother's and father's education as significant determinants of child mortality in poor countries.

Education also leads to female domestic autonomy (Dyson and Moore, 1993). Caldwell (1979) argues that in Nigeria, greater equality and autonomy between spouses undermines tradition feeding, priorities and thereafter results in a more equal distribution of food within families hence both mothers and children experience improved nutrition. Caldwell further suggests that educated women are better able to adapt innovative behaviours and can stand up to the mother-in-law's authority more than uneducated women can- this may help them acquire modern medical services and to practice new, more hygienic form of child care.

2.2.2 Proximate Maternal factors

Numerous studies have found a strong relationship between children's chances of dying and certain fertility behaviours. Typically, the probability of dying in early childhood is much greater if children are born to mothers who are too young or too old, if they are born after a short birth interval, or if they are born to mothers with high parity. Very young mothers may experience difficult pregnancies and deliveries because of their physical

immaturity. Older women may also experience age-related problems during pregnancy and delivery. For purposes of this analysis a mother is classified as 'too young' if she is less than 20 years of age and 'too old' if she is over 34 years of age at the time of delivery; a 'short birth interval' is defined as a birth occurring within 24 months of a previous birth; and a 'high-order' birth is one occurring after three or more previous births (i.e. birth order 4 or higher). For the short birth interval category, only children with a preceding interval of less than 24 months are included. Short succeeding birth intervals are not included, even though they can influence the survivorship of a child, because of the problem of reverse causal effect (i.e., a short succeeding birth interval can be the result of the death of a child rather than being the cause of the death of a child), (DHS 2008/9 Kenya).

A very young mother is biologically not fully mature to support pregnancy related complications hence raising the probability of complications during pregnancies. Further, a very young mother, being inexperienced may not be able to take proper care of the young infants. Besides, ages above thirty years also increases the risks of pregnancy complications because of increasing inflexibilities of the female reproductive organs (Mooley, 1991; Potts and Thapa, 1991).

Somoza (1980) in a study on child mortality in Columbia showed that the level of infant and child mortality is determined by age of mother, sex of the child, urban and rural residence and education of the mother. Age of the mother showed the expected U-shaped relationship with child mortality especially for infants.

The study also showed that children from multiple births are more than four times more likely to die during infancy and substantially more likely to die at older ages.

According to the Cambodia demographic health survey results of 2010, multiplicity of birth, birth order, birth interval and age of the mother among other factors, were found to be significant determinants of under-five mortality. The decline in under-five mortality between

2000 and 2010 was significantly positively related to a decrease in multiple births, a decrease of births of fourth or higher order (due to the decline in fertility over this period), an increase of birth interval >35 months, a decrease in the proportion of mothers age 40 or older, an increase in contraceptive use, an increase in antenatal care, and an increase in receiving two doses of tetanus injection during antenatal visits. The decline in under-five mortality was offset by an increasing proportion of second-order births (relatively to a decrease in births of third-order or of fourth order birth or higher), and by a decrease in birth interval 24-35 months (relatively to an increase of birth interval >35 months).

2.2.3 Proximate Environmental factors

In spite of the launch of the Millennium Development Goals with strong emphasis on Goal 4, focusing on reduction in child mortality, progress has been slow and static in some countries. (Black et al., 2003). It is increasingly being recognized that improvements in training and facilities alone may not reduce mortality significantly as child mortality is affected by several other factors. These factors include socio-economic and physical environments, delays in arrival of patients to health posts, available resources and health inequalities (Campbell et al, 2009; Nolan et al, 2001; Victora et al, 2003). Some of these effects are directly or indirectly related to the town or locality where a child lives (Pickett, 2001). A study in Mozambique found that higher under-five mortality was associated with the location of mother's residence in some provinces and these were not only related to environmental variables, but also to other variables such as income distribution, population density and distribution of basic infrastructure, including health facilities (Macassa et al., 2012).

Although there are studies that have described these trends (e.g., Carvalho and Wood, 1978; Sawyer, et al., 1987; Wood and Carvalho, 1988), there are few that have sought to explain them. Thus, little is known about both how and why rural-urban or intra-urban

differentials have changed over a period in which the development processes unfolded and levels of urbanization rose, women's educational attainment improved, and infrastructure spread, and income and wealth increased. For example, in a review of Brazilian studies on urbanization and health, Akerman et al. (1994) concluded that there were major gaps in understanding the relationship between urbanization and health in Brazil, which is similar to the situation in other developing countries (Harpham and Tanner, 1995).

For instance, childhood mortality among the slum residents in Kenya was estimated to be 151 deaths per thousand in 2000, compared to 95 for the whole of Nairobi and 117 among the rural population of Kenya (African Population and Health Research Center, 2002). Similar patterns have been reported in other African settings (Madise & Diamond, 1995). The relatively poor health outcomes among children living in poor slum settlements (African Population and Health Research Center, 2002; Kyobutungi et al., 2008; Ndugwa & Zulu, 2008); the fact that the majority of urban residents live in slum settlements (UN-Habitat, 2003); and the projections that more than half of Africans will live in urban areas by 2030 (United Nations, 2008) pose a new challenge in global and national efforts to reduce child mortality in Africa.

2.2.4 Health seeking behaviour

Mother's behaviour in seeking healthcare services either as a preventive or curative treatment is an important factor in determining child survivorship through the child's health and nutritional status, as well as through her own health. Women are known and considered all over the world as the first providers of health care in the home.

Parents in all societies raise their children in a way that is generally compatible with the demands of their physical environment, socio-economic conditions, demographic characteristics, and the belief system that has been ingrained in their society. Variation in

patterns of child rearing is associated with diversity in parent's control over these four dimensions of their environment.

Health-seeking behaviour also includes consulting a physician during the prenatal (for mother's immunization against tetanus), natal (place of delivery and help at delivery) and postnatal (immunization of the child) period, especially when disease Symptoms are apparent. Education of mother and father and their work status have strong effect on child survival in developing countries [Caldwell (1979) and Caldwell et al. (1983)]. In view of the above, mothers who have regular attendance to healthcare facilities tend to have successful deliveries and care of their children than those who lack the services in their locality. A study conducted in Pakistan found out that there was higher child mortality in deliveries conducted at home compared to that were done in public health care facilities (Ghulam, 1996).

2.5 Conclusion of Literature Review

In view of the above, it is evident that maternal age, education and the nature of place of residence have a negative influence in under-five mortality. Further, there exist variations between urban centres as far these factors are concerned and it is on this basis that this research will attempt to find out what variations exist in Nairobi, Dar-es-Salaam and Kigali in terms of determinants of under-five mortality.

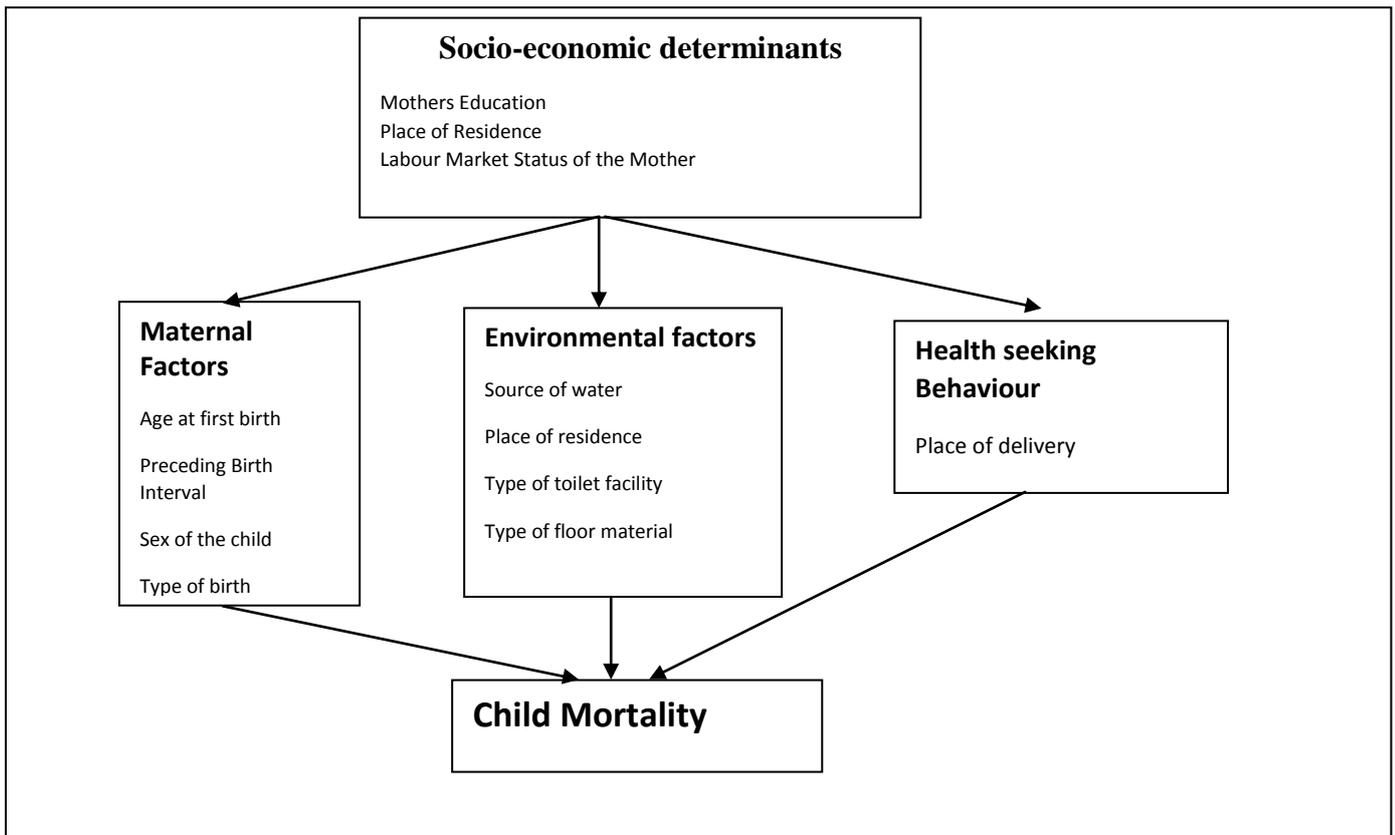
2.6 Operational Framework for analyzing the determinants of Child Mortality in the three Cities

The study will use the multi-disciplinary approach of Mosley and Chen (1984) to explain the determinants of child mortality in Nairobi, Dar-es-Salaam and Kigali. The major assumption here is that the family must solve the problem of how to satisfy the needs of its members with the available resources and hence, a pattern of behaviour is developed which constitutes the family's survival strategy. And that, all the decisions taken may affect directly or indirectly the survival of a child. The framework indicates on the one hand how socio-economic determinants acting at both family level and individual members operate through the proximate/intervening variables.

They are as follows:

- i. Maternal factors in the reproduction process such as age, fertility and spacing of births
- ii. Environmental contamination which encourages the spread of infectious agents and the incidence of infectious diseases.
- iii. Nutritional deficiency due to inadequate supply of nutrients for the child and mother during pregnancy.
- iv. Injuries to the child
- v. Practices in the care of healthy and sick children including both traditional and modern medicine.

Figure2: Operational Framework for the determinants of under-five mortality



Note: Adopted from Mosley and Chen (1984), page 9.

In figure 2 above, the conceptual framework shows that the socioeconomic conditions of life are a major determinants of child survival and that these determinants make their impact through a set of intermediate variables. Within this framework, child survival or child mortality occur from the social conditions and behaviour of families. For example, education works through maternal factors like status and choice of residence where there are facilities that ensure quality of water, electricity and type of housing are favourable to support life of its inhabitants. These conditions diminish when the level of education attainment is low and hence endangers the lives of the young ones owing to environmental conditions and their ability to control infections.

It is, therefore, evident that reduction in the survival probability of children in any society is due to the operation of socio-economic, environmental, biological and demographic factors.

The socioeconomic determinants have been isolated as independent variables which however, must operate through more basic determinants that in turn influence the risk of disease and at the end mortality.

2.7 Operational Hypotheses

1. Improved wealth status of a family reduces under-five mortality in Nairobi, Dar-es-salaam and Kigali.
2. Higher maternal education reduces chances of under-five mortality in Nairobi, Dar-es-salaam and Kigali.
3. Working mothers experience lower under-five mortality in Nairobi, Dar-es-salaam and Kigali.

2.8 Operational Definition of Variables and Concepts

1. Child mortality – refers to deaths among children aged between exact age one and under five years.
2. Infant mortality – refers to deaths that occur to children who were born alive between the time of birth and die before they celebrate their first birth day.
3. Maternal education level- refers to the highest level of formal schooling attained by the mother and recognizes no education, primary education and secondary level and above.
4. Mother's age –refers to the exact age of the mother at the time of the survey.
5. Source of drinking water- refers to the main source of water for use in the household.
6. Type of toilet facility- refers to the type of facility used to dispose human waste.
7. Type of floor material- refers to the type of floor material used on the floor in the household
8. Work status-this variable measures the respondent's current working status in relation to preferred waiting time for next birth.

CHAPTER THREE

STUDY DESIGN AND METHODOLOGY

3.1 Data Source

The data for the study was drawn from the Demographic and Health Surveys for Kenya, Tanzania and Rwanda. They were nationally representative surveys in which representative sample of 8444 women aged 15 to 49 were interviewed for the case of Kenya; 10,139 women for the case of Tanzania in 2010 and 13,671 women for the case of Rwanda in 2010. However, the study will use data collected from the capital cities of the three countries: Nairobi had 1044 women who participated in the survey, Kigali had 1021 women who participated in the survey and Dar-es-Salaam had 1051 women who participated in the survey.

3.2 Survey Design

For Kenya, a total of 9,936 households were selected in the sample, of which 9,268 were occupied at the time of fieldwork and thus eligible for interviews. Of the eligible households, 9,057 households were successfully interviewed, yielding a response rate of 98 percent. From the households interviewed, 8,767 women were found to be eligible and 8,444 were interviewed, giving a response rate of 96 percent. Interviews with men covered 3,465 men of the eligible 3,910 men, yielding a response rate of 89 percent. The response rates are generally higher in rural than in urban areas. However, the sample under study constituted 1044 women from Nairobi city.

The 2010 Tanzania Demographic and Health Survey (TDHS) is the eighth in a series of Demographic and Health Surveys conducted in Tanzania. The 2010 TDHS was a nationally representative survey of 10,300 households selected from 475 sample points throughout Tanzania.

All women age 15-49 in these households and all men age 15-49 in a subsample of one-third of the households were individually interviewed. However, the sample under study constituted 1051 women from Dar-es-Salaam city.

The 2010 Rwanda Demographic and Health Survey (RDHS) is designed to provide data for monitoring the population and health situation in Rwanda. The 2010RDHS is the fifth Demographic and Health Survey to be conducted in Rwanda. A nationally representative sample of 13,671 women, age 15–49 from 12,540 surveyed households, and 6,329 men, age 15–59 from half of these households were interviewed. This represents a response rate of 99 percent for women and 99 percent for men. The sample provides estimates at the national and provincial levels. However, the sample under study constituted 1021 women from Kigali city.

3.3 Sampling

The survey questionnaire utilized 3 types of questionnaires: A household questionnaire, a woman's questionnaire and a man's questionnaire. This study will use the women questionnaire captured in the child file.

3.4 Methods of Data Analysis

3.4.0 Introduction

This section discusses the major methods that were employed in data analysis: Frequency distribution and percentages, bivariate analysis and logistic regression.

3.4.1 Frequency Distributions

The Frequency distributions and percentages were used to show the distribution of children dead according to the various categories of the study variables. The frequencies give the first hand picture of preliminary findings of the study.

3.4.2 Bivariate Analysis

Bivariate analysis was used in the study to establish the effect of socioeconomic and proximate determinants on under-five mortality.

3.4.3 Logistic Regression

In order to ascertain the effects of the various socio-economic variables on the risk of under-five mortality, a multi-variate logistic regression analysis was applied. It was used in the study to assess the effects of socio-economic variables, the direction of their association and how they act through the proximate determinants of under-five mortality. In its basic form, the logistic regression model is shown as:

$$P = \frac{e^{a+bX}}{1 + e^{a+bX}}$$

Where

P = The probability of an event occurring

e = The base of natural logarithm, equal to 2.71828...

α and b= The coefficients of the model

x = The independent variables

The merits of using this method in the study can be stated as follows:

- i. It is flexible and can easily be adopted for use. It lends itself to a biologically meaningful interpretation.
- ii. It is a suitable method for estimating relative risk. The logit co-efficients are the natural logarithms of the relative odds by which the determinants of mortality are different for the risk of dying.

The main assumptions of Logistic regression are:

1. The dependent variable is normally distributed
2. The sample studied is large enough and randomly drawn
3. The effect of each explanatory variable is the same irrespective of the effect of any other variable unless interaction terms are introduced.

3.4.4 Recoding of Variables

For ease of analysis using logistic regression, table 1 indicated the recorded variables used in the study. It was necessary to combine mothers who had secondary education and those of higher education in one category due to relatively small number of mothers in the latter group and also to achieve harmony in analysis for the three cities. The categories were no education, primary and secondary plus. Mothers' occupation was not recoded, but was used as it appears in the data set- not working and working. Two bio-demographic variables have been used in the analysis as controls. Maternal age at birth was recorded as among <20, 20-34 and 35+, giving rise to three categories.

Preceding birth interval was grouped as <24 months to represent short birth interval, while >24 months and more to represent long birth interval from the past age in century months computed. Three environmental variables were used as proximate variables of under-five mortality: Source of drinking water was recorded into two viz., piped water to represent all the respondents who drew their water from piped water and un-piped water to represent other forms of non-piped water. Toilet facility was recorded into 'have toilet' for those respondents who had the different forms of flush toilets combined and 'no toilet' for those respondents who had latrines and others. Type of floor material was grouped into three: poor, average and good to represent the various categories as used in the original data set.

Table 1 Characteristics of the study population by background variables

Variable	Variable Code	Operational Definition	Role of variable
Child dead	Recoded	0=Alive 1= Dead	Dependent Variable
Maternal Educ.	V106	1=No education 2=Primary 3=Secondary	Independent variable Socio-economic
Wealth Index	V190	1=Poor 2= Rich 3= Richest	Independent variable Socio-economic
Mother's working status	V714	1=Not working 2=Working	Independent variable Socio-economic
Maternal Age at first birth	Computed	1= <20 2= 20 – 34 3= 35+	Proximate determinant- Maternal factor
Preceding Birth Interval	B11	< 24=Short > 24=Long	Proximate determinant- Maternal factor
Sex of the child	B4	1= Male 2= Female	Proximate determinant- Maternal factor
Type of birth	B0	1= Single 2= Multiple	Proximate determinant- Maternal factor
Sex of the child	B4	1= Male 2= Female	Proximate determinant- Maternal Factor
Type of floor material	V127	1= Poor 2= Average 3= Good	Environmental variable
Type of toilet	V116	1=Have toilet 2=No toilet 3= Missing	Proximate determinant Environmental variable
Source of drinking water	V113	1= piped water 2= No pipe water	Proximate determinant Environmental variable
Place of Delivery	M15	1= Home 2= Public facility 3= Private medical facility	Health seeking behaviour Control

CHAPTER FOUR

SOCIO-ECONOMIC DETERMINANTS OF UNDER-FIVE MORTALITY

4.0 Introduction

This section looked at the summary of socio-economic determinants of under-five mortality arising from the combined analysis of the data obtained from the DHS for the three cities concerned: Nairobi, Dar-es-Salaam and Kigali. It gave the outcome of the findings from descriptive statistics through frequencies in a table form highlighting the variables involved, and Logistic regression results.

4.1.0 Distribution of births by the study variables

Table 2 below summarizes the frequencies and percentages of the variables used in the study of the three cities.

Table2 Combined frequencies and percentages of variables for the cities

Variable	Operational Definition	Frequencies	Percentages
Child dead	0=Alive	1530	95
	1= Dead	81	5
Wealth Index	1= Poor	49	3
	2= Rich	217	13.5
	3= Richest	1345	85.5
Maternal Education	1=No education	111	6.9
	2=Primary	847	52.6
	3=Secondary	653	40.5
Mother's working status	1=Not working	606	37.6
	2=Working	1004	62.4
Maternal Age at first birth	1= <20	173	10.8
	2= 20 – 34	1221	76
	3= 35+	185	11.5
Preceding Birth Interval	1= < 24=Short	247	24.5
	2= > 24=Long	762	75.5

Sex of the child	1= Male	843	52.3
	2= Female	768	47.7
Type of birth	1= Single	1567	97.3
	2= Multiple	44	2.7
Source of drinking water	1=Piped water	1158	71.9
	2=Non piped water	301	18.7
Type of toilet	1=Have toilet	445	28.3
	2=No toilet	1127	71.7
Type of floor material	1= Poor	367	23.3
	2= Average	4	0.3
	3= Good	1204	76.4
Place of Delivery	1= Home	221	15
	2= Public facility	980	66.4
	3= Private medical facility	274	18.6

Tables 2 above, 1611 children of under-five years were covered in the survey from a sample of 3286 women who participated in the 2008/09 survey. Of the under-five children whose mothers reported their cases, 81 children accounting for 5% experienced death while 1530 (95%) of the children were alive.

Of the children whose mothers participated in the survey, 1345 (85.5%) were in the upper quintile of the wealth index while 217 (13.5%) were in the second quintile of the rich and only 49 (3.0%) children were in the lower quintile of the poor according to how the variable was recorded for this study.

As concerns the highest level of education, 847 (52.2%) children were reported to have mothers who had attained primary education while 653 (40.5%) of the children had their mothers who had attained secondary education and above. Children whose mothers had no education were 111 which accounted for only 6.9% of the total number of children who participated in the survey.

Concerning job participation by the mothers whose children were covered in the survey, 1004 (62.4%) children belonged to mothers who were working while 606 (37.6%) were from homes where mothers were not engaged in any form of labour. On the other hand, 1221 (76.0%) of the children were given birth to by mothers who were aged between 20-34 years while 185 (11.5%) children were from mothers who were aged 35 years and above and only 173 (10.8%) children belonged to mothers who were age twenty years and below.

A total of 762 (75.5%) children were born to mothers who had long preceding birth interval while 247 (24.5%) of the total were from mothers who had experienced short preceding birth interval. In addition, of the children whose mothers participated in the survey, a total of 843 (52.3%) were males while females were 768 (47.7%). Further, a total of 1567 (97.3%) of the children who were covered in the interview were children born through single births while only 44 (2.7%) constituted those who were born through multiple births.

Of the children whose mothers were interviewed, a total of 1158 (71.9%) were from families where their mothers had piped water while 301 (18.7%) were from mothers who used water from other sources such as well, rivers and ponds among others. Further, of the children whose mothers participated in the survey, a total of 1127 (71.7%) came from families which had no toilets while only 445 (28.3%) were from families which had proper toilets. Besides, a total of 1204 (76.4%) children came from homes with good houses which had proper floors, a further total of 367 (23.3%) were from homes with poor houses which had poor floor materials and from the total of these children only 4 (2.3%) came from homes which had an average floor.

Place of delivery was also important in this study; a total of 980 (66.4%) children were delivered through public health facilities and a further 274 (18.6%) were delivered from private health facilities, but only 221 (15.0%) of the total were given birth to at home.

4.1.1 Distribution of births by cities

Table 3: Number of children born in the three cities

City	Child Alive	Child Dead	Total
Nairobi	396	18	414
Kigali	947	43	990
Dar-es-Salaam	187	20	207

Table 3 above gives a summary of the total number of child born who were alive at the time of the survey and those that had experienced death during the five year period preceding the survey. Of the three cities covered in this study, the city of Kigali had the highest number of children totaling to 947 (58.8%) who were alive, followed by Nairobi which had 396 (24.6%) and the city of Dar-es-Salaam had the least number of 187 (0.1%) of the total children who were reported alive.

Among the children who were reported dead, Kigali city still accounted for the highest number of children who had died during that period. A total of 43 (53.1%), 20 (24.7%) and 18 (22.2%) of the reported dead were for Kigali, Dar-es-Salaam and Nairobi respectively. It is noted that Nairobi had the least number of the children dead.

4.1.2 Socio-Economic Variables

In regard to the wealth index, 30% of the children were in the lower category of poor, while 13.5% and 85.5% were found in the rich and the richest categories respectively.

According to the highest level of education of their mothers, 6.9% of the children were in the no education category, 52.6% were in the primary category while 40.5% were in the category of secondary education and above.

For women labour participation, 37.6% of the children belonged to the category of women who not working and 62.4% were in the category of women who were working.

4.1.3 Proximate Determinant Variables

Among the proximate determinants which were considered in the study, children who belong to mother of ages under twenty were 10.8%, while those who belong to mothers of ages between 20-34 years constituted 76.0% and those that belonged to ages greater than 35 years and above constituted 11.5% of the total population involved in the survey.

Children who had short preceding birth interval constituted 24.5% of the total population in the study, while those had long preceding birth interval were 75.5% of the total population in the study. Among the children in the study, 52.3% were males while females constituted 47.7% in the sample under study.

The percentage of children whose mothers had a single birth was 97.3% compared to 2.7% of the children whose mothers had multiple births. Further, of the children who participated in the survey, 71.9% were living in homes where their mothers had an access to piped water while 18.7% of them had their mothers living in homes which did not have piped water.

In addition, 28.3% of the children were from homes with toilets while 71.7% came from homes which did not have toilets. Children who came from homes with poor floor material constituted 23.3% while those who came from homes with at least an average floor material made from bamboo and other wood materials constituted 0.3% and those whose mothers had good floor material constituted 76.4% of the total population who were included in the survey.

Children whose mothers experienced delivery at home were 15.0%, while those whose mothers delivered in a public facility constituted 66.4% and the children whose mothers delivered in a private facility were 18.6%.

4.2.0 Bivariate Analysis

The bivariate analysis in the succeeding sub-sections gives the results of each socioeconomic variable, maternal and biological variables, household environmental variables and health-seeking behaviour variable to establish their effect on the dependent variable, under-five mortality.

4.2.1 Socio-economic Variables and Under-five mortality

Table 4 Bivariate results for social economic determinants of under-five mortality

Variables	B	S.E.	Sig.	Exp(B)
Wealth Index				
Poor (Reference)				
Rich	-0.907	1.018	0.373	0.404
Richest	0.29	0.304	0.34	1.336
Highest level of education				
No education (Reference)				
Primary	0.407	0.436	0.35	1.502
Secondary +	0.248	0.246	0.312	1.282
Labour participation of the mother				
Not working (Reference)				
Working	-0.237	0.244	0.331	0.789

Key: B- Coefficient for constant, S.E- standard error, Sig- significant, ExpB- odds ration

Noting that the dependent variable, under-five mortality was dichotomous, binary logistic regression model was applied to examine the influence of socio-economic variables on under-five mortality in three major cities of East Africa viz., Nairobi, Kigali and Dar-es-Salaam.

Table 4 above, the three socio-economic determinants used in the model as defined by Mosley and Chen framework of 1984 were not significant. However, under-five children from the rich families in these urban centres were less likely to die before age five compared to those who hailed from poor families. Nevertheless, under-five children from the richest families had a slight risk of dying before age five, but the influence was not significant.

On the other hand, under-five children whose mothers had primary education were likely to die more than those whose mothers had no education. Further, those children who had their mothers having a secondary education and above showed the slightest risk of dying before they attained the age of five. Besides, under-five children whose mothers were working were less likely to die before attaining age five than those whose mothers were not working.

4.2.2 Maternal, and Biological Variables and Under-five mortality

Table 5 Bivariate results for maternal and biological and under-five mortality

Variables	B	SE	Sig.	ExpB
Birth type Single (Reference)				
Multiple	- 1.515 ***	0.409	.000	.220
Age at first birth <20 (Reference)				
20-34	- 1.455**	0.650	0.025	0.233
35 +	- 0.325	0.315	0.297	0.720
Preceding birth interval Short (Reference)				
Long	- 0.032	0.354	0.927	0.968
Sex of the Child Male (Reference)				
Female	0.405	0.234	0.084	1.499

This study also looked at the influence of proximate determinants under maternal and biological variables in the absence of socio-economic variables to ascertain their impact on under-five mortality. As shown in Table 5 above, having multiple births was statistically significant at $p=0.000$ and that it had 0.220 odds of reducing under-five mortality than those parents who experienced single births. In addition, the age of the mother at first birth was also

found to statistically significant at $p=0.025$ if the mothers had ages between 20-34 years and that the children born to such mothers were less likely to die than those whose mothers were below 20 years of age. Further, children born to mothers who had their ages from 35 years were also less likely to die before attaining age five though it was not significant.

Long birth interval was not significant, however it showed that it can reduce the risk of under-five mortality in these cities compared to short birth intervals. On the other hand, the sex of the child, whether male or female, was not significant in influencing under-five mortality in the urban centres under study.

4.2.3 Household Environmental Variables and Under-five mortality

Table 6 Bivariate results for household environmental variables and under-five mortality

Variables	B	SE	Sig.	ExpB
Environmental factors Source of water Piped(Reference)				
Non-piped	- 0.157	0.293	0.591	0.854
Type of toilet facility Have toilet(Reference)				
No toilet	0.130	0.247	0.600	1.138
Type of floor material Poor(Reference)				
Average	0.077	0.265	0.771	1.080
Good	-18.272	20096.485	0.999	.000

This study also looked at the influence of environmental factors on under-five mortality in the three cities covered under this study in the absence of socio-economic factors. The study found out, as depicted in Table 6 above, that the source of water, the type of toilet facility and the type of floor material were not significant in influencing under-five

mortality in the three cities. However, children who are born and brought up with mothers who had no access to piped water were less likely to die before attaining age five than those whose mothers had access to piped water.

On the other hand, children who were born to mothers who had no access to proper toilets were more likely to die than those whose mothers were using proper toilet facilities. Further, those children who hailed from homes which had an average floor material such as wood planks and bamboo were likely to die as those who lived in houses with poor floor material, but children who came from homes with good floor material were less likely to die than those with poor floor material.

4.2.4 Health seeking Behaviour and Under-five mortality

Table 7 Bivariate results for health seeking behaviour and under-five mortality

Variables	B	SE	Sig.	ExpB
Type of place of delivery				
Home (Reference)				
Public facility	- 0.075	0.548	0.891	0.928
Private facility	0.602	0.387	0.120	1.825

Mosley and Chen (1984) framework identified the behaviour of the mother in seeking health matters as an important factor in determining under-five mortality in urban centres as shown in figure 7 above. Nevertheless, the study found out that the place of delivery of the mother without the influence of socio-economic factors is insignificant. Besides, the study revealed that children who were given birth to in public facilities were less likely to die before attaining the age of five than those who were born at home. Alternatively, those children who were born in private facilities showed a slight risk of dying before age than those born at home.

4.3.0 Multivariate Analysis

Model 1 gives the results of the combined effect of socio-economic determinants on the dependent variable. None of the determinants was found to be significant to explain their direct influence on under-five mortality. There was need therefore to fit them in the second model to establish whether they act through the proximate determinant variables to influence under-mortality anyway. This was vital in fulfilling the objectives of this study.

Table 8 Multivariate fitted model and under-five mortality

Variables	Model 1				Model 2			
	B	S.E.	Sig.	Exp(B)	B	S.E.	Sig.	Exp(B)
Wealth Index								
Poor (Reference)								
Rich	-1.087	1.026	.289	-1.087	-17.710	6883.750	0.998	0.000
Richest	.109	.330	.742	.109	0.873	0.684	0.202	2.395
Highest level of Education								
No education (Reference)								
Primary	.455	.465	.328	.455	0.171	0.696	0.806	1.186
Secondary +	.298	.260	.251	.298	0.295	0.439	0.502	1.343
Labour participation of the mother								
Not working (Reference)								
Working	-.245	.248	.323	-.245	0.245	0.375	0.513	1.278
Type of birth								
Single (Reference)								
Multiple					-1.894***	.639	.003	.150
Age at first birth								
< 20(Reference)								
20-34					-19.043	8087.967	.998	.000
35 +					-.894**	.408	.028	.409
Source of water:								
Piped(Reference)								
No piped water					.232	.491	.637	1.261
Birth Interval								
Short (Reference)								
Long					.340	.386	.379	1.405
Type of toilet facility								
Have Toilet (Reference)								
No toilet					1.013**	.466	.030	2.754

Type of floor material									
Poor (Reference)									
Good					.004	.633	.995	1.004	
Place of delivery;									
Home-Reference									
Public facility					.899	.744	.227	2.458	
Private facility					1.195**	.612	.051	3.303	
Sex of the child									
Male (Reference)									
Female					.286	.358	.423	1.331	

** Significant at $p < 0.05$ *** Significant at $p < 0.001$

4.3.1 Multivariate Models Fitted

Since the socio-economic determinant variables were insignificant in explaining the influence they had on the dependent variable and to achieve the objective of this study that rests on the tenet that socio-economic determinants act through the proximate determinant variables to influence child mortality as explained in the Mosley and Chen framework of 1984, it was incumbent for this study to fit the second model to establish whether socio-economic determinant variable act through the proximate determinant variable to influence child mortality. Also, it was important to find out which of the proximate determinant variables do socio-economic determinant variables work through if any.

Table 8 above, the multivariate analysis results show that under Model 2 which encompassed socio-economic and proximate determinant variables of under-five mortality found out that under-five children born from multiple births had a negative significant influence at $p = 0.003$ on under-five mortality and that children born from multiple births were less likely to die when they are born to families with better wealth, better education and where the mother is working than to under-five children who hailed from mothers who were from poor families, from no education backgrounds and from mothers who were not working. Besides, age of the mother at birth was also found to be statistically significant at $p = 0.028$ for mothers with ages from 35 years and above. Their children were less likely to die before age

five if their mothers had enough wealth to provide for their needs, had better education and were working altogether.

Having no toilet was also positively statistically significant at $p=0.030$, an indication that it strongly influences under-five mortality in the three cities of East Africa. Children born to mothers who had no access to proper toilets were more likely to die than those born from families with toilets irrespective of their wealth status, education attainment and whether they are working or not.

Place of delivery was also statistically significant at $p=0.051$ indicating strong influence on under-five mortality. Under-five children born to mothers who attended a private health were more likely to experience death than those who were born from home.

Other factors such as source of water, birth interval, and type of floor material and the sex of the child were not significant, but showed that they were more likely to increase chances of under-five mortality in the three cities of East Africa

4.3.2 Discussion of Results

The study used survey data from DHS for Nairobi, Kigali and Dar-es-Salaam on 1611 children aged 0 months to 59 months who had been given birth to in the five years preceding the survey. The study generally wanted to find out the influence of socio-economic factors on under-five mortality in Nairobi, Kigali and Dar-es-Salaam noting that under-five mortality has remained high in major urban centres of sub-Saharan Africa.

The bivariate analysis showed that variables such as the type of birth- whether single or multiple, and the age at first birth were significantly associated with under-five mortality in the combined data set for the three cities. Under-five children who were born to mothers who experienced multiple births were less likely to experience mortality during their first five years of life than those who were born to mothers who had single births in the three cities.

This outcome contradicts findings by the Cambodia DHS that found out that multiplicity in births contributed to high under-five mortality. This result can be attributed to the small number of under-five children who were reported to have been born through multiple births and that when the confounding factors of socio-economic determinants were introduced in the model, it was found to be still positive and significantly associated with under-five mortality. This could be partly explained by the fact that if they were born among the richest quintile, then the mothers had the resources to provide adequate health services at all times hence increasing their chances of survival compared to those who were born through single births.

Age at first birth was statistically significant at $p=0.025$ indicating a strong influence on under-five mortality in the three cities combined despite having a negative association with it. This outcome confirms literature that asserts that under-five mortality more likely to occur among mothers whose ages are below 20 years than it is in women whose ages are between 20 and 34 years. This result further confirms that even though women aged 34 and above did show any significant influence on under-five mortality, it had a negative association with under-five mortality. Indications that women in these ages were more likely to experience decrease under-five mortality compared to those whose ages were below 20 years. This is confirmed by Mooley, 1991; Potts and Thapa (1991) who argued that a very young mother is biologically not fully mature to support pregnancy related complications hence raising the probability of complications during pregnancies.

Further, a very young mother, being inexperienced may not be able to take proper care of the young infants. Besides, ages above thirty years also increases the risks of pregnancy complications because of increasing inflexibilities of the female reproductive organs. Other variables at the bivariate analysis were insignificant in their influence on under-

five mortality despite showing either positive or negative association with under-five mortality.

In model 1, the first multilevel analysis was done to ascertain the influence of socio-economic factors on under-five mortality, but the results showed none of the factors: the wealth status of the family, the highest education level of the mother and the labour participation of the mother were not statistically significant to act alone towards determining the level of under-five mortality. This confirms what Mosley and Chen framework on determinants of child mortality that socio-economic factors act through proximate determinants to influence under-five mortality.

In model 2, multivariate analysis was reintroduced to ascertain the influence of socio-economic determinants through the proximate determinants to determine under-five mortality in the three cities under study. The results indicate that the type of birth, the age at first birth, the type of toilet facility and the place of delivery were statistically significant at $p=0.003$, $p=0.028$, $p=0.030$ and $p=0.051$ respectively. This indicates that the socio-economic determinants act through the maternal factors, environmental and health seeking behaviour factors to strongly influence under-five mortality in the three cities under study.

This is confirmed by literature when Mosley and Chen (1984) asserted that all social and economic determinants of child mortality necessarily operate through a common set of biological mechanisms, or proximate determinants (intermediate variables) to directly influence the risk of mortality. It further assumes that socioeconomic determinants (independent variables) must operate through more basic proximate determinants that in turn influence the risk of disease and the outcome of disease processes and concludes that only infrequently is a child's death the result of a single isolated episode (Mosley and Chen, 1984).

Depending on where a child is born and to the family it is born, these factors influence their survival rates; children born in environments where conditions of the environment is good and well taken care of survive more than those born in deplorable environments like slum areas of urban centres where contamination of the environment, lack of quality water for domestic use and limited toilet facilities are a characteristic.

Popkin, 1975; Kumar, 1977 further add that the consequences for infant health and mortality depend largely upon the general economic circumstances of the household. For poor families, a mother's outside work may result in child neglect or care by a less skilled sibling, while a wealthy family may hire a skilled and attentive nursemaid thus reducing the chances of under-five mortality.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This section will be presented in three parts namely summary, conclusion and recommendations.

5.1 Summary of findings

This project attempted to examine the effects of socio-economic determinants on under-five mortality in Nairobi, Kigali and Dar-es-Salaam. The study used a combined data for the three cities to achieve this objective.

The study found out that the type of birth, whether single or multiple, was negatively associated with under-five mortality in the three cities under the study. An indication that under-five children born to mothers through multiple births were less likely to experience mortality before their fifth birth day. This is a unique outcome from what many research studies have found out, but it is possible from the researcher's findings that despite the small number of multiple births reported for the three cities, it can occur that such births when they occur in towns tend to receive maximum attention from their mothers and relatives to the extent that all the twins or the triplets are able to survive to their fifth birthday. Alternatively, when such births occur in families with high socio-economic status, then the children who are products of such births tend to live long to surpass their fifth birthday since their mothers can adequately provide for their needs just having one child.

In addition, the study also revealed that the age of the mother at birth was an important factor in determining under-five mortality in the cities under study. This finding that under-five children born to mothers in ages less than 20 years were more likely to

experience high mortality compared to those who were born to mothers whose ages were between 20-34 years.

Nevertheless, this study found out that mothers whose ages were 35 years and above were less likely to contribute to under-five mortality in the three cities than those whose ages were in the middle at 20- 34 years of age. At the bivariate analysis level, women whose ages ranged between 20 to 34 years were significant at $p=0.025$, while when the socio-economic factors were fitted in the model, this level was insignificant in predicting the outcome. At multivariate analysis, the third category of women whose ages were 35 years and above was statistically significant thus indicating that the age of the mother has an important influence in the under-five mortality experienced in the three cities.

This study further revealed that under-five children whose mothers did not have proper toilets were most likely to experience under-five mortality in the three cities under study than those children who come from households with proper toilets. This finding is confirmed by Hala (2002) who found out in a study that was carried out in Egypt that access to water and proper sanitation impact on child mortality and that access to municipal water decreases the risk of child mortality, but sanitation was found to have a more significant impact on mortality than water. Access to proper toilet facilities help to improve on sanitation thus reducing the occurrence of under-five mortality.

This study also found out that place of delivery was also statistically significant in explaining under-five mortality in the three cities covered in the study. Under-five children who were delivered in private facilities were more likely to die than those who had their births at home. This outcome contradicts what is known in literature that deliveries done at are at high risk of death than those done in health facilities. This can partly be explained by the findings of Chinkhumba et al (2014) that pregnant mothers delivering in facilities have a

significant higher risk of experiencing a maternal death and so to their newborns, than women delivering at home because those seeking care at facilities may be complicated cases with higher risk of mortality. They further assert that in such settings, higher mortality at facilities would be expected due to high risk selection.

5.2 Conclusion

The study intended to establish the influence of socio-economic determinants on under-five mortality in Nairobi, Kigali and Dar-es-salaam. It found out that the wealth of a family, the education of the mother and the work status of the mother play an important role in the choice of place of residence that will ensure easy access to proper toilet facilities, healthcare services and late entry into marriage owing to the level of education of the mother, to influence under-five mortality in the three major cities of East Africa. This study confirms the theory of Mosley and Chen(1984) in explaining that socio-economic factors of the household act through the proximate determinants such as maternal factors, environmental factors and health-seeking behaviour to influence under-five mortality in cities of East Africa.

5.4 Recommendation

5.4.1 Recommendations for policy

The governments of the three cities in the study should encourage compulsory education up to secondary level in order to delay early marriages. This will help the girl-child to experience child birth after attaining the age of twenty and above. This will further help in increasing their knowledge in health issues, a factor that will lead to reduced under-five mortality in the cities. Having higher education will also increase chances of mothers participating in labour opportunities which lead to women empowerment and their decision making moreso in the choice of health matters.

5.4.2 Recommendation for further research

There is need to find out the underlying reasons explaining the likelihood of under-five mortality in private health facilities across cities of East Africa because the study revealed that children born from private facilities are more likely to experience death before age five than those born at home.

Besides, there is need to reassess the data relating to type of toilet facility used in the three cities. The study revealed that slightly over seventy percent of the children under study came from households with no proper toilets, yet eighty five percent of them were from households in the richest quintile of the wealth index.

REFERENCES

- African Population and Health Research Center (2002) Population and Health Dynamics in Nairobi's Informal Settlements. African Population and Health Research Center, Nairobi (Kenya)
- Aly H.Y., R. Grabowski (1990), 'Education and child mortality in Egypt', *World Development*, **18**: 733-742.
- Aminzadeh, K. et al., (2013). Neighbourhood social capital and adolescent self-reported wellbeing in New Zealand: a multilevel analysis. *SocSci Med*, 84, 13-21...
- Anker and Knowles (1997), An Empirical Analysis of Mortality Differentials in Kenya at Macro and Micro levels, Population Paper No. 60. International Labour Office, Geneva. 1977.
- Akerman, Marco, Carolyn Stephens, Paulo Campanario, and Paulo Borlina Maia. (1994) "Saúde e meio ambiente: Uma análise de diferenciais intra-urbanos enfocando o município de São Paulo, Brasil," *Revista Saúde Pública* 28(4): 320–325.
- Ashford, L. S. (1995), New perspective on population: Lessons from Cairo, *Population Bulletin*. Vol. 50, No. 1 March 1995. The Population Reference Bureau, Washington D.C.
- Bairagi, R., et al. (1999): "levels, trends and determinants of child mortality in Matlab, Bangladesh, 1966-1994," *Asia-pacific population journal*, 14, 51-68.
- Baker, R. (1999) 'Differential in Child Mortality in Malawi', Social Networks Project Working Papers, No. 3, University of Pennsylvania.
- Becares, L. et al. (2013). Ethnic density and area deprivation: Neighbourhood effects on Maori health and racial discrimination in Aotearoa/New Zealand. *Soc Sci Med*, 88, 76-82.
- Bicego, G and Ahmad B. Omar (1996), *Infant and Child Mortality*, Macro International Inc. Calverton, Maryland USA.
- Bicego G. et al. (1997) *Survey on adult and childhood mortality, Tanzania 1995*, Macro International Inc. Calverton, Maryland USA.

- Becher, H. (2010). Analysis of Mortality Clustering at member HDSSs within the INDEPTH Network-an important public health issue. *Global Health action Supplement 1*, 3-7.
- Berger, U., Fahrmeir, L. & Klasen, S. (2002): Dynamic Modelling of Child Mortality in Developing Countries: Application for Zambia.SFB 386 Discussion Paper 299, University of Munich, Germany.
- Birdsall, N., and W. P. Greevey. (1978). "The second sex in the Third World: Is female poverty a development issue?" Summary of Workshop on Women in Poverty, International Center for Research on Women, Washington D.C.
- Black et al., (2003) "Where and why are 10 million children dying every year?" *Lancet* 2003, 361:2226-2234
- Blacker, J. (1979) "Report on the Analysis of the Kenya National Demographic Survey" Unpublished (1979)
- Boerma, J. T., et al. (1991). Child Morbidity and Treatment Patterns. DHS Comparative Studies, No. 4 Columbia, MD: IRD/Macro International, Inc.
- Boone P. and Zhan, Z. (2006). Lowering Child Mortality in Poor Countries: The Power of Knowledgeable Parents, LSECEP Discussion Paper 751.
- Briscoe, John. (1983). "Water supply and health in developing countries: Selective primary health care revisited." Paper presented at the International Conference on Oral Rehydration Therapy, USAID, WHO, UNICEF, and International Centre for Diarrheal Disease Research, Washington, D.C., 7-10 June.
- Caldwell J. and McDonald, P. (1981) Influence of maternal education on infant and child mortality: levels and causes. *Int. Popul. Conference (Manila)*, 2, 79.
- Caldwell, J. C. et al. (1993) "Women's Position and Child Mortality and Morbidity in Less Developed Countries." Pp 122-39 in *Women's Position and Demographic Change*, edited by N. Federici, K. O, Mason, and S. Sogner. Oxford: Clarendon Press.
- Caldwell, J. C. (1979) "Education as a factor of mortality rates." *International Journal of Health Services*, Vol. 33, 1979.

- _____ (1979) "Education as a factor in mortality decline: An Examination of Nigerian Data". *Populations Studies* 35(3) PP. 395-414 Simmons, G.B, Berstein, S.
- (1992) The Education status of parents and infant and child mortality in rural North India in *Health Policy and Education* 2(34), PP. 349- 367.
- Cambodia Demographic and Health Survey (2010) National Institute of Statistics
- Campbell, et al., (2009) "Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000" for the Child Health Epidemiology Reference Group of WHO and UNICEF.
- Carvalho, J. A. M. and C. Wood. (1978) "Mortality income distribution, and rural-urban residence in Brazil." *Population and Development Review* 4:405–20
- Chinkhumba et al., (2014) Maternal and perinatal mortality by place of delivery in sub-Saharan Africa: a meta-analysis of population-based cohort studies. *BMC Public Health* 2014;14(1):1014.
- Coale, A. J. and F. Lorimer (1967), "Summary Of Estimates of Fertility and Mortality." In W. Brass and A. J. Coale, (eds), *The Demography of Tropical Africa*. Princeton, N. J, Princeton University Press.
- Cleland, J., et al. (1991). "Socio-Economic Inequalities in Childhood Mortality: The 1970's Compared With the 1980's." Pp. 135-54 in *Proceedings of the Demographic and Health Surveys world Conference*, Vol. 1. Columbia, MD: IRD/Macro International, Inc.
- Cleland, J. and G. Kaufmann (1993). "Education, Fertility and Child Survival: Unravelling the links." Paper presented at the workshop of International Union for Scientific Study of the Population, held in Barcelona, November 10-14.
- Cleland, J. (1990). "Maternal Education and Child Survival: Further Evidence and Explanations." Vol. 1. Edited by J. Caldwell et al. Canberra: Health Transition Centre, The Australian National University.

- Cramer, James, C (1987) Social Factors and Infant Mortality: Identifying high risk groups and proximate causes. *Demography* (Alexandria, Virginia), Vol., 24, No 3 (August) PP.229-332.
- Davanzo and Habitch B.P. (1983), "How biological and Behavioural influence on mortality vary in Malaysia during the first year of life" *Population Studies*, 37 (3)PP. 381-402.
- Davanzo Julie and Habicht Jean Pierre (1984), "What accounts for the decline in infant mortality in Peninsular Malaysia, 1946-1975?" The Rand Corporation, Santa Monica.
- Derose, L. F. and Kulkarni, V. (2005) Community-level effects on infant and child mortality in Zambia, with special attention to HIV prevalence. USA: Department of Sociology and Maryland Population Research Center, University of Maryland, College Park.
- Dyson, Tim and Mick Moore (1983). "On kinship structure, female autonomy, and demographic behavior in India," *Population and Development Review* 9, no. 1: 35-60.
- Engle, P. L. 1981. "Maternal care, maternal substitutes and children's welfare in development and developing countries." Papers prepared for Policy Roundtable, International Center for Research on Women, Washington D.C
- Espo, M. (2002) 'Infant Mortality and its Underlying Determinants in Rural Malawi', Dissertation, University of Tampere Medical School.
- Ewbank, D. C et al. (1986) An Intergration of Demographic and Epidemiology research on mortality in Kenya PP 33-85 in *Determinants of mortality change and differentials in developing countries*. New York United Nations.
- Fotso, J. (2007) *Child Health Inequalities in Developing Countries: Differences across Urban and Rural Areas*. *International journal for equity in health* 9:5.
- Garenne M. & Gakusi E. (2006) Health transitions in sub-Saharan Africa: overview of mortality trends in children under 5 years old (1950–2000). *Bull World Health Organisation* 84, 470–478.

- Ghulam (1996) “Mother’s Health-seeking Behaviour and Childhood Mortality in Pakistan”
The Pakistan Development Review 35: 4 Part II (Winter 1996) pp. 719— 731.
- Hala, A. (2002) ‘The effect of water and sanitation on child mortality in Egypt’,
Environmental Economics Unit, Department of Economics, Gothenburg University.
- Harpham, Trudy, and Marcel Tanner. 1995. Urban health in developing countries: Progress
and prospects. London: Earthscan.
- Hmwe H. et al. (2013). Association of Urban Slum Residency with Infant Mortality and
Child Stunting in Low and Middle Income Countries.
- Hobcraft J. N. et al. (1984) Socio economic factors in infant and child mortality: Across-
National Comparison. Population Studies (London), Vol. 38, No. 2 (July) PP. 193-
223.
- Ikamari, L. D. E (1996) Factors affecting Child Survival in Kenya. Unpublished PhD Thesis.
Australian National University. Canberra.
- Harttgen K. and Misselhorn M. (2006) “A multilevel Approach to Explain Child Mortality
and Undernutrition in South Asia and Sub-Saharan Africa” Ibero America Institute
for Eco.
- Kenya National Bureau of Statistics, Kenya Demographic and Health Survey-2008/09
- Khasakhala, A. (1996) “ Health Nutrition And Population; Population Studies And Research
Institute Occasional Publications Series Vol. V. Training Documents For The Short
Course On Population And Development.”
- Klaauw, van der B. and L. Wang (2003) ‘Child Mortality in Rural India’, World Bank

Working Paper, Washington DC: World Bank.
- K’Oyugi, B. O. (1992) The Impact Of Household And Community Environmental Factors
On Infant and Child Mortality In Rural Kenya. Unpublished Phd. Thesis, University
of Nairobi.

- Kumar, S. K. (1977) "Composition of economic constrains in child nutrition: Impact of maternal incomes and employment in low income households," Ph.D. Thesis, Cornell University.
- Kunstadter, P. (1995). "Community, Household and Parental Factors in Rapid Improvement of Infant Survival: Preliminary Analysis of Changes Among Hamong in Thailand." Paper presented at the Annual Meeting of Population Association of America, San Francisco, April 6-8.
- Kyobutungi C, Ziraba AK, Ezeh A & Ye Y (2008) The Burden of disease profile of residents of Nairobi's slums: results from a demographic surveillance. *Population Health Metric* 6, 1.
- Macassa, G. et al., Geographic Differentials in Mortality of Children in Mozambique: Their Implications for Achievement of Millennium Development Goal 4. *J Health Popul Nutr.* Sep 2012; 30(3): 331–345.
- Maclean, V. 1974. *Magical Medicine: A Nigerian Case Study*. London: Penguin.
- McGuire J. (2006). Basic health care provision and under -5 mortality: A cross-national study of developing countries *World Development* Vol .34, No, 3 pp405-425 2006
- Madise NJ, Diamond I. 1995. Determinant of infant mortality in Malawi: an analysis to control for death clustering within families. *J Biosoc Sci.* 1995; 27(1):95–106.
- Magadi M. A. (2000) "Status of Women and Infant child health in Kenya with particular reference to the high mortality zone in Nyanza province", Study reports No. 26- 1997. Union for Africa Population Studies.
- Martin, et al., (1980).Covariates of Child Mortality in the Phillipines, Indonesia, and Pakistan. *Population Studies*, 37 .3: 417 - 432
- Maurice M. et al. (2012). Is mortality among under-five children in Nairobi slums seasonal? African Population and Health Research Center, Nairobi, Kenya.
- Mensch, B. et al. (1983) Comparative patterns of child mortality differentials in developing countries. Paper presented to the annual meetings of the Population Association of America, Pittsburgh, Pa., April 13-15.

- Mensch, B. and Preston S. (1985) Socioeconomic Differentials in Child Mortality in Developing Countries. New York: Department of International Economic and Social Affairs, United Nations.
- Merrick, T. W (1983) Access to Piped water and early childhood mortality in Urban Brazil. 1970-1976. World Bank Staff Working Paper, No. 594. Washington D. C. World Bank
- Mill E. S. and Becker C. M. (1986).Studies in Indian Urban Development. Washington, D.C.: World Bank.
- Mooley W. H. (1991). “Will Primary Health Care Reduce infants/child mortality” In Health Policy, Social Policy and Mortality prospects (edited by Vallin, J and Lopes A. D); International study of population, New York.
- Mosley W. H and Chen L. (1984) An analytical framework for the study of child survival in developing countries. In child survival: Strategies for Research, Population And Development Review, Vol. 10. Supplement, pp. 25-45. N.Y.
- Muhuri P. K. (1996) Estimating seasonality effects on child mortality in Matlab, Bangladesh. Demography 33, 98–110.
- Ndugwa RP & Zulu EM (2008) Child morbidity and Care-seeking in Nairobi slum settlements: the role of environmental and Socio-economic factors. Journal of Child Health Care 12, 314–328.
- Nolan, T. et al., Quality of hospital care for seriously ill children in less-developed countries The Lancet, Volume 357, Issue 9250, 13 January 2001, Pages 106-110
- Ndunya, N.L. (1992) “Environmental risk factors of childhood mortality in Kenya: Evidence and policy inolications” PSRI, University of Nairobi M. A. Thesis.
- Ooi L & Phua K. (2007) Urbanization and slum formation. Journal of Urban Health 84, 27–34.
- Omariba, D. et al., (2007). Determinants of infant and child mortality in Kenya: an analysis controlling for frailty effects. Popul Res Policy Rev, 26, 299–321.

- Palloni, A. (1981). "Mortality in Latin America: Emerging Patterns." *Population and Development Review* 7:623-49.
- Pickett, J. A. et al., (2001). Listing of causes of death of persons with autism in California, 1983–1987. <http://www.LifeExpectancy.com/autism.html>.
- Popkin, Barry, M. 1975. "Income, time, the working mother and child nutriture," Discussion Paper No. 75-9, Institute of Economic Development and Research, University of the Philippines, Manila.
- Potts, M and Thapa, S. (1991) *Child Survival: The role of family planning*; Family Health International. N.Y.
- Preston, Samuel H. and Michael R. Haines. 1991. *Fatal Years: Child Mortality in Late Nineteenth Century America*. Princeton: Princeton University Press.
- Prudh'Homme, Remmy (1994). "On the Economic Role of Cities." Paper presented at the conference on cities and the New Global Economy organized by the government of Australia and OECD, November 20-23, Melbourne.
- Puffer, R and Serrano V. C. (1979) *Patterns of mortality in childhood Pan American Samrary Bureau*. N. Y.
- Ross, A. J. et al. (1992) *Family planning and child survival programmes as assessed in 1991*. The Population Council N.Y.
- Rwanda Demographic and Health Survey-2010
- Shultz, T. Paul (1985), *Household Economic and Community Variables As Determinants Of Mortality*. In *International Population Conference, Florence 1985, Vol 2* Liege: International Union For The Study Of Population.
- Sastry, N. Trends in Socioeconomic Inequalities in Mortality in Developing Countries: The Case of Child Survival in Sao Paulo, Brazil. *Demography* 41 (3) (2004): 443-464
- Sawyer, et al., 1987. "The impact of urbanization and industrialization on mortality in Brazil," *World Health Statistics Quarterly* 40: 84–95.

Simmons, G. B. and Stan Bernstein, 1982. "The Educational Status of Parents and Infant and Child Mortality in Rural North India", *Health Policy and Education*, Vol. 2 349-67.

Somoza, J.L. 1980. *Illustrative analysis: infant and child mortality in Colombia*. World Fertility Survey Scientific Reports .No. 10. London: World Fertility Survey.

Tanzania Demographic and Health Survey-2010

Tekce, B and Shorter, F. C. (1985) Determinants of child mortality. A Study of squatter settlements in Jordan. In *child survival: strategies for research* W.H. Mosley and Chen (eds) *Population and Development Review* (N.Y.) Vol. 10, supplement, PP257-280.

Tesfay Teklu and Venkatacharya K. (1986) "Estimation of Infant and Child Mortality in Africa: Recent Experiences." A Paper Presented at the World Fertility Survey Regional Review Seminar. Addis Ababa: 17-21 March

Unger, A. (2013). Children's health in slum settings. *Arch Dis Child*. Doi: 10.1136/archdischild-2011-301621.

UNICEF (1992, 2012), *Situation Analysis of children and women in Kenya*. Unicef, Nairobi.

UNCHS (1996) *An Urbanizing World: Global Report on Human Settlements, 1996*, Oxford University Press, Oxford and New York.

United Nations Children's Fund, *Progress for Children: A World Fit for Children statistical review*, Number 6, UNICEF, New York.

UNCHS (1993). *Support Measures to Promote Rental Housing for Low Income Groups*. Nairobi: United Nations Centre for Human Settlements, HS/294/93E.

Un - Habitat. (2008). *State of the World's Cities 2008/2009: Harmonious Cities*. London & Sterling, Va: Earthscan

United Nations Human Settlements Programme (UN-Habitat). (2003) *The Challenge of Slums – Global Report on Human Settlements 2003*. Earthscan Publications Ltd, Nairobi

United Nations Population Fund (2003) State of World Population 2003, New York.

Victoria, C. et al. (1993). 'International Differences in Clinical Patterns of Diarrhoeal Deaths: A Comparison of Children from Brazil, Senegal, Bangladesh and India.' Journal of Diarrhoeal Disease Research 11:25-29.

Victora , et al., (2003) Applying an equity lens to child health and mortality: more of the same is not enough. Lancet 2003; 362: 233-241.

Wilm Quentin, et al., (2014) Inequalities in child mortality in ten major Africa cities, BMC Medicine 2014, 12:95 doi: 10.1186/1741-7015-12-95.

Woldemicael G. (1998), 'The effects of water supply and sanitation on childhood mortality in urban Eritrea', Stockholm Research Reports in Demography No. 127, Demography unit, Stockholm University.

Wood, C.H., and J.A.M. Carvalho (1988) The demography of inequality in Brazil. New York: Cambridge University Press.

World Factbook (2011) Accessed on February 28, 2011.). Fact book, from http://en.wikipedia.org/wiki/The_World_Factbook

Zanini, R R, et al. (2009) Infant mortality trends in the State of Rio Grande do Sul, Brazil, 1994- 2004: A multilevel analysis and community risk factors. Cad.Saude Publica, Rio de Janerio, 25(5), 1035-1045.